



Clean and Innovative Textiles Strategy for Circular Economy

MODULE 4

Waste Management and Recycling

Unit 4.1

Introduction To Waste Management



kaunas
university of
technology



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In this lecture you will find an introduction to waste management, in order to give a perspective into waste treatment and learn the best practices to manage them.

To introduce waste management, it is strictly necessary to define the waste management hierarchy. The waste hierarchy is a tool and conceptual framework designed to guide and rank waste management decisions at both the individual and organisational level. It gives top priority to waste prevention, followed by reduce, re-use, recycling, recovery and finally disposal. This concept is in the evaluation of processes that protect the environment alongside resource and energy consumption from most favourable to least favourable actions. The hierarchy establishes ideal program priorities based on sustainability. To be sustainable, waste management cannot be solved only with technical end-of-pipe solutions, but an integrated approach is necessary.

The hierarchy helps us rethink our relationship with waste based on six priorities ranked in terms of what is best for the environment. This is often illustrated as a six-tier inverted pyramid as you can see here. We will break down the pyramid to define each block and indicates an order of preference for action to reduce and manage waste. The hierarchy captures the progression of a material or product through successive stages of waste management and represents the latter part of the life cycle for each product. Therefore, the first block on the pyramid is the

1. **Prevention Block:** Preventing waste generation is essential to prevent the environmental impact. Waste minimisation involves redesigning products and processes and/or changing societal patterns of consumption and production.
2. **Reduce Block:** This stage encourages industries, communities and governments to reduce their use of virgin raw materials to produce goods and services. The idea is to maximise efficiency and prevent the unnecessary consumption of resources through steps such as:
 - Procuring raw materials that come with the least packaging or require the fewest resources to refine.
 - Avoiding disposable or single-use goods.
 - Procuring materials that are recycled or can be recycled, repaired or reused.
 - Optimising inventory to prevent perishable goods (e.g., food) from going to waste.
3. **Reuse Block** and preparation for reuse is giving the products a second life before they become waste. Preparing materials for reuse in their original form is the third-best approach to waste management. Aside from reducing landfill impact, reusing waste also allows companies to avoid spending money on new goods or virgin materials or paying a provider to dispose the waste.

Some examples where everybody can use these measures to prepare common items for reuse can be:

- Refilling toner and printer cartridges instead of buying new ones.
 - Reuse wheels from scrap cars, which are in a good condition, but the car became scrap.
 - Reusing envelopes, boxes and other packaging materials.
 - Donating or selling used furniture, computers and other office equipment, that can be useful in other sectors as education or similar.
4. **Recycle Block:** any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes composting and it does not include incineration. Recycling involves processing materials that would otherwise be sent to landfills and turning them into new products. It is the fourth step of the waste management hierarchy because of the extra energy and resources that go into creating a new product. For instance, scrap paper can be recycled, but the process requires water and electricity to transform it into pristine paper products.
 5. **Recover Block:** When further recycling is not practical or possible, businesses can recover energy or materials from waste through processes such as:
 - Incineration
 - Anaerobic digestion
 - Gasification
 - Pyrolysis.

The recovered energy can be made available for the organisation's use or fed back into the electricity grid.

6. Dispose Block: The last option on the waste hierarchy, Disposal is the processes to discard of waste through landfilling, incineration, pyrolysis, gasification and other final solutions¹.

To dispose textile waste, it is important to differentiate between citizen and companies, basically the quantities of waste are different, while citizens can generate a limited amount of waste, companies can generate huge quantities, that is why it is important to differentiate the ways of collecting waste.

First, regarding citizens, more than 90% of the collection comes from clothing and footwear containers, both on the street and in public or private establishments, including municipal waste. Second, concerning companies, for specific collection associated with economic activities, bulk collection is carried out at the production site, where the textile waste has previously been prepared in sacks, cages, etc².

Specifically, the collection and reduction waste models³ are:

- Door-to-door: Door-to-door selective collection (DtD) consists in leaving out refuse for municipal collectors outside your front door, on given days and at given times for each fraction. Using a door-to-door system, all domestic fractions can be collected from the street (final waste, glass, packaging and paper and cardboard and include textile waste), or only certain fractions, at least final waste and OFMSW, with containers for the other fractions. The results of selective collection achieved in municipalities operating door-to-door systems are superior in general, both in the amount collected and the quality of separation (in general between 60 and 80% for selective collection). Implementation of door-to-door collection is simpler in areas with lower population density, where it is easier to identify individuals' refuse. Implementing DtD collection systems requires a change of habits on the part of the public, which must be achieved through an adequate communication campaign.
- Recycling Center: It is any facility which is maintained and operated for the purpose of receiving, collecting and processing source-separated recyclable materials for resale or transfer. Everybody can go there to dispose their waste.
- Social Programs: some social programs are employment projects for people with special difficulties which consist of reusing old clothes and accessories in good conditions. For example, in Barcelona you can find Roba Amiga Programme, which helps to reduce the amount of garbage which is delivered to landfills and to reuse waste which can be still reused. The different kinds of clothes which can be collected are: clothes for home and clothing, shoes, handbags and other accessories. The ones that cannot be collected are: textile waste, wet clothes and clothes which cannot be reused (with parasites or odours, dirty or used rags from workshops or similar places).
- To finish with these examples, there are the Green Points: Green dots are used to get rid of waste that cannot be thrown into street containers. By using this service, we contribute to improve the recycling process and help preserving the environment.

The current situation regarding textile waste data in the European Union (EU) is important to understand the huge environmental impacts caused by textile waste.

Since 1996, the amount of clothes bought in the EU per person has increased by 40% together with a strong decline in prices, which has reduced the lifespan of clothing. Other shocking facts are, Europeans use nearly 26 kilos of textiles and discard about 11 kilos of them every year. And it is estimated that less than 1% of all textiles worldwide are recycled into new textiles⁴.

To counter this, at present, EU policy launched the circular economy package, in which for the first time will require Member States to ensure that textiles are separately collected. The new Waste Directive requires Member States to set up schemes by 2025 at the latest. It also requires to consider, by the end of 2024, whether targets for textile waste re-use and recycling should be introduced as well. The action plan includes 54 CE action points, and their expectation results are the following: They included measures to help stimulate Europe's transition towards a circular economy, boost global competitiveness, foster sustainable economic growth and generate new jobs.

Regarding waste reduction targets, the directive also introduces targets for general municipal waste re-use and recycling of 55 % by 2025, 60 % by 2030 and 65 % by 2035. Although not specifically aimed at textiles and clothing, other directives in the circular economy package could also mitigate some of the environmental impacts of textiles and clothes.

Regarding waste disposal, the Landfill Directive requires Member States to reduce 10 % the share of municipal waste landfilled by 2035. Therefore, Member States will be required to establish separate collections of certain waste types, including the obligation to establish them for textiles and hazardous waste from households by 1st of January 2025.⁵

In line with the waste management policies, it is important to highlight the extended producer responsibility (EPR).

EPR can be defined as “an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle.” EPR is typically understood to involve a shift in responsibility (administratively, financially or physically) from governments or municipalities to producers as well as an encouragement of producers to take environmental considerations into account during the design and manufacture phases of product development. EPR uses financial incentives to encourage manufacturers to design environmentally friendly products by making producers responsible for the end-of-life handling costs of their products. This policy approach, which differs from product stewardship, shares responsibility throughout a product's chain of custody, and it attempts to relieve local governments of the costs of handling certain priority products by requiring manufacturers to standardise the cost of recycling within the price of the product. Therefore, the desired results are:

- EPR seeks to achieve a reduction of the environmental impact of products, throughout their lifespan, from production through end-of-life.
- In the textile sector, EPR seeks to promote sustainable and treatment of textile waste in accordance with the waste hierarchy.
- And get the measures to extend producer responsibility to cover the whole product lifecycle via new business models⁶.

Other tools for improving the waste management and recycling are the voluntary standards. The Recycled Claim Standard (RCS) and Global Recycled Standard (GRS) are international, voluntary standards that set requirements for third-party certification of recycled input and chain of custody. The shared goal of the standards is to increase the use of recycled materials. The GRS includes additional criteria for social and environmental processing requirements and chemical restrictions.

The main difference between RCS and GRS⁷ are:

- GRS is a more rigorous standard.
- The recycled content requirement in GRS certification is more than 20%; whereas the RCS certification only requires a minimum of 5%.
- GRS requires environmental and social responsibility audits; RCS does not.
- Companies should choose GRS or RCS, depending on the customer needs and the product specifications.

The goals of these Standards are:

- To reduce harmful impact of production to people and the environment.
- To provide assurance that products are processed more sustainably.
- To have higher percentages of recycled content in products.

All these measures try to solve the environmental impact caused for the textile waste management. Textile production takes a lot of water to produce textile, plus land to grow cotton and other fibres. It is estimated that the global textile and clothing industry used 79 billion cubic metres of water in 2015, while the needs of the EU's whole economy amounted to 266 billion cubic metres in 2017. To make a single cotton t-shirt, 2,700 litres of fresh water are required according to estimates, enough to meet one person’s drinking needs for 2.5 years. It also affects the water pollution, the release of substances that makes water unsafe for human use and disrupts aquatic ecosystems.

The textile production is estimated to be responsible for about 20% of global clean water pollution from dyeing and finishing products. Washing synthetics releases an estimated 0.5 million tonnes of microfibres into the ocean per year. Laundering synthetic clothes accounts for 35% of primary microplastics released into the environment. A single laundry load of polyester clothes can discharge 700,000 microplastic fibres that can end up in the food chain.

In addition, textile waste contributes to greenhouse gas emissions. 87% of the total textile waste ends up incinerated or landfilled, thus, most of them are still discarded and subsequently incinerated, or they reach a landfill where they release methane. The goal of the Landfill Directive is to reduce the share of municipal waste landfilled to 10 % by 2035 for all Member States.

It is estimated that the fashion industry is responsible for 10% of global carbon emissions, more than international flights and maritime shipping combined. According to the European Environment Agency, textile purchases in the EU in 2017 generated about 654 kg of CO₂ emissions per person. Finally, global textiles and clothing industry was responsible 1715 million tons of CO₂ emissions in 2015.⁴

To finish with the introduction to waste management, some promoting actions for the prevention and reuse of textile waste are defined below:

- Revalorisation of textiles by companies, revalorising possible textile waste that was previously discarded but now sustainable practices can be applied and give more value to this textile clothing.
- WRAP is one of the globe's leading sustainability charities. WRAP is taking action to transform the way the fashion and textiles industry buys, uses and re-uses textiles and clothing. They are convening the sector for a transformational change. Their cross-industry collaborative agreements cut carbon, water and waste from textile supply chains, and bring businesses together in nations around the world to accelerate progress towards a circular textiles economy⁸.
- Other important way to foster sustainability are ecolabels. The main purpose of ecolabels is to stimulate consumers to buy environmentally-sound products and, in turn, to stimulate producers to produce in an environmentally friendly manner. Ecolabels allow consumers to make comparisons among products. Consumers are also provided with the ability to reduce the environmental impacts of their daily activities by purchasing environmentally preferable and healthy products and are able to minimize adverse consequences during the use and disposal. Ecolabelling has emerged globally as a differentiating factor in retail markets for textile and apparel purchases⁹.
- Swishing/swapping means exchanging clothes. People take good-looking, clean and presentable clothes that they no longer wear to the event, where others can fall in love with them and give them a second life. Therefore, swishing/swapping is good for the environment. Swishing/swapping events can be organized all over the world¹⁰.
- Like swishing/swapping is the fashion library. It is an example of a collaborative consumption business model for extended life cycles of textiles, in which a monthly membership fee (often EUR 30-60) allows members to borrow a specific number of pieces of clothing in a set time, typically a few weeks. Clothing libraries can extend the life cycle of a garment two to four times and proportionally reduce the production of new clothing and the associated waste generation and other environmental impacts¹¹.

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