RESOURCE RECOVERY OR DOWNCYCLING

RECOVERING RESOURCES THROUGH DOWNCYCLING

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INTRODUCTION

This video explains resource recovery and downcycling processes and introduces one of the tools for developing a resource recovery extension business model.

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EXPECTED LEARNING OUTCOMES

KNOWLEDGE	• Knowledge of opportunities from downcycling • Knowledge of downcycling and business models relating to resource recovery
SKILLS	• Defining the differences between resource recovery processes and downcycling processes • Developing your own resource recovery business model concept
ATTITUDES	• Importance of resource recovery business models and the impact of such businesses in circular economy processes

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SELF-REFLECTION EXERCISE

Please fill the self-reflection exercise to test your knowledge about downcycling and resource recovery for sustainable business and circular economy. There are only five questions, be careful, there are questions where the right answers are more than one!

https://docs.google.com/forms/d/e/1FAIpQLSdYX7MxC5hAcYOugvcWNUOouABR7ploTjhvNXL5w3rr7hqhOg/viewform

A DEEPER INTRODUCTION INTO RESOURCE RECOVERY

Many of the earth's resources are not finite. Therefore, we must invest in a circular economy that prioritises resource management and recovery to keep materials in circulation if possible. Resource recovery aims to use waste as an input material to create valuable products as new outputs. It forms a foundational part of a circular economy in which materials and products are designed for durability, reuse, repairability, remanufacturing and recycling.

Resource recovery can take many forms. It is principally the recycling of waste or recovery of materials in an industrial setting and does not involve the recycling of consumer waste. It converts industrial waste into secondary raw materials with the ambition of obtaining additional uses from the resources and extracting more value from them by delaying their final disposal for as long as possible. The resource recovery model intends to limit the need for new, virgin resources by reusing existing waste and transforming it into a new resource. Industrial businesses can benefit massively by adopting the resource recovery model into their business plan. Firstly, it is advantageous as consumers are becoming increasingly environmentally conscious and seeking to support businesses that adopt eco-friendly practices. There are also financial advantages for companies as identifying cost-effective ways to reuse waste offers an opportunity to recover resource investment costs. This is of particular interest to companies that produce large volumes of products.

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One form of resource recovery is downcycling. It's important to note that downcycling is like, but different from 'open-loop recycling. Downcycling, by default, is associated with a loss of quality. In contrast, open-loop recycling combines upcycling and downcycling as the resultant secondary material is involved in a different production system than the original material. Another form of resource recovery is 'upcycling', whereby a product is transformed into a secondary material of higher value than its origin.

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HOW TO CONDUCT A PRODUCT LIFECYCLE ANALYSIS: APPROACHES, TOOLS, ADVANTAGES AND PITFALLS

Life Cycle Analysis, also known as Life Cycle Assessment (LCA), is a process for evaluating a product's or service's environmental impacts throughout its life. It is often used to determine the best performing product, service, or other solution, at a given time, in terms of specific environmental impacts, such as carbon emissions.

Different LCA Approaches

There are several different approaches to a life cycle analysis, each with its merits and pitfalls. The most common of these are listed below:

- Conceptual LCA: fundamental level looking at qualitative inventory to create flow diagrams and assess, for instance, which components have the highest relative environmental impact
- Simplified LCA: A more detailed LCA using generic data and standard modules for energy production. A simplified assessment that centres on the most vital environmental aspects and thoroughly analyses the reliability of the results
- Detailed LCA: The full process of in-depth data collection, focused on the product in question

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Tools for Lifecycle Analysis

There are many free LCA tools online available to start-up businesses:

- OpenLCA – an open-source Life Cycle Assessment software
- The LCA Calculator – instant carbon footprint software for a sustainable design solution
- SimaPro – an LCA software used to perform comprehensive life cycle analysis of products, services, and manufacturing processes.

Advantages

Consumers are demanding that businesses provide ethical products and services in a world that is becoming increasingly conscious of its environmental impact and the need to counteract the influence of the climate emergency. It's, therefore, vital that businesses can calculate their business impact and can trace this for consumers with credible data.

Below are some other advantages:

- Provides a comprehensive view of the environmental impacts
- Quantifies environmental effects such as overall energy consumption or air emissions
- Allows the comparison of alternatives
- Recognises the inefficiencies or significant changes across life cycle phases
- Reduce overall environmental impact and costs

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Pitfalls

While generating an LCA is intelligent for your business, it also has some downsides. They are a costly process that requires business time and money; therefore, investors may delay investment decisions to the timescales involved with this process. LCAs can only measure metrics we can quantify, like carbon emissions, and skew findings towards those metrics. The method also often ignores impacts that are harder to measure or poorly understood, for example, environmental plastic or the long-term effects of landfill runoff.

Anything that isn't defined within the model of the LCA will not be accounted for. Not only that, LCAs, like all models, depend on the data you feed into them and the assumptions you make. If you do not have a robust dataset, i.e., data deficient, then the LCA will not be accurate. The authors of the LCA, reliability of the data, availability of the data, etc., should always be considered when interpreting the results.

Moving toward a circular economy is vital for the future of our planet, especially when finite resources are involved. While LCAs are a fantastic starting point for businesses to transition to a circular-based model, they must also look at the long-term collective benefits and the short-term gains from individual companies.

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CLOSING THE LOOP: HOW TO INNOVATE YOUR BUSINESS USING DOWNCYCLING

While downcycling is often associated with being the poorer relation of its upcycling cousin, this doesn't have to be the case. Downcycling can also be an example of rags to riches for your business.

Transitioning from a linear economy – whereby resources are shaped into products that are then destined for landfill after their first use – to a circular economy that focuses on reducing, reusing, and recycling is necessary for the planet. Not only this, but it can also have enormous bonuses for your business. Numerous businesses and start-ups have incorporated it within their business model and are already reaping the rewards.

Closed-loop recycling is collecting, recycling, and producing waste to create a new product. As a result, the loop of products from product conception to end of life is closed. The waste does a complete circle without harming the environment. Through this system, products are designed to benefit the overall supply chain, emphasising universal collection and recovery, ease of re-manufacturing, and economic feasibility.

A classic example of closed-loop recycling in action is products that include glass used for bottles and jars, aluminium used for cans and tins, and a minimal amount of plastic. Glass and aluminium are wonder materials as they are infinitely recyclable with no degradation of quality, making them infinitely valuable to the loop. Roughly 75% of all aluminium ever produced is still in use today. Conversely, only 2% of global plastic production is reused for the same or similar products.

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It’s important to note that closed-loop recycling differs from the far more widespread open-loop recycling, which does not rely on the output of the process and instead focuses more on the action of recycling material. Recycling materials may take multiple routes, such as downcycling or upcycling.

Closed-loop recycling isn’t only good for reducing your business’ impact on the environment, but by using fewer materials, you can lower costs too. With better environmental credentials, your business can charge more money for products, improving your profits and heightening your social credibility amongst consumers simultaneously. Furthermore, your business will also experience lower bills as energy efficiency is improved, and your business must send less waste to landfills. In some countries, you may also benefit from tax relief.

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Examples of Closed-Loop Recycling in Action

So how do businesses implement closed-loop recycling into their business model?

- Dell has been an international leader in circular design, generating a closed loop for the plastics used in computers and monitors and a partnership with hard drive manufacturer Seagate to recover and reuse rare-earth magnets.
- In the textiles and apparel industry PANGAIA uses a closed-loop lyocell rayon made from bamboo, eucalyptus, and seaweed fibres as one of its materials.
- Days engineers its clothing with 100% organic cotton and provides customers with a prepaid envelope to swap them in exchange for a new item on its site. The company re-pulps the old clothes and manufactures the fibres back into yarn used in the new clothing.

POSITIVE BUSINESS DEVELOPMENT: WHY CLOSING THE LOOP IS GOOD FOR YOUR BUSINESS

From those just getting started in the business world to those at the top of their game, the focus is often the same: how can we drive costs down and increase profits? Closing the loop is an excellent way of doing just that in an environmentally conscious way that helps to win consumer support. But don't just take our word for it. Here is a list of start-ups making the most of a business model prioritising closed-loop recycling through downcycling and succeeding.

What is Downcycling?

Downcycling starts the same way as recycling: products are broken down into basic materials and refashioned into something new. When those new products have a lower value than the original product, this is called "downcycling". For example, concrete is widely known to last for hundreds of years. Still, when old buildings are demolished, it starts a new life as the crushed concrete is downcycled into road filler: a cheaper product with less value and lower complexity than newly produced concrete. This is not motivated by a shortage of road filler or any surplus of concrete. It simply occurs because, most of the time, it is cheaper and easier to downcycle than to recycle.

Businesses Building Back Better

- GumShoe is true to its name - it creates shoes out of used (i.e. chewed) gum. The company focuses on collecting their gum straight from the street – cleaning the path for people's shoes whilst making more shoes. Based in Amsterdam, the GumShoe team walk the streets of the Netherlands to gather their material. Not only does this help clean community streets of chewed gum litter, but it also provides a recycled source of rubber.

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- Bureo is “untangling the ocean”. Plastic pollution is a global issue. With an estimated 640,000 discarded fishing nets polluting the ocean yearly – comprising roughly 10% of plastic ocean pollution – Bureo has focused on reusing that material to produce new commodities. They partner with other manufacturing brands to create recycling goods like Jenga, Patagonia and Carver. Staying true to their coastal roots, their recycling material specialities are skateboards and sunglasses. They’ve collected over 185,000kg of used materials for recycling since 2013

- Eight bottles in one t-shirt should be the unofficial slogan for Recover Brands, a sustainability advocate and 100% recycled clothing manufacturer. Their unique selling point comes from their specialisation in generating recycled yarn. Based in North Carolina, USA, Recover Brand prioritises global partnership and responsible manufacturing. They also support co-ops in Haiti and Guatemala.

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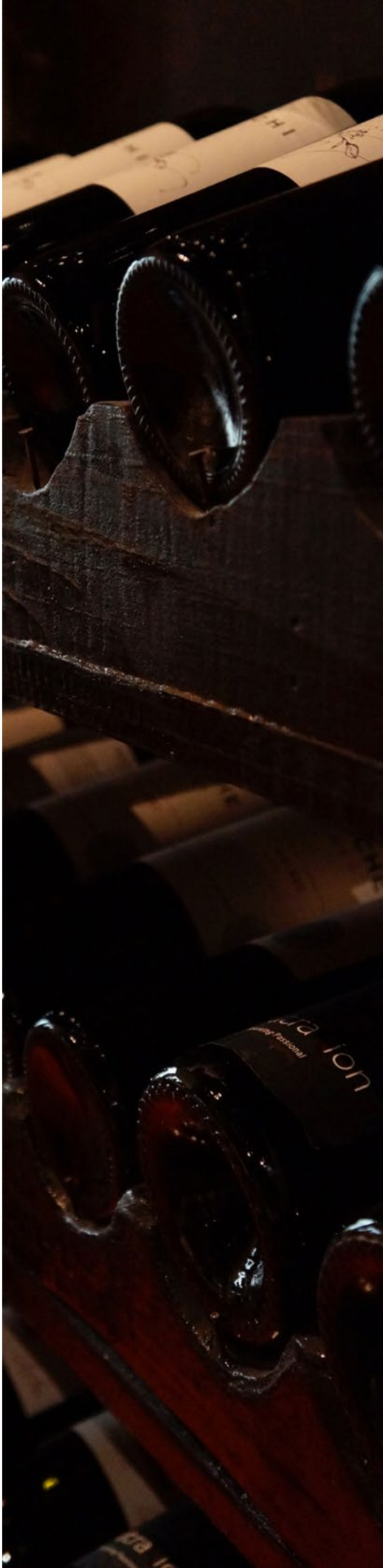
While downcycling is far from perfect, it is widely considered preferable to landfill or incineration. Any recycling helps keep materials in use, potentially lowering demand for certain materials. Downcycling paper and plastic into new products means that these new products don't need to be created from virgin paper or plastic, which is hugely beneficial for the environment. Another example of success is the Dutch-based company Rebottled that upcycles empty wine bottles into designer glassware. They have diverted 140 000 glass bottles from going to waste to date. Moreover, the energy used to create the original glass bottles has been preserved. Rebottled has thus 'saved' at least 63 MWh compared to the production of new glass.

Making money doesn't have to cost the Earth; downcycling proves that.



CASE STUDIES INVOLVED IN THE CLOSED LOOP

Downcycling takes make forms. One example is the transformation of plastic bottles into carpeting or fleece fibres which are later turned into plastic lumber products. Plastic bottles may also be downcycled into railroad ties, drainage pipes or park benches, for example.

Sustainable art is another vast area of potential for downcycling. Whether it takes the form of glass bottles, plastic bags or aluminium cans, waste that would otherwise be filling landfills or floating in the ocean is now being utilised by artists worldwide to create inspiring artwork.

Car parts are another beneficiary of downcycling. Steel scrap from end-of-life vehicles is frequently contaminated with copper from wires and tin coating, which yields secondary steel that doesn't meet the requirements of the automotive steel industry and, as a result, ends up in the construction sector. Other examples include melting aluminium alloys to produce lower-grade casting alloys.

Within the IT sector, companies like Dell have established closed-loop supply chains to increase the value of their products. Recognising that materials like plastics and paper are likely to lose their value after each recycling period, Dell has developed processes to prevent plastics from deteriorating, saving the company money and reducing carbon emissions.

In the paper industry, downcycling is already reasonably commonplace. For example, paper waste can be used to create package fillers, eco-friendly packaging, toilet paper or marketing materials.

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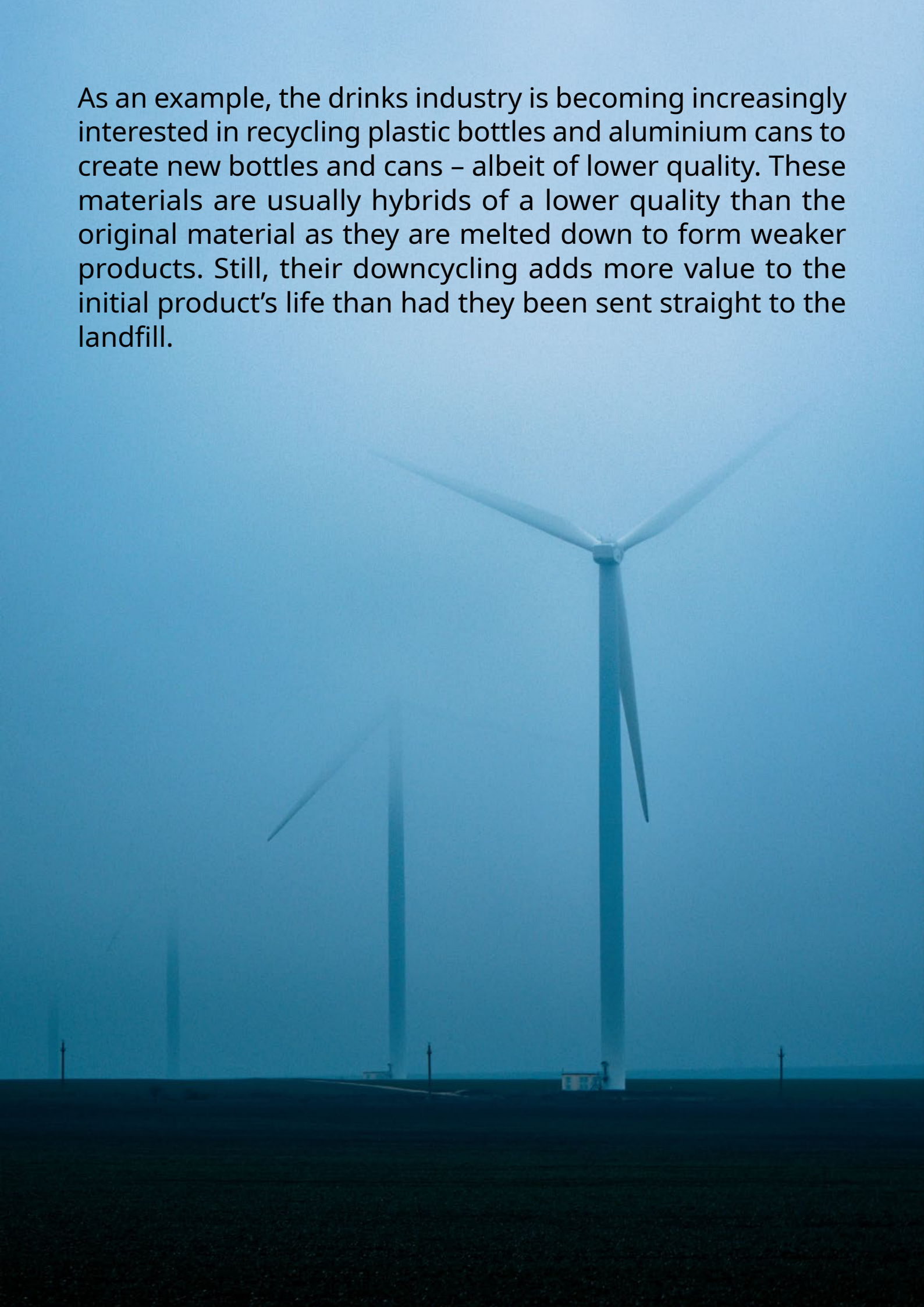
As an example, the drinks industry is becoming increasingly interested in recycling plastic bottles and aluminium cans to create new bottles and cans – albeit of lower quality. These materials are usually hybrids of a lower quality than the original material as they are melted down to form weaker products. Still, their downcycling adds more value to the initial product's life than had they been sent straight to the landfill.



FINAL ASSESSMENT TASK

TITLE OF THE TASK:
Make your own Resource recovery business model concept

AIM OF THE ACTIVITY:
The aim of the activity is to understand an advanced level resource recovery business model concept where knowledge from all theoretical studies combines at one final task. This task needs to be done in groups of three or four people.

TIME REQUIRED:
3 hours + time for presentation (each team has 10 min)

MATERIALS REQUIRED:
www.canva.com

FORMAT FOR THE PRESENTATION:
Infographic in a pdf or jpg (png) format

STEPS TO COMPLETE THE TASK:
- Before the task, please, watch videos about resource recovery and downcycling
  https://www.youtube.com/watch?v=4bUFfo3LQCY&t=2s
  https://www.youtube.com/watch?v=87t-xuXwvRo
  https://www.youtube.com/watch?v=syxHThaBe90
  https://www.youtube.com/watch?v=brMxcEbu43c
- Following, within a group of three or four people, please, brainstorm ideas of resource recovery business model or business model which contains downcycling.
- With your team members agree on one idea

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- For this idea develop a resource recovery business model concept or business model which contains downcycling in an infographic format using digital tool (for example: www.canva.com; https://www.altexsoft.com/business-model-canvas-template-online/) or download your copy: https://www.businessmodelsinc.com/en/inspiration/tools/business-model-canvas
- Each give an explanation and has discussion on infographics which then can be shared amongst the overall group

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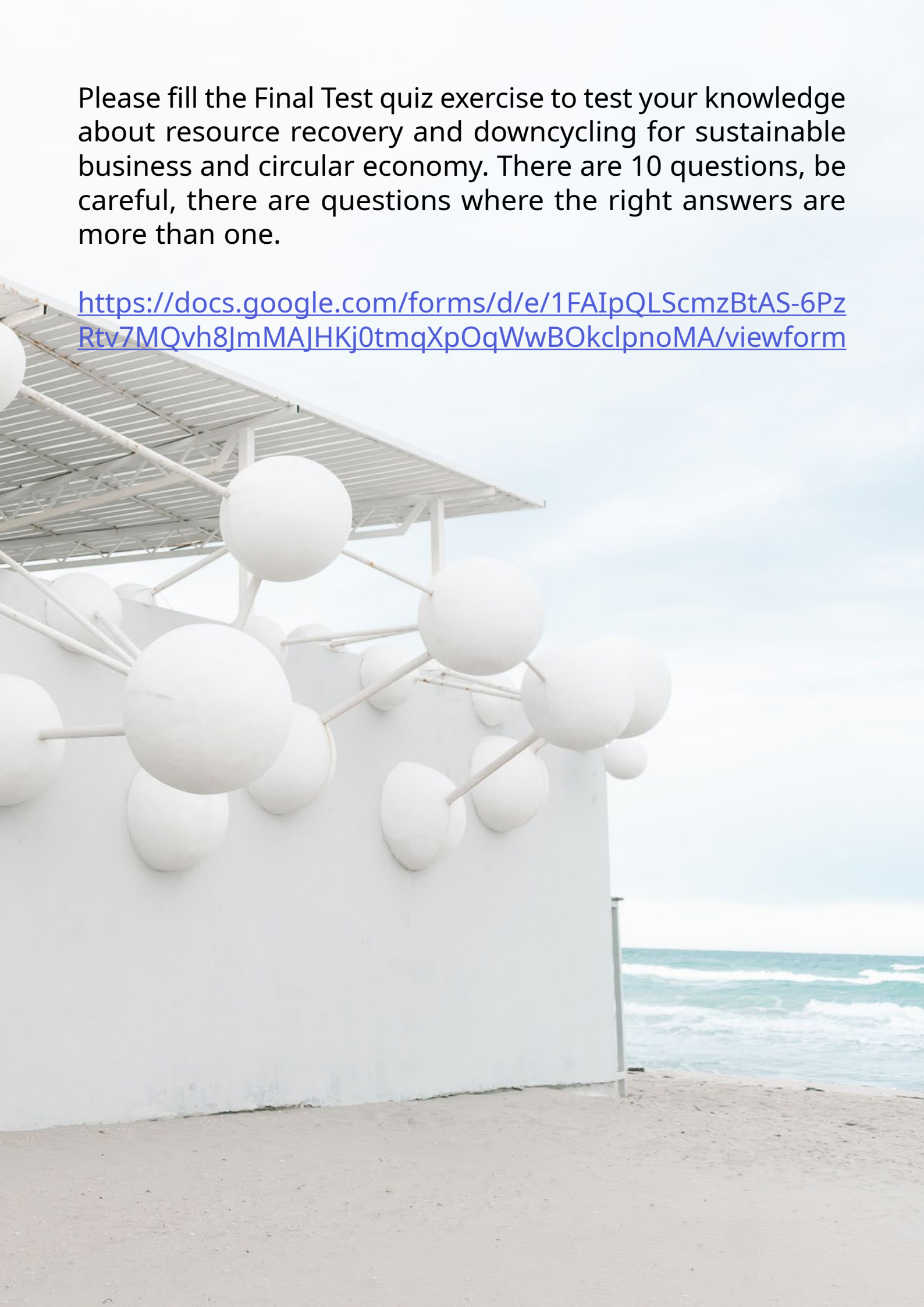
FINAL TEST

Please fill the Final Test quiz exercise to test your knowledge about resource recovery and downcycling for sustainable business and circular economy. There are 10 questions, be careful, there are questions where the right answers are more than one.

https://docs.google.com/forms/d/e/1FAIpQLScmzBtAS-6PzRtv7MQvh8JmMAJHKj0tmqXpOqWwBOkclpnoMA/viewform



FURTHER READING AND RESOURCES

Closed Loop recycling
https://www.forbes.com/sites/next-1000/2022/04/18/closing-the-loop-is-the-future-of-business/?sh=4a37f3d96877

Life Cycle assessment
https://ellenmacarthurfoundation.org/life-cycle-assessment-for-the-circular-economy

Resource Recovery From Waste
https://www.frontiersin.org/articles/10.3389/fenvs.2020.00035/full

What is downcycling
https://www.greenmatters.com/p/what-is-downcycling

Recycling, downcycling and the need for a circular economy
https://www.metabolic.nl/news/recycling-downcycling-and-the-need-for-a-circular-economy/

Gum Shoe Case study
https://www.theverge.com/2018/4/24/17274414/sneakers-chewing-gum-tec-amsterdam-gum-drop-explicit-wear

Six products making the most of ocean waste
https://resource.co/article/six-products-making-most-plastic-ocean-waste-11535

What is Resource Recovery?
https://grasshopper.net.au/what-is-resource-recovery/

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Resource Recovery: Turning Waste into Energy
https://extension.psu.edu/resource-recovery-turning-waste-into-energy

The Circular Economy: What Is a Resource Recovery Model?
https://blog.veolianorthamerica.com/circular-economy-what-is-resource-recovery-model

It's All Downcycled From Here
https://freshkillspark.org/blog/its-all-downcycled-from-here

Recycling Explained! Learn About Upcycling, Downcycling & Pre-Cycling
https://www.youtube.com/watch?v=YjJMTy5noy8

Shaping the future of resource recovery in Aarhus, Denmark
https://iwa-network.org/shaping-the-future-of-resource-recovery-in-aarhus-denmark/

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