

# Module 3: Clothing upcycling as a green practice

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## REFERENCED DOCUMENTS

ID	Reference		Title
1	2021-1-EL01-KA220-VET-000034695		AR4RECLTHING Proposal
2	PR1/T1.3		Set Up AR4ReClothing Training Guide structure & Training methodology

## APPLICABLE DOCUMENTS

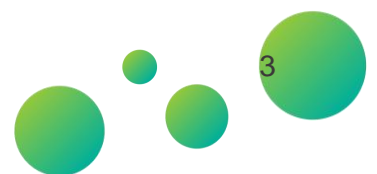
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# 1. Introduction

The module describes the basic principles of clothing "upcycling" and mentions other ways that could minimise textile waste - reducing, reusing and recycling. The material focuses on issues affecting the complexity of clothing recycling. In the production of textiles and clothing, various types of textile waste are generated, which can be divided into two large groups - pre-consumer and post-consumer waste. Both types of waste can be used for upcycling and clothing reconstruction. The process of upcycling involves both professionals who create fashionable clothes for sale, and amateurs - people who work on their own using do-it-yourself practices. A separate section describes the advantages and limitations of using textile waste in the upcycling process, including examples of refashioned clothing. The final part of the module includes extensive information on the ways of upcycling clothes - recovering and decorating, upcycling clothes from textile scraps or from used clothes - by transforming and refashioning them. The module concludes with various examples and opportunities for promoting and expanding the practice of clothing upcycling.

## 1.1 Learning Outcomes

<b>Module 3: Clothing Upcycling as a green practice</b>	The AR4REcLoTHING Expert is able to understand the concept of clothing upcycling as a green practice.	
<i>KNOWLEDGE</i>	<i>SKILLS</i>	<i>COMPETENCES</i>
a. Know the basics of clothing upcycling	a. Describe sustainable clothing design and upcycling	a. Raise awareness for sustainable clothing design and upcycling
b. Recognize sources of textiles used in the upcycling process	b. Determine clothes and fabrics for creative reuse and upcycling	b. Select and provide solutions for the clothes, fabrics/materials upcycling, and reuse
c. Identify types of clothing upcycling	c. Select most appropriate upcycling method for the clothing design	c. Provide solution for clothing upcycling.
d. Navigate in promotion and scaling-up of upcycling practices	d. Choose the most appropriate promotion and scaling-up strategy	d. Provide solution for promotion and scaling-up strategy





## 1.2 Key words

Upcycling, recycling, textile waste, clothing reuse, sustainable fashion

## 1.3 Estimated seat time to complete the Module

It is expected that this module [studying and implementation of practices] will take you around 20 hours to complete.

# 2. Clothing upcycling as a green practice

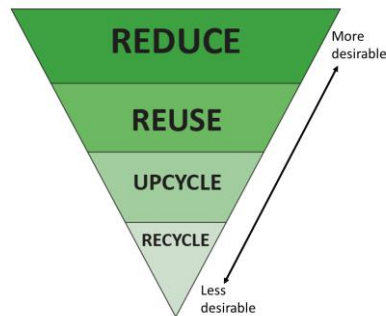
## 2.1 The basics of clothing upcycling

The fashion industry, as a part of the textile and garment sector, is one of the world's biggest polluters and has a significant impact on the world's available raw materials and human resources needed for product manufacturing. Because of ongoing changes in the fashion market and low pricing, the lifespan of textile materials is decreasing day by day. Fast fashion has led to a large increase in the amount of clothing produced, purchased, and thrown away each year, filling landfills, polluting nature and water, and negatively affecting the health and lives of living beings.

The EU Waste Framework Directive defines two objectives for the protection of the environment and human health: “to prevent and reduce the negative impacts caused by the generation and management of waste and to improve resource efficiency”. The Directive establishes a 'hierarchy' that EU member states must apply to waste management, where waste prevention and reuse are the most appropriate options, followed by recycling (including composting), then energy recovery, while waste disposal through landfills should be the very last resort (European Commission, 2022).

The most widely known sustainable waste management strategy in the fashion industry is referred to as the 3Rs waste hierarchy - reduce, reuse, and recycle. However, considering the rapid growth of fashion consumption and their subsequent disposal, the search for alternative solutions for waste management becomes an important issue, so another approach to fashion waste management has appeared: the refashioning of used clothes (Dissanayake & Sinha, 2013), or, as the currently widely used term - “upcycling”.





**IMAGE 1. TEXTILE WASTE MANAGEMENT HIERARCHY**

The textile sustainability pyramid clearly shows what should be the attitude of everyone toward textiles and clothing. The pyramid is upside down to better reveal the importance of each part. It makes you think about resources, quality, and your attitude toward clothing. At first you should use your own clothes and other textile materials for as long as possible. You should shop wisely and choose clothes that will last a long time, that can be combined with other items of clothing and that will not go out of fashion for a long time, or you can buy used clothes, thus reducing the amount of waste. Before recycling, it is possible to transform your own or used clothes and give them a new look through upcycling. When the clothing is no longer needed, it can be given away, sold, or finally recycled. At the very beginning, which is the most important thing in order not to harm ourselves and nature, we must think about using only sustainable clothing and textiles, i.e., those that provide the greatest benefit to humans while having the lowest negative impact on the environment.

## **Reducing**

Waste reducing or prevention is closely linked with improving production methods and influencing consumers to demand greener products and less packaging (Petarčić, 2020).

In general, reducing at the product manufacturing level means to prevent or minimise the amount of waste, the hazardous content and pollution generated at all stages of production. At the consumer level, reducing means less demand for new textiles and clothing, which would result in less waste. However, this is difficult to accomplish since retailers, particularly fast fashion brands, encourage excessive consumption by regularly introducing new fashions throughout the year and offering them at low prices. To reduce over-consumption, it is necessary to educate consumers and create an understanding of sustainable consumption (Apsara et al., 2022).

The low quality of products and the environmentally damaging effects of fast fashion have fuelled the growth of the 'slow fashion' movement, i.e., using greener fibres, reducing waste, or considering the movement of a product in the supply chain. Slow fashion is gaining popularity as designers move away from the fast fashion industry and embrace flexible, seasonless designs. However, since fast fashion companies have no interest in reducing consumption, the idea that slow fashion could replace fast fashion is currently not possible (Coskun & Basaran, 2019).

However, the popularity of fast fashion, which could replicate runway looks quickly and cheaply, is waning in favour of slow fashion, or items that are better for the environment and designed to last longer. As consumers look for brands that take a stand for the environment, nearly half of fast fashion



## *Stimulating gender-based innovative training methods to promote CLOTHING REcycling through Augmented Reality*

retailers have reported a recent decrease in customer purchases (Blake, 2020). To maintain sales volumes, but at the same time to "look greener" in the eyes of consumers, fast fashion companies participate in actions that could indicate their sustainability, for example, the H&M initiative, where customers can hand over old clothes for recycling.

The aim of a circular economy is to attain a sustainable society and economy by avoiding and reducing resource consumption through multiple product and material loops. Consisting of two opposing terms, sustainability and consumption, sustainable consumption is a complicated and ambivalent concept. The main goal of sustainable consumption is to find a balance between satisfying the needs of customers and protecting the environment, which means reducing the negative effects of material extraction, production, and consumption (Michalak et al., 2022).

The concept of reducing focuses on changing people's habits to decrease consumption. However, to reduce consumption is a difficult issue because it conflicts with the current consumption-driven culture. That's why we as consumers need to start realizing how to change our thinking. A start would be to buy less low-quality, cheap products that quickly lose their value and thus become unusable and thrown away. We must think, maybe we should reduce the number of clothes in our wardrobe and buy only high-quality, universal clothes that can be easily combined with each other.

### **Reusing**

In general, reuse is using an item again, prolonging its life. Reusing is the most environmentally friendly approach to handling waste from discarded clothing since it increases the life of clothes without having to reprocess them. Textile reuse is basically giving away or selling to other products that are no longer useful but are still in good condition and fully wearable. One of the ways to reuse textiles is through charitable giving. Donated textiles are sorted by quality, degree of wear and tear, seasonality, and use, while also extending the life cycle of textiles. Charities provide clothing, shoes, home textiles, and other necessities to those in need. This is a good opportunity to reuse unwanted textiles. The most common example for reusing is the second-hand clothing market. Waste sorting companies that provide cities with waste sorting containers help used clothes end up on store shelves for resale.

One of the newest consumer behaviour trends is collaborative fashion consumption, that includes an alternative approach to meeting needs. Instead of buying new fashion products, consumers have access to already existing garments either through alternative opportunities to acquire individual ownership (gifting, swapping or second hand) or through usage options for fashion products owned by others (sharing, lending, renting, or leasing). Digitalization, consumer awareness of environmental issues, and anti-consumer attitudes have all contributed to the rise in collaborative consumption's popularity (Michalak et al., 2022). For example, if the clothes are no longer in use, a good option is to share them, for example, with friends or family, or sell them to others. Websites for the sale and exchange of used clothing are becoming more popular, allowing people to sell or give away unwanted textiles. In addition, some of the most popular clothing brand shopping sites have a separate blog in their online stores where customers can resell items that they purchased in that store but no longer use.

Currently, you can rent products that interest you or lease those that you do not need. The rental of formal wear, suits, wedding dresses, and other social event outfits is also becoming increasingly





popular. It is also good from a sustainability point of view, with the outfit being worn several times rather than stored in the closet until it is no longer needed.

Companies are also beginning to adapt their operations to this principle. For example, the brand "MUD Jeans" offers its customers the choice of renting jeans for a fixed amount per period - if you like the pants, you can buy them, making a thoughtful purchase, while if they are worn out, they can be recycled into new ones (Mood Jeans Circular, 2022). Also, luxury fashion brands offer to rent their clothes. For example, Burberry is expanding its garment rental business via collaboration with luxury rental and resale platform My Wardrobe HQ (My Wardrobe HQ, 2022). It is possible to rent out many of Burberry's best-known designs for a minimum of four days and up to 14 days. If a buyer does not want to give up, it is also feasible to purchase a thing second-hand, which is less expensive than purchasing it new. Renting clothing is becoming increasingly popular among young people since it is the only way they can afford to acquire high-end designer gear for occasions such as weddings, theme parties, picture shoots, and filming (Textile Focus, 2022).

All the methods described above are very good because the products are returned to circulation completely without or with minimal resource and energy consumption, benefiting both people and nature.

### Clothing care

Regardless of whether new or used clothing is worn, it is necessary to properly care for it. Garments are usually accompanied by labels that indicate both the composition of the textile materials and the care instructions in the form of symbols (GINETEX, 2022), which help to understand how to act correctly to maintain the properties of the garment. Regarding washing, the instructions only indicate the main conditions, but do not talk about the frequency of washing. It must be evaluated individually, depending on the degree of soiling of the clothes. Except for dirty physical work or exercising, there is really no need to wash clothes after every wear. Underwear, shirts, sportswear should be washed more often - even after wearing them once, but for example, pants and jackets are washed only when they are dirty. Re-wearing clothing between washes has benefits: clothes will last much longer, reduce microplastic pollution from synthetic materials (acrylic, nylon, and polyester) and ultimately reduce water and energy consumption (Uncomplicated Spaces, 2019).

### **Recycling**

Recycling of waste is defined in the Waste Framework Directive (Eurostat, 2022) as "any recovery operation by which waste materials are reprocessed into products, materials, or substances whether for the original or other purposes. Recycling can be split into the subcategories 'Material recycling' and the organic recycling 'Recycling - composting and digestion'. The latter is only possible for separately collected organic waste."

Recycling is the act of transforming waste into new products in order to save potentially usable materials and reduce the use of fresh raw materials. The goal of recycling is to provide the manufacturer with recycled raw materials to reuse as an input in the production of new products. Material recycling can save resources and typically consumes less energy than the creation of new materials (Rathinamoorthy, 2018). To preserve natural resources and reduce climate change, textile







waste recycling is a high priority. Everything in the textile and clothing sectors should be utilized since textiles are almost entirely recyclable (Yalcin-Enis et al., 2019).

To make recycling possible, a special sorting of textile materials is performed, in which products are divided primarily by colour and fibre composition instead of wear, and then all non-textile parts are separated from them - buttons, zippers, rivets, etc. After that, the textile waste is processed mechanically, thermally, or chemically to produce textile fibres. In this way, more energy and resources are consumed than through reusing or upcycling, but it is less than the extraction of new materials, and the waste does not end up in landfills. For example, there is a city in Italy that has come together to mechanically recycle unwanted textiles and turn them into new products (Bettiza & Patruno, BBC News, 2020).

### What is preventing clothing recycling, and why is it so difficult?

Textile recycling gives materials that would otherwise end up in landfills a second life, protecting the environment. However, not every textile item yet is recyclable, and some may end up in landfills due to a variety of factors (Kanchana & Pammi, 2013). In clothing manufacturing, we do not see as much recycling as in other industries, such as paper or plastic recycling. One of the biggest challenges to face is that most clothes are simply not made for recycling and are very difficult to recycle. Garments, by their nature, are very diverse, with many different components of raw materials, so they are not suitable for classic recycling processes that require a constant material (Rissanen, 2022).

- First, the recycling of clothing begins with its disassembly and separation. But not all textile products can be disassembled; there are those whose dismantling takes a lot of time, and there are those whose dismantling is no longer possible at all.
- Second, even seemingly simple products are often made from a combination of different fibres or raw materials. For example, a T-shirt made of 100% cotton yarn but sewn with 100% polyester threads cannot be recycled unless it is separated into raw materials - fabric and sewing threads. Meanwhile, some innovations in this area have appeared, such as heat-dissolvable thread by Resortecs (Resortecs, 2022).
- Thirdly, colour is important; recyclable textile products must also be sorted according to it. Colour is especially important for a category of textiles that are intended to be mechanically recycled and then mixed with new fibres of the same colour to form yarn of the same colour.

Recycling methods vary depending on the fibre composition. Wool and cotton are two examples of natural fibres that can be mechanically processed. The chemicals used to dye or finish the fabric may also have an impact on its recyclability. In addition to the fittings that must be removed, a complex product such as a lined jacket may have more than five different types of fabric. If the material composition of the clothing, fabrics, and sewing threads differs, they must be separated. As a result, it is costly and time-consuming. Sometimes it is easier to shred the garment and convert it into a downcycled product, such as thermal insulation, but some separation steps are still required.

Even in the best eco-design scenario, a portion of textile production, such as women's underwear, cannot be recycled. A single bra can contain up to 140 different elements, and disassembling it is both time-consuming and technically impossible because not only fasteners, hooks, and other parts must be separated, but also different fabrics and materials, which are frequently compressed or fused together. Laminated fabrics and membranes are not recyclable either.



## Stimulating gender-based innovative training methods to promote CLOTHING RECYCLING through Augmented Reality

Across the fashion industry, only 13% of the total material input is in some way recycled after clothing use. Most of this recycling is cascading into other industries and being used in lower-value applications like mattress stuffing, wiping cloths, insulation, and other materials that are currently difficult to recover and therefore likely constitute the final use. Given the complexity of textile recycling, less than 1% of material used to produce clothing is recycled into fibres for new clothing. Even though some countries have high rates of clothing collection for reuse and recycling, most of the clothing that is collected there is exported to countries that lack their own collection infrastructure. Despite these valuable efforts to increase clothing utilisation, most of these clothes end up in landfills or are used in lower-value applications (Ellen MacArthur Foundation, 2017).



IMAGE 2. GLOBAL MATERIAL FLOWS FOR CLOTHING IN 2015

Source / Copyright: Ellen MacArthur Foundation. A new textiles economy: Redesigning fashion's future, 2017

Because the current dominant textile recycling process degrades the quality and value of the materials by mixing different materials and/or adding other materials or chemicals, recycling is quite often "downcycling" (Sung et al., 2019a). Currently, most mechanically recycled textile fibres obtained from textile waste are shorter and more heterogeneous, i.e., lower quality compared to virgin fibres. For recycled fibres to be used in yarn production, it is necessary to add virgin fibres to them. Even though downcycling benefits the environment by keeping waste out of landfills (for a while at least), it frequently ends up there in the long term (Rathinamoorthy, 2018).

### Upcycling

The term "upcycling" was first used by William McDonough and Michael Braungart, the creators of the *Cradle to Cradle* concept (McDonough & Braungart, 2002). One of the most important ideas is that products "can be composed either of materials that biodegrade and become food for biological cycles, or of technical materials that stay in closed-loop technical cycles, in which they continually circulate as valuable nutrients for industry". However, in today's world, when engineers and



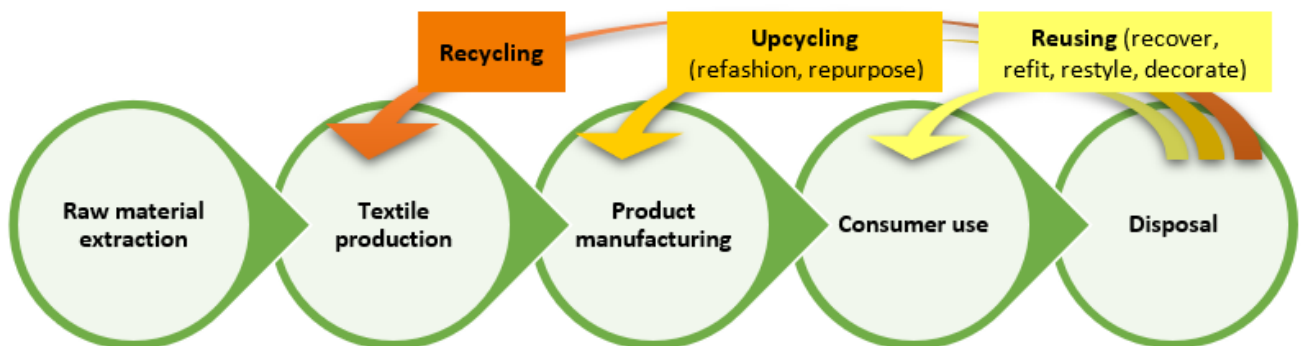
designers create a product, they usually only think about how to use it for the first time, not how it might be used again when it breaks, becomes out of style, or falls apart. “Most materials are not recycled but downcycled - degraded in quality through the “recycling” process.” The item moves through a series of cycles that make it less valuable or more harmful. Upcycling, an opposite of downcycling, means “the return to industrial systems of materials with improved, rather than degraded, quality” or “retain material’s high quality in a closed-loop industrial cycle” (McDonough & Braungart, 2013).

Currently, the term "upcycling" is widely used superficially, meaning only the improvement or transformation of products, without considering that the product may have been produced in a way that is not friendly to nature and people, and after "upcycling" will end up in a landfill or, in the best case, will be downcycled. However, in the current situation, any action, whatever we call it, that reduces the number of usable products ending up in landfills is welcome. Instead of buying new products, "improved" existing, already produced ones are used, at least for a while.

“Upcycling” is frequently understood as a common term for creative forms of reusing, recovering, repurposing, repairing, refurbishing, upgrading, redesigning, refashioning, remanufacturing, reconstruction, or value-added recycling.

“Upcycling” is an improved and viable method of reuse of a product after significant modification. In the current situation, used clothing is only used for their basic functions and a few inferior purposes, when clothing isn't used to its full potential. Upcycling is one of the best alternatives to recycling and direct reuse due to the improved use of products, which enables higher values to be derived from existing resources (Manoj et al., 2019).

In the waste hierarchy, upcycling is one of the sustainable circular solutions, positioned between reuse and recycling. Upcycling generally requires less energy input than recycling and can eliminate the need for a new product. Upcycling, in contrast to direct reusing or recycling, uses available clothing, fabrics, manufacturing scraps, or other items to improve upon the original ones (Cuc & Tripa, 2018).



**IMAGE 3. WASTE MANAGEMENT STRATEGIES FOR DISCARDED CLOTHES**

There are several ways to explain the definition of upcycling, for example: “Upcycling is the creation or modification of a product from used or waste materials, components or products which is of equal or higher quality or value than its compositional elements” (Sung et al., 2019b), or “Upcycling refers



to creative reuse. It is the process of transforming by-products, waste materials or products that we no longer use into new materials that we can classify as having a higher quality, artistic value or environmental value” (CEMELI, 2021), also according to another source “The process of upcycling is intended to work contrary to shopper culture, urging individuals to consider new and creative approaches to utilize things, rather than just purchasing new merchandise. It likewise benefits the environment, by promoting reuse over disposing of at whatever point conceivable” (Rathinamoorthy, 2018).

In short, “upcycling” is a more advanced kind of reuse that focuses on value-added recovery. This is a creative process of improving or transforming something that has already been created. “Upcycling”, according to clothing, is the creative process of transforming old clothes and other textiles into new ones using a variety of methods. It extends the life of outdated items that can be used again by giving them a new look. With careful choice of materials and methods, some upcycled clothing is even recyclable or biodegradable at the end of its useful life.

As consumers increasingly consider sustainability when making purchases, upcycled apparel is gaining popularity in the fashion industry. 73% of Gen Z and millennials say they're willing to pay extra for these kinds of things since they're becoming so important. This is one of the best things that has happened to the fashion industry - this change in consumer behaviour. Clothing that has been recycled or upcycled is great for the environment. The main benefit of upcycling used clothing is that it's much simpler to do it yourself and uses fewer resources than recycling (Willis, 2022).

Upcycling is a circular economy strategy for reducing resource consumption by slowing and closing material cycles, improving the quality of items and materials in the value chain, and preventing unplanned and premature obsolescence. Upcycling could also encourage businesses, create job opportunities, and promote environmentally friendly consumption habits through reuse (Singh, 2022).

The circular economy's guiding principle is to reduce waste and pollution while circulating goods and materials at their highest value. This means using materials until they can no longer be used, whether as components or raw materials or as products. This ensures that nothing is wasted, and that materials and products retain their intrinsic value. There are many ways materials and products can be kept in circulation, among which it is necessary to highlight two fundamental cycles - the technical cycle and the biological cycle. Throughout the technical cycle, products are reused, repaired, remanufactured, and recycled. As part of the biological cycle, biodegradable materials are returned to the earth through composting and anaerobic digestion (Ellen MacArthur Foundation, 2022).

## **2.2 Sources of textiles used in the upcycling practice**

Textile materials, which are generated in the textile industry and are considered waste, can be divided into pre-consumer and post-consumer waste. Reusing pre-consumer and post-consumer textile wastes offers many environmental advantages - it reduces the amount of waste that ends up in landfills and incinerators; conserves resources, i.e., saves virgin materials in the production of new fibres; saves energy and reduces pollution that occurs in the process of manufacturing new products. Also, using textile waste, which is suitable to produce new products, to make clothing,



accessories, or interior textiles, offers economic advantages - textile waste is a low-cost raw material (Lau, 2015).

All kinds of textile waste can be used in the upcycling or clothing reconstruction process - both those left over from the textile and clothing manufacturing process and those that have already been used.

### **2.2.1. Pre-consumer textile waste**

Pre-consumer textile waste is any textile material waste generated during the production process by fibre producers, textile mills, and fabric and apparel manufacturers. It is a material that was discarded before it was ready for consumer use. The types of production waste can vary depending on the manufacturing steps used where the waste is generated – it can be fibres, yarns, damaged fabrics, fabric scraps, fabric roll ends etc. There are some ways to dispose of production waste: it can be recycled into fibres; it can be converted into energy to power the manufacturing process, or it can enter the solid waste stream and end up in landfills. Pre-consumer waste is one of the important waste types due to its virginity and it can be used for recycling and upcycling processes (Yalcin-Enis et al., 2019).

Finished unsold textiles and clothing are also considered pre-consumer waste if it does not reach consumers. These products can be manufactured with design mistakes, fabric faults, the wrong colours and they are not intended to be sold or, if they have arrived in stores, they have not been sold for various reasons. If such textiles are not sold in outlets or second-hand stores, they end up in the landfills or waste incinerators. This last option is the least used, as finished but unused textiles still have some resale value (Rathinamoorthy, 2018).

#### **Deadstock fabrics**

Deadstock fabrics, which are sometimes referred to as overstock, surplus, or jobber fabrics, are typically unused leftover fabrics (usually woven or knitted) from mills, designers, and clothing companies. They are no longer in use and occupy unnecessary space in the warehouse. Deadstock fabrics can be accumulated because of the end of a product line, damaged or low-quality materials, or the acquisition of materials in large quantities. Usually, companies return these excess materials to suppliers who can then supply them to fashion brands. If the fabrics are not usable, they are likely sent to landfills where they are disposed of with other waste (Fashinza, 2022).

#### **Textile wastes from apparel manufacturing**

The apparel production process begins in the fabric warehouse, where the manufacturer receives the raw materials from the supplier. Fabric quality control is the first point of waste generation. After inspecting the fabric, it is cut, and this is where the second point of waste occurs. After the cutting and assembling process, the cut parts are sent for the sewing process. During sewing, either due to poor sewing quality or problems with the cut parts, components may be rejected. This is the third point of waste generation. After sewing, the garments are submitted to the quality control of the finished garments, where if unrepairable defects are found, the garment is rejected. This is another source of waste (Rathinamoorthy, 2018).



**IMAGE 3. TEXTILE WASTES GENERATED BY APPAREL INDUSTRIES**

The different types of wastes generated in the apparel industry from the sample making process to the retail shop – sampling waste as a fabric or garment, leftover fabric rolls, cutting and sewing waste or unsold finished garment waste.

- *Fabric and garment sampling waste.* Various kinds of fabrics will be used for the sample development during the garment development stages. Fabrics and garments will be sent to the buyer for approval following development. Based on the buyer's comments, the samples may be accepted or rejected. Even if the product is accepted, the buyer may still wish to modify the design or make a few minor adjustments. At the very least, the garment samples and fabrics at that point are discarded as waste.
- *Cutting department waste.* Cutting waste is the cutting department's first type of waste. The second one is left over fabric. In this stage, very short and unused material will be discarded as waste, but the remaining fabric will be utilized to its fullest extent.
- *Sewing department waste.* This is the waste that typically results from sewing defects. Occasionally, this waste consists of fully or semi-finished garments (Rathinamoorthy, 2018).

### Pre-consumer waste collection and distribution

To ensure that pre-consumer textile waste does not end up in the landfill, there are companies that not only collect the waste and pass it on for recycling, but also offer materials (fabric rolls and scraps) to designers, artists, students, etc. for creative reuse. For example, some companies, like Fabscrap and Fabcycle, facilitate the use of discarded fabrics by helping small designers gain access to them. Fabscrap provides convenient pickup and recycling of textiles for businesses. The company collects unwanted and unused material from fashion, interior, and entertainment companies to recycle their excess, pre-consumer material "waste." Whenever possible, the company utilizes fibre-to-fibre technologies. Some larger fabric pieces and scrap packs of smaller pieces, organized by colour, are sold through online stores for reuse. Students, artists, crafters, quilters, sewers, teachers, and designers can use any material. The goal is to reduce the number of materials going to landfill and instead offer them to makers at an accessible and affordable rate. (Fabscrap, 2023). Another company, Fabcycle also is a collection service of textile waste. They work directly with local apparel



manufacturers like factories, fashion designers and schools to collect the scraps, off-cuts, deadstock fabrics and ends of rolls that are left during the apparel production process and reuse or recycle what they cannot use. The purpose of the ReUSE Centre is to provide an open and inclusive physical space for the local creative community to come together and experiment with textile waste. The company encourages artists, designers and creative minds of all skill levels, backgrounds, orientations, and identities to experiment with scraps and deadstock fabric and come up with innovative and exciting ideas to divert textile waste from the landfill (Fabcycle, 2023).

There are some online platforms, for example, Nona-Source is the online resale platform which re-values deadstock fabrics and leathers from the most exclusive French Maison de Couture. Nona Source allows creatives to easily access high-quality materials whilst encouraging the creative reuse of existing resources (Nona-Source, 2023). UPCYBOM is an upcycling solution as a platform for the textile industry. Via the platform, suppliers can digitalize and upload all their leftovers, stocks, dead inventories and communicate to their internal team but also to their clients (or not) what is available. In this way we could reduce the use of resources to make samples or create collections made only with leftovers (Henno, 2022).

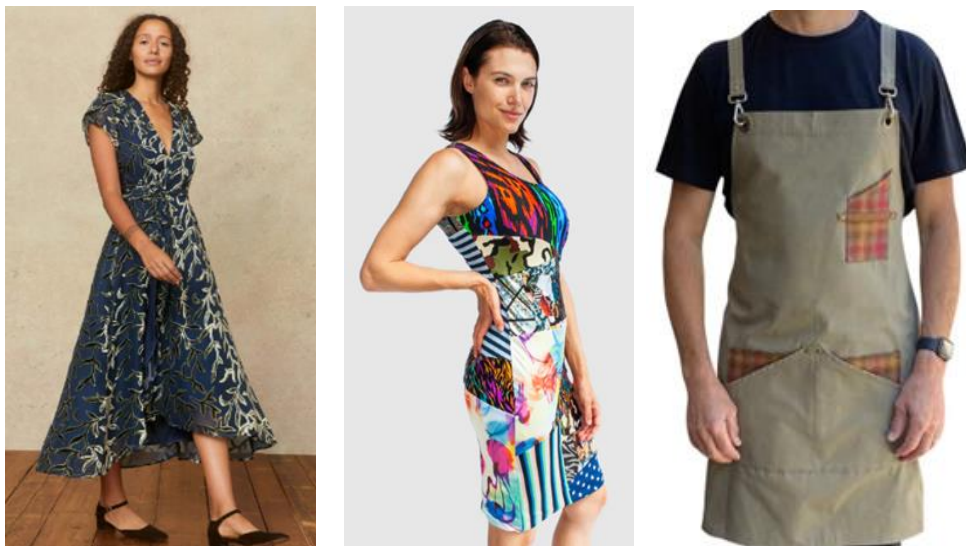
### **Advantages and limitations of using pre-consumer waste in the upcycling process**

- *Advantages.* Reduces costs - it is possible to find quality leftover fabrics that haven't been used or large pieces of scraps by well-known brand designers at a much lower price; unique designs - since leftover fabrics and scraps may not be available in a certain size, colour, design, it is both a challenge and an opportunity for designers to create unique designs.
- *Limitations.* Limited amount - it's possible that fabrics and scraps won't be offered in large quantities; source of materials - if there is no textile label added to the fabrics, then there is no information about the textile fibres used, as well as about the exact production technology and fabric parameters; technical flaws - often deadstock fabrics are those that are not used due to quality issues - they may have manufacturing or finishing faults; discarded trends - fabrics may have a pattern or print that is out of fashion. [Guide To Deadstock Fabrics: Advantages and Shortcomings (Fashinza, 2022).

### **Examples of upcycled clothing from pre-consumer waste**

The growing public interest in sustainable design affects fashion design trends - more and more fashion designers and clothing manufacturers make clothes from pre-consumer textile waste.

For example, *Christy Dawn (2022)* is a slow fashion brand that has a line of dresses all made from deadstock fabric. Every piece is made from the rescued and revitalized fabric that would otherwise be cast aside, finding its way eventually into a landfill. Each style within this collection is limited in nature, with pieces often being only one or two of a kind. *Zero Waste Daniel (2023)* pioneered turning fabric scraps into fashion. Upcycled pieces are made from 100% pre-consumer cutting room scraps, design room leftovers and discarded materials. *Looptworks (2023)* works with textile waste headed to the landfill, or even worse - the incinerator. The company diverts these excess materials by extending their life as high quality upcycled products. For example, Voyager Collection is made from pre-consumer excess cotton canvas and premium salvaged Pendleton® woollen textiles.



**IMAGE 5. CLOTHES FROM PRE-CONSUMER WASTE. CHRISTY DAWN, ZERO WASTE DANIEL, LOOPTWORKS**

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The goal of Madlena Udre, a student at Riga Technical University, in developing the collection "Under the Walnut Tree" was to make people think about what the word "home" symbolizes and to appreciate the possibility of returning to it. Textile fabric leftovers were used in the creation of the collection, addressing the current issue of environmental pollution.



**IMAGE 6. COLLECTION "UNDER THE WALNUT TREE". DESIGNER: MADLENA UDRE**

Source: from the archive of RTU, photographed Miks Uzans, Sintija Selicka Uzane





## 2.2.2. Post-consumer textile waste

Post-consumer textile waste occurs after using products generated by households, commercial and industrial companies or institutions that are end users of the products. Household textile waste consists of both clothes and home textiles that are no longer be used for their intended purpose or that have no use value for consumers for various reasons and are therefore thrown away. Consumers may discard these articles when they are damaged, worn out, outgrown, or out of fashion. Usually, used clothes and home textiles are of good enough quality to be reusable. Although they can either be sold, donated or given to relatives and friends, a lot end up in municipal landfills. The volume of post-consumer textile waste is very large.

### Second-hand clothing

Poor fit, poor quality, wear and tear, boredom, and the influence of the fast fashion industry on consumers are just a few of the many reasons why clothes are thrown away. Donating used clothes to charities and giving them to friends and family are the most common consumer behaviours. If the used clothing is not donated or passed on, it is possible to hand it over to waste collectors which act as middlemen between the consumer and the secondary market seller. There are three phases in their business process: collection, sorting and distributing.

*Collection.* There are two ways to collect textile and clothing waste: 1) textile banks - managed by waste management companies or municipalities in supermarket parking lots or recycling centres, where customers can drop off their used clothes; 2) door-to-door collection - this is a company-run collection program where the householder put in the bags unwanted clothes and places them outside the house (Dissanayake & Sinha, 2013).

*Sorting and distribution.* All the items that are brought to the plant are weighed and go through a pre-sorting process to separate clothes from wet textiles, rubbish, as well as other non-wearable and non-reusable items. The sorting step is done by hand and carefully to distinguish them by types such as trousers, linens, jackets, and sweatshirts, except for baby clothes. In the second part, as soon as the pre-sorting is finalized, the reusable items are sorted into different sub-categories, by gender and by season. There are different product categories, for example, Sofrip textile recycling company (2023) sorts clothes in four categories: Cream Grade (the highest quality second-hand clothes with no defects and meet top fashion standards); Grade 1 (very good quality used clothing wearable but not necessarily modern); Grade 2 (old clothing, wearable with a few defects that indicate they are second-hand goods) and Grade 3 (second-hand clothes that are not in perfect condition and have defects). Then the product is ready for packaging. Depending on the requirements of the buyer, clothes can be fully or partially sorted. The items of lower quality will be recycled, and the rest are sent to the destination markets.

Some of the clothes are referred to as diamonds. Categories of diamonds include couture clothing and accessories, certain branded items, trendy vintage clothes. The diamond category accounts for approximately 1% of the total volume of goods that enter the textile recycling stream. Many of the customers for diamonds are well-known designers or wealthy individuals (Coskun & Basaran, 2019).

Today, consumers frequently purchase new clothes and discard the old ones that are still in perfectly usable condition. As a result, a significant amount of clothing is wasted. On the other hand,



consumers' awareness of the negative environmental effects produced by clothing consumption has grown significantly, prompting them to look for environmentally friendly ways to reduce clothing waste. In this context, purchasing second-hand clothing, also known as purchasing clothing that has already been worn, is widely recognized as one of the environmentally responsible actions because it may reduce the amount of clothing that is thrown away. Besides environmental values, customers may be motivated to purchase second-hand products by economic values related to having a limited budget and the desire to save money or spend less. Buying second-hand products has become a popular trend around the world. As a result, consumers are encouraged to purchase second-hand products by financial, environmental, and hedonic considerations. Among other things, consumers would prefer to purchase second-hand clothing for a variety of reasons, for example, to find a unique piece or get nostalgic pleasure (Ögel, 2022).

### **Used home textiles**

There are various types of home textiles that become unnecessary and are thrown away - bed linen; bedspreads; blankets and throws; curtains, cushion covers, kitchen towels, tablecloths and runners, chair pads, bathroom textiles. Although home textiles do not end up in waste as often as clothes, there are various reasons why home textiles become unfit for their intended purpose, including: they have a hole or stain that won't go away, or they are in good condition, but you want to replace them, for example if it is planned to change the interior, etc. Home textiles are repaired more often and stored longer than clothes. When home textiles become unnecessary, they are sold or more often donated. Most of the time, decisions about how to dispose of household textiles are made by one person in a household, and other members of the household either know nothing or are not particularly concerned about it. This decision-maker is often identified as the "woman of the house" (Lehner et al., 2020).

Used home textiles can potentially be transformed into clothes, accessories (bags, hats, etc.), or other types of home textiles (carpets, pillowcases, etc.).

### **Advantages and limitations of using post-consumer waste in the upcycling process**

- *Advantages* of buying second-hand clothing and used home textiles: they are cheaper than new products; often of high or good quality; huge variety of styles - it is possible to find some unique designs.
- *Limitations*: clothes and home textiles can be damaged - running colour, loose seams, tears and permanent stains; clothing may get infected by various diseases that are related to the skin (prevention needed by soaking the clothes in disinfectant before use); if the labels are not preserved, then the fibre composition of the materials and care conditions are unknown; getting second-hand products can be time-consuming.

### **Examples**

One of the examples is the collection "Outsider" created by a student at Riga Technical university Linda Klimanova. The collection's intended target was customers concerned with sustainable

resource conservation, ethics, and aesthetic design. The collection's message of resource conservation and repurpose has been presented in a new form.



IMAGE 7. COLLECTION “OUTSIDER”. DESIGNER: LINDA KLIMANOVA

Source: from the archive of Riga Technical University, photographed by Ieva Leinisa

RE/DONE (2023) uses vintage clothes (most of them are Levi's denim), takes them apart and sews them into new, modern clothes. 3am Eternal (2023) is a contemporary womenswear brand that creates something eternal by sourcing and re-styling designer vintage and upcycling by reworking pre-owned base garments from international designer brands through cutting, chopping, reshaping, and embellishing, juxtaposing colour, pattern, texture, and details.



IMAGE 2. CLOTHING FROM POST-CONSUMER WASTE. RE/DONE LEVI'S JEANS AND 3AM ETERNAL RESTYLED VINTAGE CLOTHES

Source: (RE/DONE, 2023), (3am Eternal, 2023) / Copyright: we will be asking for permission

Post-consumer textile waste refers to the textile waste created at many levels following the use of a completed article by the final consumer, which might be any apparel or household item that has



been thrown or is no longer in use for any causes such as being worn out, damaged, or outgrown. Since most of this waste is generated at the domestic level, its management is challenging as industrial waste is easier to handle than household waste. Achieving a zero-waste goal requires the handling of post-consumer textile waste. This learning resource presents some good practices in the sector.

This chapter covered various types of textile waste generated in textile and clothing production. Some of them can be reused by production companies in the same or another manufacturing process, some can be processed into fibres. However, a large part of textile waste is not used, but ends up in a landfill. To extend the life of already produced different types of textile materials, it is possible to use them as a source in the textile and clothing upcycling process.

## **2.3 Different groups involved in the upcycling process**

The process of upcycling involves both professionals (fashion designers) who create fashionable clothes for sale, and amateurs - people who, using DIY practices, improve or transform their own or second-hand clothes rather for enjoyment, not money.

Even though the clothing upcycling process is still in its development stage, its presence in the fashion industry suggests that it can work as a business strategy. From casual wear to haute couture, numerous discarded garments are being redesigned and made available to consumers. When compared to recycling, this method could perform better in terms of energy and environmental performance and is clearly a less resource-intensive and more sustainable method of increasing a product's lifespan. This strategy has helped a few fashion designers start businesses, but this is still a small market (Dissanayake & Sinha, 2013).

Businesses based on upcycling have the potential to be financially viable and provide new employment opportunities. Techniques and skills for upcycling vary. Some clothing upcycling can be done with minimal skills, however, to be able to redesign and reconstruct clothing in high quality, a higher level of skills is required. By upcycling existing products rather than purchasing new ones, individuals in households can save money while also gaining sociocultural and psychological benefits, such as a sense of community, learning, empowerment, and relaxation, for example (Sung et al., 2019a).

### **2.3.1. Professionals**

Upcycled fashion production uses textile waste to create products with a higher retail value than traditionally recycled goods. The idea of upcycling gives designers a chance to lead the way in using the many tons of textile waste that are made in a sustainable way to create more value and meet the constant demand for new fashion while technology moves toward more sustainable production methods. High quantities of textile waste have been regarded as the end of the garments' lifespan. However, the fashion industry could make use of this resource to produce upcycled clothing that is well-designed and sourced sustainably (Han et al., 2015). Fashion designers use deadstock fabrics,



fabric scraps, second-hand clothes, or unsold clothes (including fashion designers' vintage clothes) to make upcycled fashion clothes.

The main differences between the standard design process and the upcycling process begin at the material acquisition stage. First the concept is developed and then the materials are found. Often the design concept is directly related to the choice of available materials. This contrasts with the standard design process, where fabric purchasing occurs much later, after research, design, and orders. Upcycling designers take a leadership role in the organization, either overseeing the entire process or actively involved in all stages, from sourcing, design, and production to promotion. The differences also exist in the approach to selling upcycled products, where the main buyers are consumers who understand the ecological benefits of such products. Customer relations are a priority. To strengthen the relationship, events are offered that engage consumers in sustainable fashion ethics and lifestyles. The main element of the advertising strategy is social media and strong online presence through their own e-commerce sites (Han et al., 2015).

### Examples

Latvian fashion designer Aiva Zīle (ZĪLE, 2023) striving for a more sustainable future through the concept of upcycling. The label's main resource materials are denim trousers and shirts. ZĪLE not only makes upcycled clothes from men's shirts, but also offers to make a unique shirtdress from the shirts sent by the customers themselves.



**IMAGE 9. SHIRTDRESSES FROM MEN'S SHIRTS AND JACKETS FROM JEANS. DESIGNER AIVA ZĪLE**

Source: from the archive of "ZĪLE-ZĪLE", photographed by Andra Marta Babre and Lelde Gusta

FADE OUT Label (2023) is a unisex line of exclusive clothing and accessories made from deconstructed vintage clothing using handicraft methods, where the patina of used material recombined in a fresh and different way creates new unrepeatably alchemies. FADE OUT Label embodies a dump-to-hanger ethos and celebrates responsible recycling of materials and innovative designs.



**IMAGE 10. CLOTHES FROM DECONSTRUCTED VINTAGE CLOTHING. FADE OUT LABEL**

Source: <http://www.fadeoutlabel.com/collections/>

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The RealReal (2023) is the online marketplace for resale of luxury goods. The RealReal has been one of the biggest names in vintage fashion for years, but now, the luxury resale retailer is experimenting with a new way to shop sustainably: upcycling. The first collection from its new upcycling program ReCollection brings together a diverse group of luxury brands to collectively promote the importance of creating an afterlife for clothing. Created in partnership with fashion brands, the RealReal transforms distressed or damaged clothing into new, one-of-a-kind luxury pieces (Textile Focus, 2021).

### 2.3.2. Amateurs

Everyday people or amateurs - people without designer education or special skills are also involved in clothing upcycling, using the so-called do-it-yourself (DIY) practice at home, or working in workshops under the guidance of professionals. Own clothes, second-hand clothes, and used home textiles are used to create upcycled products.

In essence, the term "do-it-yourself" refers to the practice of producing goods on one's own with no direct assistance from a professional rather than hiring a specialist to complete a particular task. Even if you use a YouTube tutorial, a book, or a blog post to get your project moving in the right direction or find directions, it still counts as doing it yourself. DIY is about you are finding out what you need to know and learning how to do something you normally pay someone else to do (Morgan, 2018).

It is not surprising that the do-it-yourself movement is expanding. Learning to make or remake things at home gives you the self-sufficiency and confidence to make anything you want or need. Reducing waste and conserving resources are both generally beneficial. Set your own trends by adding a



unique touch to what you wear and show off clothes and looks that you love. There are numerous explanations, why should you learn how to do it on your own.

- *Trendiness.* Knowing how to make your own clothes and accessories allows you to quickly update your look and keep up with fashion trends using what you already have. Get the look you want right away, on your budget, and exactly how you want it. Refashioning a basic into something special is simple.
- *Cost.* If done correctly, making your own clothes can save you a lot of money and give you the same look as a particular piece you've been eyeing. Getting a custom fit and style is simple and cheap.
- *Creativity.* DIY is about being yourself and not just copying other people's ideas. Thinking outside the box and creating one-of-a-kind items that demonstrate your individuality (Stanley, 2015).

It is possible to find ideas for clothing upcycling projects in any kind of magazine, Pinterest or favourite stores or catalogues. Basic construction and sewing skills can be learned from YouTube tutorials and books. If you need professional help, you can take courses or work in workshops under the guidance of professionals.

Workshops are a great opportunity to work with clothing upcycling for different types of people. If these are classes for children, schoolchildren, and students, then it is also an educational process about the reuse of textile materials and environmental issues. Likewise, seniors and disabled people can be involved in the upcycling process, as it is a creative process and ensures the company of other people.

In industrialized nations, the number of people who upcycle has increased. This could be a response to the current "maker movement," shared digital resources like Instructables and Etsy, and readily available physical resources like upcycling workshops. Upcycling as a consumer behaviour, despite this expansion, remains a niche or marginal activity. As a result, realizing the potential advantages of upcycling may be made possible by encouraging more customers to participate (Sung et al., 2019b).

## 2.4 Types of clothing upcycling

Upcycling of clothing and textiles in general tends to be of various types - from simple improvement of clothing to transformation into other types of clothing or interior textiles. It is possible to create clothing and home textiles from deadstock fabrics, cutting scraps, as well used clothing can be transformed into other types of clothing or interior textiles, and discarded home textiles can be used as a source for creating new clothing. However, before the garment is considered unusable because it no longer fits or is damaged, it can be altered or repaired. Moreover, mending clothes can be a creative process these days.



### 2.4.1. Recovering, refitting, and decorating

#### Recovering, repairing, mending

The lifespan of clothing can be extended through maintenance and repair. Retailers are beginning to offer repair services, through which customers can bring their clothing into the store and have it fixed. To assist customers in extending the product's lifespan, new independent cloth repairing shops that provide cloth mending services and sewing skill workshops are emerging. Repairing can also be done at home by the customer. However, customers may be discouraged from performing home repairs because they lack the time or sewing skills (Dissanayake & Weerasinghe, 2022).

One of the best ways to make your clothing and other textiles last longer is mending holes, tears, and stains. The fast fashion model of consumption frequently means that it is easier and less expensive to buy new clothing than to repair old clothing, and many of us are not learning the fundamental sewing skills necessary to perform simple repairs like replacing buttons and darning socks. As a result, repairing clothing has become somewhat of an endangered art form over the past few decades. Fortunately, however, the visible mending trend has really taken off recently as well as the rise of circular fashion. A growing number of people are now taking pride in expressing their individuality and sustainable values through the subtly revolutionary act of mending their clothes (Caldecott, 2022).

*Invisible mending* is the type of clothing repair that tries not to draw attention to the area that has been mended, blending in, and trying to return the item to as close to its original condition as possible. Repairs that are purposefully made visible are referred to as *visible mending*. Using brightly coloured or contrasting yarns and patches on the repaired areas of clothing, the repair is transformed into a feature of the garment. You can try embroidering a shape over the area that needs to be repaired for smaller holes and tears, and you can play around with adding fabric patches and embroidering the edges or patterns across the patches for larger areas. On holes or patches of wool that are beginning to wear thin, techniques such as Swiss darning can be performed using threads of contrasting colours.



IMAGE 11. EXAMPLES OF INVISIBLE AND VISIBLE MENDING

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The visible mending movement has also benefited greatly from the influence of Japanese culture. Boro and sashiko are two mending techniques that apply the same principle to clothing repairs, making the repair something beautiful rather than something to be hidden. Sashiko mending is a type of visible mending in which beautiful surface designs are created with embroidery stitching.





Boro is a type of patching that uses patches that are attached with running stitches in straight lines to cover the area that needs to be repaired (Briscoe, 2004, 2020).



IMAGE 12. SASHIKO AND BORO MENDING TECHNIQUES

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### Refitting, altering, resizing

It is possible to rehem, refit, let out, or take in the clothes for a custom fit if they don't fit well. The hem, whether it is too short, too long, or uneven, is the most common issue with clothing. Taking out and putting in a new hem is one of the most important skills in clothing customizing. Most other alterations are made to correct clothing that is either too loose or too tight. This is usually simple to accomplish unless the size is significantly wrong. Letting out: if there is sufficient seam allowance, opening the seams and restitching them closer to the raw edges can frequently resolve the tightness issue. Taking in - tightening clothing is simpler than letting it out. (Howstuffworks, 2023)



IMAGE 13. EXAMPLES OF CLOTHING REFITTING

Source: [www.pixabay.com](http://www.pixabay.com) (first photo)

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### Clothing embellishing, decorating

Clothing can be given a new look by adding various decorative details, using embroidery, painting, or hand dyeing.



IMAGE 14. EXAMPLES OF CLOTHING EMBELLISHING

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## 2.4.2. Upcycling from fabric leftovers and scraps to clothing

According to *Redress Design Award (2023)* **upcycling is a repurposing of 'waste' material that is in textile form** - textiles that have never been made into any garment form or textiles from non-clothing products, such as textile swatches, cut-and-sew textiles, end-of-rolls, sampling yardage, damaged textiles, surplus yarn, etc. Since "upcycling is transforming materials into products of equal or higher quality", using scraps or leftovers to create clothing from them clearly gives them a higher value.

*Redress Academy* gives some advice according to the upcycling from textile waste. First, *decide* whether you want to create one-of-a-kind pieces or a collection that can be reproduced. Because upcycling can take many different forms depending on the textiles and design utilized, this choice will influence your design as well as the waste materials you select.

Second, start with *sourcing the materials* because this is a key to this method. The materials typically vary in size, shape, availability, and quality. Make them your primary source of design ideas. Upcycling has advantages for the economy as well because it is frequently simpler and less expensive to source "waste" materials as opposed to new ones. Cut-and-sew waste, end-of-rolls, sample yardages, damaged textiles, and surplus yarn can all be found by looking at your own waste streams or those of the textile industry. You could also look after surplus materials on online marketplaces.

Finally, *design and make*. Look at sourced textiles and experiment. Layer the cut-and-sew waste textiles to create volume or puzzle the pieces together and let the textiles form your pattern. Utilize colour blocking and patterns that are adaptable to a variety of textile combinations to create repeatable designs. Simply work with the textile's dimensions when dealing with a larger piece of textile waste, such as end-of-roll textiles. Because textile waste frequently comes in irregular shapes and has uneven edges, high-quality craftsmanship is necessary to prevent your finished garment from appearing ripped or broken.



## Examples

When it comes to reusing discarded fabrics, *Patagonia* (2023) leads the industry. They are also one of the first companies to use environmentally friendly methods to make fashionable clothes. *Looptworks* (2023) use fabrics usually dumped in landfills. They also introduce fresh, eco-friendly, and trendy designs in the market. Their clothes are limited edition because of the variability of the deadstock fabrics in the market.

Krista Volodina, a young designer from RTU, shows how to aesthetically invert men's shirts into women's outfits in her collection "Dream". The other student of Riga Technical University has shown an example of using small pieces of one type but different colours fabric in the development of the fashion collection "The motives of architecture in the clothes".



**IMAGE 15. CLOTHING FROM FABRIC LEFTOVERS AND SCRAPS. DESIGNERS: KRISTA VOLODINA AND LAIMDOTA VILCENA**

Source: from the archive of Riga Technical University, photographed by Ieva Leinisa

By cutting scraps of fabric into strips, it is possible to obtain "yarn" from which, using various technologies (weaving, knitting, crocheting), it is possible to create unique clothes. For example, to achieve their zero-waste goal, *tonlé* (2023) designers create custom handwoven garments each season. Long strips are cut from leftover production scraps from the previous season. They are then looped into long lengths of textile "yarn", which are woven into garments that have been twice upcycled.



IMAGE 16. HANDWOVEN FABRIC AND KNITTED CLOTHING FROM FABRIC SCRAPS. TONLÉ

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### 2.4.3. Clothing refashioning or reconstruction

Refashioning is a process that uses used clothing and reworks them into new garments. Refashioning goes under many names: reconstruction, remanufacturing, redesigning, restyling, customizing, reshaping, remaking.

According to the environmental NGO *Redress Design Award* (2023) classification, **reconstruction, as a form of upcycling, is the reusing of 'waste' material that is in the garment form - previously worn garments or preformed finished clothing products.** "The reconstruction technique involves first deconstructing garments and then reconstructing the 'waste' materials into new designs".

The reconstruction guide given by *Redress Design Award Academy*, clothing reconstruction starts with deciding whether you want to make a design that can be replicated or unique designs that might take more work and time and probably won't be scalable or replicated. Second, obtaining the materials is the first and most important step in reconstruction. The design you can create will be greatly influenced by the textiles you choose. The materials typically vary in size, quality, or availability. Look at your own waste streams or unsold clothing waste, or second-hand clothing. Regardless of size, shape, or design, look for high-quality clothing. Third, design and manufacture: draw inspiration from the original garments' features: "What is the garment's best feature? How can you get the most out of it? Can certain details be reused? Can you create a new textile from it? After that, begin deconstructing, shredding, quilting, patchworking, and draping" (*Redress Design Award*, 2023).

**Reconstruction or refashioning process** can be described as follows (Dissanayake & Sinha, 2013):

- *Collection.* Garment waste from second-hand wholesalers, charity shops and donations from citizens are brought to small factories run by designers and entrepreneurs.



## Stimulating gender-based innovative training methods to promote CLOTHING REcycling through Augmented Reality

- *Sorting, Grading and Storage.* The collected clothes are sorted by design, colour and type of fabric, and their quality is assessed. Low-quality products are sent for recycling, while those suitable for upcycling are cleaned and stored in a separate storage room.
- *Disassembly.* Disassembly is manual and time-consuming, which is the most time-consuming compared to other steps in the production process. Therefore, depending on the final design idea and production requirements, designers try to keep the product's disassembly to a minimum, preserving the features and shapes of the original product for the new design. Accordingly, the disassembly time may vary depending on the type of garment, the type of seam, the type of fabric and the length of the seam. Most designers unpick the seam thread by using a quick thread un-picker, rather than cutting along the seam - this operation allows maximum use of the material.
- *Redesign.* Disassembled parts are redesigned. Redesigning is primarily focused on creating unique pieces, as remodels are also mostly one-of-a-kind, however, whenever possible, designers try to create a few sizes of the same style. Both draping and flat pattern cutting techniques can be combined in the redesign process to ensure optimal use of the fabric. Next comes the fitting and stitching of the cut pieces and deciding on other necessary additions to the unique design. Any fabric scraps that result from reconstruction can be used to create decorative elements for other garments, such as pockets, hems, or other design elements.



IMAGE 17. RECONSTRUCTING JEANS TO DRESS

Clothing to be refashioned must be clean, washed and assessed for previous wear and tear before use. If another product is made from several products, then the compatibility of clothing materials should be taken into account - what will be the degree of shrinkage of the fabrics, colour fastness and other geometric and physical properties.

### Examples

The young fashion designers of Riga Technical University, Nadina Poga and Marta Cimdirina, developed a clothing collection COLLISION. To address pollution, a collection of women's outerwear was made from used denim, resulting in the development of new products. To bring attention to the excessive distribution of plastic bags, the clothing details were supplemented with brightly coloured polyethylene.



**IMAGE 18. COLLECTION COLLISION FROM USED JEANS BY NADINA POGA & MARTA CIMDINA**

Source: from the archive of Riga Technical University, photographed by Ieva Leinisa

#### 2.4.4. Repurposing

Generally, repurpose means adapting a product for use in a different or new purpose. In this case, unnecessary clothing can become a bag or interior textiles, or home textiles and various textile accessories can turn into clothing.

##### Clothing from home textiles

Used home textiles (throws, tablecloths, curtains, sheets, etc.) can potentially be transformed into clothes or accessories. For example, *Hôtel Vetements* (2023) - a Danish-French brand founded by Alexandra Hartmann - creates clothes from forgotten curtains, upholsteries, handmade embroideries, linens, tablecloths, cotton sheets from Provence and more.



**IMAGE 19. TRANSFORMED HOME TEXTILES TO CLOTHES. HÔTEL VETEMENTS**

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### Clothing from accessories

By repurposing different types of accessories, it is possible to get unique design clothes. In addition, when making clothes from gloves, belts, scarves, and other accessories, it is possible to use them as whole products, so they are not cut and there are no scraps left over. For example, women's top can be made from men's ties, or top from gloves made by Martin Margiela (CEMELI, 2021), or jacket made from leather belts (Carvell, 2012), or dress from scarves made by D&G (Livingly, 2012).

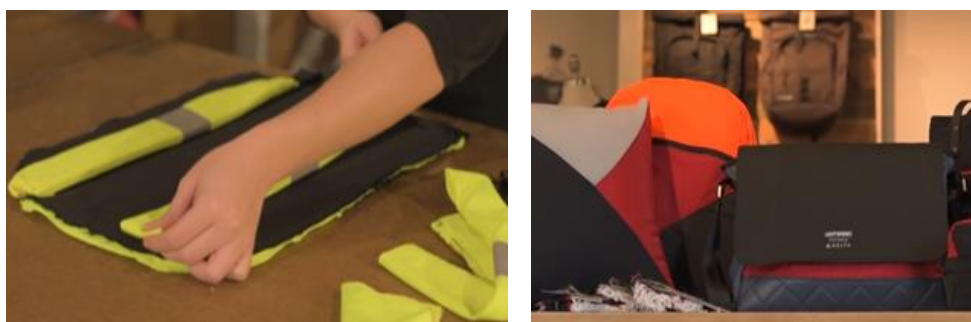


**IMAGE 20. TRANSFORMED ACCESSORIES TO CLOTHES**

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### Accessories from clothing

When 64,000 Delta Air Lines employees headed to work in their new uniforms, over 1 million pieces of their old uniform were retired. To prevent those uniforms from ending up in landfills, more than 350,000 pounds of clothing have been donated to be upcycled and repurposed by Delta's partner, Looptworks. The former uniform pieces were transformed into items like laptop bags, travel kits and passport cover. To add durability, leather from retired aircraft seats will be upcycled and sewn into selected products (Delta Air Lines, 2018).



**IMAGE 21. BAGS FROM USED UNIFORMS. DELTA AIR LINES & LOOPTWORKS.**

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With a bit of imagination, it is relatively easy to make bags from jeans with the help of various techniques.



**IMAGE 22. BAGS FROM USED DENIM FABRIC**

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### Interior textiles from clothing

When making interior textiles and other items from clothing, it is possible to use not only the entire garment in one piece, but every detail of it. This is in line with the general idea that nothing should be thrown away. For example, denim seating can be made from whole jeans. Using pieces of fabric and sewing them together in the patchwork technique, it is possible to create interior textiles of a unique design.



**IMAGE 23. INTERIOR TEXTILES FROM USED CLOTHING**

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By disassembling the garment into parts, it is possible to use not only larger pieces of fabric, but also pockets, waistbands, side seams, hems, labels etc. For example, pillow cover can be made from jeans pockets, rugs from waistbands, side seams, hems, or jeans labels.





**IMAGE 24. INTERIOR TEXTILES FROM PARTS OF JEANS**

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It is possible to make high-quality interior textiles from different types of fabric strips using weaving, braiding, knitting, and crocheting techniques. For example, the hairy hand-knotted chair cover RAGAMUF is made by a Finnish designer Tuula Poyhonen who uses surplus waste from the textile industry in Turkey (Tuula Poyhonen, n.d.). Designers from Sweden textile company Studio Brieditis & Evans (Studio Brieditis & Evans, n.d.) transformed old jumpers and t-shirts into rag rugs using various knitting, sewing and crocheting techniques. Germany based company *Lumikello* (Lumikello, n.d.) home textiles are crocheted by a small team using discarded t-shirts, recycled yarns, night gowns and sheets that are unfit for use.



**IMAGE 25. EXAMPLES OF INTERIOR TEXTILES FROM FABRIC STRIPS**

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In this section, you gained knowledge about many types of activities that may be done to improve or maintain the functioning of a product while using the least quantity of raw materials and energy. The methods were proposed for giving new life to items that were on the point of being discarded. One of the most crucial processes in upcycling is redesigning, which includes conceptualization, repairing, and suiting. The variety in size and pattern is a restriction of redesigning. Various strategies, such as craftsmanship, dedication, creativity, authenticity, willingness, and storyline, can be used to overcome this.



## 2.5. Promotion and scaling-up of upcycling practices

According to Sung et al. (2019a) upcycling is still a niche or marginal activity that needs to be scaled up to have a significant impact on society and the environment, despite the recent growth of practitioners and businesses based on it. As a niche sustainable behaviour, upcycling has the potential to spread in households and industries. Upcycling that is scaled up may have the following effects: a) regular upcycling of used or waste materials, components, and products by common consumers; b) enthusiastic hobbyists who turn their passion for upcycling into products made from used materials for sale; c) micro-enterprises based on upcycling growing into small, medium, and even large businesses; d) the expansion of upcycling businesses and their accessibility to customers; and (e) companies using upcycled production methods and concepts for large-scale production.

Some of the interventions for scaling up upcycling can be, for example, through community workshops, reuse/upcycle centres with a product collection or materials provision services. To promote the reuse of textile materials, it is possible to enrich the curriculum in art and design at schools, colleges, and universities to incorporate advanced upcycling knowledge and skills; organize upcycling competitions; demonstrate high quality and value of upcycling through commissioning high profile upcycling projects by famous artists and designers etc. (Sung et al., 2019a).

### Examples

#### *Workshops*

The students of RTU's Institute of Design Technologies collaborated with the Valkas county association "Kastanis" to produce hand-crocheted recycle mats for the "Juglas animal shelter" as part of RTU's creative workshop at the Kipsala Creative Industries Centre (RTU Institute of Design Technologies, 2015).





IMAGE 26. RTU'S CREATIVE WORKSHOP

Source: from the archive of Riga Technical University, (RTU Institute of Design Technologies, 2015). <https://www.facebook.com/media/set/?set=a.671881669590181&type=3>

### **Competitions and awards**

To stimulate designers to use sustainable solutions in the field of fashion design, there are different types of competitions and awards. The *Redress Design Award*, formerly known as the *EcoChic Design Award*, is the largest competition in the world for sustainable fashion design. Its goal is to educate fashion designers all over the world about sustainable design theories and methods in order to encourage growth toward a circular fashion industry. The *Redress Design Award* "provides a unique platform for passionate and talented fashion game-changers to transform the global fashion industry and rewards the best with career-changing prizes to maximize long-term impact by putting sustainable design talent in the spotlight worldwide" (Redress Design Award, n.d.). Every cycle of the competition includes an educational process in which participants are educated about the harmful effects that fashion has on the environment and are encouraged to employ the fundamental sustainable design strategies of zero-waste, upcycling, and reconstruction to eliminate fashion waste (Redress, 2023).

### **Participation in exhibitions**

Students of the Art Academy of Latvia together with Sigulda region craftsmen will create a stand at the Milan International Design Fair 2022 on SaloneSatellite pavilion, which is a space for young designers and design schools to showcase their talents. The concept of the Latvian stand "If you want to mend the world, start mending your socks" was dedicated to mending the world in a very literal sense. It embodies taking care of our world – inheriting it from the previous generations, preserving it and leaving it intact for the upcoming generations, since in its own way design shares the responsibility and the blame for the unrelenting stimulation of the industrial process and consumption (Art Academy of Latvia, 2022).



IMAGE 27. EXAMPLES FROM EXHIBITION

Source / Copyright: we will ask for permission to use the images

### Campaigns

The campaign and environmental installation "Nothing to wear", which took place in Latvia, drew attention to the fact that unused textiles that end up in the household waste are as dangerous a source of pollution as packaging and other waste. As part of the campaign, it was encouraged to find solutions for reducing the volume of textile waste and for more sustainable management, including the creation of a sorting system in Latvia.



IMAGE 28. INSTALLATION "NOTHING TO WEAR"

Source/ Copyright: Photographed by Gunta Zommere

The campaign reminds you: before buying new clothes, review your wardrobe, shop thoughtfully, but hand over worn, useless clothes for reuse or recycling, so that mountains of clothes do not pollute the environment and bury us!



## Conclusion

Purchasing second-hand clothes, renting, repairing, or “upcycling” - all these alternatives to conventional fashion prolong the life of existing clothing and help to significantly lessen the impact that the fashion industry has on the environment.

Clothing “upcycling” is the creative process of converting what the textile industry considers waste into products of equal or higher quality. On the one hand, this is a welcome move - it is possible that in this way the consumption of new clothes can be reduced, instead consumers would choose already produced and improved clothes, thus extending the overall life of clothing. Consequently, the need for obtaining new raw materials and the amount of textile waste is reduced. On the other hand, it is a temporary solution, a short-term strategy, because it extends the life of already produced textiles only for a while. After that, these materials end up back where they were at the beginning - in the waste. In the best case, these modified clothes can then be recycled, or in most cases downcycled. However, there is also the possibility that “upcycling” (can we even use that term in this case?) can make further processing difficult or even impossible. For example, if clothing is made of various materials that often are cut into small pieces and then sewn together, or if various decorative details are added to it, recycling will no longer be possible because it will be difficult to disassemble the garment.

Despite the fact that it is currently desirable to use already produced products in every possible way, when buying new ones, attention should be paid to how they are manufactured, how friendly they are to people, i.e. how sustainable they are. However, there is a threat that encourages consumption by making consumers think they are doing something good for the environment. As public interest in environmental issues increases, many clothing manufacturers and fashion brands use the idea of sustainability as a slogan to attract consumers and increase sales. In essence, it is a “greenwashing”, because not only the method of extraction of the raw materials used, their composition, but also the production process does not comply with the principles of the existing circular economy, not to mention desirable, truly sustainable principles.

The principles of sustainability based on the concept *Cradle to Cradle* (McDonough & Braungart, 2022, 2013) assume that all materials (both biological and chemical) are initially produced with the aim that they can be used for as long as they are intended, and after they wear out, they will return to the continuous biological or technical cycle, without creating any kind of waste and pollution. Reduction, reuse, and recycling, because they only slow the rates of contamination and depletion rather than stopping these processes, are slightly less destructive than landfills and incinerators. Referring to William McDonough and Michael Braungart: “The environmental goal should be recycling and up-cycling – the return to industrial systems of materials with improved, rather than degraded, quality. To eliminate the concept of waste means to design things - products, packaging, and systems - from the very beginning on the understanding that waste does not exist” (McDonough & Braungart, 2022).



### 3. Additional materials and resources

Module 3: Upcycling as a green practice			
Type of resource	Title	Topic	Link
Website	Fashion for Good	2.1. The basics of clothing upcycling	<a href="https://fashionforgood.com/">https://fashionforgood.com/</a>
Website	Ellen MacArthur Foundation. Redesigning the future of fashion	2.1. The basics of clothing upcycling	<a href="https://ellenmacarthurfoundation.org/topics/fashion/overview">https://ellenmacarthurfoundation.org/topics/fashion/overview</a>
Blog	Looptworks. Upcycling, Downcycling and Recycling Explained	2.1. The basics of clothing upcycling	<a href="https://www.looptworks.com/blogs/looptworks-blog/34391171-upcycling-downcycling-and-recycling-explained">https://www.looptworks.com/blogs/looptworks-blog/34391171-upcycling-downcycling-and-recycling-explained</a>
Online article	H&M Sustainability Disclosure 2021	2.1. The basics of clothing upcycling	<a href="https://hmgroupp.com/sustainability/">https://hmgroupp.com/sustainability/</a>
Online article	The Next Big Thing In Fashion: Scraps	2.2. Sources of textiles used in the upcycling process	<a href="https://www.ozy.com/rising-stars/the-next-big-thing-in-fashion-scraps/87442/">https://www.ozy.com/rising-stars/the-next-big-thing-in-fashion-scraps/87442/</a>
Online article	7 Sustainable Fashion Brands That Upcycle Deadstock and Fabric Scraps	2.2. Sources of textiles used in the upcycling process	<a href="https://www.greenmatters.com/p/upcycled-deadstock-fashion-brands">https://www.greenmatters.com/p/upcycled-deadstock-fashion-brands</a>
Online article	How SuperCircle Is Changing Fashion And Climate	2.2. Sources of textiles used in the upcycling process	<a href="https://www.forbes.com/sites/cassellferere/2022/05/26/what-is-supercircle-and-how-is-it-changing-fashion-and-climate/?sh=109ccb6c4544">https://www.forbes.com/sites/cassellferere/2022/05/26/what-is-supercircle-and-how-is-it-changing-fashion-and-climate/?sh=109ccb6c4544</a>
Online slideshow	11 Upcycling Designers To Watch	2.3. Different groups involved in the upcycling process	<a href="https://www.commonobjective.co/article/11-upcycling-designers-to-watch">https://www.commonobjective.co/article/11-upcycling-designers-to-watch</a>



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Online article	Upcycling Is The Biggest Trend In Fashion Right Now	2.3. Different groups involved in the upcycling process	<a href="https://www.vogue.co.uk/fashion/article/upcycling-trend-ss21">https://www.vogue.co.uk/fashion/article/upcycling-trend-ss21</a>
Online article	Gabriela Hearst Is Launching A New Deadstock Capsule Collection – And It Redefines Sustainable Luxury	2.3. Different groups involved in the upcycling process	<a href="https://www.vogue.co.uk/news/article/gabriela-hearst-retrofit-sustainability-capsule">https://www.vogue.co.uk/news/article/gabriela-hearst-retrofit-sustainability-capsule</a>
Online article	Upcycling Fashion: The Art of Designing with Waste Materials	2.3. Different groups involved in the upcycling process	<a href="https://closedloopfashion.com/innovative-design/upcycling-fashion-the-art-of-designing-with-waste-materials/">https://closedloopfashion.com/innovative-design/upcycling-fashion-the-art-of-designing-with-waste-materials/</a>
Online article	Dressing for the metaverse	T2.3. Different groups involved in the upcycling process	<a href="https://www2.hm.com/en_us/sustainability-at-hm/our-work/the-latest/2016-dressing-for-the-metaverse.html">https://www2.hm.com/en_us/sustainability-at-hm/our-work/the-latest/2016-dressing-for-the-metaverse.html</a>
Online article	20 Brands That Are Reworking Old Clothes Into Beautiful Upcycled Fashion	2.3. Different groups involved in the upcycling process	<a href="https://www.consciouslifendstyle.com/upcycled-fashion-brands/">https://www.consciouslifendstyle.com/upcycled-fashion-brands/</a>
Video	Invisible Mending	2.4. Types of clothing upcycling	<a href="https://youtu.be/CH5myvMh5rw">https://youtu.be/CH5myvMh5rw</a>
Video	How to Repair a Hole in a Sweater with Double Ended Latch Hook	2.4. Types of clothing upcycling	<a href="https://youtu.be/nq9X9F2GNb0">https://youtu.be/nq9X9F2GNb0</a>
Blog	Repairing Jeans With Invisible Mending	2.4. Types of clothing upcycling	<a href="https://madamsew.com/blogs/sewing-blog/mending-jeans-with-your-sewing-machine">https://madamsew.com/blogs/sewing-blog/mending-jeans-with-your-sewing-machine</a>
Video	Visible Mending: 10 Basic Principles to Get You Started Mending Your Clothes	2.4. Types of clothing upcycling	<a href="https://youtu.be/IKIKEbkbX_M">https://youtu.be/IKIKEbkbX_M</a>
Video	Visible Mending - Sashiko & Patching	2.4. Types of clothing upcycling	<a href="https://youtu.be/zph7_sKMjWA">https://youtu.be/zph7_sKMjWA</a>

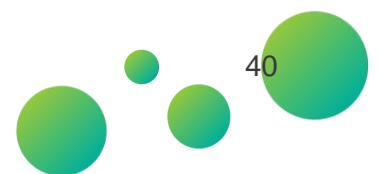


Online article	H&M Take Care Tips and hacks on how to repair, remake and refresh your clothes to make them last longer.	2.4. Types of clothing upcycling	<a href="https://www2.hm.com/en_us/hm-sustainability/take-care.html/">https://www2.hm.com/en_us/hm-sustainability/take-care.html/</a>
Online article	101 Upcycling Ideas: The Ultimate List for 2021	2.4. Types of clothing upcycling	<a href="https://pagouroupcycle.com/blogs/news/101-upcycling-ideas-the-ultimate-list">https://pagouroupcycle.com/blogs/news/101-upcycling-ideas-the-ultimate-list</a>
Video	Love Your clothes. Videos and guides: Refashioning and upcycling.	2.4. Types of clothing upcycling	<a href="https://www.loveyourclothes.org.uk/guides/videos-and-guides-refashioning-and-upcycling">https://www.loveyourclothes.org.uk/guides/videos-and-guides-refashioning-and-upcycling</a>
Video	The Cafe Collection	2.4. Types of clothing upcycling	<a href="https://vimeo.com/617233352">https://vimeo.com/617233352</a>
Video	KEEN Harvest Collection: The Journey of Our Twice-Upcycled Bag	2.4. Types of clothing upcycling	<a href="https://youtu.be/2T621kE02ag">https://youtu.be/2T621kE02ag</a>
Online article	10 designers making unique furniture and decor from recycled textiles	2.4. Types of clothing upcycling	<a href="https://www.upcyclist.co.uk/2017/11/furniture-decor-recycled-textiles/">https://www.upcyclist.co.uk/2017/11/furniture-decor-recycled-textiles/</a>

## 4. Wrap-Up

In this module we have looked in depth at five main topics:

1. The basics of clothing upcycling (including, the topic "what is preventing clothing recycling, and why is it so difficult?");
2. Sources of textiles used in the upcycling process (pre-consumer textile waste and post-consumer textile waste);
3. Different groups involved in the upcycling process - professionals, amateurs;
4. Types of clothing upcycling - recovering, decorating, clothing upcycling from garments - refashioning, reconstructing, repurposing;
5. Promotion and scaling-up of upcycling practices.







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## 6. Assessment

### 6.1. Introduction

An individual must know the basics of clothing upcycling and understand why clothing recycling is so difficult. In his everyday life, he should be aware of individual responsibility for the clothes he uses and reduce their number in his closet as much as possible. He should be aware that the sources of textile products used in the upcycling process can be both before and after consumption.

One must know and be able to distinguish between different types of clothing upcycling - recovery, decoration, clothing upcycling from garments - refashioning, reconstructing, repurposing.

Estimated time to complete: **2 hours**

### 6.2. Knowledge assessment

Quiz-like assessment based on the main content. Please mark the correct answer with bold when required. Include 10 questions for your module. Increase gradually the level of difficulty.

Question 1 (multiple choice or true/false): What basically is clothing upcycling?

[recycling of clothes] [**clothing transformation by cutting and sewing**] [raw material extraction from clothes]

Question 2 (multiple choice or true/false): According to the textile sustainability pyramid, what should be the main attitude of everyone towards textiles and clothing?

[**reduce clothing items**] [recycle clothing items] [upcycle clothing items]



Question 3 (multiple choice or true/false): Evaluate the true/false statement: "Clothing recycling is a complex process".

[TRUE] [false] [I do not know]

Question 4 (multiple (two) answers correct): What are two main sources of textiles used in the upcycling process?

[pre-consumer textile waste] [post-consumer textile waste] [fabric and garment sampling waste]  
[second-hand clothing]

Question 5 (multiple answers correct): What textile wastes are generated by apparel industries?

[cutting waste] [home textiles] [textile swatch samples waste] [unsold finished garment waste]

Question 6 (multiple answers correct): Mark types of clothing upcycling.

[reconstructing] [sewing] [resizing] [decorating]

Question 7 (multiple answers correct): What sentence describes the process of refashioning or reconstruction the best?

[refashioning or reconstruction is disassembly and redesign of garments] [refashioning or reconstruction is sorting, storage and redesign of garments] [refashioning or reconstruction is collecting, sorting, disassembly, and redesign of garments] [refashioning or reconstruction is redesign of garments]

Question 8 (matching): Match the terms with their definitions.

**REDUCE:** At the consumer level, it means less demand for new textiles and clothing, which would result in less waste

**REUSE:** In general, it is using an item again, prolonging its life

**RECYCLE:** It is the act of transforming waste into new products to save potentially usable materials and reduce the use of raw materials

**UPCYCLE:** Using a product after significant modification is an enhanced and practical method of reuse

Question 9 (matching): Match the concepts with their explanations.

**Clothing refashioning:** process that uses used clothing and reworks them into new garments

**Clothing decoration:** giving a new look to garments by adding various decorative details, using embroidery, painting, or hand dyeing



**Refitting of garment:** adjusting clothing to individual body needs - shortening, improving the fit, narrowing, or widening

**Repairing clothes:** an activity which results in the maintenance and extension of the useful life of the garment

**Sorting clothes:** An operation during which clothing is divided into separate groups according to garment types, colour, materials, and quality

Question 10 (matching): Match the problems with their solutions.

**There is a hole in the sweater:** it is possible to make invisible and visible mending

**The pants are too wide and long:** it is recommended to make clothing refitting

**There are many outdated clothes in the closet:** possible to do reconstruction of clothes or donate to charity

**There is a non-washable stain on the garment:** it is possible to give new look by adding various decorative details

**There are beautiful fabric curtains in the closet with no use:** one of the possibilities is to sew a beautiful dress

### 6.3. Skills assessment

Task 1. Analyse your wardrobe.

Analyse the contents of your wardrobe, paying attention to clothes that are not used or used very rarely. Select several such items of clothing and assess the reasons why they are not used. For example, the clothes no longer fit, are out of fashion, or have some minor damage, but it is a pity to give them away, etc.

To point out what the solution might be to reuse the garment yourself, for example, repairing, or refitting if possible, or give it away, sell it, rent it to someone else who would benefit from it.

Task 2. Create a new product.

Use one of the upcycling methods to create a new product. If clothing is used as the starting material, then it would be desirable that the end product is also clothing in order to preserve the basic meaning of its use.

Choice of materials. Choose some clothes from those that you have previously analysed - those that really have no other use. Or you can buy second-hand clothes. So, choose ones that you can experiment with and won't be sorry if the result fails.

Concept. Decide what your final product might be. It is mostly influenced by the available materials – fibre composition, type of fabric (knitted or woven), quantity of materials. Think



about whether it is possible to make a garment using its existing parts, i.e. without taking it apart completely.

Process - disassembling clothes, cutting, sewing, decorating, etc. The whole process needs to be documented, i.e. written down and photographed.

If there are leftover materials, think about how they could be used. Perhaps it is possible to use the small scraps to make some interior textiles, either by sewing pieces of fabric together or by dividing the fabric into strips, using it as "yarn" for knitting.