EEA Report No 18/2020

Plastics, the circular economy and Europe's environment — A priority for action

European Environment Agency

Cover design: Formato Verde
Cover image © iStock.com/Thomas Faull
Publication design: Formato Verde

Luxembourg: Publications Office of the European Union, 2021

ISBN: 978-92-9480-312-2
ISSN: 1977-8449
doi: 10.2800/5847

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Acknowledgements

Lars Fogh Mortensen and Ida Lippert Tange (both from the EEA) co-authored this report with Åsa Stenmarck, Anna Fråne, Tobias Nielsen, Nils Boberg (all from the IVL Swedish Environmental Research Institute) and Fredric Bauer (Lund University), who prepared a technical report commissioned by the EEA providing underpinning analyses for this report.

Martin Adams and Daniel Montalvo (both from the EEA) provided guidance, comments and strategic oversight in the preparation of this report. James Daniell (from the EEA) led the editing.

The following are thanked for their input during the preparation of the report:

- Ioannis Bakas, Ricardo Fernandez, Almut Reichel, Xenia Trier and Bastian Zeiger (from the EEA);

- Representatives from the European Commission's Directorate-General for Environment.

Plastic items and products surround us every day © Pixabay

Summary

Plastics play an essential role in modern society, but also lead to significant impacts on the environment and climate. Reducing such impacts while retaining the usefulness of plastics requires a shift towards a more circular and sustainable plastics system. This report tells the story of plastics, and their effect on the environment and climate, and looks at their place in a European circular economy.

Plastics comprise a range of materials, each with its own unique characteristics, properties and applications — 99 % of plastics are made from carbon from fossil fuels (CIEL, 2019). The consumption and production of plastics have grown exponentially since the 1950s, with the resulting products (including packaging, kitchenware, electronics, textiles, car components and furniture) constituting an important part of everyday life. Plastics are light, cheap, durable and can be made in an infinite number of variations, and the plastics industry contributes to growth and job creation.

Plastic packaging is the largest sector of the plastics industry, representing almost 40 % of total plastic consumption. Among other things, plastics provide new transport solutions for the logistics sector, and they are important for improving hygiene in healthcare (e.g. in virus protection) and for reducing food waste by keeping food fresh for longer. Plastics are also used in cars and aeroplanes, reducing weight and improving fuel efficiency, in synthetic fibres in clothing and other textiles, and in furniture and kitchenware.

In recent years, plastic has been subject to increased focus and attention from an environmental perspective. Being lightweight and durable are two key strengths of plastic, but this also means that plastic spreads easily and can persist in the environment for many years. Plastic waste can now be found in our parks, on our beaches, at the bottom of the oceans and seas, on top of mountains and even inside our bodies. The leakage of plastics into the environment poses a significant problem for current and future generations, and there are significant gaps in our knowledge about the kind of effects that this exposure can have. The potential magnitude of impacts on the environment and human health varies a lot depending on the type of plastics and the chemical additives they contain. The negative effects of plastics go beyond littering and leakage: 7 % of crude oil output is used to make plastics, a proportion set to grow rapidly as consumption of plastics is expected to double in the coming 20 years (EC, 2020). The energy and fossil feedstock used to produce and transport plastics and manage plastic waste creates a large and growing carbon footprint.

Today, plastics are too often used as single use products, then discarded, then too often littered. The current linear models of production and consumption of plastics are failing nature and our economy at the same time, which is why we need a circular plastics economy. Reducing the environmental and climate impacts of plastics, while retaining the usefulness of plastics in society, requires making the systems of plastic consumption and production more circular, resource efficient and sustainable, thereby enabling longer use, reuse and recycling. Adequate policies and the scaling of circular business models can, together with changes in the behaviour of producers and consumers, enable a more circular and sustainable plastics system.

This report introduces the wide family of plastics and briefly explores the main challenges involved in transitioning towards a circular plastics economy. It shows that, although the production, use and trade of plastics continue to grow, significant differences exist between Europe and other regions of the world. Furthermore, it explains the environmental and climate impacts that occur across the life cycle of plastics, including the leakage of plastics into natural environments and the growing demand for oil and emissions of greenhouse gases. Finally, it shows that an increasing number of EU initiatives are already in place to address some of these issues, but that more coordination and scaling up is needed. Three pathways (smarter use; increased circularity; and use of renewable raw materials and decarbonisation) are discussed, which together can help ensure the continued longer term move towards a sustainable and circular plastics system.

The road ahead: towards a circular plastics economy

Innovation, business models, societal awareness and new policies are gradually changing the way we produce, use, recycle and dispose of plastics. Many barriers to achieving circular and more sustainable production and consumption of plastics remain. Given the multiple environmental and climate impacts that exist across the life cycle of plastics, the shift towards a circular economy requires circular business models, changed consumption patterns and policies. These should address all stages in the plastic product life cycle and consider the many different types of and uses of plastics.

Policies and business models

Policies towards a circular plastics economy

Plastic has received growing EU policy attention in recent years. In 2018, the European Commission presented the world's first comprehensive strategy on plastics in a circular economy, which lays out the EU's approach to addressing the challenges of plastics. The strategy aims to curb plastic leakage into the environment and to ensure that plastic products are designed and produced in a way that allows for circularity, including through reuse and recycling. Emphasising the strong business case for European industries to take the lead towards a circular plastics economy, the strategy introduces four overarching aims of the initiative. These include the aim to improve the economics and quality of plastics recycling, curb plastic waste and littering, drive investments and innovation towards circular solutions, and harness global action.

As a main component of the European Green Deal, the new Circular Economy Action Plan (EC, 2020), put forward in March 2020 by the European Commission, presents a range of policy initiatives that will move the EU towards a more circular economy. Building on the efforts of the EU Plastics Strategy, the Action Plan targets plastics as a key product value chain. It contains concrete commitments to develop mandatory requirements for recycled content and waste reduction measures for selected products, to restrict the presence of micro-plastics in the environment, to create a policy framework on bio-based and biodegradable plastics, and to ensure the timely implementation of the Directive on Single Use Plastics (EU, 2019; EC, 2020).

The increased focus on plastics and circularity in EU strategies has also resulted in the adoption of new directives and the amendment of existing ones. In line with increased awareness of the negative environmental impacts associated with single-use plastics, the European Council adopted the Single Use Plastic (SUP) Directive (EU, 2019) in May 2019. With the objectives of preventing single use plastic waste and increasing recycled content in the products, the SUP Directive bans, from 2021 onwards,

10 of the most common plastic objects found polluting European beaches for which alternatives exist. These items include cotton bud sticks, cutlery, plates, straws, stirrers, sticks for balloons, certain food and beverage containers and all products made of oxo-degradable plastics. The SUP Directive also introduces economic incentives to reduce consumption and establish higher collection rates, along with extended producer responsibility (EPR) schemes.

EPR schemes increase producers' responsibility when their product turns into waste. The aim is to incentivise producers to improve collection and waste management of their products and to close the loop through better design and higher recyclability/reusability of their products. Such EPR schemes are also implemented through EU directives on batteries and accumulators (EU, 2006), electrical and electronic waste (EU, 2012), end-of-life vehicles (EU, 2000) and packaging (EU, 2018b). The last three cover product categories with a high plastic content and also represent some of the largest demand segments for plastics. These products are thus collected separately, which allows dedicated recycling systems.

In addition, several waste management directives have been revised to include new targets specifically on plastics. These include the 2015 EU Directive 2015/720 on lightweight plastic carrier bags, which stipulates that Member States should reduce the consumption of lightweight plastic bags by setting a target of 40 bags per person by 2025 and/or introducing measures that prevent carrier bags being provided free of charge by 2018 (EU, 2015). The Waste Framework Directive (EU, 2018a) has likewise been revised with new recycling targets for municipal waste and packaging, and landfill reduction targets. By 2025, 55 % of municipal waste needs to be recycled (60 % by 2030), and by 2025 50 % of plastic packaging must be recycled (55 % by 2030).

In response to the growing awareness around marine plastic pollution, there has also been a range of international actions. These come first and foremost from a growing number of civil society initiatives aimed at limiting the consumption of single-use plastic items and cleaning up waste items. In recent years, business and governments have also begun to discuss how they may take stronger, more coordinated action addressing marine plastic pollution specifically, for example through voluntary action and global agreements.

In relation to this, trade in plastic waste has also risen up the international political agenda. As discussed in the section on trade in plastic waste, the effects of the 2017 Chinese ban on imports of certain types of plastic waste led to significant changes in the international plastic trade. In addition, the revision of the Basel Convention (2019) encourages countries to take greater ownership of and give more consideration to their plastic waste.

In the context of this plethora of initiatives, coordinated action is needed to enable best practice to be shared between countries and regions and to scale up circular and more sustainable plastics initiatives. To this end, the EU has a unique opportunity to play a

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leading role when it comes to promoting sustainable plastic production and consumption in the global arena. The new circular Economy Action Plan sets out an ambition to create a global circular economy alliance that can identify knowledge and governance gaps in transitioning towards a global circular economy.

Circular and sustainable business models

Current business models in the plastics industry are dominated by traditional and very linear business models enabling the extraction, production, consumption and waste management of plastics, with little or no focus on circularity. Resource extraction is dominated by large multinational companies in the oil and gas industry with high levels of international trade and imports and exports to and from Europe. The many production phases related to plastics involve companies of many different sizes operating in Europe and elsewhere, and the same is the case in the waste management phase.

Moving towards more circular and sustainable business models in the plastics production and consumption system — often enabled through social and technological innovation — has huge potential for reducing environmental and climate impacts.

During resource extraction and use of materials for plastic production, innovation and circular business models can enable a gradual move from sourcing entirely virgin raw materials (mainly from oil and gas) to renewable resources and secondary

resources from the recycling and recovery of plastics. More circular product design is also important. The choice and organisation of materials, including plastics, are the main determining factors for product and material circularity. Basically, the aim should be to keep the materials in the economy for as long as possible.

Along with the environmental and climate impacts of production, the logistics of the plastics supply chain, including transport, storage and retail, affect circularity significantly.

Circular business models can enable longer use, reuse and repair of materials, while at the end-of-life phase these business models are crucial to enable the sorting, recycling and remanufacturing of plastics.

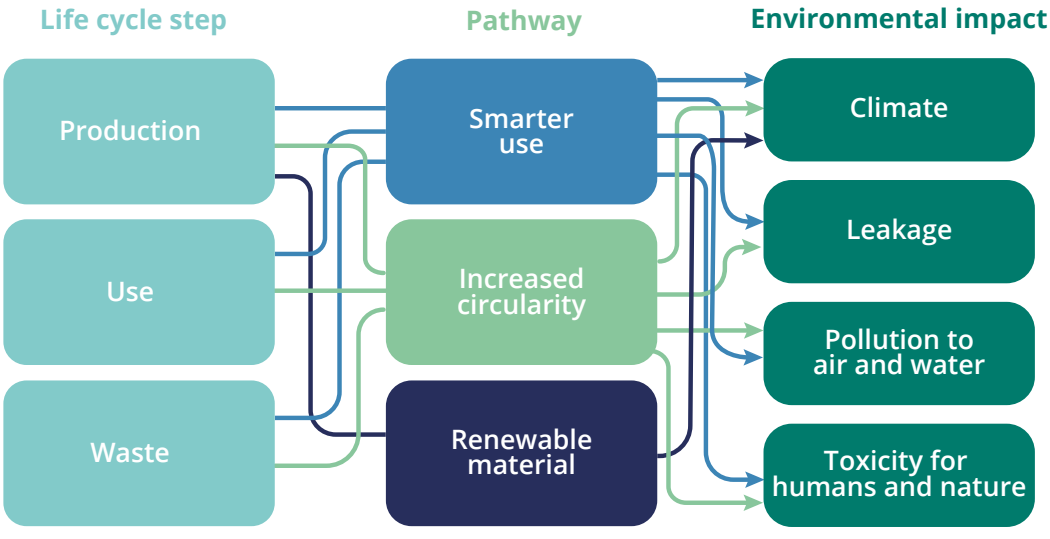
Pathways towards circularity in the longer term

Despite increasing initiatives to change the current plastics system, various stakeholders in business, policy and civil society often promote specific solutions aimed at addressing particular problems, such as littering and low recycling rates. However, given the challenges associated with different plastic applications and different stages of the life cycle, as explained in the previous section, a single initiative will not suffice to facilitate the trajectory towards a circular plastics economy.

Rather than searching for a silver bullet solution, this section presents three pathways that may together ensure the continued longer term move towards a sustainable and circular plastics production and consumption system. These pathways should be seen not as alternative options but rather as pathways that are in line with current policies and that offer options for continued policy development towards circularity and sustainability in the longer term.

The three pathways are smarter use, increased circularity and renewable material (Nielsen et al., 2018). Figure 20 illustrates that each pathway addresses different stages of the plastics value chain, as well as different environmental and climate impacts. For each pathway, the following section explores the problems it seeks to address, the types of solutions it promotes, its limitations, and the possibilities for further action. Policy action, circular business models and a changing role for consumers are important to all three pathways.

Figure 20. Scope of different pathways towards a more sustainable plastic system



Source: Based on (Nielsen et al., 2018).

The smarter use pathway

Through policy, circular business models and consumer action, the smarter use pathway aims to reduce the use of unnecessary plastics by ensuring that the right plastic is used for the right purpose and by substituting plastics with more resource-efficient materials when this is beneficial and possible.

Problems it addresses

This pathway addresses the environmental impact of plastic pollution and the exponential growth rates in plastic production and consumption, which far outpace our ability to manage the waste generated. Rather than merely relying on technological fixes such as better recycling systems, this pathway aims to reduce the projected growth curve of plastic production and consumption by using plastics in a smarter way.

Types of solutions it promotes

A 'smarter use' of plastics entails a reduced use of plastics when this is beneficial, coupled with a more effective use of the plastic that is consumed. Achieving this requires significant changes in current consumption patterns. Not only is it important for consumers to consider the types of materials, products and services they use, but products should also be used for longer, through reuse and repair, as enabled by circular business models.

It is also crucial to consider which types of plastics are used for which types of applications. For instance, reducing the number of different plastic types used for packaging through circular business models can reduce complexity further down the value chain. It also means, in some cases, exchanging plastics with other materials while making sure that these materials do not have higher environmental impacts. A smarter use likewise entails limiting the number of toxic elements in plastics.

In line with this pathway, there is a growing number of initiatives that aim to make users more aware of how much plastic they consume and the negative effects that this can have. These initiatives range from civil society actions aimed at changing consumer habits, such as encouraging reusable takeaway coffee cups (Freiburg cup), to global efforts to clean up the large plastic patches in oceans (Ocean Cleanup) and more local efforts to clean beaches (Ocean Conservancy) or harbours (GreenKayak in Denmark). Several circular business models that promote longer life cycles of plastic products have also come to light in recent years.

A significant number of public and policy initiatives aimed at curbing plastic waste and reducing consumption (of single-use plastics) also exist. These range from the Single Use Plastics (SUP) Directive to bans and taxes on plastic bags. In addition, there are an increasing number of initiatives aimed at dealing with toxic elements in plastics, from bans on specific additives, such as bisphenol A in baby bottles (EU, 2011), to bans on micro-plastics in rinse-off cosmetics in France, Italy and Sweden, for example.

Example of a reusable coffee cup © Pixabay

Box 10. Seven recommendations of the European Academies' Science Advisory Council to transform the plastics system

The European Academies' Science Advisory Council recently published a report on plastics packaging in a circular economy that shows that fundamental changes along the entire value chain are required to slow and reverse environmental and climate impacts. The report includes seven messages for EU policymakers on how to transform the plastics system.

1. Ban exports of plastic waste to third countries
Rather than shipping huge amounts of plastic waste to third countries that often do not have the necessary capacity to deal with it in a sustainable way, Europe should manage its own plastic waste. This is better from both an environmental and an ethical perspective, even if part of the waste has to be recovered for energy.

2. Adopt a target of zero plastic waste to landfill, and minimise consumption and one-way use
In addition to adopting a target of zero plastic waste to landfill and making reduction in consumption an explicit objective, policymakers should extend deposit refund schemes to cover a wider range of containers and single-use beverages.

3. Extend producer responsibility (EPR)
Ambitious EPR schemes should include measures that facilitate product design choices that consider end-of-life use and environmental impacts, such as toxicity, durability, reusability, repairability and recyclability/compostability.

4. End misleading information about bio-based alternatives
At present, scientists see very limited potential for biodegradable plastics, as only a few products meet biodegradation tests in the natural environment. Furthermore, consumers may be misled by the diversity of existing labelling schemes and are often not aware of the environmental impacts associated with bio-based alternatives. A uniform European labelling scheme that relates to the actual rather than theoretical recyclability of bio-based plastics should therefore be created.

5. Advanced recycling and reprocessing technology
To extract more value from plastic waste, advanced recycling and reprocessing technology must be developed. In addition, recycling for use in the same product (closed-loop recycling) must be prioritised over other options, such as recycling for use in the production of different products (open-loop recycling) or energy recovery.

6. Limit additives and types of resin to improve recyclability
To increase the recyclability of plastics, the use of additives must be reduced and the number of polymers that can be used for specific products simplified.

7. Price regulations and quotas for recycled content
The current cost of virgin plastic feedstock is very low and does not include costs to the environment and climate. Policymakers should therefore adopt a regulatory and financial framework, including, for instance, a plastics tax or a requirement for minimum recycled contents, that takes into account adverse impacts across the plastic product life cycle.

Source: EASAC (2020).

Information encouraging more sustainable consumption of plastics is also found in environmental product declarations, on labels about types of plastic used in packaging and in guidelines for green public procurement.

Constraints

Plastics are very useful materials and substituting them with alternative materials is not always straightforward. It can be difficult to determine the negative impact of specific plastic products compared with alternative materials (Spierling et al., 2018) a review on available data from life cycle assessment (LCA). This, in turn, makes it difficult to choose which plastic items to tax, ban or redesign.

Similarly, using fewer types of plastics in certain applications may also lead to unintended negative impacts. For instance, although laminates used in plastic food packaging can complicate recycling, they offer advanced food protection, thereby reducing food waste while also reducing the overall amount of plastic used. The value of food protection is likely to outweigh the cost of poor mechanical recyclability in most cases, but such assessments may be difficult to make.

Possibilities for further action

Initiatives to reduce the use of plastics tend to focus on packaging, such as straws, cups and bottles. However, future initiatives could look at other key plastic sectors, such as the automotive industry (car tyres), textiles (synthetic textiles) and agricultural film, that also pose significant challenges. In addition to widening the scope of action, standards and guidelines on how to achieve a 'smarter use of plastics' could be further developed and used as part of, for example, green public procurement or corporate social responsibility initiatives. An overall goal would be to make plastic a more 'valuable' product, both in economic terms, whereby the price reflects its environmental impacts, and in terms of how consumers use and relate to it.

The increased circularity pathway

The main ambition under the 'increased circularity pathway' is to transition from a linear plastics economy to a circular plastics economy, in which the value and utility of plastics is maintained within closed loops through, for example, circular business models enabling improved end-of-life management and enhanced product design.

Problems it addresses

A key problem with the current take-make-dispose plastics system is that it leads to low resource efficiency and high material and economic value losses, with a continuous input of virgin materials derived from the Earth's finite resources. This pathway therefore addresses the (material) inefficiency of the plastics system, in which only a limited amount of plastics is currently conserved.

Types of solutions it promotes

Proponents of this pathway focus on technical and systemic solutions, along with circular business models that help unlock material and energy savings by enabling plastic waste to re-enter the system after use, thus replacing virgin raw materials in new products. This includes improving the design of products and services, reducing the toxicity and complexity of applications, improving collection and sorting, and promoting a market for recycled and reused plastics.

Box 11. The 'New Plastics Economy': a vision for an economy in which plastics never become waste

Launched by the Ellen MacArthur Foundation in 2016, the New Plastics Economy initiative envisages a circular economy in which plastics never become waste. Instead, unnecessary plastics should be abolished, and innovation should ensure that all necessary plastics can be circulated within the economy through reuse, recycling or composting. For plastic packaging specifically, the initiative defines a circular economy by the following six characteristics:

1. Eliminating problematic or unnecessary plastic packaging through redesign, innovation and new delivery models is a priority.
2. Reuse models are applied when relevant, reducing the need for single-use packaging.
3. All plastic packaging is 100 % reusable, recyclable or compostable.
4. All plastic packaging is reused, recycled or composted in practice.
5. The use of plastic is fully decoupled from the consumption of finite resources.
6. All plastic packaging is free of hazardous chemicals, and the health, safety and rights of all people involved are respected.

Together with a wide set of stakeholders, the initiative takes a systemic approach to creating a shared vision and a common set of actions that can set an irreversible path towards creating the New Plastics Economy.

It does so through several accompanying initiatives, such as the Global Commitment initiative, which was launched in collaboration with the United Nations Environment Programme. The Global Commitment initiative gathers more than 450 businesses, governments and organisations behind a set of targets aimed at tackling plastic waste and pollution at its source by 2025.

To contribute to reaching these targets across all regions, the Plastics Pact network brings together national and regional initiatives that implement solutions towards a circular plastics economy. The network also works as a platform for sharing knowledge and best practices related to the transformation of the plastics system.

Source: Ellen MacArthur Foundation (2019).

Examples of these types of solutions and circular business models can be found in the growing number of initiatives on a circular (plastics) economy that have been embraced by both the European Commission and a wide range of companies and Member States. This includes the increasing number of companies that present voluntary commitments to using recycled plastics in their product lines or new design specifications that increase recyclability. It also includes policy tools, such as deposit refund systems for PET (polyethylene terephthalate) bottles that are common in the Nordic countries, and EPR schemes on plastic packaging in, for instance, France, the Netherlands and the United Kingdom. There is also a growing amount of investment going into improving waste management infrastructures.

Box 12. The Circular Plastics Alliance

In 2018, the European Commission launched the Circular Plastics Alliance as part of the European strategy for plastics. It aims to boost the EU market for recycled plastics to 10 million tonnes by 2025. The Alliance covers the full plastics value chain and includes over 175 organisations representing industry, academia and public authorities (EC, 2019a).

Constraints

The constraints of this pathway include challenges related to (mechanical) recycling and how to integrate the different steps along the value chain. Key obstacles to plastic reuse and recycling include toxic elements in recycling streams, quality loss in the recycling process (downcycling), lack of transparency regarding polymers and additives in plastic products, complexity of collecting and sorting, difficulties in recycling laminate and thermoset plastics, and concerns over low market demand for recycled plastics.

Possibilities for further action

To improve the traceability of all the different elements in plastics, new techniques such as mass-balance measurement could be scaled up. This would improve product information, including how much of a product is made from recycled content, and enable a more gradual shift towards the use of recycled plastics. Moreover, recycling could be improved if current fragmented waste management practices were more harmonised across regions, countries and the EU, and if deposit return systems were expanded to a broader range of products and sectors.

However, circularity should not be reduced to simply improving recycling rates. It also necessitates reuse, redesign of products and rethinking of the entire value chain.

The use of renewable raw material and decarbonisation pathway

The central idea of this pathway is to reduce the amount of plastics that is derived from fossil fuels (today more than 99 %) by switching to renewable raw materials.

Maize harvesting © Pixabay

The problem it addresses

This pathway highlights the plastic sector's dependence on fossil feedstock and the implications of this in terms of energy and resource security, greenhouse gas emissions and a situation of 'petrochemical lock-in'.

Types of solutions it promotes

Solutions promoted under this pathway focus on decoupling plastics from fossil feedstock by switching — when more beneficial — to renewable feedstock, in line with the broader EU actions on climate change and the bioeconomy. In doing so, it focuses more attention on the early stages of the value chain, compared with the other pathways. A key solution is promoting a market for plastics made from alternative raw materials, often called bio-based plastics. These are plastics made fully or partly from biological feedstock, typically oils, starches and sugars from agricultural crops. Feedstocks can also include cellulose, bio-waste and even CO_2.

The benefits of using renewable feedstock include reduced dependency on imports, reduced dependency on fossil resources, reduced greenhouse gas emissions and, if locally sourced, increased rural development.

There are fewer examples of current initiatives for this pathway than for the previous two pathways. However, the new Circular Economy Action Plan will develop a policy framework on bio-based plastics to assess in which cases bio-based feedstock leads to genuine environmental benefits beyond the simple reduction in fossil fuel use. In the EU Plastic Strategy, research and development projects are used as a

policy instrument to promote renewable raw material for plastics at the EU level (EC, 2018). In addition, there are also a number of civil society and private sector initiatives that promote plastic products such as packaging and toys made from renewable feedstock.

Constraints

A key concern for this pathway is the discussion around feedstock scarcity and the implications for land use. A significant scaling up of bioplastics would, using current production patterns, take up a significant part of global arable land, leading to competition for food, feed and other bio-based products.

In addition to issues concerning land use, consumers often confuse bio-based plastics with biodegradable and compostable plastics. Bio-based plastics are fully or partly derived from raw materials other than fossil fuels, while the term 'biodegradable plastics' indicates that a plastic application is compostable (under certain conditions). Another central limitation is price. Currently, virgin fossil-based plastics are relatively cheap, and producers have to pay a premium for alternative raw materials. Finally, bio-based plastics such as bio-polypropylene (PP) and bio-polyethylene (PE) are identical to regular fossil-based PP and PE, which means that they do not solve problems further down the value chain, such as leakage and recyclability.

Possibilities for further action

When it comes to land use competition and availability of feedstock, it is necessary to diversify the source of non-fossil feedstocks to include second- and third-generation biomass and carbon capture and use, for example using captured CO_2 to produce new plastics.

Subsidies and upscaling initiatives from the bioeconomy strategy could help provide a more level playing field when it comes to price. Alternatively, a tax/levy on fossil-based plastic could be considered. It is also necessary to develop more knowledge of the environmental impacts and energy demand from a scale-up of bio-based plastics production. Moreover, clearer information, standards and labels are needed to address consumer confusion.

There are pathways but no silver bullets

To reach a sustainable and circular use of plastics, different stages of the value chain as well as different types of environmental and climate impacts must be addressed. A combination of the three pathways described above therefore offers a way forward for the longer term.

- **Smarter use** focuses on production and use to alleviate problems connected to leakage and toxicity, but it focuses less attention on the impacts on climate change and other negative externalities.

- **Increased circularity** aims to integrate the entire value chain to improve the circularity of plastics. This promises to deal with many of the environmental impacts highlighted in this report. However, circular plastic economy initiatives often do not address the expanding levels of consumption or the dependence of plastics on fossil resources.

- **Renewable material** takes up the fossil lock-in of plastics but does not focus on their use and waste management. Switching to renewable materials would not in itself do much for the leakage problem of plastics.

As is often the case with sustainability shifts and transitions, there are no silver bullets for solving the challenges of plastics. We need to consider multiple pathways to address all the challenges of plastics in the longer term. This includes not only improving synergies between them but also acknowledging potential trade-offs (Nielsen et al., 2018). In order to implement a sustainable transition in the plastics economy, there is a need to reduce knowledge gaps on the negative impacts of plastics and facilitate more coordinated efforts along the value chain and across multiple sectors.

What can you do as a consumer?

We are all consumers of plastics. Although the environmental and climate impacts of plastics are to a very large extent the result of the current production, consumption and waste management system — with linear value chains, dependency on oil and gas, impact of chemicals, insufficient infrastructure, etc. — there are also a number of things citizens can do, either in organised ways or as individuals.

To directly prevent the use of unnecessary or replaceable plastics (often for single use), consumers can think twice before buying or using them. They may, for instance, support stores offering packaging-free goods, or choose packaging made from alternative and perhaps reusable materials, such as wood, cotton and metal. Using less single-use plastics — for example for cutlery, plates and cups — is also an option. However, choosing a product from a different material may not always be the most environmentally friendly solution, as discussed under the smarter use pathway.

As plastics are an omnipresent part of our daily life, it is virtually impossible to avoid them altogether. Sometimes plastic is preferable to other materials because of its lightweight nature and durability. If the use of plastics cannot be avoided, consumers can instead opt for purchasing reusable plastic products and thus contribute to increased circularity by keeping materials out of the waste stream. Whereas reusability depends on several factors, such as a product's design and compliance with hygiene requirements, the willingness of consumers to favour reusable over single-use products is essential. Another option is to purchase products made from recycled plastics if a more sustainable alternative material does not exist.

In the after-use phase when plastics have become waste, consumers play a central role in determining the fate of plastics and ensuring that they are not leaked into the environment. High-quality waste management systems are crucial for enabling the proper separation of waste. But consumers also need to make an effort to contribute to collection and recycling systems by ensuring that recyclable plastics are not thrown into the residual waste bin, or by using available take-back systems for different products, such as empty cans and bottles, electronic equipment and vehicles. In addition, avoiding littering of plastics in the environment is an obvious option for all consumers and citizens.

As discussed in the previous chapter, large amounts of plastics have already escaped proper waste management and ended up as litter. There is a growing number of initiatives that aim to involve users in capturing what has already been leaked. These initiatives range from global efforts to clean up the large plastic patches in the oceans (e.g. Ocean Cleanup) to more local efforts to clean beaches (e.g. Ocean Conservancy) or harbours (e.g. GreenKayak in Denmark). Citizens and consumers can choose to join such initiatives.

Although consumers can do a lot, it is the current systems of plastic production and consumption that are the major reason for unsustainable use of plastics. Businesses, policymakers and other stakeholders in the plastics system have a responsibility to make it more sustainable and circular.

Box 13. GreenKayak

GreenKayak works to reduce the amount of rubbish floating in our coastal waters. The idea is simple: volunteers get free GreenKayak trips in return for collecting waste. GreenKayak also shares knowledge and helps people of all ages to get out on the water and take action. GreenKayak operates in Copenhagen and other regions of Denmark and in some other European countries (GreenKayak, 2020).

GreenKayak in action in Copenhagen © GreenKayak

List of abbreviations and acronyms

BPA	Bisphenol A
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COVID-19	Coronavirus disease 2019
EEA	European Environment Agency
EPR	Extended producer responsibility
EU	European Union
EU-28	The 28 EU Member States as of 1 July 2013 to 31 January 2020
NO_x	Nitrogen oxides
PE	Polyethylene
PM	Particulate matter
PP	Polypropylene
PVC	Polyvinyl chloride
SO_2	Sulphur dioxide
SO_x	Sulphur oxides
SUP	Single-Use Plastics
VOC	Volatile organic compound

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TH-AL-20-025-EN-N
doi: 10.2800/5847

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