

Rethinking plastics – closing the loop

Teaching materials on plastics
and the circular economy

for secondary level I and II
and adult education



LEGAL NOTICE

Publisher and media owner

Umweltdachverband gGmbH (UWD)
Dresdner Strasse 82/7th floor, 1200 Vienna, Austria
Tel.: +43 1 401 13

Edited by and available at

Forum Umweltbildung im Umweltdachverband
Dresdner Strasse 82/7th floor, 1200 Vienna, Austria
Tel.: +43 1 402 47 01
E-Mail: forum@umweltbildung.at
www.umweltbildung.at

Forum Umweltbildung is an initiative funded by the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology and the Austrian Federal Ministry for Education, Science and Research.

Editor: Samira Weiss-Bouslama

Authors: Samira Weiss-Bouslama (UWD), Anna Streissler (UWD), Sektion V (BMK)

English translation: Kathrin Burger

Proofreading: Katharina Nieschalk

Graphics and layout: Markus Wurzer

Picture credits: All picture credits are provided next to the images.

Vienna, February 2022 | 1st edition | All rights reserved.

Commissioned by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)

 Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

Acknowledgements

We would like to thank the following individuals for their valuable feedback and for their support in preparing these materials: Peter Iwaniewicz, BMK; Claudia Scholz, BMK; Marie Gndl, Zero Waste Austria; Regina Steiner, Teacher Training College Upper Austria; and educators Nicole Schaller-Picard and Marina Celebi as well as the staff at the Umweltdachverband.

Content

1. Roadmap for educators	4
2. Background information	6
What is plastic and what is it used for?	6
What are bioplastics?	9
What happens to plastic after its use?	10
What are microplastics and how do they end up in our food? ²⁴	12
What are the effects of plastics and microplastics on the environment?	14
How do (micro)plastics affect our health?	15
What are governments doing to deal with plastic pollution?	16
How can we transition away from a “take-make-waste” model towards a circular economy?	18
An example: PET bottles in the linear vs. the circular economy	19
What does sustainable product design mean?	20
How are governments supporting the circular economy?	22
How can we contribute as consumers?	22
What can we do as part of civil society and through education?	25
3. One poster – many opportunities for discussion	27
Using the poster to introduce the topic and encourage discussion	29
4. Deep-dive activities	31
Which of these are plastic?	31
Understanding the circular economy	33
Homemade products free from microplastics	34
When is plastic a good choice?	35
Protest practice	37
5. Information and materials for further study	38
6. Appendix	40

1. Roadmap for educators

Although the mass distribution of plastic only began in the 1950s, it is hard to imagine our everyday lives without it. It has come to be used in everything from food packaging to personal hygiene products, from textiles and cosmetics to vehicles, electronics, medical devices and building materials. Plastic, made from crude oil, natural gas and coal, has many advantages. It is lightweight, temperature resistant, malleable and durable. Over the past few years, however, we have also seen more and more disadvantages to plastic emerge. We now know that some plastics end up in our air, our soil and our water, harming the environment and our own health. If we want to mitigate the environmental burden of plastic, we must reduce wasteful consumption, extend the useful life of unavoidable products made of plastic and increase recycling. This will only be possible if we shift away from the linear “take-make-waste” model towards a circular economy. And while this sounds like a simple solution, it requires major changes to how products are designed, produced, used and disposed of.

In line with our slogan “Shaping education today for the world of tomorrow”, Forum Umweltbildung has decided to tackle this pressing issue. We provide background information and teaching ideas on how to talk about plastic and the circular economy in the classroom and beyond. In doing so, we hope to encourage learning, reflection and sustainable behaviour. The terms plastic and plastics are used interchangeably in everyday language and the media. In this brochure, we do the same.

The teaching materials include a poster, digital tools and this accompanying booklet with background information and suggested activities for the classroom. They can be used in various school subjects of the secondary level I and II and are suitable both for in-person and virtual classes. These newly created materials place a particular focus on the situation in Austria and were developed in consultation with subject matter experts and educators.

The materials explore the following three areas:

- 1.** What impact does the increased use of plastic have on our environment and our health? This section focuses on microplastics and PET bottles, in particular.
- 2.** What is a circular economy and how could it work, based on the example of plastic?
- 3.** What can we all do to reduce, reuse and properly recycle plastic in our everyday lives? We answer this question by looking at the role of individual consumers and that of civil society.

These three questions are answered in **section 2** of this booklet.

The methods described in **section 3** were developed based on the principles of education for sustainable development and are designed to help educators make the concept of a circular economy more tangible, in particular by using the example of plastic. The emphasis of these methods is on learning through active involvement with a hands-on approach that speaks to students’ emotions and gives them the opportunity to reflect and to change perspectives.

The teaching materials can be used for individual lessons, cross-curricular learning or for project weeks. The issues discussed in these materials link directly to **biology and environmental studies** (e.g. understanding material cycles and the impact human activities can have on nature, the environment and our health), **geography and economics** (e.g. learning how to manage the environment responsibly, how to identify the impact businesses and production processes have on the environment) and **chemistry** (e.g. learning about the production and recycling of plastic). The poster can also be used in connection with **general principles of education** (e.g. environmental education, education for sustainable development, health promotion, political education).

Section 4 lists a number of high-quality resources in German and English that enable you to dive deeper into the subject matter.

We hope that you and your students will have an inspiring learning experience and enjoy exploring the poster as well as trying out the teaching materials on this hot topic.

The team of Forum Umweltbildung

2. Background information

What is plastic and what is it used for?

Plastic is a synthetic material that does not occur in nature and has a low density and mass. It is predominantly produced from oil, natural gas and coal and a number of additives.

8.3 billion tonnes of plastic were produced between 1950 and 2015. That corresponds to more than a tonne of plastic for every person living on our planet today. The regions that see the highest production and consumption rates are China, North America and Western Europe. Globally, we produce over 400 million tonnes of plastic per year (2018) – and the numbers keep rising.¹ Approximately 7 % of our global oil consumption goes towards producing plastic.²

Nowadays, it is hard to imagine life without plastic. Its properties often offer important advantages compared to other materials. The majority of the plastic we produce is used in packaging. It protects our food against bacteria, humidity and mechanical damage during transport, which increases shelf-life. Because it is so lightweight, plastic used in vehicles contributes to lower petrol consumption (and in turn cuts carbon emissions). In the construction industry, plastic can be used to insulate buildings, reducing heating demand. Plastic is also used in household goods, electrical appliances and in the healthcare sector, e.g. for syringes or as an aesthetic filling material (breast implants). About one third of all goods made of plastic are disposed of within a month.³ Many are only used once (single-use plastics).

¹ *Plastic atlas* (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 26.

² Global2000 (o. J.). *Plastik*. In: www.global2000.at/plastik, accessed on 29 June 2021.

ÖWAV – Österreichischer Wasser- und Abfallwirtschaftsverband (2016): *Überlegungen und Vorschläge aus Sicht der Abfallwirtschaft zur Verbesserung der Ressourcenschönung und -effizienz*. Ein ExpertInnenpapier der Arbeitsgruppe „Ressourcenschönung und Ressourceneffizienz“ des ÖWAV-Arbeitsausschusses „Abfallstrategie – BAWP 2017“. Wien: ÖWAV.
www.oewav.at/Page.aspx?target=196960&mode=form&app=134598&edit=0¤t=294006&view=205658&predefQuery=-1.

³ *Plastic atlas* 2019², p.14.

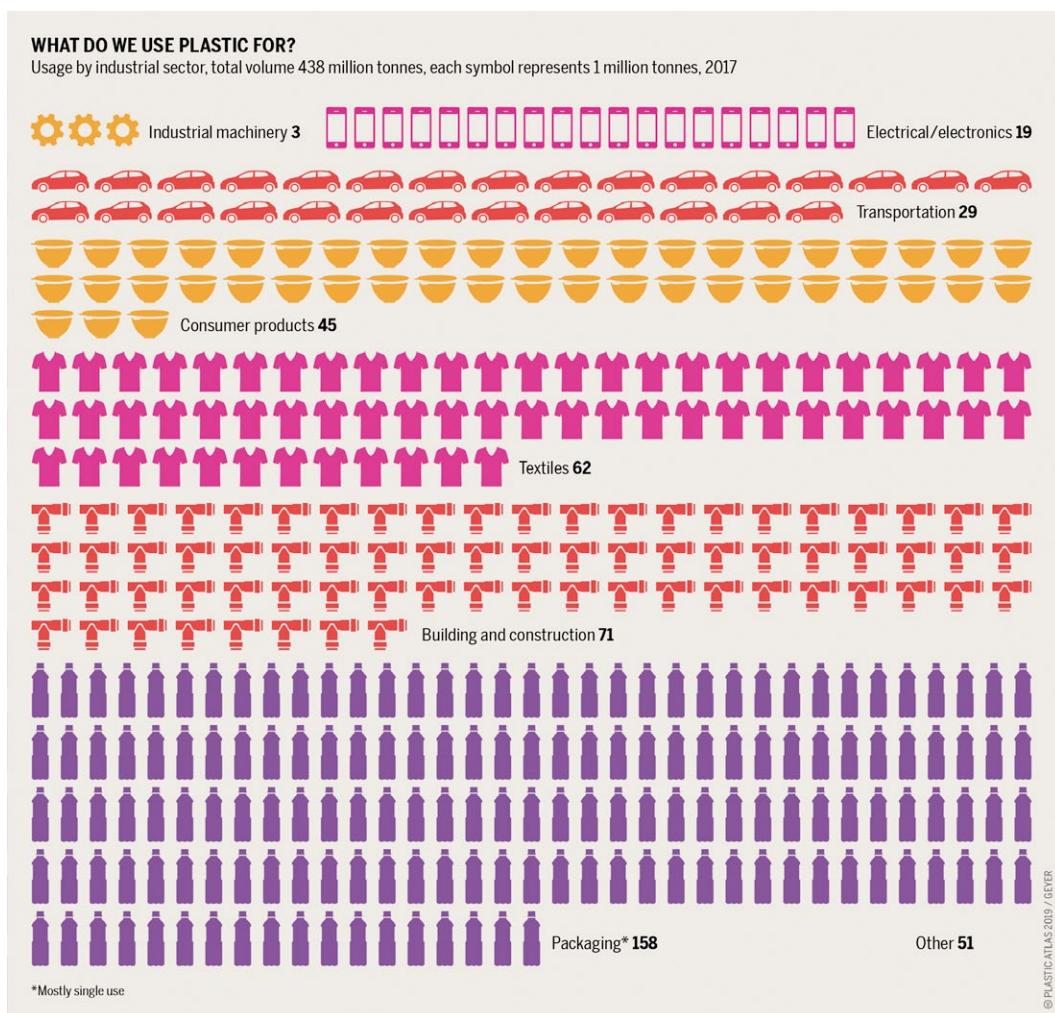


Figure: Plastic atlas 2019, p. 15. Reproduced with the kind permission of the publishers.

The most common type of plastic is called polyethylene. Polyethylene (of varying density) can be used to produce things like bin liners, cables, hoses and pipes. Beverage bottles are often made of polyethylene terephthalate (PET). Plastics are labelled with an identification number for recovery and/or recycling (see table).

Recycling number	Acronym	Name	Main application	Recycled into
 01 PET	PET or PETE	Polyethylene terephthalate or polyethylene	Bottles for carbonated beverages, egg cartons, other food packaging, polyester fibres, plastic film	Carpets, polyester fibres, fleece jackets and other items of clothing made of fleece, bottles, PET film
 02 PE-HD	PE-HD or HDPE	High-density polyethylene	Packaging for liquid detergents, shampoo bottles, milk and fruit juice bottles, plastic carrier bags, plastic containers for margarine and dairy products, packaging for cleaning products, pipes for gas and drinking water	Collection tanks, drainage pipes, garden furniture such as benches and tables, flooring
 03 PVC	PVC	Polyvinyl chloride	Acid-resistant containers for aggressive cleaning products, window profiles, pipes, flooring, roofing, garden fences, gloves, shower curtains, electrical cables, imitation leather	Coatings, pipes, traffic cones, floor tiles
 04 PE-LD	PE-LD or LDPE	Low-density polyethylene	Plastic bags, bin liners, plastic film, cling film, tubes, coating for milk cartons	Plastic planks, plastic bags and bin liners

Recycling number	Acronym	Name	Main application	Recycled into
	PP	Polypropylene	Plastic containers for margarine and dairy products, plastic lids, bottle lids, DVD cases, interior trims, car bumpers, child car seats	Flower planters, transport pallets, plastic planks, plastic boxes
	PS	Polystyrene	Plastic containers for margarine and dairy products, plastic lids, bottle lids, DVD cases, interior trims, car bumpers, child car seats	Decorative trims and borders, office supplies, CD/DVD cases, insulating boards
	O	Other plastics including acrylics, glass fibres, nylon, polycarbonate (bisphenol A, BPA), poly-lactic acid (compostable material, PLA) and mixtures of different plastics	Ketchup bottles, coolant containers, cooling elements, suitcases, CDs and DVDs, items of clothing, ropes, parachutes, toothbrush bristles, toys, housings for electrical appliances	Plastic planks

Table: Labelling and classification of plastics for recycling⁴

Plastics often contain **additives**. They improve the chemical, mechanical and/or electrical properties of the material. Some of these additives have proven to be harmful to the environment and our health. They can leach out of the material, enter our water supply or pollute the air and even end up in our food.⁵ Facing pressure from consumers and policy makers alike, the European industry has now stopped using some of these additives such as phthalates (their use in baby bottles has already been stopped since 2005). The following figure illustrates the functions of various additives.

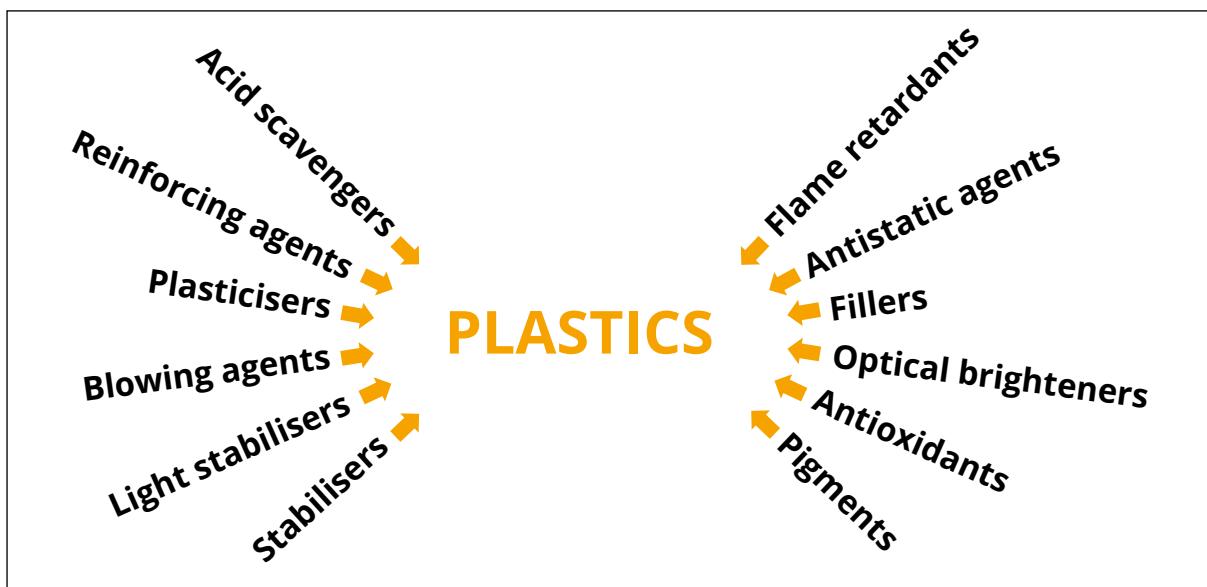


Figure: Possible plastic additives. Source: BMK / Düzgün G.

⁴ Wikipedia (o. J.). *Recycling-Code*. In: https://en.wikipedia.org/wiki/Recycling_codes, accessed on 30 June 2021

éducation21 (2018). *BNE-Kit III: Plastik – ein Unterrichtsthema für BNE. Handreichung für Lehrpersonen aller Zyklen mit Hintergrund, Anleitung und Anwendungsbeispielen für BNE*. Bern: éducation21. https://www.education21.ch/sites/default/files/uploads/pdf-d/bne-kit/BNE-Kit_III_Dossier_DE.pdf.

Plastic atlas (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND), p. 11. In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 11.

⁵ *Plastikatlas* 2019², p. 11

What are bioplastics?

Bioplastics and **biopolymers** are plastics that are either made from renewable resources or are made to be biodegradable. The prefix “bio” stands either for “bio-based” or “biodegradable”.

Bio-based means that the plastic is made from natural, renewable resources. These include starch, cellulose or lignin. **Biodegradable** means that over 90% of the material will disintegrate into water, carbon dioxide and biomass after a certain period of time and under the right conditions (temperature, oxygen and humidity levels).⁶ However, biodegradable plastics can also be made from finite (non-renewable) fossil resources that are made to be biodegradable.⁷

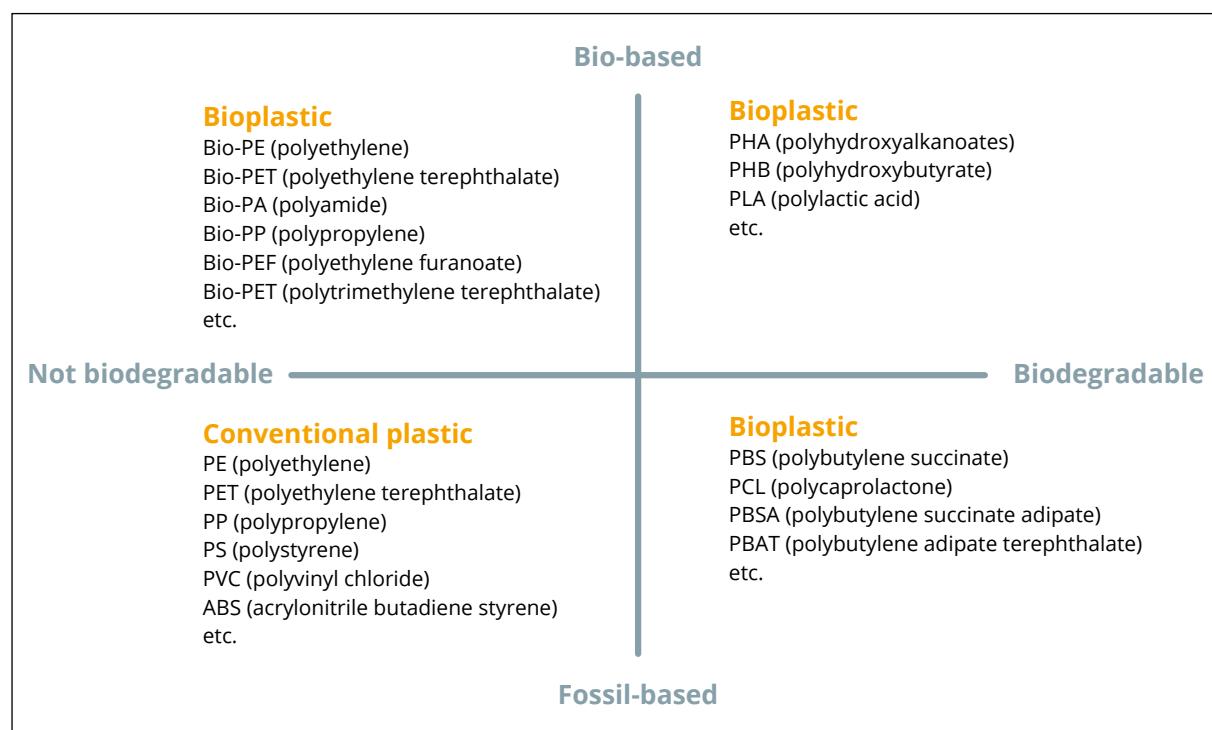


Figure: Overview of bioplastics and conventional plastics according to their source of raw materials and biodegradability, sources: BIOPRO Baden-Württemberg GmbH, European Bioplastics e.V.

Bio-based plastics are not always the best alternative to fossil-based plastics because agricultural land is limited. The cultivation of the raw materials used for bio-based plastics not only occupies land that could otherwise be used for food production but also contributes to soil acidification.⁸ Raw materials for the production of bio-based plastics are usually grown as a monoculture. This kind of agriculture can lead to water scarcity, the extinction of species, desertification and the loss of natural habitats.⁹ Bio-based plastics should not be put in organic waste bins, even though some manufacturers claim

⁶ Umweltbundesamt (13/04/2021). *Kunststoffe in der Umwelt: Verkehr, Bau und Landwirtschaft größte Quellen*. Press release No. 17/2021. www.umweltbundesamt.de/presse/pressemittelungen/kunststoffe-in-der-umwelt-verkehr-bau.

⁷ Beier, W. (2009): *Biologisch abbaubare Kunststoffe*. Dessau-Roßlau: Umweltbundesamt. www.umweltbundesamt.de/sites/default/files/medien/publikation/long/3834.pdf.

⁸ Umweltbundesamt (08/10/2012). *Biokunststoffe nicht besser*. Press release No. 37/12. www.umweltbundesamt.de/presse/pressemittelungen/biokunststoffe-nicht-besser.

⁹ Plastic atlas (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND), In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 34.

that you can. They often have to be filtered out and disposed of separately at the organic waste collection points, which involves considerable effort and creates additional costs.

The real environmental benefits of bio-based raw materials for plastics that go beyond reducing the consumption of fossil resources are yet to be assessed. Researchers are currently experimenting with bioplastics made from food waste such as banana peel or shellfish shells, which might improve their environmental performance. Because bioplastics (both bio-based and/or biodegradable) come in such a wide variety, it is not recommended to put bioplastics in your organic waste bin – with the exception of compostable organic waste bags. Biodegradable packaging should be disposed of together with other packaging waste (the yellow bin/bag in Austria). Other items made of bioplastic should be put in the residual waste bin.

What happens to plastic after its use?

Europe produces 25,800,000 tonnes of plastic waste every year. Only a small portion of this waste (less than 30 %) is currently recycled. The European Union (EU) has committed itself to a recycling rate of 55 % for plastic packaging waste and a separate collection rate of 90 % for single-use plastic bottles by 2030.¹³

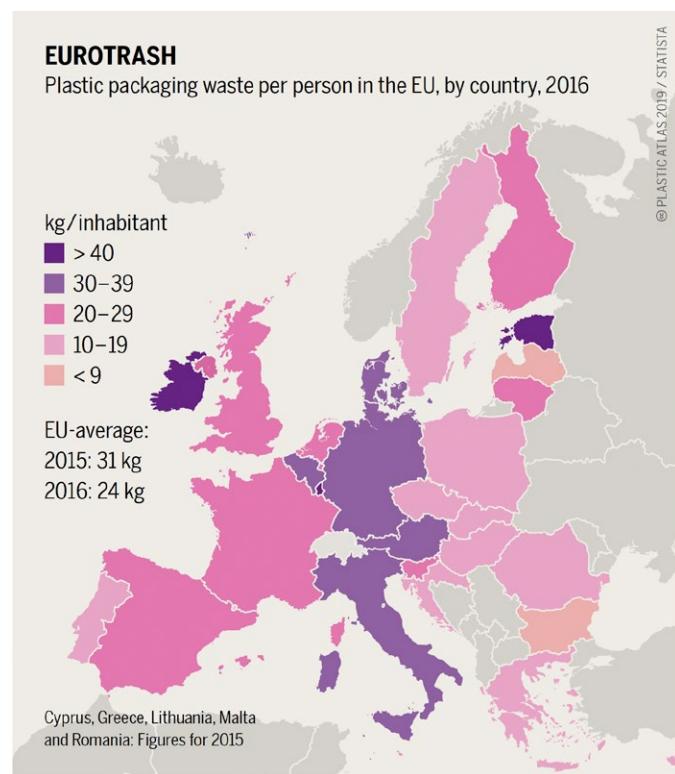


Figure: Plastic atlas 2019², p. 13.
Reproduced with the kind permission of the publishers.

¹⁰ WWF Jugend (11/08/2014). Plastik aus Bananenschalen. *Die 16-jährige Elif macht's vor*. Author: Cookie (username). In: www.wwf-jugend.de/blogs/5518/5518/plastik-aus-bananenschalen-die-16jhrige-elif-macht-s-vor, accessed on 29 June 2021.

Plastic atlas (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 11.

¹¹ ÖWAV – Österreichischer Wasser- und Abfallwirtschaftsverband (2021). „Bio-Kunststoffe“ und die biologische Abfallverwertung. Ein ExpertInnenpapier des Arbeitsausschusses „Biogene Abfälle“ der Fachgruppe „Abfallwirtschaft und Altlastensanierung“. Wien: ÖWAV. www.oewav.at/Publikationen?current=420717&mode=form.

¹² Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (n.d.). *European Plastics Strategy*. In: <https://www.bmk.gv.at/en/topics/climate-environment/plastics/european-strategy.html>, accessed on 29 June 2021.

¹³ European Commission – Representation in Germany (21/05/2019). *Einwegplastik: EU-Staaten geben grünes Licht für neue Regeln*. In: https://ec.europa.eu/germany/news/einwegplastik20190521_de, accessed on 29 June 2021.

At 34 kg/person, **Austria** is one of the countries with the highest rates of plastic waste per capita in Europe – on par with Belgium, Germany and Italy and just behind Estonia, Ireland and Luxemburg.¹⁴ A total of 906124 tonnes of plastic waste were produced in Austria in 2018, 70 % of which was only partly made of plastic (e.g. vehicles, clothing, furniture) and only a fraction of which was “pure” plastic waste. In 2015, the majority (71 %) of all plastic waste was incinerated, while 28 % was recycled and only 1 % was put into landfill.¹⁵ Several tonnes were exported to third countries where environmental standards are often lower. Austria also imported similar amounts of plastic for incineration.¹⁶

Cross-border waste shipments (import, export and transit) have been governed by national, European and international legislation for many years in order to avoid harmful impacts on the environment. Different principles apply depending on the quality of waste, the intended waste management and the countries involved.

PET bottles, a very common everyday item, are fairly easy to recycle.¹⁷ The most efficient way to recycle PET bottles is “bottle-to-bottle” recycling. This treatment process uses old bottles to produce new ones (usually blended with virgin plastic). Other types of plastic that are collected separately can also be recycled into high-quality granules, fibres and pellets. These recycled “raw materials” are then used to manufacture pipes, packaging, furniture, backpacks, textiles and many other useful items.¹⁸

Plastic that is put into the residual waste bin is incinerated for energy recovery, which reduces our need for primary energy sources. Plastic that is carelessly or illegally thrown away in the open environment, on the other hand, pollutes our environment. This can have dire consequences: litter counts on European beaches revealed that 80 to 85 % of marine litter is made of plastic. Millions of tonnes of plastic waste end up in the ocean every year. Every third piece of marine litter is a cigarette stub.¹⁹ Even though marine plastic pollution receives the most media attention, the level of microplastics in our soil and inland water is actually 4 to 23 times worse according to the Austrian non-profit organisation Umweltberatung.²⁰

In Austria, the collection of plastic waste is organised by the Federal Provinces and local municipalities due to differing technical recycling and recovery options. Some Federal Provinces and regions combine small plastic packaging with residual waste and burn it in waste incineration plants. The energy this generates is then used for public amenities and district heating networks, which reduces the need for fossil resources such as coal or natural gas. Plastic packaging is often collected separately, in the so-called yellow bag, for recycling. More details about how plastic is collected in individual areas can be found on the local municipality's website or at the local waste management association.²¹

¹⁴ Plastikatlas – Österreichausgabe (2019). Ein Kooperationsprojekt von Heinrich-Böll-Stiftung und Global2000. In: www.global2000.at/sites/global/files/2019-Plastikatlas-Oesterreich.pdf, p.13.

¹⁵ Umweltbundesamt (14/05/2018). Kunststoffabfälle in Österreich. In: www.umweltbundesamt.at/aktuelles/presse/news2018/news20180514, Stand: 29.06.2021.

¹⁶ European Commission (16/01/2018). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels: European Commission. <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018DC0028&from=LT6>.

¹⁷ Forum PET (n.d.). PET Products. In: <https://www.forum-pet.de/en/material/pet-produkte/>, accessed on 29 June 2021.

¹⁸ ARA – Altstoff Recycling Austria (o. J.). Kunststoffverpackungen im Kreislauf. In: wwwара.at/kreislauf-wirtschaft/verpackungsrecycling/kunststoffverpackungen, accessed on 29.06.2021.

Forum PET (n.d.). PET Products. In: <https://www.forum-pet.de/en/material/pet-produkte/>, accessed on 29 June 2021.

¹⁹ Katapult (Hg.) (2021⁴). 102 grüne Karten zur Rettung der Welt. Berlin: Suhrkamp, p.19.

²⁰ Die Umweltberatung (o. J.). Plastikmüll in der Umwelt. In: www.umweltberatung.at/plastikmuell-in-der-umwelt, accessed on 29 June 2021.

²¹ ARA – Altstoff Recycling Austria (o. J.). Kunststoffverpackungen im Kreislauf. In: wwwара.at/kreislauf-wirtschaft/verpackungsrecycling/kunststoffverpackungen, accessed on 29 June 2021.

Increasing the recycling rate could conserve resources and protect both the environment and the climate.²² The **European Union** has plans to ensure that by 2030 all plastic packaging can either be reused or properly recycled. This measure is part of the European Commission's strategy to reduce pollution through plastic waste. Ultimately, this benefits not only the environment but also us and our health²³, for which microplastics have been shown to be particularly harmful in recent years.

What are microplastics and how do they end up in our food?²⁴

WHAT ARE MICROPLASTICS?

Microplastics are tiny plastic particles that are smaller than five millimetres and can be made of various types of plastic.

Plastic particles that were deliberately designed for commercial use are called **primary microplastics**. These are used as stand-alone products (e.g. abrasive agents) or as additives to products (e.g. for cosmetics, laundry detergents, paints, cleaning agents). Primary microplastics often reach wastewater treatment plants through our drains. These plants are capable of filtering out some of these particles, which then end up in the sewage sludge and potentially in our soil if this sludge is spread on agricultural land (although this is no longer permitted or practised in most of Austria). For the future, there are plans to incinerate the sewage sludge (including the microplastics) and to recover phosphorus from the remaining ashes. This phosphorus could then be used to replace rock phosphate (which has to be imported from Western Sahara, Morocco, at the moment) in the production of fertiliser. Currently, some fertilisers still contain plastic, which also contributes to the accumulation of microplastics in the soil. Floods can then transport these small plastic particles to rivers and oceans.

²² World Economic Forum, Ellen MacArthur Foundation und McKinsey & Company (Hg.) (2016). *The New Plastics Economy – Rethinking the future of plastics*. In: https://www.ellenmacarthurfoundation.org/assets/downloads/EllenMacArthurFoundation_TheNewPlasticsEconomy_Pages.pdf.

²³ Unsere Umweltprofis (18/07/2018). *Kunststoffabfälle trennen? Warum sollen Kunststoffabfälle getrennt gesammelt werden und was haben wir davon?* In: https://www.umweltprofis.at/voecklabruck/aktuelles/nachrichten_detail/n/detail/News/kunststoffabfaelle_trennen.html, accessed on 29 June 2021.

²⁴ Liebmann, B. (2015). *Mikroplastik in der Umwelt. Vorkommen, Nachweis und Handlungsbedarf*. Publication commissioned by the BMLFUW Section I climate and environmental protection. Vienna: Umweltbundesamt. <https://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0550.pdf>.

Liebmann, B. et al. (2020). *Factsheet Mikroplastik*. Wien: Umweltbundesamt GmbH. https://www.umweltbundesamt.at/fileadmin/site/angebot/analytik/factsheet-mikroplastik_202003.pdf.

So-called **secondary microplastics** include all particles that are a result of larger plastic items breaking down into smaller pieces. Estimates suggest that, in Germany, a third of all microplastics emissions come from car tyre wear. UV light, oxidation and mechanical wear will often cause plastic litter in the open environment to decompose into microplastics. Microplastics can also be created in the oceans, where sunlight (UV light), salty sea water and wind break down larger pieces of plastic. The following figure provides an overview of the various ways in which microplastics can enter the environment via the air, water or soil.

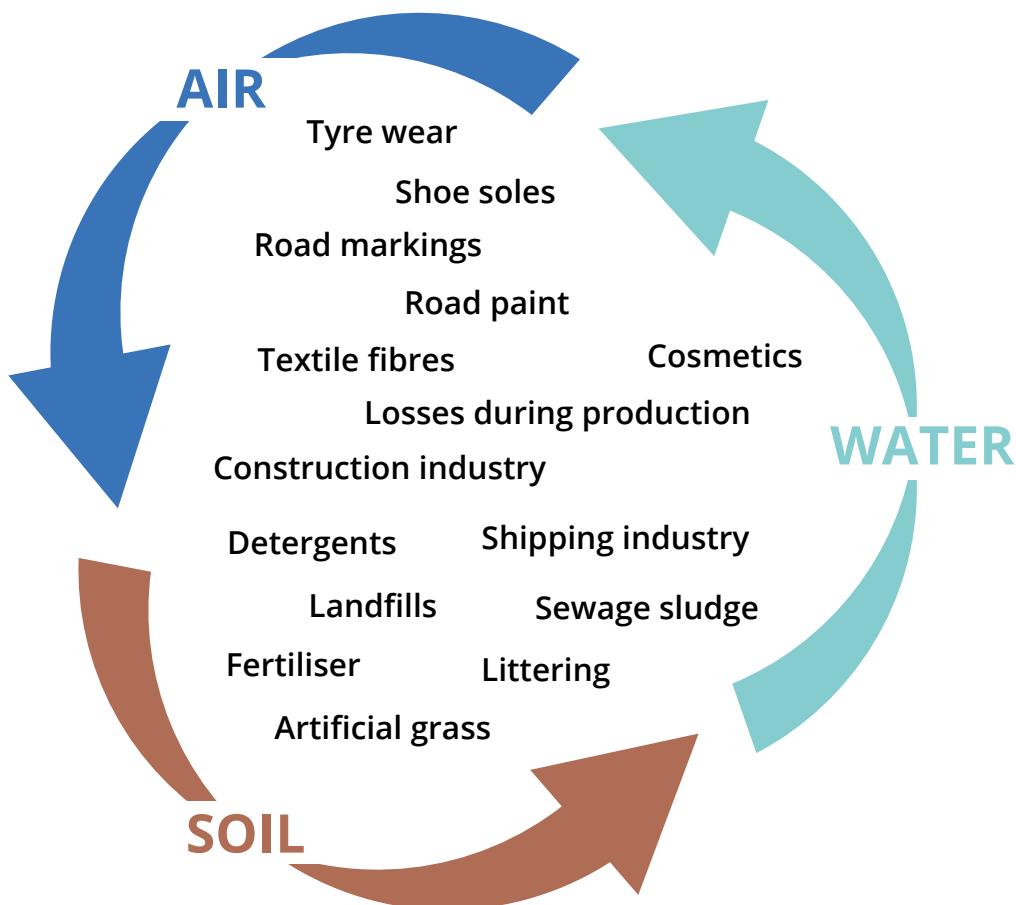


Figure: How do microplastics enter the environment? Source: adapted from BMK/Düzung G.

A study performed by Germany's central environmental authority UBA examined the amount and sources of plastics entering the environment every year. It found that transport was the biggest polluter (133,000 to 165,000 t), followed by the building sector (9,000 to 60,000 t) and agriculture and horticulture (6,000 to 22,000 t). Careless littering accounts for about 650 to 2,500 tonnes of plastic entering the environment. Plastic fibres from fabrics, paints and varnishes also contribute to plastic pollution, as well as the sports, leisure and events sector (e.g. granules from artificial grass, playground equipment).²⁶

²⁵ *Plastic atlas (2019)*. A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 43.

²⁶ Umweltbundesamt (13/04/2021). *Kunststoffe in der Umwelt: Verkehr, Bau und Landwirtschaft größte Quellen*. Press release No. 17/2021. In: www.umweltbundesamt.de/presse/pressemeldungen/kunststoffe-in-der-umwelt-verkehrbau.

What are the effects of plastics and microplastics on the environment?

Microplastics have now been found in all parts of the world: they are in our oceans and surface water bodies, in deep-sea sediments, in land used for agriculture and in various living beings, including in us humans.²⁷

We have known that plastic is a major environmental problem for our **oceans** for about ten years. Marine plastic originates mainly from tourism, agriculture, wastewater and the fishing industry. Most of the plastic in the ocean (80 %) comes from land. Rivers and winds carry plastic bags, textile fibres, plastic pellets, cosmetics, tyre wear, etc. into the ocean. There, the plastic is picked up by ocean currents and then accumulates in certain areas, so-called garbage patches. The five biggest areas of trapped plastic are in the North and South Atlantic Ocean, the North and South Pacific Ocean and the Indian Ocean. The largest and most well-known of these trash vortexes is the Great Pacific Garbage Patch.

At 1.6 million km², it is about 19 times the size of Austria. According to the German Environmental Agency, of the 300 million tonnes of plastic that were produced globally in 2013 30 million tonnes ended up in the ocean. Europe is responsible for between 3.4 and 5.7 million tonnes a year.²⁸ The Mediterranean is the most polluted of all the oceans and seas surrounding Europe. The majority of its litter comes from tourism in coastal regions. The limited exchange of water with the global ocean only increases the concentration of plastics in the Mediterranean Sea. It currently holds similar amounts of plastic to the five oceanic garbage patches.²⁹

Plastics also often contain toxins such as softening agents or flame retardants. Because of their structure, the microplastics floating in the ocean absorb other **environmental toxins and bacteria**. These plastic particles enriched with toxins are then eaten by marine organisms. For mussels, for example, ingesting microplastics can trigger an inflammatory reaction in their cells. Studies of other animals indicate that the plastic particles also affect growth and reproduction. If animals consume large amounts of plastic, this can damage internal tissues, block their gastrointestinal tract and ultimately lead to death.³⁰

A German study from 2018 estimates that of the over 400 million tonnes of plastic that are produced globally every year around a third ends up in our soil and inland waters in various shapes and forms. The effect of microplastics on terrestrial ecosystems is not yet fully understood. Microplastics alter both the structure of the soil and the habitat of soil organisms of different sizes. They interfere with the movement of soil organisms, are consumed by them through their food and thus enter the food cycle. Microplastics also reduce the productivity of agricultural land.³¹

²⁷ Liebmann, B., Sexlinger, K. (2020). *Mikroplastik in der Umwelt. Statusbericht 2019*. Eine Publikation im Auftrag des BMLRT, Abteilung I/2 Nationale und internationale Wasserwirtschaft. Wien: Umweltbundesamt. <https://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0727.pdf>.

²⁸ Umweltbundesamt (29/09/2015). *Mikroplastik im Meer – wie viel? Woher?* Press release No. 34/2015. www.umweltbundesamt.de/presse/pressemitteilungen/mikroplastik-im-meer-wie-viel-woher

²⁹ *Plastic atlas* (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 28.

³⁰ Hamann, S. (17/07/2020). *Mikroplastik: Schädlich für unsere Gesundheit?* In: www.gesundheit.de/medizin/gesundheit-und-umwelt/mikroplastik, accessed on 29 June 2021.

³¹ Circular Futures – Plattform Kreislaufwirtschaft Österreich (o. J.). *Kreislaufführung in der Landwirtschaft*. In: www.circularfutures.at/themen/stakeholderprozesse/kreislauffuehrung-in-der-landwirtschaft, accessed on 29 June 2021.

Microplastics then ultimately end up in our food and on our plates. They have been detected in fish, seafood, sea salt, fruit, vegetables and honey. Researchers have found that, on average, humans globally ingest up to five grams of plastic per week. That is equivalent to the weight of a credit card.³²

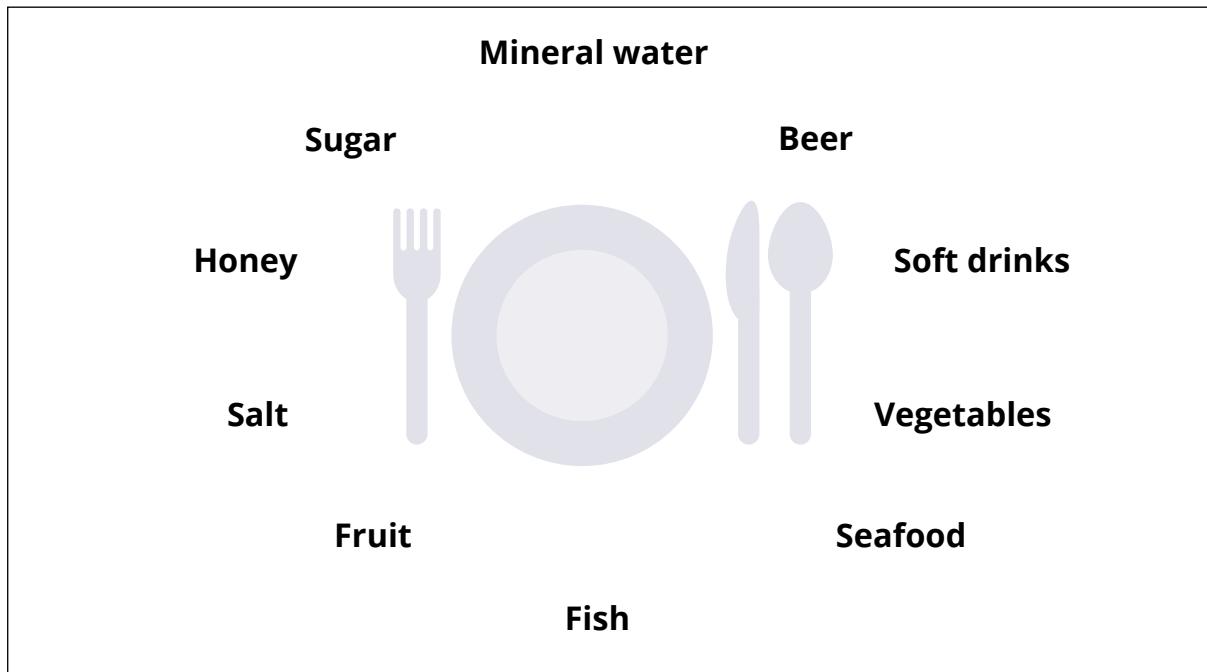


Figure: Foods in which microplastics have been detected.

How do (micro)plastics affect our health?

We are all exposed to toxic chemicals and microplastics, even if we try to avoid plastic in our everyday lives. At every step of the plastic cycle – from extracting the raw materials and manufacturing products to using plastic items and disposing of them – plastic particles and toxic chemicals enter the environment through water, air and (agricultural) soil, where they continue to cause harm for a long time.³³

As mentioned above, **plastic additives** can be particularly harmful to our health. These additives leach into the air and water, collect in household dust and can enter our bodies in different ways.

Endocrine disruptors, such as softening agents, are particularly problematic. They can cause breast cancer, infertility, early puberty, obesity, allergies and diabetes.³⁴ Women are more strongly affected by plastics than men. On the one hand, this is because the female body responds differently to toxins than the male body. On the other hand, women tend to use more personal hygiene products (including period products) and cosmetics, which often contain more plastic than one would expect. Tampons, for example, are made up of up to 6 % plastic.³⁵ Lastly, because women are still predominantly responsible for household chores, they also use more cleaning products that can contain microplastics, harmful surfactants and solvents.³⁶

³² WWF (n.d.). *Assessing plastic ingestion from nature to people*. An analysis for WWF by Dalberg and the University of Newcastle, Australia. In: https://awsassets.panda.org/downloads/plastic_ingestion_press_singles.pdf.

³³ *Plastic atlas* (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 17.

³⁴ *Plastic atlas* 2019², p.16.

³⁵ *Plastic atlas* 2019², p.21.

³⁶ *Plastic atlas* (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 18.

What are governments doing to deal with plastic pollution?

Because of its characteristics, plastic is an ideal material and fulfils important functions in many areas of use. It was the careless and wasteful way we used it that has led to plastic being found in practically all parts of the world. Many things came together to create this situation, and only a combination of measures will lead to real change.

The **European Green Deal** is an **EU Action Plan** that aims to achieve climate-neutral, sustainable and resource-friendly growth, while still maintaining economic power. It was passed in December 2019. The agenda places a particular focus on supporting the European industry as it transitions to climate neutrality and digitalisation. It also includes the goal of achieving zero net greenhouse gas emissions by 2050 and decoupling economic growth from the use of resources. The measures focus mainly on resource-intensive sectors such as the textile, building, electronics and plastics industry.

In 2018, the **European Commission** adopted the **EU Plastics Strategy** with the aim of reducing the amount of plastic entering the environment by avoiding waste, increasing recycling and gradually reducing landfilling (where this still occurs). Starting in 2022, domestic hazardous waste must be collected separately throughout the EU. This rule will be extended to organic waste from 2023 and textiles from 2025. These changes will contribute to an economy that is resource-efficient, competitive and good for the environment as well as the climate. The strategy also intends for all new plastic packaging to be either reusable or easily (and cost-effectively) recyclable by 2030. The EU also published a new **Circular Economy Action Plan** in 2020.³⁷ Part of the implementation of this Circular Economy Action Plan included developing a strategy for plastics. It encompasses important milestones such as amendments to six waste directives and the enactment of the directive on single-use plastics (SUPD). The latter was agreed during the Austrian presidency of the Council of the European Union. Among other things, it prescribes market restrictions, extended producer responsibility and higher recycling quotas.

The **EU Single-Use Plastics Directive** tackles those single-use plastic products that are most commonly found on European beaches. Plastic products for which more sustainable alternatives are readily available were banned in 2021. These include cotton buds, plates, cutlery, balloon holders as well as food packaging, drinks containers and cups made from expanded polystyrene (EPS). All products made of so-called oxo-degradable plastic have also been banned. The directive also aims to drastically reduce the use of products for which suitable alternatives do not yet exist, such as cups for beverages and food containers. Labelling that includes a warning of the environmental impacts of littering will be introduced for some single-use products with a certain level of plastic content. This will affect sanitary products, cups for beverages, wet wipes and tobacco products with filters. Manufacturers will also be made to contribute to the cost of collecting plastic litter and recycling plastic products. The EU has also agreed on a collection target of 77 % by 2025 and 90 % by 2029 for single-use plastic bottles (Austria currently collects about 73 %, as of 2021).

³⁷ European Commission – Representation in Germany (11/03/2020). *Für länger haltbare und nachhaltigere Produkte: Neuer EU-Aktionsplan zur Kreislaufwirtschaft*. In: https://ec.europa.eu/germany/news/20200311-kreislaufwirtschaft_de, accessed on 29 June 2021.

Extended Producer Responsibility will take effect **throughout the EU** in January 2023. It aims to limit littering of cigarette stubs and other kinds of plastic waste. EU-wide labels have been created both for single-use plastic items and for cigarette filters to inform consumers of the negative effects that careless littering has on the environment and on marine life in particular (using the example of a sea turtle).



Figures: EU-wide label for single-use plastic in products (left) and cigarette filters (right)

The increasing environmental and health hazards and the costs incurred by plastic waste have prompted governments of individual countries, regions, cities and municipalities to impose bans, fees and other restrictions on plastics. Because recycling alone will not be enough to stop the flood of plastic.³⁹

Austria – a model country with a need for action

Austria has already taken some important steps in terms of waste management. Specific regulations (such as the Packaging Ordinance, Waste Electrical and Electronic Equipment Ordinance, End-of-Life Vehicle Ordinance) have been in place for many years to ensure separate collection and treatment of about 45 % of the plastic waste generated in Austria. The Austrian ban on depositing plastics in landfills, which has been in effect since 2004 (or 2009 for certain exceptions), was an important first step towards closing the loop. Hazardous waste has been collected separately for many decades and a separate collection for organic waste was first implemented in 1993.

Austria banned plastic carrier bags from 1 January 2020.⁴⁰ The country also has a very well-functioning waste collection and waste management system (exemplary even in a European comparison). It has achieved this not only through legislative measures, but also with the help of voluntary agreements, research and project funding as well as public awareness campaigns. In a participatory process, the Austrian government is currently revising its Waste Prevention Programme and developing a circular economy strategy.

Increasing the recycling rate must coincide with avoiding the spread of toxins through contaminated plastic fractions. Sustainable plastic management also means excluding plastics that contain substances of concern from the material cycle. This, in turn, means that plastic products need to be designed and manufactured with the requirements of a circular economy in mind (i.e. ensuring products can be repaired and recycled). Targets have been set for the packaging sector to reduce plastic packaging by 20 % by 2025 and to increase the recycling rate to 55 % by 2030 (double of what it is now).

The Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology has developed a 3-point plan to prevent plastic from becoming waste. It includes a mandatory quota for reusable drink containers, a deposit return scheme for single-use plastic bottles and a fee

³⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L:2019:155:FULL&from=IT>

³⁹ *Plastic atlas* (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 39.

⁴⁰ Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (n.d.). *Plastic bag ban in Austria as from 2020*. In: <https://www.bmkk.gv.at/en/topics/climate-environment/waste-resource-management/waste-prevention/plastic-bag.html>, accessed on 30 June 2021.

for manufacturers who use plastic packaging. It aims to move towards a more resource-friendly plastic packaging industry.

Consumer awareness of the responsible use of plastic items, and single-use items in particular, has to be increased further and consumers need to be encouraged to change their consumption habits (e.g. more reusable containers and less single-use packaging).

The Austrian government programme for 2020-2024 also includes an **action plan against microplastics** and a microplastics roadmap was drawn up in 2021. The Austrian Federal Ministry for Climate Action is working on developing an **Austrian Microplastics Strategy** to set specific targets and identify appropriate measures. The ministry has also commissioned projects to investigate microplastics in sea salt and sewage sludge samples as part of a special campaign. Products carrying the Austrian Ecolabel do not contain microplastics.

How can we transition away from a “take-make-waste” model towards a circular economy?

The mass consumption of cheap products leads both to an excessive use of finite resources and raw materials, such as oil and natural gas, and to rapidly growing piles of waste. Single-use plastic products have come to symbolise the capitalist lifestyle.⁴¹ Wasteful practices have perhaps reached their climax in the alleged practice of companies designing products in a way that artificially limits their useful life, for example by using weak materials (planned obsolescence).

WHAT DOES PLANNED OBSOLESCENCE MEAN?

Planned obsolescence is a marketing strategy of designing products to rapidly become obsolete either by becoming outdated or breaking. There has been much heated discussion around the issue in recent years, but it is difficult to find actual evidence of it. Purchasing high-quality products with guarantees can be a good way to avoid this. Efforts to encourage repairing appliances instead of throwing them away are also on the rise.

Long-term solutions require system-wide change. The way our **global economy** currently works is very linear. After a product has been used, it is either put into landfill or incinerated. This is often described as the “take-make-waste” model. The situation is a bit better in **Austria**: the country recycles about 64 % of its total waste volume [excluding excavated soil] and incinerates 17 % for energy recovery. Only 11 % of waste is put in landfill. Waste prevention and reuse, however, have been somewhat neglected. Deposit return systems and repairs must once again become a matter of course.

⁴¹ *Plastic atlas* (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 12.

⁴² Wikipedia (o. J.). *Geplante Obsoleszenz*. In: https://de.wikipedia.org/wiki/Geplante_Obsoleszenz, Stand: 30.06.2021.

An example: PET bottles in the linear vs. the circular economy

The product life cycle of a PET bottle in the linear economic model starts with new raw materials (i.e. oil) being manufactured into a bottle. The bottle is then sold and used. Once the bottle is empty, it is put in the rubbish bin.



Figure: The linear economy or “take-make-waste” model

In contrast, the concept of a circular economy aims to reuse and recycle raw materials in a loop for as long as possible and to achieve this through careful design and innovative business models. This reduces energy consumption and protects resources.

Once a product has reached the end of its useful life, its components continue to be reused. The empty PET bottles are first separated by colour, compressed with other PET bottles, cleaned in a multi-stage technical process and then processed either into PET flakes or PET granules. These PET flakes and PET granules then re-enter the production cycle and are used to produce new PET bottles. These PET bottles usually contain 30 to 40 % recycled PET material, sometimes more. If the quality of the plastic is no longer good enough for “botte-to-bottle” recycling, the plastic bottles are made into lower grade plastic granules that can be used in the construction industry or as a raw material for plastic textile fibres. This significantly reduces our need for valuable resources such as oil.

The energy transition is also based on the concept of circularity. Instead of generating energy from non-renewable resources – e.g. coal, natural gas and oil – energy is increasingly being generated from renewable resources such as water, wind and the sun. The circular economy has a measurable impact on the creation of value, resource efficiency and climate mitigation.

⁴³ www.ellenmacarthurfoundation.org, Stand: 30.06.2021.

Circle Economy (2021). *Circularity Gap Report 2021*. Herausgegeben von PACE – Platform for Accelerating the Circular Economy. In: <https://www.circularity-gap.world/2021>.

EUropainfo. *Das Magazin des EU-Umweltbüros* (2/2018): Österreich auf dem Weg in die Kreislaufwirtschaft. Chancen, Herausforderungen, Strategien, AkteurInnen. Wien: Umweltdachverband. www.circularfutures.at/assets/EU-Umweltbuero/Magazin-EUropainfo/EUropainfo-2-18.pdf.

Circular Futures – Plattform Kreislaufwirtschaft Österreich (o. J.). *Kreislaufwirtschaft*. In: www.circularfutures.at/themen/kreislaufwirtschaft, Stand: 30.06.2021.
Europäisches Parlament (02/12/2015). *Kreislaufwirtschaft: Definition und Vorteile*. In: www.europarl.europa.eu/news/de/headlines/economy/20151201STO05603/kreislaufwirtschaft-definition-und-vorteile, Stand: 30.06.2021.

Line to Circle (06/04/2020). *Kreislaufwirtschaft, ein Überblick*. In: <https://linetocircle.de/kreislaufwirtschaft-ueberblick>, Stand: 30.06.2021.

⁴⁴ www.pet2pet.at/de/kreislauf, Stand: 30.06.2021.

What does sustainable product design mean?

Nowadays, products are often designed to be manufactured cheaply, not last very long and be difficult or impossible to repair. Sustainable product design turns this on its head. It ensures that products, systems, infrastructures and services fulfil consumers' needs, while requiring as few resources as possible. It also limits the use and emission of harmful substances and reduces the amount of waste that is produced over the entire product life cycle to a minimum. The circularity of a product is assessed by looking at its production and use, its transport routes and the amount of energy that all this requires. Ideally, products should be designed to make their entire life cycle as efficient as possible and to be suitable for reuse, repair, refurbishing, remanufacturing, repurposing and recycling.

WHAT DOES “CRADLE-TO-CRADLE” DESIGN STAND FOR?

“Cradle-to-cradle” design (as opposed to “cradle-to-grave design”) represents the idea that design should focus on the entire product cycle. Instead of generating waste that ends up in the rubbish bin at the end of its life, a product’s raw materials should be reused for several product life cycles. This requires a concept of sustainable product design that includes all factors from the beginning to the end of the product cycle. Besides the extraction of raw materials, sustainable product design looks at the manufacturing process, energy-efficient transportation, the distribution process, at how the product is used, packaged and whether it can be repaired, and, finally, at how it can be reused and recycled. Only chemicals that have been classified as safe may be used in production.



Figure: Sustainable product design in a circular economy (European Union 2014, available at: [Recyceln, reparieren, wiederverwerten: Kreislaufwirtschaft | Aktuelles und Presse | Europäisches Parlament Verbindungsbüro in Österreich \(europa.eu\)](#) (in German only))

Let us look at the production, use and disposal of two t-shirts to illustrate the difference between a linear and a circular economic model. Notice how many more phases of use the t-shirt has in the circular economy scenario.

Example of a t-shirt in a linear “take-make-waste” model:

Raw materials	Production/transport	Purchase	Use	Disposal
The t-shirt is made of polyester, which consists of polyethylene terephthalate. The main raw material used for this fibre is oil.	It is produced in a low-income country with bad working conditions and with the use of harmful chemicals. There are long transport routes between the individual production stages.	The t-shirt is bought in a fast fashion retail shop.	The t-shirt is only worn a few times. It is washed at high temperatures (above 30°C) and without a filter for microplastics. This contributes to it quickly becoming unwearable. The fibres shed microplastics, which enter the wastewater system and the environment.	The t-shirt is thrown in the residual waste bin or a container for used clothes.

Example of a t-shirt in a circular economy model:⁴⁴

Raw materials	Production/transport	Purchase	Use	Repair
The t-shirt is made of certified organic cotton that was grown in a way that conserves the environment and treats workers fairly.	The t-shirt is produced under fair working conditions and without the use of harmful substances (e.g. for dyeing). There are short transport routes between the individual production stages.	The price of the t-shirt includes fair wages and working conditions for producers and retailers.	It is worn for several years and washed carefully (max. 30°C).	Stains are removed carefully with natural stain removers (e.g. bile soap). Small holes in the t-shirt are darned, large tears or holes are mended professionally.
Redistribution / clothing swaps / flea markets	Used clothes collection for aid organisations	Upcycling	Used clothes collection for recycling	Disposal
If the t-shirt no longer fits, it can be passed on to siblings or friends. Clothing swaps and flea markets are also a good way to pass clothes on to other people.	By giving the t-shirt to a used clothes collection, it is passed on to an aid organisation or second-hand shop.	The t-shirt can also be made into something else, such as a new piece of clothing or a bag.	When the t-shirt is no longer of use, it is cleaned and made into new yarn.	If the t-shirt is very contaminated or broken, it is put in the residual waste bin.

⁴⁴ Lexikon der Nachhaltigkeit (12/11/2015). EcoDesign. In: www.nachhaltigkeit.info/artikel/ecodesign_1758, accessed on 30 June 2021.

TU Wien – Ecodesign-Forschung (2020). Lehrmaterialien zu Kreislaufwirtschaft und Abfallvermeidung im Baubereich. In: www.ecodesign.at/fileadmin/t/ecodesign/Abbau/Alle_Module.pdf.

Tröger, N. (n.d.). Produktgestaltung und Konsum neu denken. Wirtschaft & Umwelt – Zeitschrift für Umweltpolitik und Nachhaltigkeit. In: www.ak-umwelt.at/schwerpunkt/?article=618&issue=2016-04, accessed on 30 June 2021.

The fast fashion industry is known to produce new collections almost once a week and is one of the main driving forces behind our throwaway mentality. The plastics industry has been pursuing a dual strategy of lobbying and promoting its products by claiming that plastic itself is not the problem as long as it is recycled. This places responsibility back in the hands of consumers.⁴⁵

How are governments supporting the circular economy?

Institutions and governments play a crucial role in driving the transition from a linear to a circular economy. They do so by publishing regulations, awarding grants and subsidies, using policy instruments such as voluntary certificates (e.g. Ecolabel), by supporting research and development activities and raising awareness. The European Commission has declared the circular economy a political priority. It defines the basic concept as “extracting valuable resources from waste”. The key to this lies in sustainable product design. In practice, this means reducing waste to a minimum, recovering as many resources and materials as possible once a product has reached the end of its useful life and keeping them in the economy. By using these materials for other products, they continue to generate value. But there is more to the economic model of the circular economy: it encourages the idea of sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products for as long as possible. This extends the life cycle of a product. The European Ecodesign Directive, first passed in 2005 and revised in 2009, was intended to mitigate the environmental impact of energy-related products by considering their entire life cycle, and to extend the useful life of products by making them easier to repair. (This regulation is being fundamentally revised in 2021 to significantly expand the scope of application, both in terms of the products it covers and the relevant sustainability criteria.)

How can we contribute as consumers?

Consumers can also play an important role in the transition from a throwaway culture to a circular economy by making conscious purchase decisions (avoiding single-use products), using products appropriately and for as long as possible, then disposing of them correctly at the end of their useful life.⁴⁶

⁴⁵ Plastic atlas (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 23.

Find out more about the circular economy and textiles at www.eea.europa.eu/themes/waste/resource-efficiency/textiles-in-europe-s-circular-economy.

⁴⁶ Circular Futures – Plattform Kreislaufwirtschaft Österreich (n.d.). *Kreislaufwirtschaft*. In: www.circularfutures.at/themen/kreislaufwirtschaft, accessed on 30 June 2021.

Reduce: avoiding (single-use) plastic

The most sustainable way to contribute to the circular economy is by avoiding plastics where they are not absolutely necessary. Replacing single-use products with sustainable reusable options is a very good place to start.⁴⁷

With a little planning, many disposable items can be replaced with glass or stainless steel containers or cotton bags brought from home. The growing number of plastic-free zero waste shops make it easier to buy food and everyday items without any plastic packaging. Even disposable period products by now have reusable alternatives (menstrual cups, reusable pads) that are readily available in shops. Some chemist's shops are making it easier for customers to reuse their own (plastic) bottles by offering refill stations for laundry detergents. Drinking tap water (from reusable bottles made of glass or stainless steel) is better for the environment and for our health than buying disposable bottles made of plastic or glass (especially in Europe).⁴⁸ When it comes to clothes, the most sustainable alternatives are choosing items made from natural fibres, participating in clothing swaps and shopping in second-hand shops.⁴⁹ Other consumer goods such as furniture, shoes or packaging often have plastic-free alternatives. Avoid shopping online due to the large amount of plastic and cardboard packaging this involves.⁵⁰ Concerns have also been raised in this context over what happens with products such as clothes and shoes that are returned. Some are allegedly directly thrown away.⁵¹

Reduce: choosing not to buy cleaning products with unnecessary (micro)plastics

Another way in which consumers can cut the amount of plastic and microplastics entering the environment is by choosing not to use cosmetics that contain plastic. Plastics are widely used in exfoliators, shower gels, shampoos, conditioners, hair sprays, creams, nail polish, make-up, deodorants, shaving foam, toothpaste, sunscreens and nappies. They act as abrasives, binding agents, filling agents and film formers. The Austrian Ecolabel helps you recognise good products.⁵³

One bar of soap for hair and body can replace three different products (shampoo, shower gel and shaving foam), which not only reduces plastic packaging (no bottles) but also avoids the microplastics that these products often contain. Apps such as CodeCheck (www.codecheck.info) provide more detailed information on products.⁵⁴

⁴⁷ WWF Junior (n.d.). *Was ist Plastik?* In: <https://www.wwf-junior.de/umwelt/plastik-kurz-erklaert>, accessed on 30 June 2021.

European Commission (2018). *A European strategy for plastics in a circular economy*. In: www.europarc.org/wp-content/uploads/2018/01/Eu-plastics-strategy-brochure.pdf.

⁴⁸ Schulz, S. (28/01/2021). *Einweg oder Mehrweg, Glas- oder Plastikflaschen: Was ist umweltfreundlicher?* In: <https://utopia.de/ratgeber/einweg-oder-mehrweg-glas-oder-plastikflaschen-was-ist-umweltfreundlicher/>, accessed on 30 June 2021.

⁴⁹ Plastic atlas (2019). *A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND)*. In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 23.

⁵¹ Gode, S. (12/02/2020). *Das machen Amazon, Otto und Zalando mit euren Retouren – ein neues Gesetz will die Händler zu mehr Transparenz verpflichten*. In: www.businessinsider.de/wirtschaft/handel/wie-amazon-otto-zalando-eure-retouren-entsorgen-neues-gesetz, accessed on 30 June 2021.

⁵² BUND – Bund für Umwelt und Naturschutz Deutschland (2020). *Mikroplastik und andere Kunststoffe in Kosmetika. Der BUND-Einkaufsratgeber*. Author: Nadja Ziebarth. Berlin: BUND. <https://www.bund.net/service/publikationen/detail/publication/mikroplastik-und-andere-kunststoffe-in-kosmetika>

⁵³ www.umweltzeichen.at

⁵⁴ <https://plastik.greenpeace.at>, accessed on 30 June 2021

A look at the list of ingredients will reveal whether a product contains plastic or not. Every kind of plastic that can be added to cosmetics is listed in the “International Nomenclature of Cosmetic Ingredients” (INCI).⁵⁵ Products that are labelled as natural cosmetics will also be free from microplastics. As an alternative, products such as exfoliators are easy to make at home using natural ingredients. There are countless recipes for every skin type available online.⁵⁶

Reduce: avoiding microplastics when doing laundry

The way we wash our clothes can affect how much plastic enters the environment. Most functional textiles and fleeces are made of plastic fibres that come from oil and natural gas. They should be washed at a maximum of 30°C as higher temperatures can cause the plastic fibres to break more easily. The use of fabric softeners also damages these fibres and creates more microplastics, some of which are particularly fine and then end up in the wastewater. Microplastics that enter the environment this way often cannot be fully filtered out at wastewater treatment plants (and the particles can end up on agricultural soil in some parts of Austria as part of sewage sludge).

Reduce: alternatives to plastics at home and on the go

You can wrap food in beeswax food wraps rather than cling film (except of raw meat and fish) or use containers made of glass or stainless steel instead of plastic.⁵⁷

You can use cotton bags instead of bags made of plastic when you go shopping. (Disposable carrier bags have already been banned in Austria.) However, according to a British study, cotton bags have to be used at least 131 times in order to be more sustainable than plastic bags.⁵⁸ Buying clothes made of wool or cotton rather than artificial fibres not only reduces the amount of plastic waste but also prevents microplastics from entering the environment when you do your laundry.⁵⁹ Clothes made of wool are self-cleaning and often just need to be hung up in the fresh air. This means that wool garments can also save water and detergent by needing to be washed less often.

The growing prevalence of takeaway meals eaten as snacks on the go has increased the use of disposable cutlery and food containers enormously. This includes the typical takeaway coffee cup. These items need to be lightweight, safe for food, heat resistant and unbreakable. That is why they are often made of plastic, which has led to a considerable increase in plastic waste in recent years. Efforts are being made to switch to paper and cardboard, use reusable containers, or offer discounts to customers who bring their own containers from home. The EU Single-Use Plastics Directive has provided an important legal framework for reducing the use of disposable plastic cutlery and containers. In many areas of use, bioplastics (see above, page 9) do not represent a viable alternative, nor do they solve the problem of littering.

⁵⁶ BUND – Bund für Umwelt und Naturschutz Deutschland (2020). *Mikroplastik und andere Kunststoffe in Kosmetika. Der BUND-Einkaufsratgeber.* Author: Nadja Ziebarth. Berlin: BUND. www.bund.net/fileadmin/user_upload_bund/publikationen/meere/meere_mikroplastik_einkaufsfuehrer.pdf.

⁵⁷ Reketat, A. (04/05/2020). *Bienenwachstücher: Besser als Frischhaltefolie.* In: <https://utopia.de/ratgeber/bienenwachstuecher-besser-als-frischhaltefolie/>, accessed on 30 June 2021.

⁵⁸ UK Environment Agency (2011). *Life Cycle Assessment of Supermarket Carrier Bags.* https://www.heartland.org/_template-assets/documents/publications/29559.pdf.

⁵⁹ Istel, K. (18/11/2016). *Mikroplastik: Von der Waschmaschine ins Meer.* In: <https://blogs.nabu.de/mikroplastik-lendet-im-meer>, accessed on 30 June 2021.

Reuse: making use of deposit refund schemes and reusable packaging

Using reusable packaging made from glass (mainly for beverages) reduces plastic packaging and avoids the creation of plastic waste. Globally, only around 3 % of plastic waste is currently recycled. In Austria, the rate is higher at around 26%. About one third of all plastic waste is packaging, mainly from private households.⁶⁰ In order for this plastic to be recycled properly, it needs to be collected by type.⁶¹

Recycle: disposing of plastic waste

Plastic only rots slowly in the open environment and has to be painstakingly collected if it is not disposed of correctly. Despite PET bottles being among the easiest kinds of plastics to recycle if collected separately, they are among the most littered items, even in Austria. If you have plastic packaging waste, make sure you dispose of it in the correct recycling bin.

Cigarette filters also contain plastic. Cigarette stubs that end up on the pavement or in nature also contribute to pollution and leach microplastics and harmful substances into the environment. Portable ashtrays are a good solution for smokers who want to dispose of their cigarette stubs properly in places where there are no bins.⁶²

What can we do as part of civil society and through education?

Every individual can get involved in civil society movements that push for a circular economy and reducing the use of plastics. This could involve talking about specific examples of plastic pollution and real solutions on social media or in (school) newspapers, signing suitable petitions or even launching your own. The campaign “Let’s Clean Up Europe” (<https://ewwr.eu/take-part/#LCUE>) has a different focus every year and invites people to participate in an EU-wide effort while also emphasising the international dimension of both the issue and its solutions.

Highlighting **positive examples** – such as plastic-free school functions or community events and clean-ups of hallways – encourages others to do the same. Schools often have fruit juices, coffee and tea available in disposable plastic containers. Fortunately, more and more alternatives are becoming available. We would like to introduce two of them here.

In Vienna, the project **“Wassertrinken in Schulen”** [“drinking water in schools”] combines the positive health aspects of drinking tap water with the aspect of reducing waste. Students are given a free reusable water bottle. Drinking rituals and other educational measures then encourage them to drink regularly. Both teachers and parents are given useful information and tips; the schools are named “water schools”. So far, over 75 % of primary schools in Vienna have participated and more and more secondary schools are joining in as well.⁶³

⁶⁰ Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (2021). *Die Bestandsaufnahme der Abfallwirtschaft in Österreich – Statusbericht 2021*. https://www.bmkk.gv.at/dam/jcr:04ca87f4-fd7f-4f16-81ec-57fca79354a0/BAWP_Statusbericht2021.pdf.

ÖWAV – Österreichischer Wasser- und Abfallwirtschaftsverband (2016): *Überlegungen und Vorschläge aus Sicht der Abfallwirtschaft zur Verbesserung der Ressourcenschonung und -effizienz*. Ein ExpertInnenpapier der Arbeitsgruppe „Ressourcenschonung und Ressourceneffizienz“ des ÖWAV-Arbeitsausschusses „Abfallstrategie – BAWP 2017“. Vienna: ÖWAV. www.oewav.at/Page.aspx?target=196960&mode=form&app=134598&edit=0¤t=294006&view=205658&predefQuery=-1.

⁶¹ ÖWAV 2016.

⁶² Die Umweltberatung (n.d.). *Plastik-Ausweg: Filter für Tabakprodukte*. In: <https://www.umweltberatung.at/plastik-ausweg-filter-fuer-tabakprodukte>, accessed on 30 June 2021.

⁶³ City of Vienna – Vienna Water (n.d.). *Projekt „Wassertrinken in Schulen“*. In: www.wien.gv.at/wienwasser/bildung/wassertrinken, accessed on 30 June 2021.

Students at the University of Applied Sciences in Vorarlberg, Austria, started the initiative "**“1.2.3.. Tasse dabei?”**" [a rhyming slogan that means as much as "Have you brought your cup?"] that is committed to avoiding disposable takeaway coffee cups. This university alone uses an estimated 100,000 single-use coffee cups a year. As part of a seminar, the students developed and tested a system for reusable cups made of polypropylene in 2018. They received financial support from the university and collaborated with the university canteen as well as the operator of the coffee vending machines. The group ordered 100 reusable cups with the university logo and sold them to students at an affordable price. These reusable cups continue to be used and have done much to reduce the amount of disposable cups being used. The students hope to inspire others to do the same.⁶⁴

ÖKOLOG schools and schools and educational establishments that have been certified with the Austrian Ecolabel place a particular focus on avoiding and reducing waste (including plastic) as part of their comprehensive institution-wide approach.⁶⁵

Our online materials include **examples of young people all over the world** who are working towards and campaigning for solutions to our problem with plastic. Boyan Slat from the Netherlands initiated the project "The Ocean Cleanup" that collects waste from the Great Pacific Garbage Patch and large rivers. On Bali, the sisters Isabel and Melati Wijsen are campaigning against single-use plastic and successfully brought about a change in nationwide legislation. Elif Bilgin from Turkey invented a kind of bioplastic made from banana peel.

These individual initiatives are important. It is equally important to make large multinational corporations aware of their responsibility. The movement "**Break Free From Plastic**" (www.breakfreefromplastic.org), which was founded in 2016, is a civil society alliance of over 2,000 organisations and thousands of individual supporters from six continents. Their goal is to achieve fundamental change in three steps: 1) tackling pollution from production to disposal, 2) reducing the production of plastics, 3) finding long-term solutions for a life without plastic. One of the things they do are so-called "brand audits". These involve members collecting plastic waste over a certain period of time and sorting it according to corporate brands. The movement collected 187,851 pieces of plastic waste in 2018 as part of these audits. The five largest plastic polluters they identified were Coca-Cola, PepsiCo, Nestlé, Danone and Mondelez International. Denouncing these corporations and associating their brands with waste has already put some producers of consumer goods on the defensive. But it will require more pressure from civil society, governments and consumers to actually push corporations to massively reduce plastic production and establish zero-waste strategies.⁶⁶

It is possible for consumers, civil society, educational establishments, governments and the economy to actively work together to end plastic pollution and transition to a circular economy. Teachers and educators can contribute to this transformation by sharing information and encouraging students to support and reflect on the issue – both in schools, in extra-curricular educational establishments and in continuing education. The following section includes some suggestions on how this can be done.

⁶⁴ https://www.fhv.at/nc/datensaetze/news-und-veranstaltungskategorien/aktuelles/?tx_news_pi1%5Bnews%5D=599&cHash=a59c76f0a868fad5e8d862cea232f59c, accessed on 30 June 2021.

⁶⁵ For more information please visit www.oekolog.at and www.umweltzeichen.at.

⁶⁶ *Plastic atlas* (2019²). A joint project of the Heinrich-Böll-Stiftung and the German Federation for Environment and the Protection of Nature (BUND). In: <https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>, p. 44-45.

3. One poster – many opportunities for discussion

The simplest way to use the poster is to hang it up in a visible place and encourage students to find answers to various questions on their own and discuss them with their peers.

We recommend discussing what sustainability and other important terms mean before using the poster during the lesson.

AT A GLANCE: WHAT DOES SUSTAINABILITY MEAN?

The word **sustainability** can stand for many things. Environmental sustainability means treating the resources, living beings and habitats around us conscientiously. Economic sustainability refers to the efficient use of the limited material resources on this planet. Social sustainability is about people and society. It includes issues such as peace, solidarity, social justice and intergenerational justice. In 2015, the United Nations (UN) adopted the "Agenda 2030 for Sustainable Development" at a high-level United Nations summit. It provides a roadmap for the international community to achieve environmental, economic and social sustainability all over the world. It sets out 17 sustainability goals (the Sustainable Development Goals; SDGs). All 193 UN member states agreed to pursue the achievement of these goals on a regional, national and international level by 2030.

You can identify the level of difficulty of the various teaching activities based on how many stars they have. The level of difficulty mainly refers to content but can also include methodology or required social skills. As an educator, you know your students best and will be able to judge which activities and contents are most suitable for them.

★ 1 STAR: **easy**

★★ 2 STARS: **moderately difficult**

★★★ 3 STARS: **difficult**

The @ icon means that there are online materials available (in German only) or that the method can also be used online.

Pages 29-30 provide short, fun ideas for how to introduce the topic in a lesson or as part of a project. Pages 31-37 introduce a selection of activities for a more in-depth reflection on the issues of plastic and the circular economy.

The poster is available to download as a PDF from our web shop www.umweltbildung.at/plastikplakat. You can also download our online materials and additional teaching methods and worksheets from our website (available in German only).

We list further reading materials and links to additional teaching resources on this subject at the end of the booklet.

Tracing plastic

www.umweltbildung.at/plastikplakat



Using the poster to introduce the topic and encourage discussion

We have collected some suggestions for how to use the teaching poster in class. You can select individual activities based on your focus on the topic and the prior knowledge of the participants. The participants can discuss the questions in twos or threes and then share their conclusions with their peers.

PLASTIC AND YOU @

Difficulty: 1 STAR 

Take a close look at the poster. Look for one thing that contains plastic that you could do without and one thing that contains plastic that you absolutely need.

Discuss your choices with the others and think about what would happen if everyone decided to do without one item that contains plastic.

SAY HELLO TO THE PET BOTTLE @

Difficulty: 1 STAR 

Work together to identify all the places where you can find PET bottles.

What are the advantages and disadvantages of these bottles?

PLASTIC ALTERNATIVES @

Difficulty: 1 STAR 

How can consumers contribute to reducing the amount of plastic entering the environment?

Find examples on the poster and think about what else you could do.

WHAT IS GOING WRONG? @

Difficulty: 1 STAR 

Where are things going wrong?

Find situations or items on the poster that contribute to plastic pollution.

What do you think we could do against them?

DOING SOMETHING AGAINST PLASTIC @

Difficulty: 1 STAR 

- Can you find people on the poster who are actively doing something against plastic in the environment?
- What might be their approach to tackling the problem? Write your ideas on a piece of paper.
- Imagine what a day in the life of these activists could look like and tell the others about it.

THINKING ABOUT PLASTIC @

Difficulty: 2 STARS 

Read through all the thought bubbles on the poster. Choose one that you would like to answer.

Think about (and research) what problem might have led to the question and justify your answer.

Write your answer on a sticky note and stick it next to the thought bubble on the poster.

PLASTIC: A VALUABLE RESOURCE @

Difficulty: 2 STARS ★★

Imagine if we had to pay a 1€ deposit on every PET bottle and we could be fined 50€ for putting plastic waste into the wrong rubbish bin.

- Which situations on the poster might change?
- Discuss the possible advantages and disadvantages of a deposit return scheme.
- Discuss the possible advantages and disadvantages of a fine.

THROUGH THE MAGNIFYING GLASS

Difficulty: 3 STARS ★★★

Take a piece of A4 paper and cut a circle in the middle of it (with a diameter of around 7 cm). Lay the piece of paper on the poster and examine a situation as if you were looking at it through a magnifying glass. Think about what the area around this focal point would have to look like and how people would have to behave for the environment to be healthy. Remove the magnifying glass and look at the surroundings on the poster. Do they correspond to what you had imagined?

What is going well and what needs to be changed? Discuss your thoughts with the others.

FREE FROM PLASTIC – OR IS IT? @

Difficulty: 2 STARS ★★

Find four items on the poster that you are sure DO NOT contain plastic and one item that contains "hidden" plastic. Write them on a piece of paper.

Exchange your piece of paper with somebody else. Do some research to find out which of the items could contain plastic (or microplastics).

Then discuss your results.

MICROPLASTICS: TEENSY TINY AND TO BE FOUND EVERYWHERE? @

Difficulty: 3 STARS ★★★

Where on the poster can you find hidden microplastics?

Examine the poster and mark the situations in which microplastics are being created with a sticky note.

Think about how these microplastics might later end up on our plates.

THE LIFE OF A PRODUCT @

Difficulty: 2 STARS ★★

Choose a product on the poster and imagine a story about its life. You can either tell the story verbally, draw a comic or write it down.

Try to answer the following questions:

- How and where was the product made?
- How was it used and what places did it see?
- Was it passed on, reused or repaired?
- How and where did this product's life end?

THINKING ABOUT THINGS UPSIDE DOWN

Difficulty: 3 STARS ★★★

Choose three situations on the poster that you would consider good for the environment.

Now imagine the world had turned upside down and everything was reversed.

What would you have to do to cause the greatest environmental damage with plastic?

Draw your idea on a sticky note and stick it onto the poster. Explain what the consequences would be.

4. Deep-dive activities

1 Which of these are plastic?

DIFFICULTY: 1 STAR 

DURATION: 50 MINS

@ Everything made of plastic – or is it? (in German only)
(Link: <https://view.genial.ly/60642e137556880cdb6a0ced/interactive-content-alles-plastik-oder-doch-nicht>)

MATERIALS REQUIRED:

- Three differently coloured sheets of paper that say “plastic”, “unclear” and “not plastic” and three differently coloured sheets of paper that say “fossil-based plastic”, “unclear” and “non-fossil-based plastic”
- Various everyday objects such as a PET bottle, an aluminium can, plastic cutlery, a plastic bag made of bio-based plastic, a toy made of plastic, a t-shirt made of polyester, sea salt, a straw, a pen, a cigarette stub, a pack of wet wipes, etc.
- A few cosmetics that teenagers use, such as shampoo, shower gel, toothpaste, a face exfoliator
- The “CodeCheck” app to find out whether the items contain plastic

BRIEF OUTLINE:

The participants sort the items into the various categories. This helps them understand which everyday objects contain plastic that we are not aware of, and that it is often unclear whether something contains (fossil-based) plastic or not. At the end, there is a discussion about the advantages and disadvantages of conventional and bio-based plastics.

SKILL-BASED LEARNING GOALS:

- The participants can differentiate the various terms and use them correctly.
- They get to know the advantages and disadvantages of conventional and bio-based plastics.
- They understand what microplastics are and how they impact the environment.
- The participants know how to find out whether a cosmetic product contains microplastics.

WHAT TO DO:

1. Ask the participants to sit in a circle. Position the everyday objects and the pieces of paper with the three categories (plastic, unclear, not plastic) in the centre so that they are visible for everyone. Ask the participants to put the items in the correct categories. Explain that they should focus on the content rather than the packaging of packaged products.
2. Then encourage the participants to discuss. You could ask the following questions:
 - Which objects were you unsure about or could not agree on? Why?
 - Which objects might contain microplastics?If objects are put in the wrong category, let the participants know and explain why. You can use apps such as CodeCheck (www.codecheck.info) to check whether cosmetics contain microplastics.

1



Image: Screenshot of the online activity.
Link: <https://view.genial.ly/60642e137556880cdb6a0ced/interactive-content-alles-plastik-oder-doch-nicht>

3. Next, explain the sheets of paper with the categories “fossil-based plastic”, “unclear” and “non-fossil-based plastic”. Ask the participants to sort the objects according to these new categories. Then ask the following questions:

- Which objects in the category “non-fossil-based plastic” could also be categorised as bio-based plastic?
- What exactly is bio-based plastic?

If the participants do not know the term “bio-based plastic”, explain it to them (more information in the section with background information).

4. Let the participants discuss the following question in pairs:

- What advantages and disadvantages do plastic and bio-based plastic have?

Ask the students to write down their answers and then discuss them with the entire class.

Fill in any missing information on the topic.

FYI:

Some advantages of plastic are its cheap production, versatile application, low weight and durability. Some disadvantages are that it is made of a finite resource (oil), that (if littered in nature) it takes very long to decompose and that it leads to microplastics, a growing problem. Bio-based plastic is not made of oil, but it often uses basic agricultural products that are also used as food (e.g. potato starch, corn starch, etc.), which means it competes with our food for agricultural land. Its production also requires a lot of energy.

5. Talk about the issue in a final round of discussions. Consider the following questions:

- Which terms were new to the participants and which ones did they already know?
- What effects could the fact that so many products contain “hidden” plastic have?
- In which areas do students think it would make sense to use bio-based plastic?
Where would it not make sense?
- How does this knowledge influence the way they view plastics and how they use them?

2 Understanding the circular economy

DIFFICULTY: 2 STARS 

DURATION: 50 MINS

 Genially: Transitioning from a “take-make-waste” model towards a circular economy (in German only)
(Link: <https://view.genial.ly/6034bc28b276400d490923ac/interactive-image-von-der-wegwerfwirtschaft-zur-kreislaufwirtschaft>)

MATERIALS REQUIRED:

- Full-scale printed poster or PDF
- Terms for linear economy and circular economy, printed and cut out (see p. 40, print one for each group)

BRIEF OUTLINE:

The participants think about the concept of a circular economy and what impact this economic model has on our environment. They learn how important it is to dispose of plastics correctly so that they can be reused in the best way and reflect on how they could contribute to less waste being produced.

SKILL-BASED LEARNING GOALS:

- The participants understand how the linear and circular economic models work and what their impacts are on the environment.
- They know the product life cycle of a PET bottle and how important it is to dispose of plastic correctly.
- They are aware of alternatives to single-use bottles and know what they can do to produce less waste.

WHAT TO DO:

1. Divide the class into groups of two to four people. First, give each group the cards with the terms related to the linear economic model. Each group tries to put the cards in the correct order. Ask which products are most often used this way and what effect this form of economy might have on our environment.
2. Then hand out the terms related to the circular economic model and explain the meaning of the terms, if necessary. Ask the teams to put the cards in a meaningful order again. Discuss the results with the entire class and ask whether the participants know any products that correspond to this form of economy, and what impact switching to this economic model might have on our environment.
3. Invite each team to research any information they do not know about PET bottles. For example:
 - **how the raw materials are sourced and used** (this should include a focus on the issues around sourcing and using oil),
 - **production** (and the fact that it requires a lot of energy),
 - **collection and correct disposal** (point out the importance of correct separation for recycling) and
 - **recovery** (“bottle-to-bottle” recycling is the most efficient, but old PET bottles can also be made into other products).
4. Ask the entire class or the individual groups to try to locate the various stages of a PET bottle in a circular economy on the poster.
5. Questions for reflection at the end:
 - How does the linear economic model impact the environment?
 - What advantages could the transition to a circular economy have?
 - How could we optimise the product life cycle of PET bottles?
 - What are sustainable alternatives to single-use bottles?
 - What can we do as individuals to produce less waste?

3 Homemade products free from microplastics

DIFFICULTY: 2 STARS 

DURATION: 50 MINS or as a project  as homework

MATERIALIEN/VORBEREITUNG:

- „CodeCheck“ app (Link: www.codecheck.info)

BRIEF OUTLINE:

Primary microplastics are often used as abrasives in cosmetics and cleaning products. These plastic particles enter the environment when the products are used, as our wastewater treatment plants cannot catch them all. Plastic and microplastics can be avoided by making skincare and cleaning products at home.

SKILL-BASED LEARNING GOALS:

- The participants understand what microplastics are and how they enter the environment because of us humans.
- They are able to reflect on the sustainability of beauty and skincare products and recognise opportunities for action.
- They know how to create their own plastic-free cosmetics.

WHAT TO DO:

1. Introduce the subject of plastic and microplastics. Invite the class to brainstorm the following questions:

- How do microplastics enter our environment?
- What impacts do microplastics have on our environment?
- What can we all do to avoid microplastics?

Write the results down on a board or flip chart or an online document so that they are visible for everyone.

2. Then divide the class into groups of two to four people. Ask the groups to talk about what cosmetics, detergents and cleaning products they currently use and let them research whether these products contain microplastics with the help of the “CodeCheck” app. Discuss the results with the entire class.

3. Then present cleaning products or cosmetics that can be made at home out of kitchen waste. These include exfoliators, detergents made of potato peel, cleaning products made of apple vinegar and orange peel as well as deodorants
(e.g. <https://wasteless.zerowastescotland.org.uk/articles/diy-deodorant>).

4. Ask each group to choose one product that they would like to make and try out for themselves. They can do this either during the lesson or at home. Ask the participants to package and label some of their home-made product for the other participants.

5. Invite each group to think of an attractive name for their creation and write it, as well as a list of all ingredients, on the label. They can also think of a short slogan or pitch for the product.

6. To conclude the activity, ask all groups to present their products and talk about their experiences with them. Possible questions for reflection:
 - What are the advantages and disadvantages of home-made products?
 - What impact does advertising have on us in terms of buying certain skincare or beauty products?
 - How do you decide which products you need and which ones you do not need?
 - Which products did you find particularly appealing and why?

4 When is plastic a good choice?

DIFFICULTY: 3 STARS 

DURATION: 50 MINS

MATERIALS REQUIRED:

- Full-scale printed poster
- Sticky notes and pens
- Internet

BRIEF OUTLINE:

Which product is more sustainable? What conditions have to be fulfilled for this product to be the more sustainable alternative? In this activity, the participants work with various everyday products and research which consumer decisions and what type of use can contribute to a sustainable lifestyle.

SKILL-BASED LEARNING GOALS:

The participants are able to research and compare information about products.

They can reflect on their own consumption and potentially find alternatives.

They can recognise problems with the linear economic model.

WHAT TO DO:

1. Divide the class into groups of two to four people. Invite them to talk about which products made of plastic they use or buy in their everyday lives and to try to locate them on the poster.
2. Then always ask two groups to select a product from the same line out of the following list:

PRODUCT WITH PLASTIC/BIOPLASTIC	ALTERNATIVE PRODUCT
Produce bag made of bioplastic	Paper bag
PET bottle	Reusable glass bottle
Polyester t-shirt	T-shirt made of cotton
Shampoo (with microplastics)	Shampoo bar
Cling film	Beeswax food wrap
Face exfoliator (with microplastics)	Home-made face exfoliator
Toothpaste (with microplastics)	Tooth powder
Home-made product from 3D printer	Purchased product made of plastic

4

3. Next, let the teams research information on the product they chose and try to find as many advantages as possible for their product. Ask them to also try to find out how (or how often) the product has to be used for it to be as environmentally friendly as possible.
4. Each group then creates a pitch, a short presentation for their product, based on the information they have gathered. Why should consumers choose this product (e.g. the produce bag made of bio-plastic) or prefer it to the other product (e.g. the paper bag)?
5. Ask one person from each group to present their pitch or arguments. Make sure two alternative products are presented one after the other. Invite the remaining participants to decide which products they prefer and to explain why.
6. In a final round, reflect on why some products were more popular than others and what arguments were the most persuasive. Questions for reflection:
 - What questions should consumers ask themselves before buying a product?
 - How are consumers influenced by advertising?
 - When is plastic a good solution for a product?
 - Which products can easily be made without plastic?

TIP:

To continue this activity, participants can research a product with planned obsolescence (see page 18) and find out what tips and tricks there are to extend the product's useful life.

5 Protest practice

DIFFICULTY: 2 STARS 

DURATION: 50 MINS

@ Genially: Solutions for the world of tomorrow (in German only)
 (Link: <https://view.genial.ly/603f5736a46b760d7b96ec6e/guide-junge-innovatorinnen-thema-plastik>)

MATERIALS REQUIRED:

- A computer for the genially tool (optional)
- Brown paper, cardboard, wooden sticks (optional), poster markers, water colours, oil pastels

BRIEF OUTLINE:

The participants imagine participating in a peaceful protest that hopes to spread awareness of the plastic problem. They design signs and present them to each other.

SKILL-BASED LEARNING GOALS:

- The participants are able to consider different points of view and think systemically.
- They can summarise complex information into slogans and messages.
- They can agree on the wording for their sign within the team.
- They are able to express their emotions creatively.

WHAT TO DO:

1. This activity can be a great conclusion after having dealt with the poster and the issues around plastic and microplastics in-depth. Divide the participants into small groups of three to five people.
2. Invite them to imagine participating in a peaceful protest that campaigns for reducing the use of plastic. Ask them to discuss what type of change they particularly want to stand up for.
 - What do these changes look like?
 - Who can bring them about?
 - What exactly are the participants demanding?
3. Then ask the participants to design signs that they would use at this fictitious protest. The messages and slogans are allowed to be emotional. Encourage participants to think of a good slogan or a play on words that inspires others.
4. Once the signs are ready, ask all students to line up to form a lane. Then let the individual groups take turns to march through the lane and loudly present their sign, attracting as much attention as they can. You could even include a slogan as a chorus between the individual groups, such as: "We are unstoppable, another world is possible!".
5. To conclude, discuss which messages came across particularly well and why.

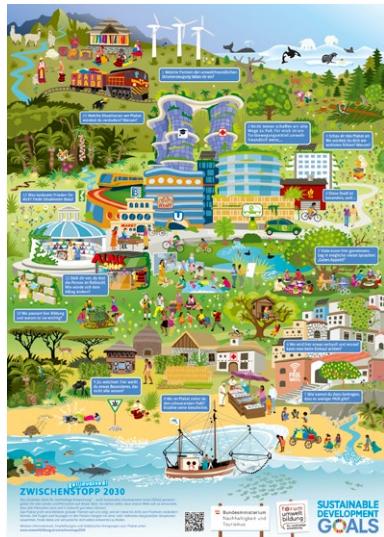
TIP:

Other questions that you could discuss:

- How much change can we effect as consumers and citizens and what are the limits?
- How important is it to stand up for social issues?
- What other opportunities are there to get involved in socially relevant issues?

5. Information and materials for further study

Environment and sustainability



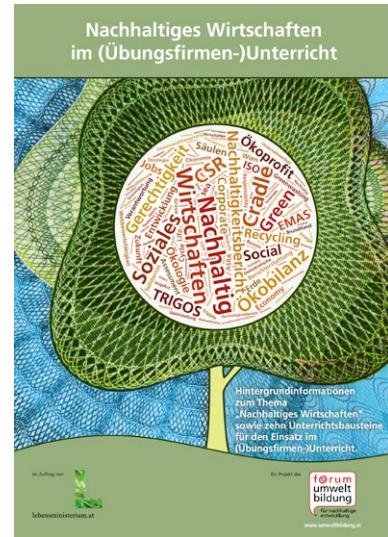
**Teaching Poster:
"Stop off in 2030"**

Forum Umweltbildung online shop: <https://www.umweltbildung.at/shop/zwischenstopp2030-alle-plakate/>



Teaching Poster: "Shape your learning environment"

Forum Umweltbildung online shop: <https://www.umweltbildung.at/shop/lernwelt-gestalten/>



Brochure "Nachhaltiges Wirtschaften im (Übungsfirmen-)Unterricht" (in German only),
Forum Umweltbildung online shop: www.umweltbildung.at/shop/nachhaltiges-wirtschaften

Plastic

- Plastic atlas 2019:
<https://www.boell.de/sites/default/files/2020-01/Plastic%20Atlas%202019%202nd%20Edition.pdf>
- Education for sustainable development kit "BNE-Kit III" (in German only), éducation21:
www.globaleslernen.de/sites/default/files/files/education-material/bne-kit_iii_dossier_de.pdf
- Education for sustainable development kit on the subject of water "BNE-Kit Wasser" (in German only), éducation21:
www.education21.ch/sites/default/files/uploads/pdf-d/bne-kit/BNE-Kit_Wasser_Zyklus2_DE_DEF.pdf
- Plastic Planet (in German only), film and teaching materials:
http://www.materialserver.filmwerk.de/arbeitshilfen/plastic_planet_schulmaterial.pdf
- Information on plastics, for chemistry lessons in particular (in German only): www.plasticschool.de
- Collection of activities and good questions (in German only):
<https://bne-sachsen.de/app/uploads/2020/04/Methoden-Plastik-BNE-Portal.pdf>
- "100 Tipps für ein Leben ohne Plastik" (in German only), 100 tips for a plastic-free life, EcoYou:
<https://ecoyou.de/plastikfrei-leben>
- Information on microplastics (in German only): www.mikroplastik.de
- Information on softening agents in plastics (in German only): www.weichmacher.de

Waste

- Project „Nachhaltig weggeworfen“ (in German only), Forum Umweltbildung teaching materials: www.umweltbildung.at/praxismaterial/nachhaltig-weggeworfen
- Interactive exercise „So viel Müll schluckt kein Meer mehr“ (in German only), Forum Umweltbildung teaching materials: www.umweltbildung.at/praxismaterial/so-viel-muell-schluckt-kein-meer-mehr

Reduce – Reuse – Recycle

- REdUSE (in German only), teaching materials on the subject of reuse and recycling: www.multivision.info/images/stories/reduse/REdUSE_Unterrichtsmaterial_Klassen_5-12_interaktiv.pdf

Textiles and sustainability

- Dossier on clothing (in German only), éducation21: www.education21.ch/de/themendossier/konsum-mode
- Exercise “Das Gewand in meiner Hand” (in German only), Forum Umweltbildung teaching materials: www.umweltbildung.at/praxismaterial/das-gewand-in-meiner-hand
- Lesson “Die Reise einer Jeans” (in German only), Forum Umweltbildung teaching materials: www.umweltbildung.at/praxismaterial/die-reise-einer-jeans
- Teaching aid “Saubere Mode ist möglich” (in German only), Greenpeace: www.greenpeace.de/bildungsmaterialien/chemie-textilien-saubere-mode-ist-moeglich
- Video “1 Mio. Tonnen Altkleider! So funktioniert das Recycling!” (in German only), Galileo, ProSieben: www.youtube.com/watch?v=ePj41rcAWHU

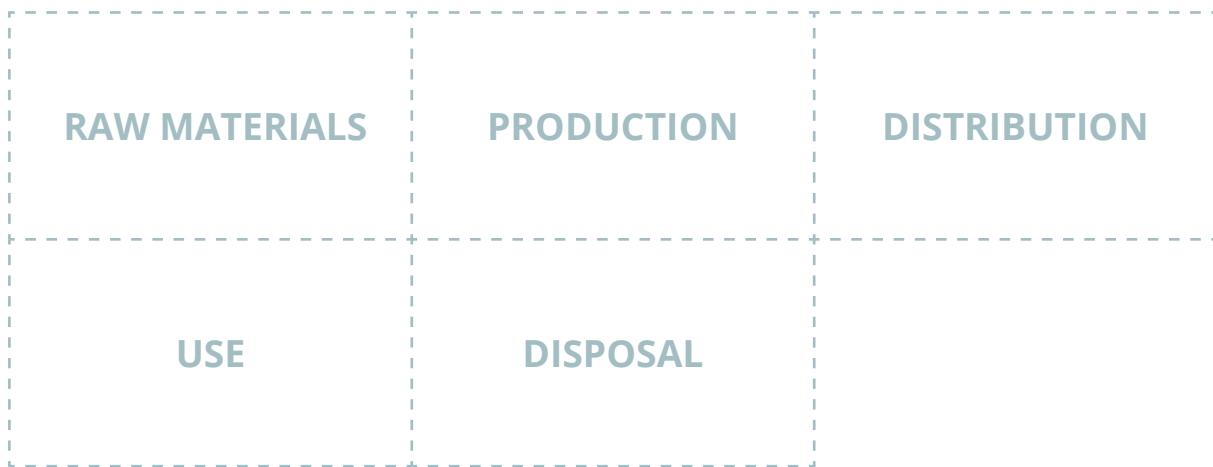
Sustainable management and the circular economy

- Instructions for making your own beeswax food wraps (in German only), Forum Umweltbildung teaching materials: www.umweltbildung.at/praxismaterial/bienenwachstuecher-selbst-herstellen
- Role play „Orangenplantagenspiel“ (in German only), Forum Umweltbildung teaching materials: www.umweltbildung.at/praxismaterial/orangenplantagenspiel
- Lesson „Die Zukunft in der Vergangenheit“ (in German only), Forum Umweltbildung teaching materials: www.umweltbildung.at/praxismaterial/die-zukunft-in-der-vegangenheit
- Redesigning plastics, Ellen MacArthur Foundation: www.ellenmacarthurfoundation.org/assets/downloads/schools-colleges/Redesigning-plastics-Final-v4.pdf
- Teaching resources and films in English, The Circular Classroom: <https://circularclassroom.com>

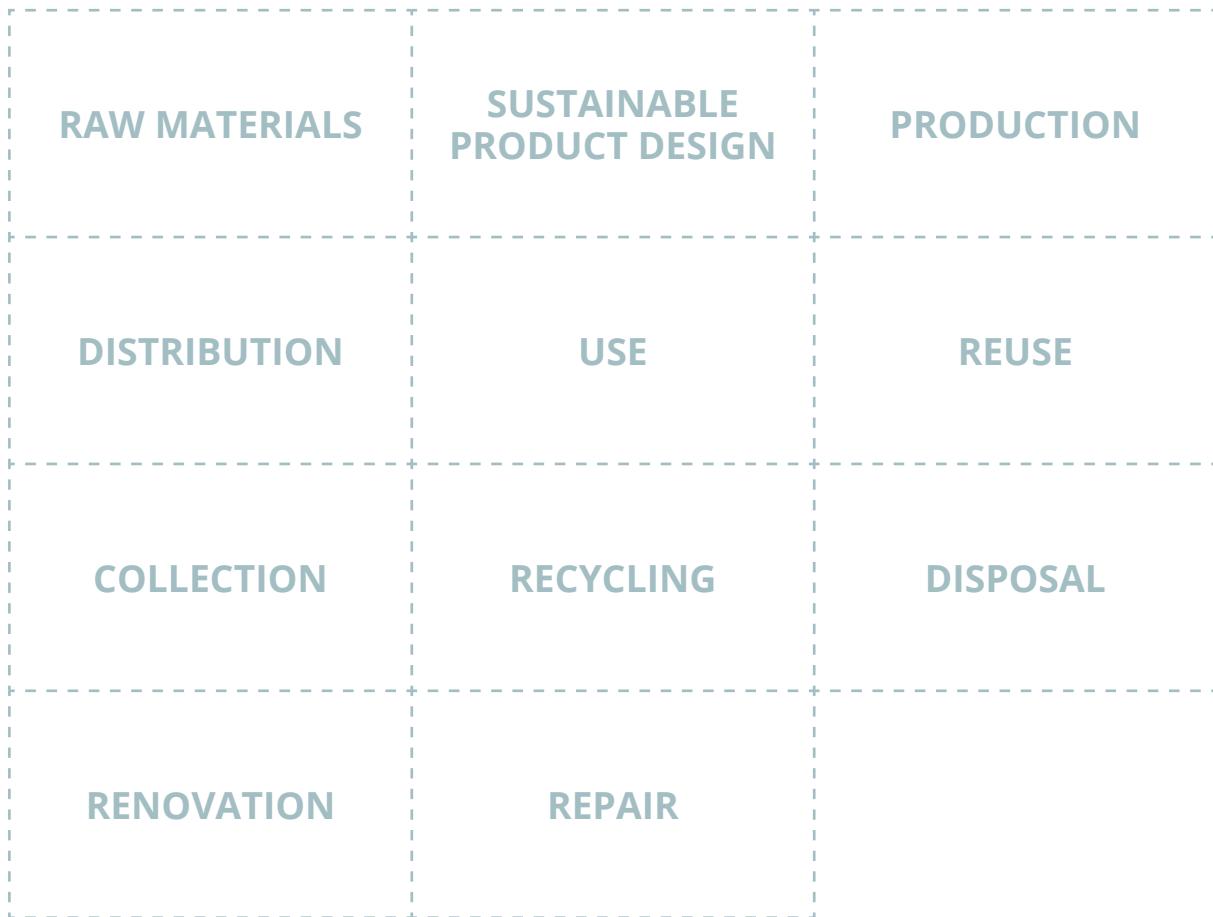
6. Appendix

Work sheet for activity 2 "Understanding the circular economy"

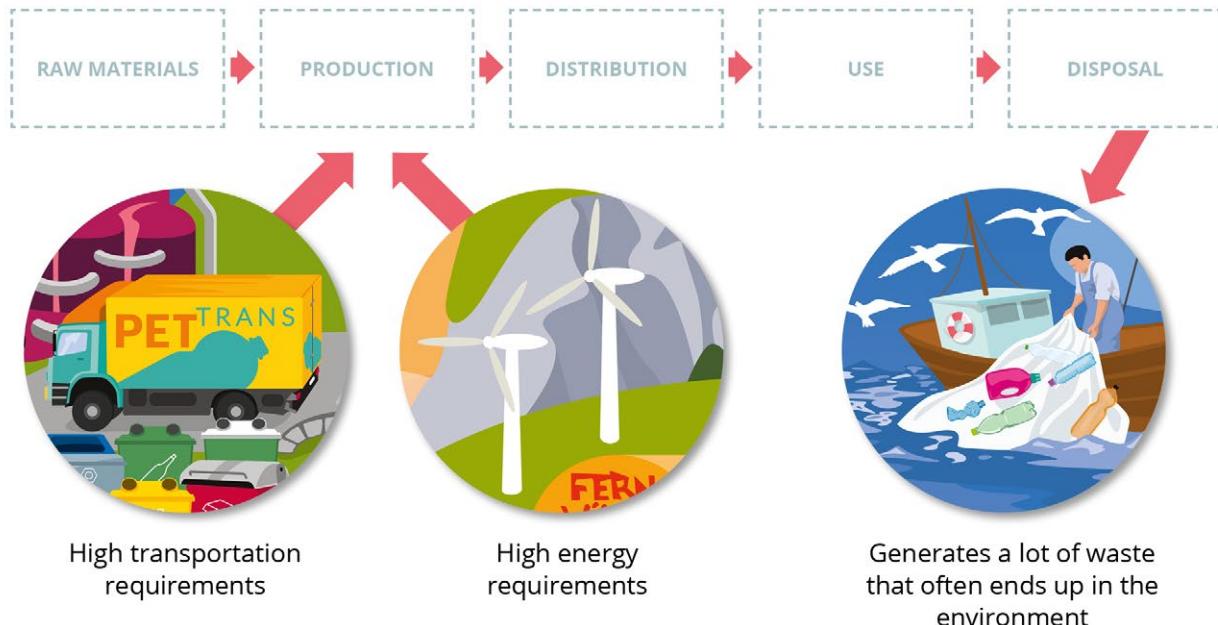
Terms to cut out: linear economy



Terms to cut out: circular economy



Solution linear economy:



Solution circular economy

