Name

Date

Circular Economy Case Studies

1. Full-Circle Fashion: Green Jeans

Even if you've never heard of "fast fashion," you've probably seen its effects. Fast fashion is all about cheap, trendy clothes that are only worn for a short amount of time. New styles appear quickly, and then disappear just as quickly when the next trend comes along. Fast fashion means that people do not wear clothing for as long as they used to before getting rid of it.

This has led to a big problem. According to the U.S. Environmental Protection Agency, the amount of textiles being sent to landfills in the United States increased by nearly 500 percent between 1980 and 2018—from 2.3 million tons to 11.3 million tons per year. Less than one percent of waste clothing is recycled into new clothing, which represents a $100 billion loss of resources per year.

How can apparel companies help reduce the amount of clothing thrown in landfills every year? MUD Jeans, based in the Netherlands, came up with a clever solution. Instead of just selling jeans to customers, they lease them. Customers pay a monthly fee to wear their MUD jeans for a year. The jeans, which are made from organic and recycled cotton, cost about $12 to $15 per month to lease. If the jeans need to be repaired, MUD takes care of everything for free.

After one year, the customer can choose to keep the jeans forever, swap them for a new pair and start another lease, or just return them to MUD for recycling. The returns are all prepaid by MUD, which makes it simple for customers to send their jeans back for recycling. Every time a customer returns a pair of jeans, they receive a discount on their next pair. By changing the idea of who owns the jeans, MUD has found a way to encourage buyers to recycle their clothes instead of throwing them out.

When jeans are returned to MUD, they are inspected. If the jeans are still in good condition, they can be cleaned and reused. If they are not in wearable condition, they are sent to a textile recovery plant. There, the jeans are shredded into fluffy blue cotton fiber. This is similar to freshly harvested cotton, but it has shorter cotton fibers because of the shredding process. Fresh organic cotton is blended into the recycled mix, which adds longer fibers and improves the strength of the material. This is then spun into new yarn, which is used to weave denim for new pairs of jeans. About 40 percent of every new pair of MUD jeans is made of old jeans. The company hopes to increase this percentage to 100 percent over time.

Reusing denim is just one way that MUD reduces its environmental impact. Its factories also use innovative water treatment and dyeing techniques. It takes about 1,800 gallons of water to make a typical pair of jeans; for a pair of MUD jeans, it takes only about 150 gallons of water. In addition, MUD uses only non-harmful, biodegradable chemicals. In total, a typical pair of non-

MUD jeans creates about 50 pounds of CO_2 emissions, while a pair of MUD jeans creates less than 16 pounds of emissions. The company offsets these emissions by investing in renewable energy.

MUD Jeans has found a clever way of reducing the clothing industry's environmental impact. By changing how consumers think about ownership, they send an important message: We're all in this together.

Helpful links:

Moving Toward a Circular Economy
https://www.youtube.com/watch?v=JaX60U2_Ibw&ab_channel=MudJeansInternationalB.V.

By the Numbers: The Economic, Social and Environmental Impacts of 'Fast Fashion'"
https://www.wri.org/blog/2019/01/numbers-economic-social-and-environmental-impacts-fast-fashion

2. Turn the Beat Around: Closing the Loop on Headphones

Headphones have become one of the most popular pieces of personal tech in recent years. A 2014 survey by SOL REPUBLIC found that more than half of millennials own three or more headphones, and wear them nearly four hours each day. However, like many modern electronic devices, headphones pose special problems when they stop working.

Electronic waste, or e-waste, is a growing problem. Quickly advancing technology, cheaper build quality, and changing style trends all mean that tech devices can become outdated or broken in a short time. According to the Global E-Waste Monitor, in 2019, over 58 million tons of e-waste were generated. And many of those waste products contain valuable materials, such as gold or platinum. In the United States alone, about $57 billion in recoverable e-waste materials were thrown away instead of recycled. E-waste also often contains hazardous chemicals that can contaminate landfills.

Like most e-waste, headphones can be tricky because they contain so many different types of components. They usually contain metal, plastic, rubber, and foam. Due to how the headphones are constructed, these parts can often be difficult to separate for recycling.

Over 16,000 tons of headphones are thrown away each year. Gerrard Street, a headphone manufacturer based in the Netherlands, is trying to close the loop on e-waste. This idea follows through the company's design, construction, and even sales methods. Gerrard Street's headphones are designed from the ground up to be modular—in other words, each part is made to be taken apart easily and replaced as necessary. This means that, unlike most headphones, Gerrard Street headphones are easy to repair, so they can be used for a longer amount of time. They also use no glue in their construction, which means that each different component can be separated easily for disassembly or recycling.

Gerrard Street offers their headphones to consumers in two ways. First, they're available for purchase, and come with a lifetime warranty. If any part breaks, they will replace it for free, and send an envelope to return the broken part for free as well. If they can find a way to fix the broken part, they will; otherwise, they will recycle it. The second way to get Gerrard Street headphones is by subscription. For an annual fee of around $100 to $150, depending on the model (which is about half of the purchase price), you can rent a pair of headphones. When the subscription is up, you can renew, try a different model, or just return them free of charge. Just like the purchased headphones, all repairs are free of charge for as long as you subscribe.

To create a more circular piece of personal tech, Gerrard Street worked from the ground up to design headphones that can last a lifetime. A product that never gets thrown away—a simple solution to reducing waste.

Helpful links:

Gerrard Street
https://gerrardstreet.nl/

Columbia University Earth Institute: "What Can We Do About the Growing E-Waste Problem?"
https://blogs.ei.columbia.edu/2018/08/27/growing-e-waste-problem/

The Global E-Waste Monitor
http://ewastemonitor.info/

3. Electrified: Reducing Emissions in Shenzhen

Shenzhen is a city located in southern China's Guangdong Province, next to Hong Kong. Beginning in 1979, Shenzhen rapidly transformed from a fishing village into a hub of high technology and industry. By 2019, Shenzhen was the third-busiest shipping port in the world.

Rapid urban growth, however, can have a severe negative impact on the environment. Shenzhen was struggling with its air quality, with fuel vehicles producing as much as 20 percent of the city's air pollution. With the support of local and national government, Shenzhen launched a plan to electrify its public transportation. Before 2016, the cost of a single electric passenger bus, or e-bus, was over $250,000. For an entire city fleet of e-buses, the cost could be overwhelming. Instead, the government and bus manufacturers came up with a plan: government-supported bus companies would rent the e-buses from the manufacturers. The e-bus companies would sign an eight-year rental agreement for each e-bus, and the manufacturer would be responsible for maintenance and repair of the e-bus. This model encourages the bus maker to reduce waste and design components for reuse and recycling.

E-buses have many advantages over traditional fuel buses. Each e-bus produces about 40 percent fewer emissions than a diesel vehicle. E-buses also run more quietly and generate less heat, reducing noise pollution and urban heat island effects. In 2017, Shenzhen became the first city in the world to have a fully electric bus fleet. By 2019, the city had replaced 16,000 buses and 23,000 taxis with electric vehicles. In addition, the city's major e-bus manufacturer has exported its success: it sells e-buses to 300 other cities across the globe.

Electrifying the city's vehicles has also led to challenges. For example, the batteries in electric vehicles wear out over time. These batteries contain materials that can be hazardous if they are simply thrown in a landfill. The batteries also contain valuable rare earth elements. This challenge has led to opportunity: a new industry devoted to recycling old batteries and extracting the useful materials inside.

Another challenge for maintaining a fleet of electric vehicles is making sure they stay charged. This has led to rapid growth in charging facilities across the city. By 2018, one of the city's main bus suppliers, Shenzhen Eastern Bus Company, had access to one charging point for every two of its buses. This allowed the company to keep its buses in a constant cycle of charging when they are not in use, since a fully charged bus can operate for one full day.

Even though the vehicles generate fewer emissions, the source of the electricity is still a concern. In 2019, only one percent of the energy used in Shenzhen's electrification program was from renewable sources. However, the city—like China as a whole—has committed to increasing its development of renewable energy in the coming years. Creating a transportation

system based on electricity, rather than fossil fuels, gives Shenzhen the flexibility to keep improving and striving for a more circular economy.

Helpful links:

Shenzhen Government Online
http://www.sz.gov.cn/en/

"Shenzhen's Silent Revolution: World's First Fully Electric Bus Fleet Quietens Chinese Megacity"
https://www.theguardian.com/cities/2018/dec/12/silence-shenzhen-world-first-electric-bus-fleet

4. From Bread to Brew: Repurposing Food Waste

Food waste is a massive problem, especially in the United States. According to the U.S. Department of Agriculture, between 30 and 40 percent of all food grown for Americans to eat is wasted. In 2010, this was equal to more than 200 pounds of wasted food per American, with a lost value of more than $160 billion. It's not just food that's wasted, either: producing all that wasted food takes farmland, water, and lots of human labor.

Bread is one food that has an especially high rate of waste. Bread has a short shelf life, which means it must be eaten quickly before it goes bad. Bread is also a food that people enjoy most when it is fresh. For these reasons, bread is often thrown away—both in the home and in supermarkets. In the United Kingdom, about 44 percent of all bread is wasted—an astonishing figure.

In 2015, a company called Toast Ale was created to address bread waste in a creative way. Toast Ale, based in London, brews beer using leftover bread that would otherwise be thrown away. The idea is not as far-fetched as it might sound: the oldest known beer recipe, from ancient Mesopotamia, used bread as an ingredient. The bread replaces some of the barley in a typical beer recipe. The bread is broken down into sugars, which are turned into alcohol by fermentation.

Much of the bread Toast Ale uses is donated by the sandwich industry. Sandwich makers normally throw away heel pieces from the ends of each loaf. Giving that bread to Toast Ale saves the sandwich makers the expense of disposing of it. The sandwich makers also get to participate in the circular economy. In 2019, Toast Ale estimated that it "upcycled" more than 850,000 slices of bread for the year, amounting to more than 30 tons. This allowed them to reduce their water use over a traditional beer maker by more than 28,000 gallons in 2019 alone.

Unlike many food companies, Toast Ale also spreads its message by sharing its beer recipe for free. The open-source recipe is available to anyone who joins their home brewer's club. In 2019, the company's bread beer recipe was downloaded more than 21,000 times. Toast Ale has even inspired other beer companies around the world to join the bread beer movement, using surplus bread from their own local bakeries. This is good news, since Toast Ale refuses to export their beer due to the negative environmental impact caused by long-distance shipping.

As a business, Toast Ale emphasizes its message over money. The company donates all its distributable profits to charities aimed at improving the current food system. This reinvestment mirrors the company's repurposing of food waste. Toast Ale's philosophy is summed up by its mission statement: "To lead a brewing movement to eliminate bread waste and fix the food system."

Helpful links:

Toast Ale: A Beer with More Taste and a World Without Waste
https://youtu.be/ukK9va0sWXo?list=TLGGIiAadnHcGnwxNjAyMjAyMQ

Food and Agriculture Organization of the United Nations: Food Loss and Food Waste Database
http://www.fao.org/food-loss-and-food-waste/flw-data

5. Repurposing with Purpose: Digital Recycling in Belo Horizonte

Belo Horizonte is a city of around 2.5 million people located north of Rio de Janeiro in Brazil. Like many large cities, Belo Horizonte faced many challenges. The city had a growing electronic waste (e-waste) problem, with computers and other electronic devices being thrown out as newer versions became available. The city also faced issues with digital exclusion: low-income communities did not have the same access to digital technology that wealthier residents enjoyed.

In 2008, city officials came up with a way to address both problems at the same time. They created the Belo Horizonte Computer Reconditioning Center (CRC), where low-income citizens are trained to restore old computer equipment to full working condition. The restored computers are then put to use in digital inclusion sites around the city. These sites are open to all citizens, but are focused in low-income areas. The sites provide online access for those who need it. They also provide digital literacy training, making it easier for those in need to perform tasks like paying bills online and submitting job applications electronically.

Here's how the process works. Companies and individuals can donate old computer and internet equipment to the CRC instead of throwing it away. The CRC program even has a door-to-door collection system for picking up donations. The donated items are evaluated by CRC team members; any equipment that cannot be remanufactured is sold off for recycling, with all profits being fed back into the CRC program.

The suitable donations are sent to the CRC's restoring facility. The facility is staffed by citizens from low-income communities, mostly aged 16 to 24. They have all been trained to restore the equipment to full working order. Once the equipment is restored, it is sent to one of the city's digital inclusion sites, where it can be used free of charge. The city has over 300 digital inclusion sites, focused mainly in low-income areas. Some of the equipment is also donated to public institutions like schools and libraries.

In the program's first nine years, about 7,000 pieces of equipment were restored and put to use. By 2018, about 360,000 pounds of e-waste had been kept out of landfills thanks to the CRC program. The program was also responsible for training more than 10,000 citizens in basic digital literacy skills, as well as digital equipment restoration.

The CRC program in Belo Horizonte is just one example of how a city can incorporate the circular economy into its policies and programs to benefit everyone. By thinking "circular," two problems—growing e-waste and lack of digital access for low-income citizens—were solved at the same time.

Helpful links:

CRC: Computer Reconditioning Center
https://prefeitura.pbh.gov.br/prodabel/inclusao-digital/centro-de-recondicionamento-de-computadores

6. Garbage into Gifts: Rede Asta Artisan Network

Like many countries, Brazil has a growing waste problem. In 2018, about 175,000 tons of solid waste was collected every single day. Less than three percent of this waste was recycled. This leads to an economic loss of about $21 billion in resources every year, in addition to the cost of dealing with all that waste.

Women in Brazil face another challenge as well: it is harder for them to enter the job market, and when they do, they are paid less than men. According to the Brazilian Institute of Geography and Statistics (IBGE), Brazilian women earned 20.5 percent less than Brazilian men in 2018. However, according to World Bank figures, women are responsible for 75 percent of consumer good purchases, and spend 90 percent of their income on their families.

In 2005, two women from the world of business created a new company to address both challenges. Rede Asta (or Asta Network in English) was created to reclaim waste products from large corporations, and use them as materials for talented artisans to create new, useful items. Specifically, the artisans create items that can be given as corporate gifts—a market worth over $1 billion.

First, Rede Asta partners with hundreds of companies throughout Brazil to collect their waste materials or unused equipment. This can include materials like plastic bottles, old uniforms, and even paper products. Rede Asta then offers these companies handmade corporate gifts crafted from the discarded materials. Corporate gifts are usually given out to employees or business partners to promote new products or projects. The company has even moved beyond the corporate world to match artisans with shop owners and designers looking to offer handmade goods.

Rede Asta also works to develop the artisans who create the goods. The company focuses on providing opportunities to low-income, female artisans around the country. It does this through an online network that matches artisans with projects. It even provides a physical workspace for artisans in Rio de Janeiro, where many of the new product designs are developed. Rede Asta also offers a business training program to help artisans make the most of their talents.

Rede Asta's model for turning garbage into gifts has proven successful. In 2019, the company earned revenues of more than $300,000, with nearly two tons of waste being reused for its products. For one project in 2019, the company's artisans transformed outdated vinyl banners into 5,000 reusable shopping bags. Since its creation, Rede Asta has supported more than 9,000 artisans with its various projects.

Helpful links:

Rede Asta company website
http://www.redeasta.com.br/

BBC: "Brazil's Social Firms Aim to Craft a Brighter Future"
http://www.bbc.co.uk/news/business-27884803