

# Chemistry

**The afterlife of our clothes**

RecyCOOL Lessons

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# The afterlife of our clothes

## **Description of the lesson**

In this lesson we will explore the end of life of our clothing. We will check our garments and the materials they are made of, then we will consider their time to biodegrade. At the end we will think of ways and possibilities to extend their life.

## **Objective**

Objective of this lesson is to discover the biodegradation of textile and the length of biodegrading of different materials that are used in our clothing.

## **After this lesson you will be able to**

- consider materials your clothes are made of and the time of their biodegradation
- determine the time of biodegradation of the main textile materials used in garments

## **Tools and materials**

ten garments from your wardrobe, pen and paper

## BIODEGRADATION:

Biodegradation is the process by which microorganisms break down organic matter.

## CHEMICAL DECOMPOSITION:

Chemical decomposition occurs when materials are chemically changed in a reaction, and the products differ from the original compounds chemically. Biodegradation is an example of chemical decomposition performed by living organisms.



Have you ever considered what processes our clothing is going through after it's disposed of? Does all our clothing decompose, or alternatively – do you know what happens to the fibres of the fabric? Think or write down on paper all the materials you know of that can make up the fabric of our clothing.

Do these materials have some specific features that make them stand out? Or do they all seem the same to you?

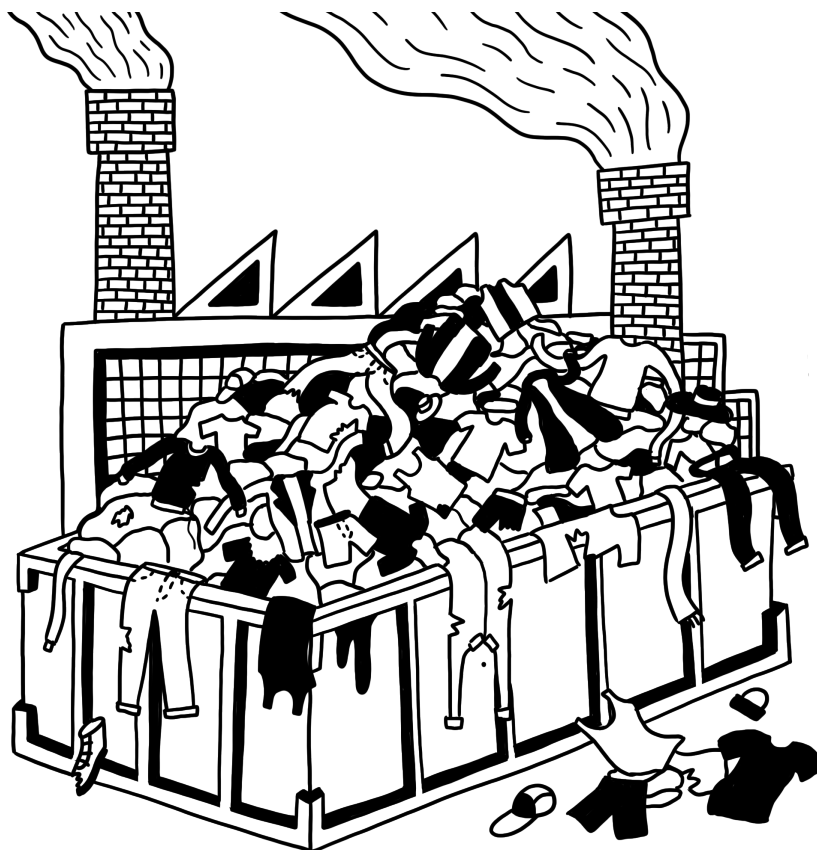
Pick 10 garments with material labels from your wardrobe. Read labels and collect all information on materials from them. Write it down.

Our clothing is made of many different materials. Some are being used by humankind since the beginning of our civilization, some are products of an industrial revolution.

People are constantly developing new materials, trying to achieve comfortable, accessible and quality fabrics. Functionality of the garment depends also on the composition of the fabric, which can be made of single material or it can be a mixture of more materials – then it is a mixed fibre material. Most of the clothing we produce is made of a blend of organic and synthetic materials.

This composition of the fabric affects everything – production of the material, for what type of garment it is suitable, care for the garment, the way it feels when we are wearing it.

Our disposed clothing ends up mostly in landfills and incinerators. In both cases there are different levels of environmental damages caused by these waste disposal methods – which in turn, translates into health impacts.



## So what are the main impacts of the disposed textile waste?

Ultimately, only 15% of used textiles are theoretically 'recycled,' and of those, up to half are simply shipped abroad to other countries, largely in the Global South where they land in landfills there.

These countries often have less advanced municipal waste systems, meaning that the environmental damage and health impacts of decomposing textiles will be much greater there than they would be in the United States. As [Matilda Lartey](#), an environmental activist and artisan in Ghana, explained in a recent panel discussion, textile waste from the United States has multiple impacts on countries like Ghana:

- Much of the clothing sent from abroad is of too low quality to use, meaning it goes directly into landfills or open-air dumps.

From there, the gas and chemical leachates that emerge during the decomposition process pollute the air, soil, and groundwater and negatively impact the environment and health of humans and other species.

- Unwanted used clothing often clogs the gutters, preventing water from flowing properly. This exacerbates flooding and leads to water-borne disease. This is particularly problematic as climate change has increased the incidence of flooding in many parts of the Global South.

- Due to limited space, people will burn unwanted clothing, resulting in significant air pollution impacting respiratory and cardiovascular health.

- Burning clothes occurs for many reasons - getting rid of the amount of textile waste, sometimes for energy, or to heat up houses in underprivileged areas. Did you know that sometimes burning new, unsold clothes from overproduction happens to protect the brand's name?

## **What happens to our trash after we throw it away?**

Well, it rots and decomposes. **There are two different kinds of decomposition: physical and chemical.** Physical decomposition is when materials are broken down into smaller pieces, but the material remains unchanged.

**Erosion of soil and rock is an example of physical decomposition. Chemical decomposition occurs when materials are chemically changed in a reaction, and the products differ from the original compounds chemically.**

## **What does biodegradable mean?**

Biodegradable means that an item can be disintegrated into its natural base elements by bacteria, fungi, or some other biological process. Biodegradation is just the process of nature breaking down materials into their component parts.

**Most fruits, vegetables, and other plant-based foods are biodegradable, in that given the passage of time and the right biological conditions, they would eventually biodegrade.**

So what happens to these organic and synthetic blend materials in clothing we throw away? Do you have any idea what this means for the environment? When our clothes end up in landfill, they do start to biodegrade too.

## What happens when I throw my clothes away?

To determine clothes' sell-by date, we need to understand the materials they are made from – whether they are natural, in which case they will biodegrade faster; or synthetic, in which case their presence on the Earth will outlive their wearer by a significantly long time.

– Orsola de Castro (Loved Clothes Last)

## Roughly how long do clothes take to biodegrade in landfill?

That said, biodegradation and composting fabrics have their toxic effects too, because all clothes in landfill release methane gas as they decompose – the infamous cow-fart substance that is the dreaded culprit of global heating.

Most clothes, even if made with natural and biodegradable materials, are usually sewn with polyester threads and contains all kinds of added components, such as synthetic labels, plastic buttons and zips; elements that are often made using metals that are unethically mined and brimming with toxicants.

As an example, the belief that wool is biodegradable and will decompose in a matter of weeks is an entirely mythical idea, when the treatment of modern materials is factored in. If you sheared a sheep and left its wool in the compost pile, it would decompose along with all the other organic matter that we consider biodegradable.

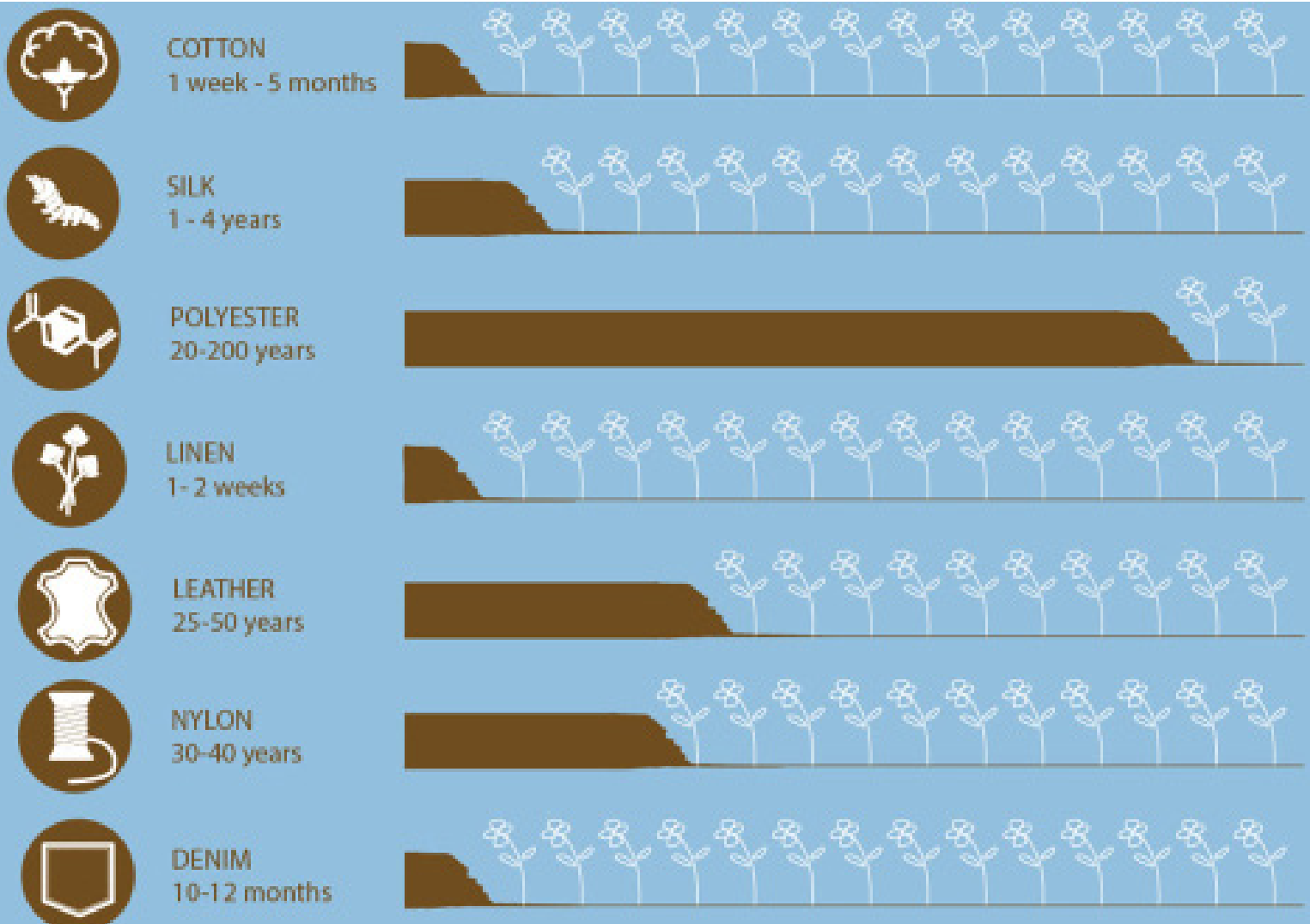
Due to the volume of nitrogen in animal hairs, it would even leave behind beneficial nutrients for the soil.



But textile wool – cleaned and scoured, carded and spun, dyed and woven, and then finished with anything from antistatic agents to flame retardants – is far from compostable. **And in its toxic state, when thrown away, wool also releases methane gas into the soil as its chemical journey breaks it down.**

**Synthetic fabrics have the worst impact on the planet. Man-made fibres generally begin life as pellets, flakes or chips which need to be made into viscous liquid before processing.** There are a lot of chemical methods to produce them: principally melting, dissolving in a solvent or chemically treating the polymer to form a soluble derivative.

Photo credit: [Her circle](#)



**Textile waste, like any other waste, creates landfill gas when disposed of in landfill. Landfills are one of three main sources of human methane pollution, along with livestock and the oil and gas industry.**

Landfill gas (LFG) is a natural byproduct of the decomposition of organic material in landfills. LFG is composed of roughly 50 percent methane (the primary component of natural gas), 50 percent carbon dioxide (CO<sub>2</sub>) and a small amount of non-methane organic compounds. **Methane is a potent greenhouse gas 28 to 36 times more effective than CO<sub>2</sub> at trapping heat in the atmosphere over a 100-year period.**

**Greenhouse gas emissions from the waste sector mainly comprise methane released from landfill sites, with the remainder (10%) from waste water treatment and incineration of waste.**

**Landfill waste – responsible for about 11% of global methane emissions – is expected to increase about 70% by 2050 as the global population continues to climb, according to the World Bank.**

There are industrial solutions, which could resolve the urgency of this problem, for example a process called gasification, which involves turning carbon-based materials into gas by heating them to a high temperature but without burning them. **The gas can be stored until it is needed for the generation of electricity.**

# Task

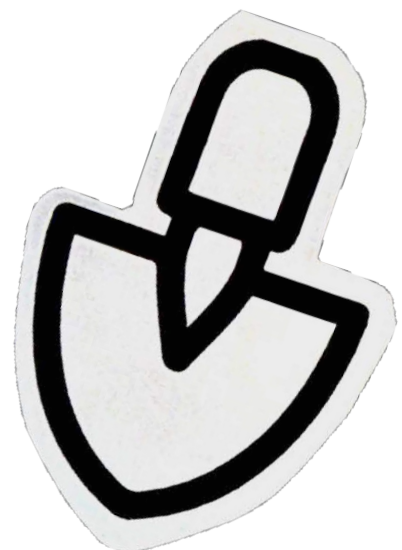
Now go back to all garments you picked in this exercise and inspect them for all – really all – materials they are made of.

Consider threads, buttons, zippers, labels. Can you determine all materials in these garments?

**If yes – how did you come to the results? Is everything written on the label?**

**If not – why do you think this is?**

Your task is to put all these garments in order how they will biodegrade. You can do it in two ways – or you consider only the main material (such as in cotton t-shirt you will consider only cotton), or you can consider ALL materials (including thread and labels) and line them up in order the last one of them biodegrade.



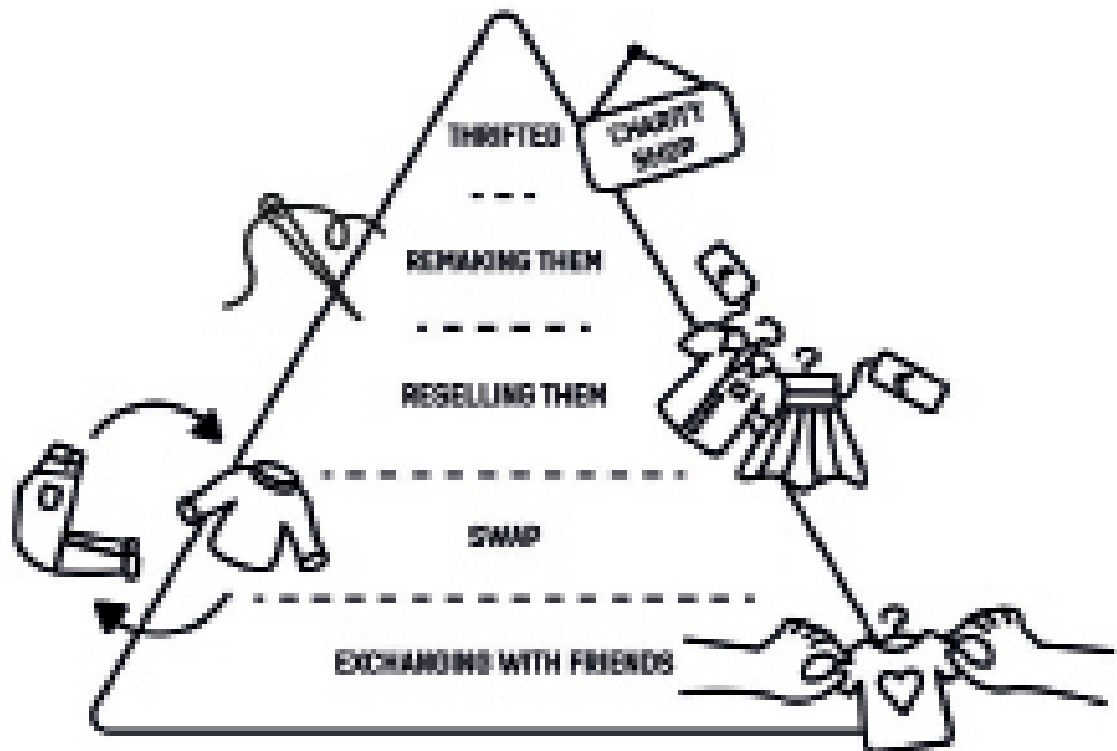
# Reflection

Considering all this information, is there any solution for us as consumers? How can we if not stop, at least delay or prevent textile waste?

There is not a single magic solution for problems that are caused by our textile waste. If we really need to obtain new clothes, preferring biodegradable materials to non-biodegradable (or those which biodegrade in long term) is one of the options.

As we could explore, biodegradable is definitely better than non-biodegradable; however, clothes should be designed to be worn, not to be buried or burnt.

Preventing textile waste is the first step. Try to consider how the life of clothes you already own could be enhanced or prolonged.



# Resources

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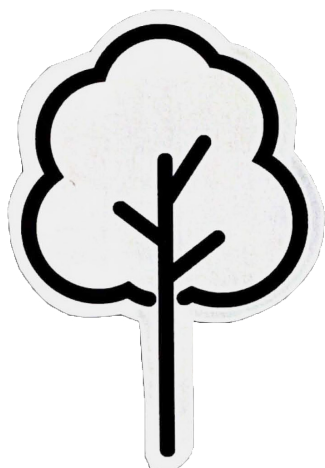
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## Attachment

MOVIE ON TEXTILE WASTE BURNING, RECYCLING, BRANDS COLLECTION, burning clothes in bulgaria, clothes from west europe <https://www.youtube.com/watch?v=23vUvQN-RlY&t=21s>



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