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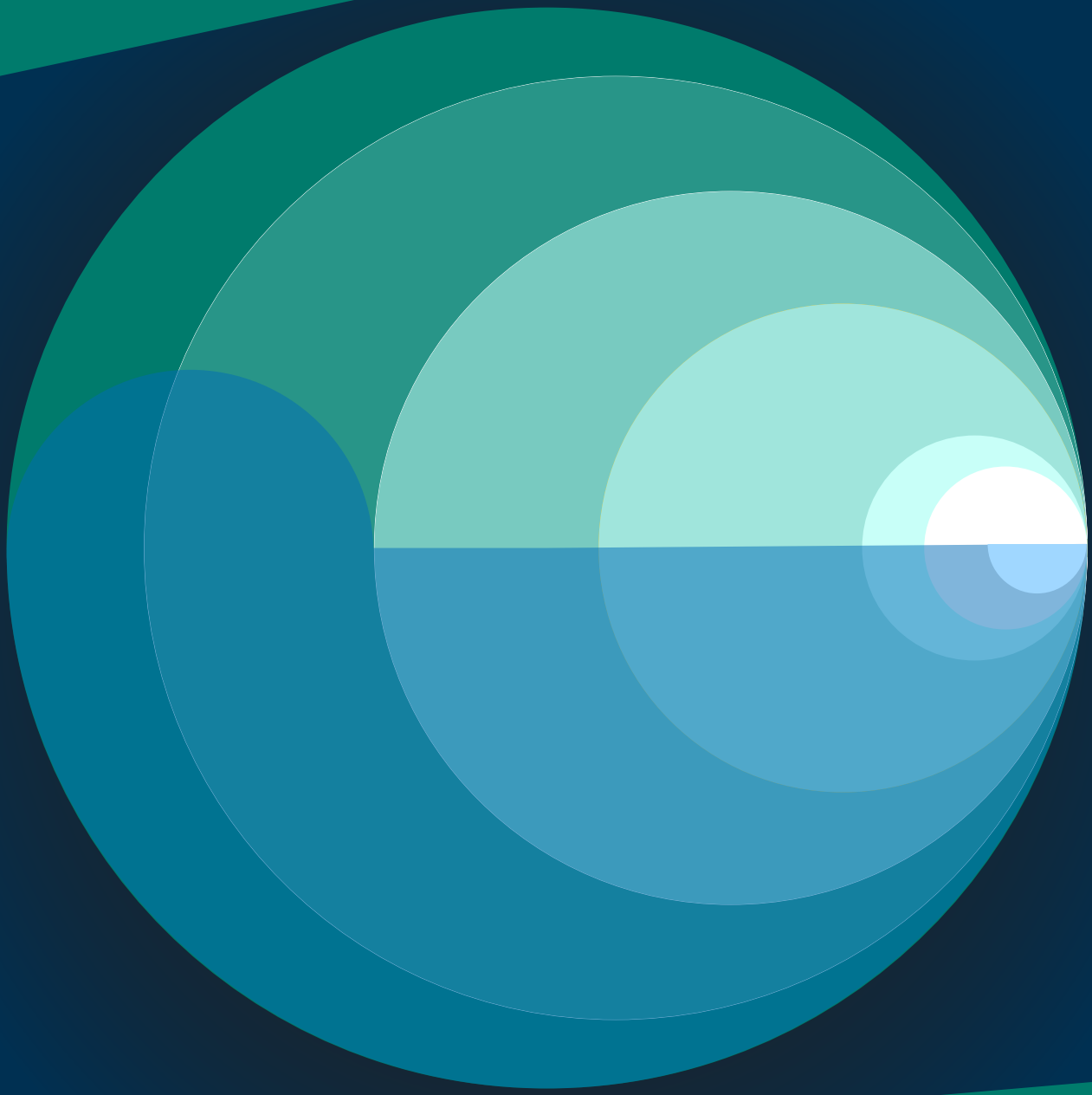

Accelerating the circular economy in Europe

State and outlook 2024

EEA Report 13/2023

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Executive summary

The circular economy is now a widely accepted concept. It goes beyond just managing waste: it is more about keeping the value of materials high and making them last longer in their intended use. It also seeks to design unnecessary material use out of the economy. This requires new business models and a more decisive transition from ownership models to service-based solutions. A comprehensive set of new circularity policies has been introduced at EU level and there is evidence of increased circular activities in EU Member States.

Developing the circular economy is a crucial part of addressing the triple planetary crises of climate change, biodiversity loss and pollution. The transformation of our economy towards circular principles can contribute to alleviate pressures on the environment and manage trade-offs.

This report offers a comprehensive analysis of the state of play of the transition to a more circular economy in Europe and the strong policy push we have seen in recent times, together with options and prospects to further accelerate it.

Europe continues to operate under a predominantly linear model, where products placed on the market tend to have a relatively short use phase. Business models primarily revolve around mass-producing products, often sacrificing quality, and this results in early breakdown or premature obsolescence.

Europe's heavy reliance on natural resources to provide materials, food and fuel comes with significant environmental degradation. However, following steep increases in resource consumption in the past, this trend has stabilised in recent years. A modest decoupling of EU resource consumption from economic growth can be observed, with total consumption of materials dropping slightly while EU gross domestic product (GDP) increased. However, this improvement does not take the demand created by EU consumption for resource extraction elsewhere into account. EU dependence on global imports for supply of some critical raw materials, metal ores and fossil-fuels is currently increasing.

Even in a circular economy, products inevitably reach the end of their lives. Waste management is arguably the most mature aspect of the circular economy, reflecting a longstanding policy focus on it. While waste generation is also showing modest relative decoupling from economic growth, it is unlikely that a significant reduction in waste generation by 2030 can be achieved. Recycling has increased over time, but rates have stagnated in recent years. To underpin circularity ambitions, increased efforts are needed to regain momentum, along with a systemic shift towards high-quality recycling. Achieving effective 'circularity' requires functioning markets, but for many recycled materials, the secondary raw material markets are not performing well, reflecting a pressing need to tackle challenges on pricing, standards and supply stability. The emphasis for waste management should now switch to producing high-quality recyclates, which can compete in the marketplace against virgin feedstocks.

Leadership on the circular economy at EU level has generated a robust and dynamic set of policy ambitions and underpinning actions. National implementation of this transformative approach is following, with national plans mostly in place, although progress is variable across the bloc. Several Member States have introduced novel interventions to further their circular ambitions and there is a good opportunity to leverage frontrunner innovations, as these could also be applied in other countries.

EU policymakers will need to look into further interventions to accelerate the transition. One option — the introduction of targets in areas other than waste collection and recycling — would raise the priority of circular economy actions for national authorities and ensure focus on implementing actions that generate measurable outcomes. To underpin new targets, robust and responsive monitoring frameworks are required at every level — from pan-EU statistics to sectoral datasets.

Actions to increase circularity are well defined and provide a good roadmap for progression towards improved circularity. Nevertheless, solid case studies of circular business models are limited, especially for critical repair or remanufacturing activities. This is particularly evident for models with the potential to disrupt the status quo by causing large-scale change across an entire sector. This gap emphasises the need for bolder implementation and further policy pressure to accelerate uptake of circular actions within businesses. Additionally, support measures — from fiscal policies to awareness campaigns — are vital to shape consumer behaviour, with a focus on improving cost, trust, and convenience to boost demand-side acceptance.

Consumption levels in the EU are high and continue to rise, leading to growing raw material demand and production activity. Fundamental changes to consumption behaviour are required, including favouring products with lower environmental impacts, and shifting to reuse, sharing and product-as-a-service models. Underpinning these changes is a fundamental need to reduce product consumption from current unsustainable levels, but current trends in the EU are, unfortunately, moving in the opposite direction. Given the strong influence of marketing on purchasing decisions, there is a need to consider legislative changes to stimulate a shift away from consumption culture. As buyers, individuals have an important role to play and should be informed about the consequences of consumption choices through awareness raising actions. However, more sustainable production and consumption systems are required to offer an alternative paradigm to EU citizens.

Achieving a just transition is a crucial aspect of the transformation to a circular economy. Without this, the magnitude of change required for this deep transition may exacerbate existing inequalities and fuel resistance. A circular economy will not, by itself, generate better working and other societal conditions. This needs careful consideration and must be designed into the circular economy transition. However, a shortage of data of the social benefits associated with the circular economy and the lack of comprehensive integration of social aspects mean that improvements may not be implemented. Better assessments and information on these areas would highlight the societal benefits of a circular economy and help accelerate the transition.

Overall, there are some positive trends to build upon. However, the likelihood of reaching the 2030 targets is either low or moderate, which indicates that more needs to be done. Many circular policies are still relatively new and some have not been fully implemented at national level. Moreover, even when implemented, the impact of novel local measures takes time to filter down to changes in consumption patterns. This report looks into potential actions for the future. These allude to a range of aspects that include:

- Circular policies should become more binding and target-oriented, extending beyond waste to possibly include targets on resource use or material footprint.
- Measures should now promote higher quality recycling to foster EU resource independence and reduce its overall material footprint.
- Bold implementation of the revamped EU Sustainable Product Policy should result in safe and sustainable products, which are designed for circularity from the outset.
- Additional attention should be paid to the economics of raw material supply, so that secondary raw material markets can thrive.
- In line with the conclusions of the International Resource Panel, additional action is needed on the demand side, potentially leveraging the concept of sufficiency.
- Just transition principles should be embedded in Europe and globally.

Overall key messages

- Considering the inherent impact of resource extraction and processing, and the impossibility of 100% circularity, it is crucial to prioritise the reduction of resource use and move towards a less material-intensive European economy.
- Maximising the utility of existing products requires significantly more intensity of use per product and much longer product lifetimes.
- Large-scale success of a circular economy relies heavily on returning substantial quantities of high-quality secondary raw materials to productive use.
- Europe alone cannot curb unsustainable resource use at planetary scale, therefore, a robust global governance framework on resource use and circular economy will be essential.

1 Introduction

Key messages

- Developing the circular economy is a crucial part of addressing the triple planetary crises of climate change, biodiversity loss and pollution.
- With a circularity rate of 11.5% in 2022, Europe consumes a higher proportion of recycled materials than other world regions, although improvement has been limited in recent years.
- In addition to implementing eco-design principles, increasing circularity by maximising the use and lifespan of products through reuse, repair and remanufacturing is critical.

Resource use is a key driver of the triple planetary crisis, with direct impacts on climate change, pollution and biodiversity loss. These three interlinked issues threaten the viability of our society and of humanity itself, and so effective measures are needed to respond to this challenge.

The late 20th century was an age of unprecedented growth in the use of natural resources, with the rate of increase fastest in developed countries. The prevailing global economic model has a linear configuration focused on producing increasing amounts of products, made from virgin raw materials. Typically, after service, these items are discarded and processed in a manner that compromises most of the value and functionality of the product itself and its constituent materials. This system creates a continuous demand to extract virgin raw materials, drives polluting production activities and generates large volumes of waste that require treatment.

In response to the environmental challenge of unsustainable raw material use, the EU has been putting measures in place to enable the transition towards a circular economy, which means shifting from linear production models and consumption patterns. This transformation is enshrined in the Circular Economy Action Plan (CEAP), which is one of the main building blocks of the European Green Deal. There has been progress in recent years towards circularity in Europe, such as increased recycling rates and the emergence of a sharing economy and other circular business models.

However, levels of consumption and production remain high, waste generation continues to increase and pollution is still accumulating. To realise a prosperous and sustainable future, Europe must accelerate action towards a circular, carbon-neutral economy where resource use is low, recirculation of materials is high and the material cycle is comprised of safe, non-toxic materials. EU ambitions in this area are well-aligned to the global aspiration set out in the Agenda 20230 process, which seeks to protect the planet from degradation through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change (UN, 2015).

Pressures on the environment from production and consumption can be reduced through four major approaches: reducing overall consumption; ecodesign of products and resource-efficient production; maintaining products in use for an extended period; and recycling materials back into productive use.

These actions also align with EU clean energy ambitions to increase efficiency and move away from fossil energy sources. Consumption levels can be reduced while maintaining quality lifestyles through a focus on demand-side changes and more intensive use of existing products, such as sharing concepts and healthier diets.

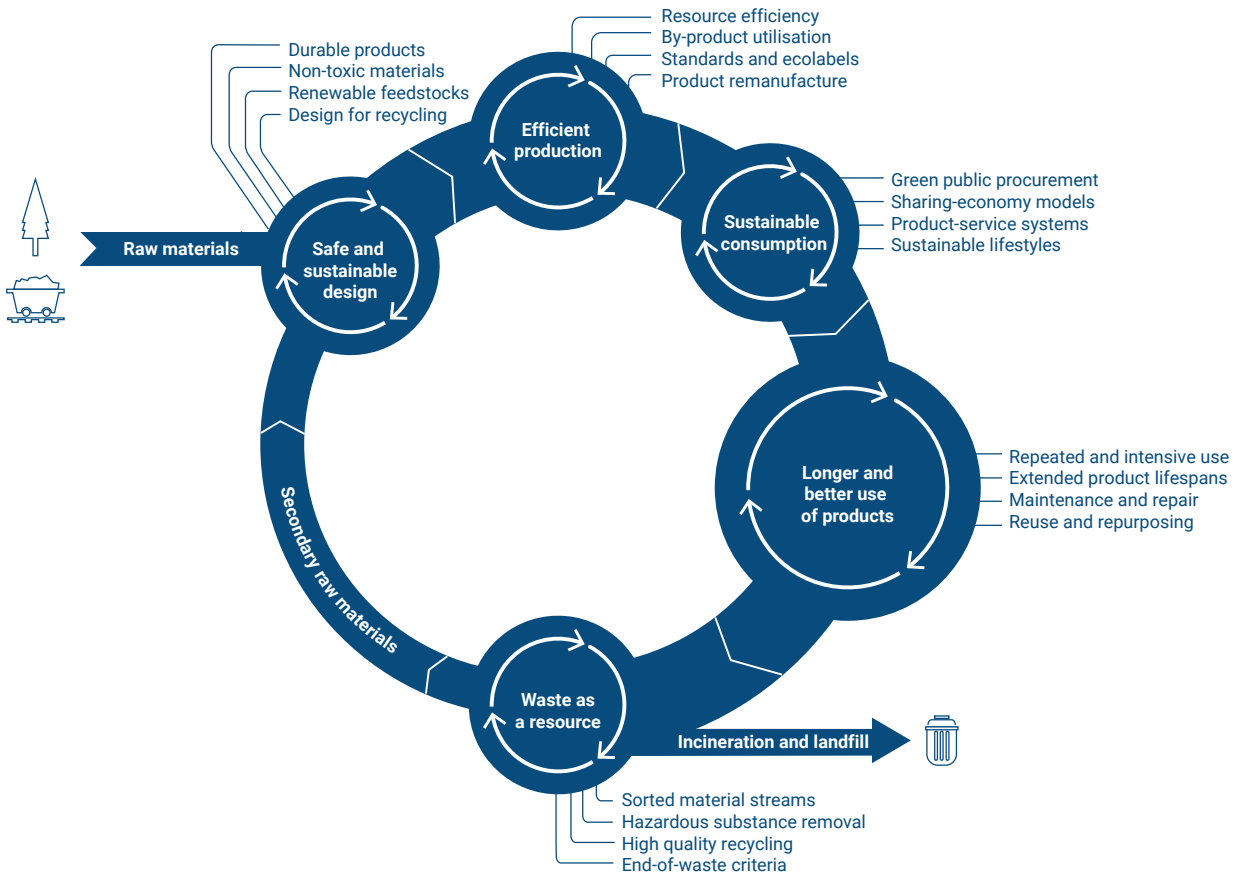
For raw materials extracted for productive use, the focus is on resource efficiency, which encompasses all actions that aim to extract the most value from available resources. Maintaining a high value means using actions such as reuse, repair and remanufacturing to achieve longer and better use of products, from small electronic devices to large buildings and infrastructure. Finally, at end-of-life, recycling entails processing of waste to recover selected materials. In this way, new, secondary feedstocks are produced and available for manufacturing use.

The circular economy is a cornerstone to delivering the ambitions of the European Green Deal to reach carbon neutrality through building a fair and prosperous society with a modern and competitive economy. In this context, it represents a transformative solution, building on the foundations of EU policy on waste management and recycling and aiming to maximise usage of products through extended use, reuse, repair and remanufacture.

Measures supporting the repair of products lead to a longer service lifetime, while sharing economy models reduce the need for individual ownership of rarely used products. Thus, these measures help to prevent the purchase of new products and reduce the extraction and processing of resources needed to make new products and the associated environmental impacts. However, there is a danger that 'rebound effects' can dilute the environmental benefits of increased circularity (Zink and Geyer, 2017). These effects can include the transfer of consumer expenditures to other areas with similar or worse environmental impacts or a failure to achieve a one-to-one replacement of virgin raw materials with recycled materials.

Figure 1.1 illustrates the systemic focus areas for attention in making Europe's economy more circular. This diagram identifies touchpoints along the product value chain and has a particular emphasis on achieving longer product lifetimes. This section presents a vision for a functioning circular economy based on successful implementation at each of the touchpoints.

Figure 1.1 **The touchpoints for achieving a circular economy in Europe, with key factors associated with each touchpoint**

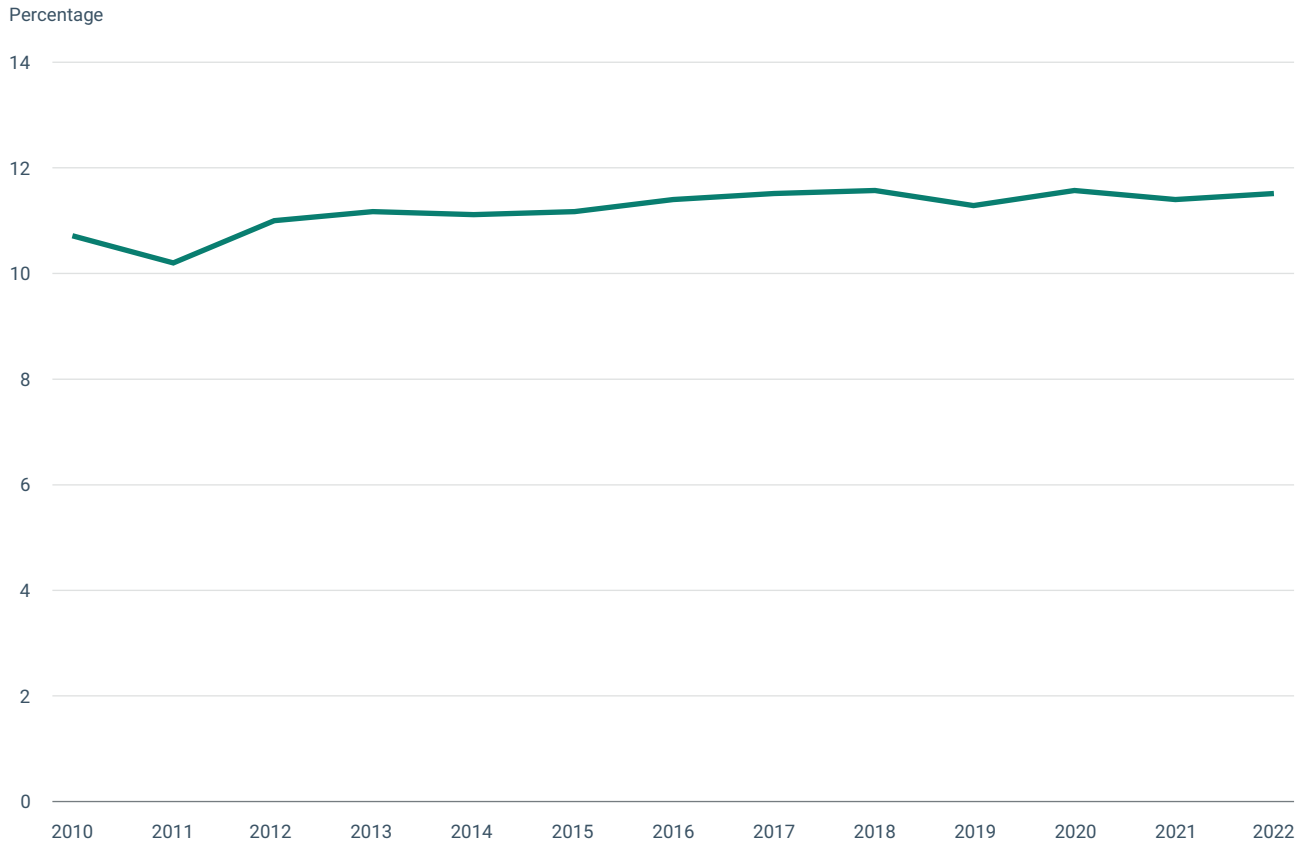


Source: EEA.

Realising this vision by activating the potential of the touchpoints requires action across Europe's economy and society. At each touchpoint, adopting circular actions will enhance sustainability and move away from wasteful exploitation of finite natural resources.

The circular material use rate (CMUR) is a metric commonly used to provide insight on circularity in an economic system. It compares the amount of recycled materials used in the economy with total material use. Successful actions to increase circularity — either by increasing use of recycled materials or decreasing the overall amount of material used — are reflected in a rise in the CMUR. Using this approach, the European economy is currently estimated to be 11.5% circular (EEA, 2023) (see Figure 1.2). On a wider scale, the situation is worse, with global economic circularity estimated at 7.2%, with a decreasing trend in evidence (Circle Economy, 2023).

Figure 1.2 Circular material use rate in the EU



Source: EEA, 2023a.

CMUR is often regarded as providing a single score that reflects all circularity aspects in an economy. However, in practice, this metric is somewhat limited in its scope as it focuses on one aspect of the circular economy, namely the use of recycled materials in production. As such, it is not well-suited to providing insights to circular actions that lead to extended product service life, such as reuse, repair and remanufacturing. Nonetheless, increasing the use of secondary materials does lead to reduced extraction of primary raw materials, and as such the CMUR is an important metric. Within the CEAP, there is an aim to double the CMUR between 2020 and 2030. In 2022, recycled material accounted for 11.5% of material used, an increase of less than 1 percentage point since 2010. This rather slow progress, alongside projections for increased material demand in the EU by 2030, indicate that the EU is not on track to achieve that goal.

Adopting circular economy principles can bring significant changes to how materials and products are manufactured and used. Successful implementation of policy in this area will change production and consumption systems and minimise wasteful production and consumption of materials and energy. In a European circular economy, the extraction of natural resources would be minimised along with the associated environmental and climate impacts. In addition, large-scale use of secondary raw materials as feedstock for European manufacturing will reduce vulnerability to external supply chains and provide strengthened open strategic autonomy for the EU.

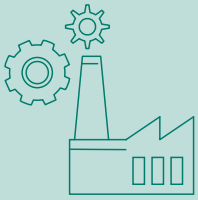
Using the structure of the EEA circular economy system diagram as presented in Figure 1.1, a future vision for a circular economy in Europe can be articulated, as shown in Box 1.1 below.

Box 1.1

A circular vision for Europe

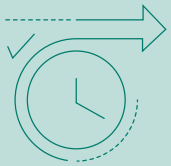
Substantial movement towards greater circularity will entail significant changes across all aspects of material use, including the practices that underlie how products are created and consumed. Implementing the principles of a circular economy will lead to the establishment of new norms and profound changes to Europe's production and consumption patterns, playing a significant role in lessening their environmental impacts. Structured around a life-cycle approach that covers the whole value chain in the EU economy, the sections below outline what circularity should look like.

Safe and sustainable by design
Ecodesign is recognised as the critical foundation of a circular economy and as a sustainable business approach. Intelligent decisions at the design stage create opportunities for sustainable material management and reduced environmental and climate pressures at all stages, from production to end-of-life treatment. Ecodesign principles are applied to all products placed on the market in the EU-27. With initial focus on the key value chains, products are engineered for clean material cycles by phasing out toxic substances. Materials and assembly techniques are optimised to facilitate longer use and easy dismantling for repair, refurbishment and recycling. Product specifications reduce the use of energy and virgin raw materials and prioritise sustainable feedstocks – including bio-based and secondary raw materials. Where primary raw material inputs are required, responsible sourcing is mandatory for public procurement. This in turn has developed the market so it is now also becoming the norm for private sector sourcing.

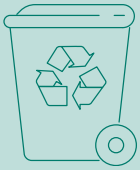


Efficient, sufficient production
By applying efficiency principles along the value chain, businesses see measurable reductions in material use and greenhouse gas (GHG) emissions while achieving savings on input costs. Offcuts and other by-products are retained for use as valuable input materials. Circular business models are the norm, including take-back of products for remanufacturing back to their original specification. Across the sectors, standards are in place for goods manufactured in Europe and those imported from third countries. These standards underpin a regulated set of recognised and reputable ecolabels to assure purchasers of environmental standards and raise awareness of resource consumption. Business have moved away from profit models based solely on increasing product sales and focus on avoiding unsold products.

Responsible consumption
Impacts on the environment and climate caused by Europe's consumption of goods and services will be under control and within planetary boundaries. The substantial spending power of public procurement is driving a transformation through specifications for improved durability, increased recycled content, reduced life-cycle GHG emissions and use of non-toxic materials. Organisational consumption by businesses and institutions has also been influenced by this action. Supported by responsible marketing, EU citizens engage with the circular vision and embrace new practices. They moderate consumption through avoiding wasteful models such as fast fashion and support sharing-economy approaches to meeting their needs. Product service system models are well-established across key sectors and reduce production volumes and material use while offering opportunities for economic growth and prosperity.



Better and longer use of products
Products remain in use for significantly longer, through actions such as regular maintenance and repurposing. The implementation of circular actions is supported by targeted policy instruments, new circular businesses and the emergence of a new skilled workforce. Operating to high standards, Europe's repair sector is thriving and increasing employment levels. Online platforms enable sharing and reselling between businesses and between citizens. Longer use and reuse of products is widespread, facilitated by established operators such as charity shops and second-hand markets, and through expanding peer-to-peer networks and channels.



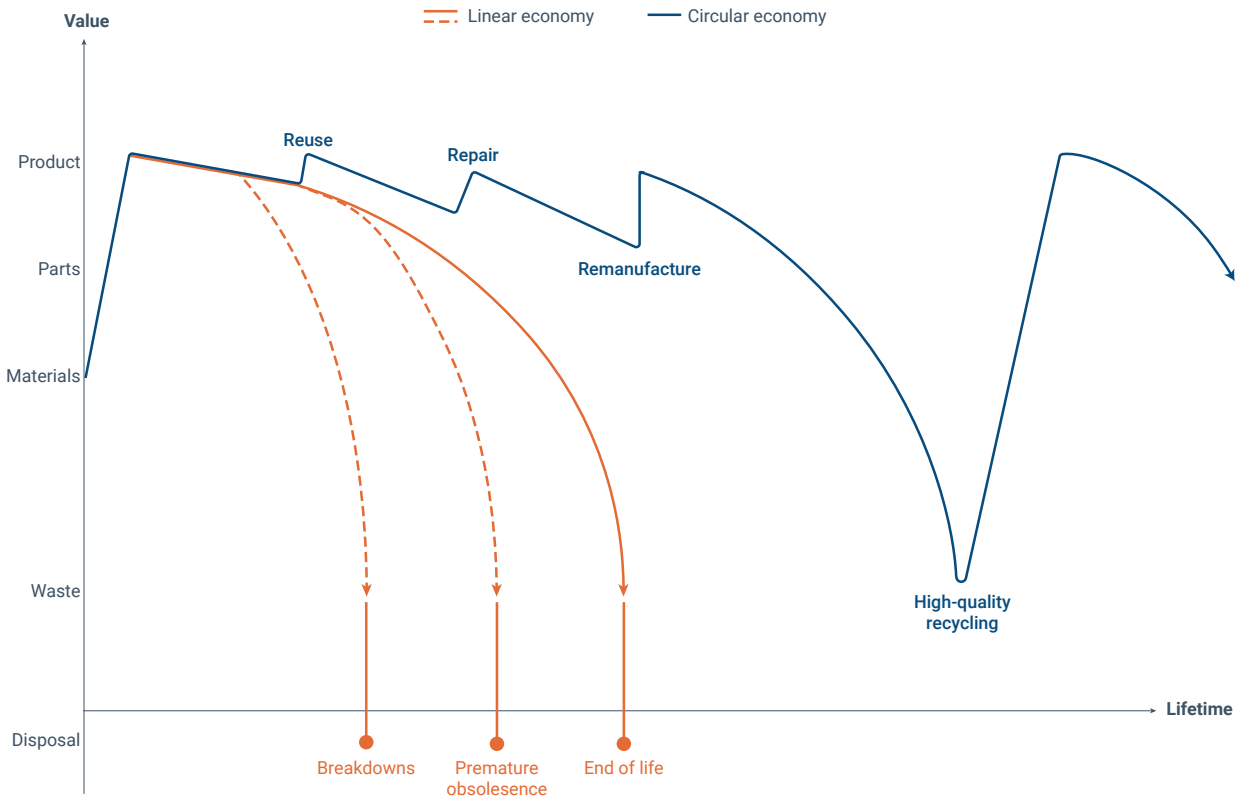
Waste as a resource
After an extended service life, end-of-life products enter a well-regulated and digitalised waste management system. Materials are segregated to maximise recycling quantity and quality. All hazardous substances are screened out to ensure clean, safe material loops. Landfilling of waste is effectively phased out and used only in limited circumstances. Recycling of materials is carefully managed with a focus on quality to facilitate their use as secondary raw materials to provide feedstocks for manufacturing.

1.1 Circular transformation

The circular economy is a transformative solution for the environmental impact of consumption and production that contributes to tackling global challenges such as climate change, pollution and biodiversity loss. The coming decade is critical to establishing the circular economy and embedding circular principles across Europe's society and economy. By the end of this period, Europe must have made significant progress away from the linear model and be well on the way to a highly circular economy. The application of circular economy principles, along with other European Green Deal actions, can limit the impact of human activities on the ecosystem and help Europe to bring its consumption within planetary boundaries. As noted above, this complements the sustainable development goals as articulated in Agenda 2030 (UN, 2015).

The basis of the circular economy is concerted action at policy, business and individual level to optimise the use of resources and reduce the need to extract further raw materials and so prevent emissions from the value chain of production and consumption. Such actions focus on retaining the value of products and materials, as shown in Figure 1.3, and are often presented as the R strategies. These actions can be seen as an elaboration of the 'Reduce, reuse, recycle' concept that emerged in the 1970s and have been presented in a variety of ways, such as the hierarchy of measures presented by Potting et al. (2017). They provide a useful framework for categorising the fundamental actions of the circular economy, from initial design decisions through usage to end-of-life treatment.

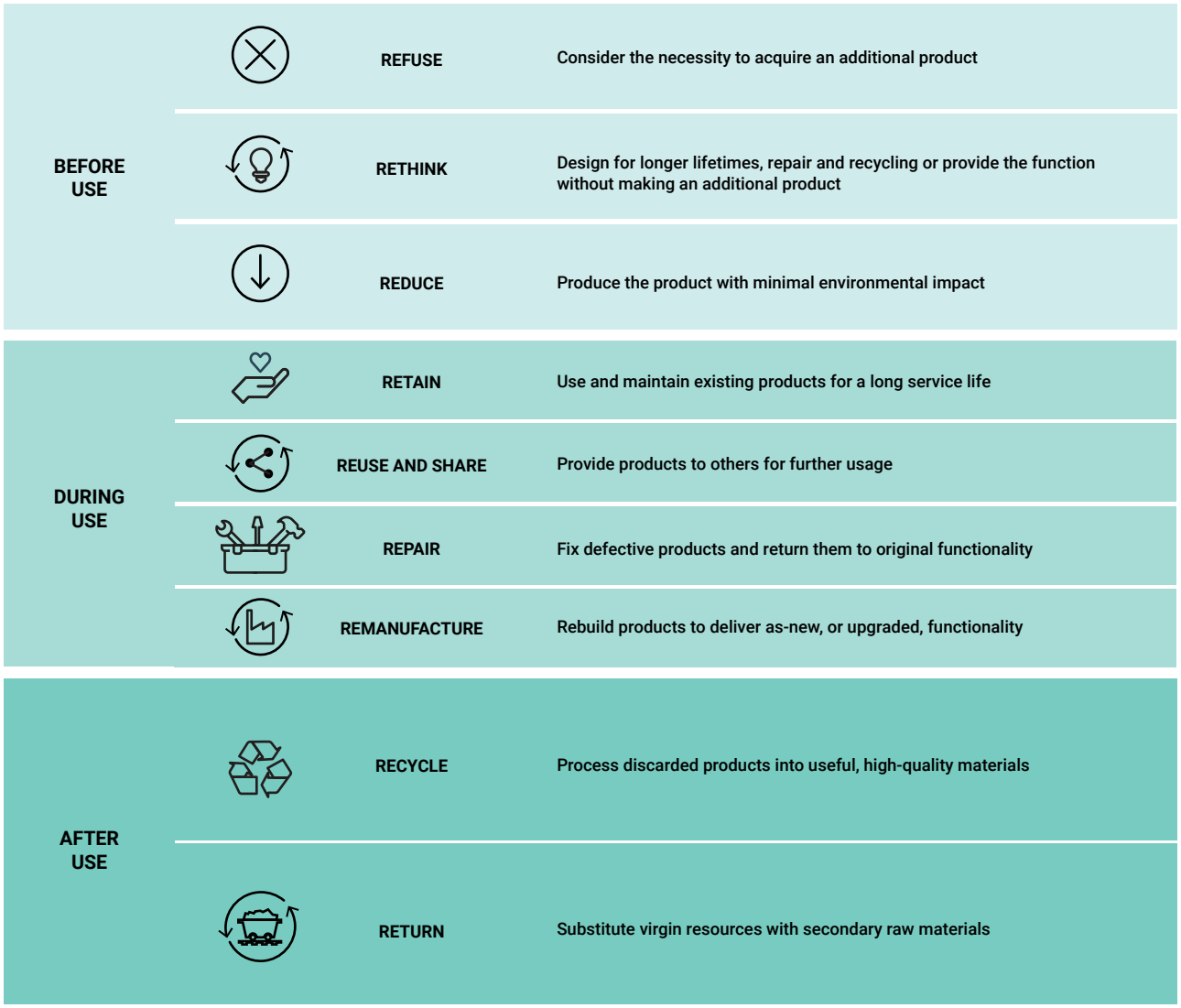
Figure 1.3 **Circular actions and their effect in maintaining product and material value**



Source: EEA, 2020e.

This report presents a set of circular actions within a framework of 'before use, during use and after use' — see Figure 1.4 (based on EEA, 2019). The before-use actions aim to meet societal needs with fewer natural resources and less impacts on environment and climate change. This can be reached by making the product redundant while providing the function or service by different means, intensifying product use, such as through shared use, or improving processes that lead to a lower use of resources. Once resources have been used to produce infrastructure and products, during-use actions can be applied to increase the lifetime of existing stocks, maintaining the functionality of products as long as possible. Once products reach their end-of-life, the after-use actions prescribe how material resources can be saved from loss or destruction and be sent back into the production cycle.

Figure 1.4 **Actions for increased circularity within the product chain**



Source: Developed by EEA based on Potting et al., 2017.

One of the ways in which a circular economy has the potential to reduce the impacts of our production and consumption system is by reducing primary resource demand (EEA, 2023h). This can be achieved, directly or indirectly, through the circular actions above. 'Refuse, rethink, reduce' lowers supply and demand for materials coming into the economy and thereby also use of primary resources. 'Retain, reuse, repair and remanufacture' increases the longevity of products and use intensity of materials already in the economy, and thereby reduces supply and demand for new materials. 'Recycle and return' ensures that materials are not discarded but looped back into the economy, offsetting demand for primary resources.

1.2 Beyond circularity: biodiversity, climate change and pollution

The seven hottest days since records began in the 1850s were reached in July 2023 (New Scientist, 2023). About one million species are at direct risk of extinction, prompting experts to argue that the Earth is already experiencing a sixth 'mass extinction event' (IPBES, 2019). Pollution levels from chemicals and new entities alone supersede our ability to monitor their extent and impact on the planet. These are all evidence of the triple planetary crisis and a stark reminder of the environmental challenges facing humanity.

Several attempts have been made to quantify the role that adopting circular economy principles could play in reducing the negative environmental impacts from production and consumption. *The Circularity Gap Report* (Circle Economy, 2013) estimates that 16 circular solutions across four key systems - food, built environment, manufactured goods and consumables, and mobility and transport — can reverse the current overshoot of five of the nine key planetary boundaries. Similarly, a recent study found that a circular economy built around regenerative production principles can halt and even partly reverse biodiversity loss (Sitra, 2022). One key feature of this is reducing demand for agricultural land by 640 million hectares by 2050, roughly one and a half times that of the EU (Sitra, 2022). A joint report by Material Economics and the Ellen MacArthur Foundation argues that the adoption of circular strategies in four key sectors — steel, cement, plastics and aluminium — could decrease GHG emissions from key industry materials by 40% by 2050 (Ellen MacArthur Foundation, 2019). While further research is needed to better understand, substantiate, and realise the potential of the circular economy in alleviating environmental challenges, these and other studies clearly point to a significant opportunity.

The goal of a circular economy is to use the above actions to reduce the environmental impacts of societal and economic activity. With 80% of biodiversity loss and 50% of climate emissions attributed to resource extraction and processing (IRP, 2019), the prevailing production and consumption model is clearly unsustainable. Therefore, the triple planetary crisis cannot be alleviated without reducing demand for primary resources and changing the prevailing production and consumption system. It is also a reminder that a circular economy is not the end in itself, but rather a means to an end.

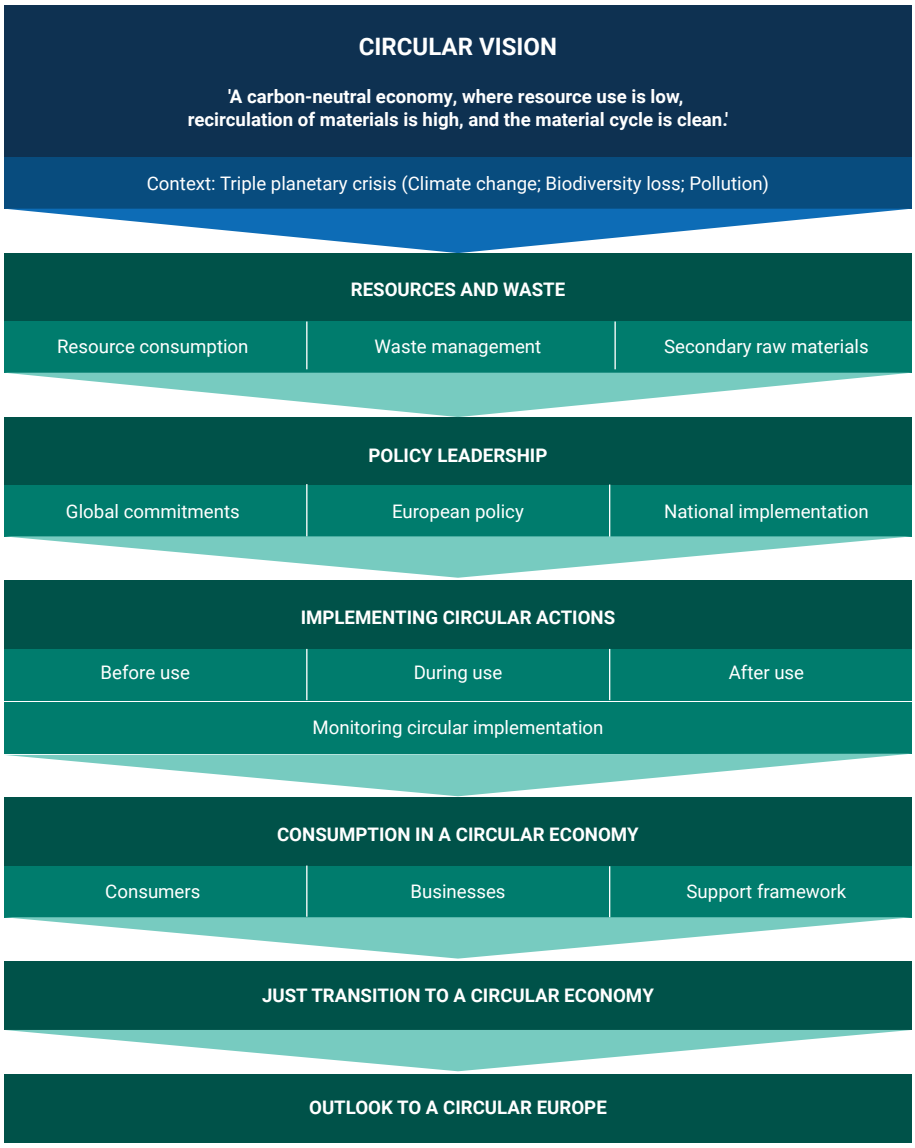
As demand for primary resources decreases, so does supply and demand for extraction and processing of primary resources. This means fewer natural habitats lost to mining or cropland, less GHG emissions from production of carbon-intensive materials and a reduction in pollution from mining and cultivation of crops.

While reducing primary resource supply and demand can be considered a core function of a circular economy, there are other ways in which a circular economy can reduce negative environmental impacts. Promoting closed and cleaner material flows (loops) can reduce leakage and phase out hazardous substances from the economy. Closed loops can ensure that products containing hazardous or contaminated materials that are unsuitable for reuse or recycling into other product lines can stay within the same product line. Cleaner loops means that hazardous materials are phased out, which both increases the circularity of products and reduces environmental impacts and health risks. A third way in which a circular economy can help reduce negative environmental impacts is by ensuring that the primary resources we do use are supplied and sourced in an environmentally friendly way (EEA, 2021, 2023). This can be achieved by reducing the negative impact of resource extraction, for example by improving environmental practices in the forestry sector or by promoting the regeneration of natural habitats in areas where resources are extracted. This in turn contributes to more resilient production and consumption systems. by improving environmental practices in the forestry sector or by promoting the regeneration of natural habitats in areas where resources are extracted. This in turn contributes to more resilient production and consumption systems.

1.3 A framework for change

The transition to a circular economy is a complex process involving many actions and a broad range of stakeholders. Through policy leadership, EU institutions and national governments provide direction and regulation, forming a framework to guide the transition. The logic flow of this framework is that global environmental pressures have set a challenge to reduce our consumption and impacts on the planet and to safeguard resources for future use in support of human prosperity and well-being. Following from policy at EU and national levels, the actions to improve circularity are defined and must be targeted for support measures. The ambitions that underlie this economic transformation will be accomplished by businesses developing new circular business models with reduced material demand, and by consumers adapting to new behaviours focused on better and longer use of products. As many social norms and structures will also need to change and disruption to employment patterns is possible, the entire transition must be framed in terms of the just transition principles. In summary, the circular transition will require attention and innovation for each of the elements in the framework shown in Figure 1.5. This framework provides a structure for this report, with a chapter focused on each element.

Figure 1.5 **Transition framework for a circular economy**



Source: EEA.

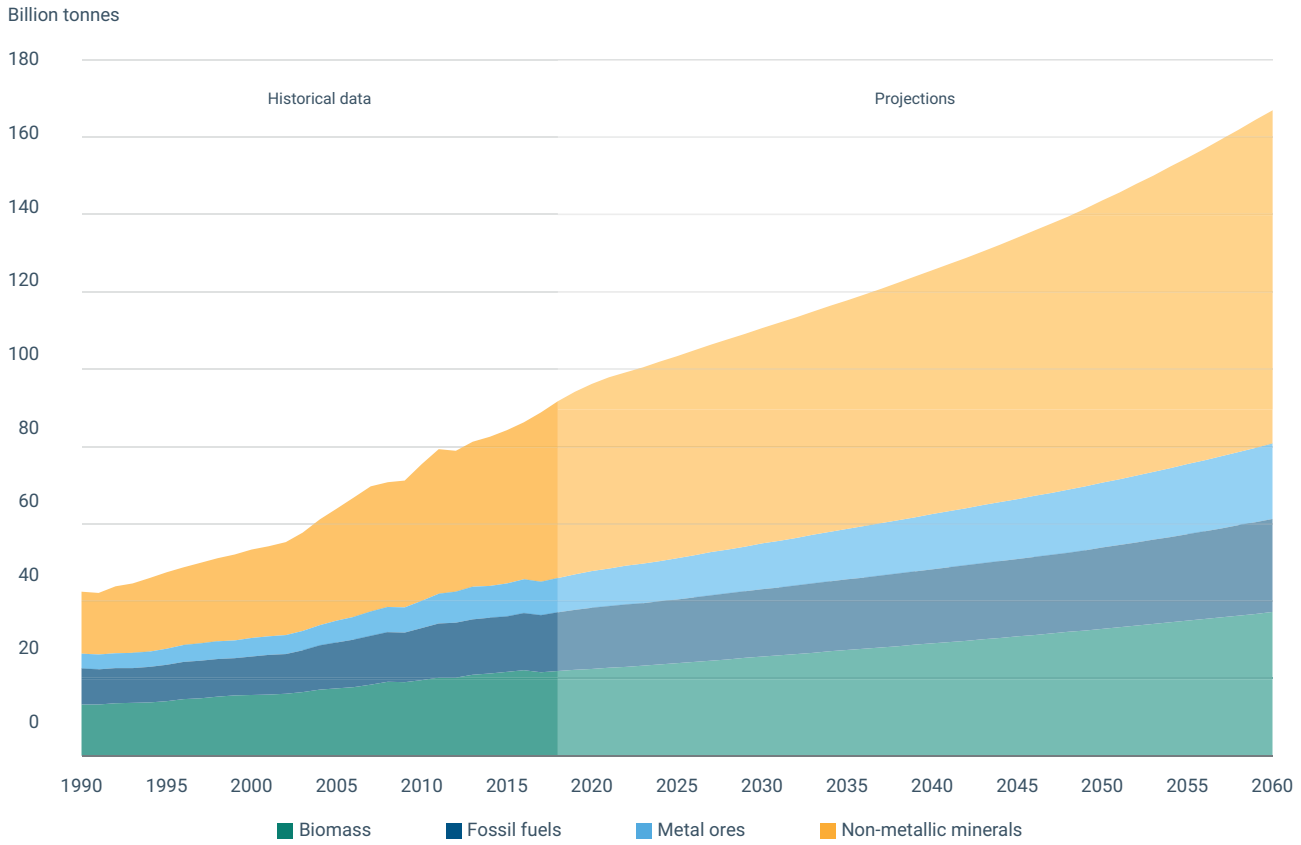
2 Resources and waste

Key messages

- Resource extraction and processing cause severe impacts on ecosystems, contribute to climate change and increase pollution levels.
- Decreasing resource extraction and increasing the use of secondary raw materials would deliver greater strategic autonomy for the EU and reduce environmental impacts.
- Focusing recycling operations on the production of high quality secondary raw materials is critical to enabling a closed loop from waste generation back to industrial inputs.

Natural resources have always fuelled human societal evolution. In more recent years, between 1970 and today, as the human population doubled, economic activity has grown fourfold and global extraction of materials has more than tripled, surging from around 27 billion tonnes per year to more than 90 billion tonnes (IRP, 2019). This trend is expected to continue, reaching 167 billion tonnes in 2060 (OECD, 2019; EC, 2021). The economic model that has been underlying this economic growth is the linear model, based on the appropriation of natural resources for transformation into materials and products that satisfy humanity's needs and desires, which are then discarded to the environment while new raw materials are sourced.

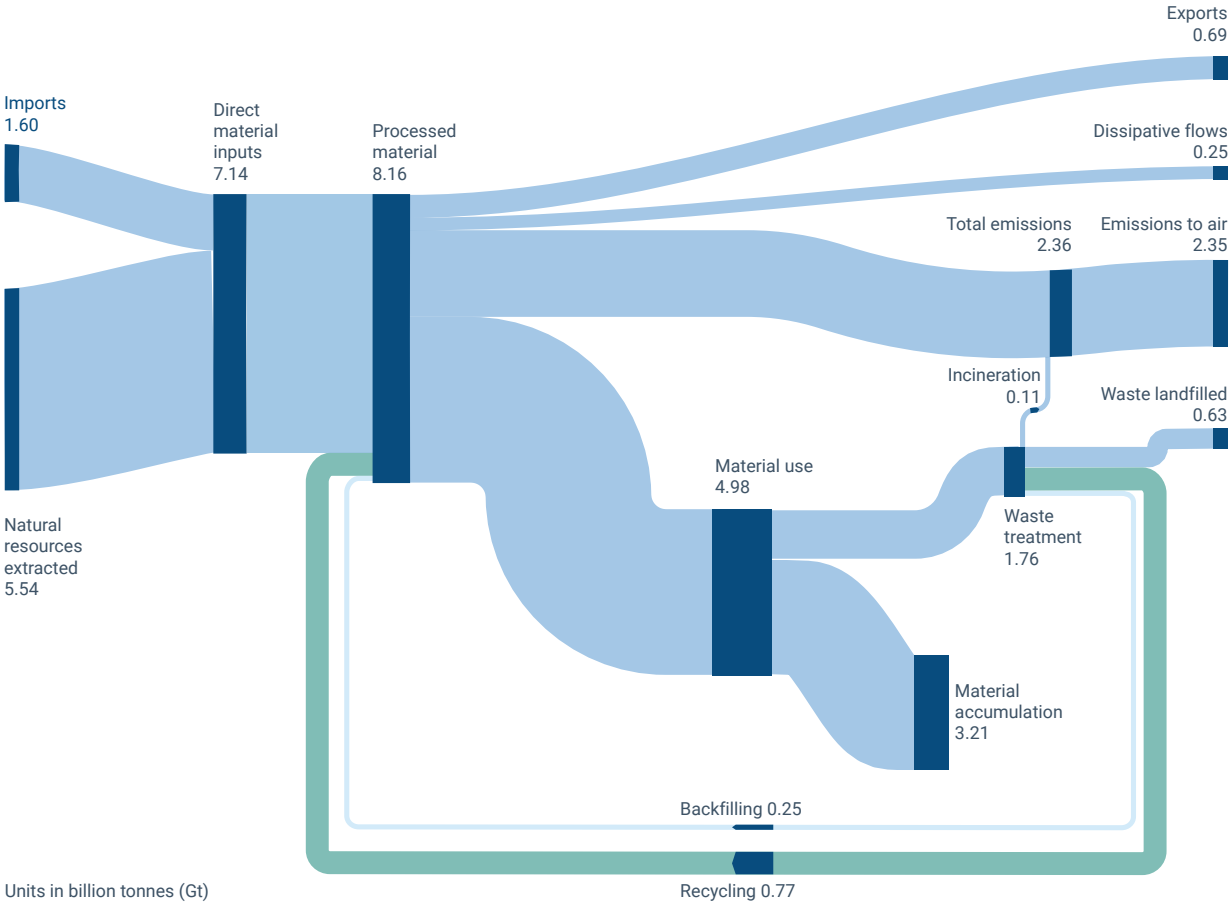
Figure 2.1 Global material use by resource type



Source: IRP, 2019.

The EU economy is resource-intensive, providing goods and services for consumption by EU citizens and for export to other parts of the world. For the EU economy to function in its current manner, more than 8 billion tonnes of material are used every year. As illustrated in Figure 2.2, 68% of this material originates from natural resources extracted within the EU (Eurostat, 2023).

Figure 2.2 **Mass flow of resources in the EU economy in 2022**

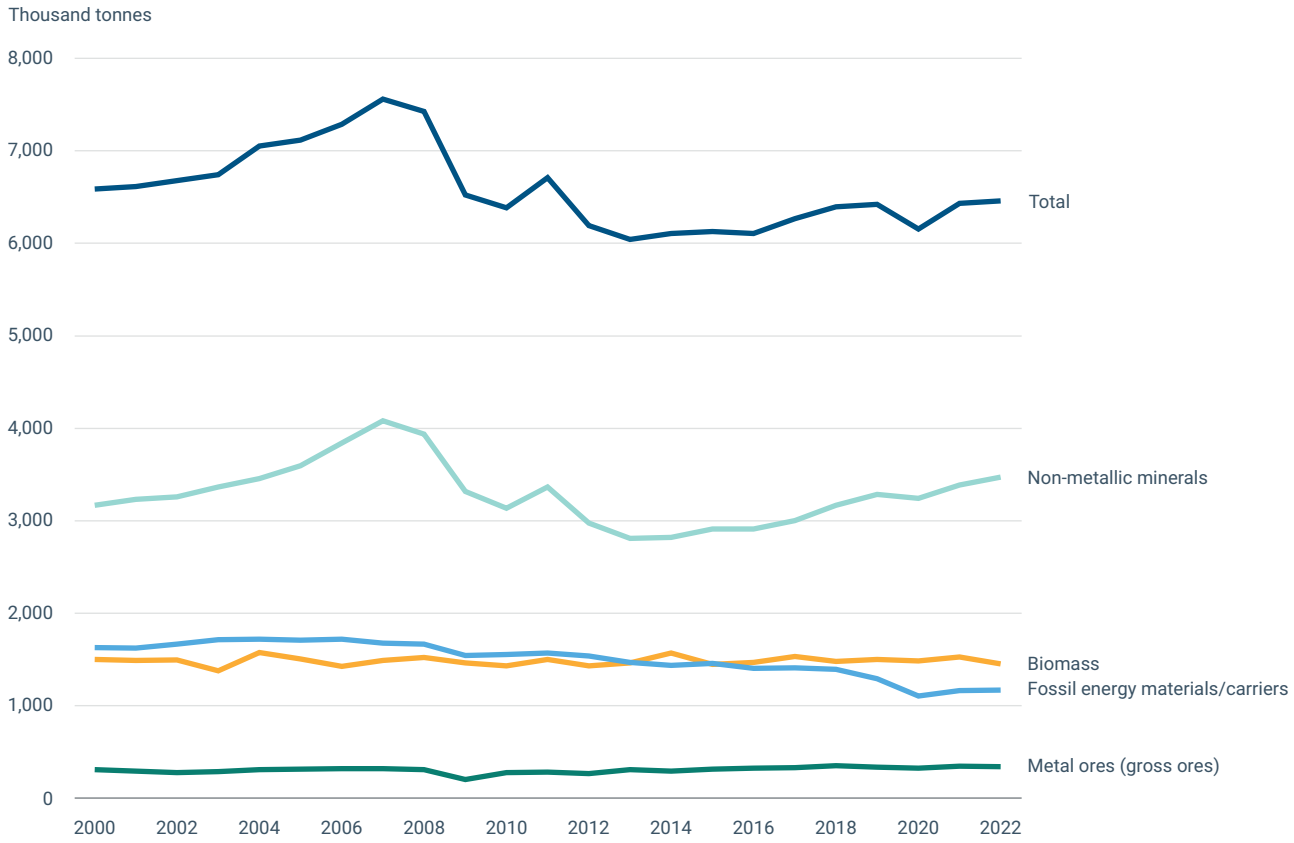


Source: Eurostat, 2023a.

Approximately 5 billion tonnes of materials were used in the EU to cover the needs and desires of EU citizens in 2022. Of this material, 35% became waste while the remainder accumulated as material stock, such as buildings, equipment and machinery. Based on this data, it is evident that the annual increase of material stock within the EU economy is massive: of every 8 tonnes of material used as input to the EU economy, 3 tonnes are destined to remain in the economy long-term as stock. These stocks represent resources that are 'locked up' in their present function and are not available to be returned to the production cycle. Long-term usage of materials and products is aligned to sustainability ambitions, but it must be factored into resource extraction and recirculation planning, both in the short term and into the future.

The heavy reliance on natural resources to provide the materials, food and fuel for human activity comes at a cost of severe environmental degradation. Extraction of natural resources means that vast land areas need to be allocated to human activity, with consequent destruction of habitats and contamination of soils and waters. The processing of natural resources into usable raw materials requires very large amounts of energy and complex industrial operations, which can cause further environmental impact and generate substantial volumes of waste, including some that is hazardous. Overall, extraction and processing of natural resources is the human activity most impactful on the environment (IRP, 2019). A circular economy can address this by reducing reliance on virgin natural resources to limit the environmental impacts associated with their extraction and processing.

Figure 2.3 **Evolution of domestic material consumption in the EU for main resource groups**



Source: Eurostat, 2023e.

Although Europe has experienced steep increases in resource consumption in the past, this trend has more or less stabilised in recent years (Figure 2.3). The total consumption of materials in 2022 was 2% lower than in 2000, while EU GDP increased by 31% (Eurostat, 2023). This indicates a slight absolute decoupling of EU resource consumption from economic growth.

Interestingly, this decrease in resource consumption includes a drop of 28% in the consumption of fossil energy carriers, which comprise mainly fuels and plastics. Since data confirm that plastic consumption is not decreasing (Plastics Europe, 2023), this indicates Europeans are consuming less fossil fuels, reflecting long-standing efforts to switch to cleaner forms of energy production.

In terms of other material groups, the consumption of metal ores and the level of consumption of non-metallic minerals (such as sand, gravel and limestone) both increased by approximately 10% between 2000 and 2022. The consumption of biomass, mainly comprising agricultural products and wood, was more stable, with a small drop (3%). Consumption of agricultural products is strongly linked to population levels, which are likely to remain stable in the EU. However, prioritising biomass for energy production due to energy supply policy could lead to increases of biomass consumption in the near future.

It is also noteworthy that the consumption of services by households — health, education, finance, recreation and other — increased in volume by 43% between 2000 and 2019, which is significantly greater than the 26% increase of total household expenditure in the same period (ETC, 2023). This appears to suggest an emerging shift in consumer spending patterns towards services and away from

material-intensive, product-focused expenditures. This shift may also partly explain the decrease in resource consumption observed in Figure 2.3, along with resource efficiency gains and increased recycling.

Regarding the circularity of each of the major resource groups, the CMUR is a key indicator for reporting on the share of recycled material in the total use of each resource group (see Figure 1.2). Unsurprisingly, circularity is lowest for fossil energy materials, as a major component of this group is fossil fuels, which are combusted for energy production without the possibility of material recovery. Circularity is highest for metals, reflecting the well-established recycling systems for this resource group as well as economic incentives to recycle metals. As CMUR is weight-based, and the tonnage of metals is low compared to total material flows, the effect of good circularity for metals is muted in the CMUR.

Box 2.1

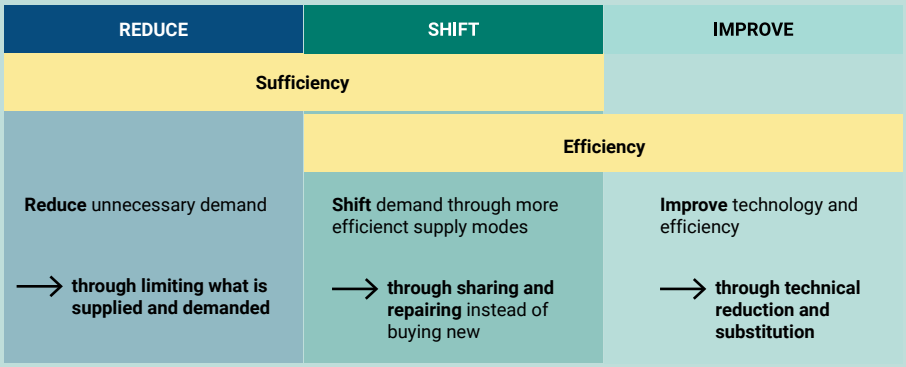
Beyond efficiency improvements in the circular economy

Decoupling economic growth from its environmental impacts is a strategy that aims to increase economic activity without a simultaneous increase in material resource use (UNEP, 2011; OECD, 2001). However, research indicates that relying solely on incremental adjustments, technological fixes and efficiency improvements within the existing system will not be sufficient to reduce material use and the related environmental impacts to a level that respects the planetary boundaries (EEA, 2023). Despite notable improvements in process efficiency that have achieved a relative decoupling of economic growth and environmental impacts, absolute reductions in environmental footprints have generally not been achieved. Furthermore, over time, increasing consumption in growing economies and rebound effects may outpace efficiency gains (Kurz, 2019). An exclusive focus on incremental efficiency improvements represents a weak approach to sustainable consumption, will not be enough to reduce absolute material resource use and would, at best, postpone environmental impacts (EEA, 2023).

In the context of circular economy approaches to consumption, it is crucial to prioritise the ultimate goal of effectively reducing overall material consumption, especially for those materials with a high environmental impact. Therefore, attention is needed to prevent circular strategies from causing rebound effects by invertedly fuelling economic growth that ultimately results in increased material consumption instead of reductions (EEA, 2021b; Kovacic et al., 2019). This calls for a rethinking of the concepts of growth, progress and wellbeing beyond consumption (EEA, 2021b).

Going beyond the focus on material consumption, the notion of well-being should be central to understanding the meaning of a wholesome life and how to achieve this. The avoid-shift-improve model shown below provides a simple, communicable and useful framework to guide policymaking for addressing systemic challenges and can be used to map efficiency and sufficiency approaches (TUMI et al., 2019; Lorek et al., 2021).

Figure 2.4 **Reduce-shift-improve model and relationship with sufficiency and efficiency**



Source: Lorek et al., 2021.

Box 2.1

Beyond efficiency improvements in the circular economy (cont.)

Sufficiency

The idea of aiming for sustainable consumption and introducing minimum and maximum levels of consumption is sometimes referred to as sufficiency (Stengel, 2011; Princen, 2005; Linz et al., 2002). There is no agreed definition of the term (Jungell-Michelsson and Heikkurinen, 2022), but the idea is to limit unnecessary demand and supply to a level that does not harm the environment (Lorek et al., 2021). While efficiency is about reducing relative impacts, i.e. the impact per product or per unit of consumption, sufficiency aims to reduce the absolute level of demand (Spengler, 2016).

Cutting resource consumption will reduce environmental impacts. Policies have targeted this in the past, including through measures to increase recycling and product lifetimes. However, other policy instruments that directly discourage consumption, such as taxes or bans on products with significant environmental impacts, are seen as politically difficult to implement (Pantzar et al., 2018). In fact, current economic systems often encourage unsustainable consumption, as many business models such as fast fashion rely on ever-increasing sales to generate profit. These business models could, however, be reconfigured to support more sustainable habits that result in less overall consumption of products.

Various social movements are experimenting with sufficiency at a micro-level, such as experiments on simpler lifestyles that reduce waste and limit consumption and which aim to decrease environmental impacts (Mossy Earth, 2022). Another option for increasing well-being is through optimised productivity — reducing work hours instead of increasing productivity — which can lead to increased social and personal time (Knight et al., 2013). Such approaches would need to be carefully managed to avoid economic decline and consequent impacts on well-being, employment and other social issues (Büchs and Koch, 2019). In addition, there is also a danger of rebound effects if people use this additional time for activities with a high environmental impact, such as long-haul air travel

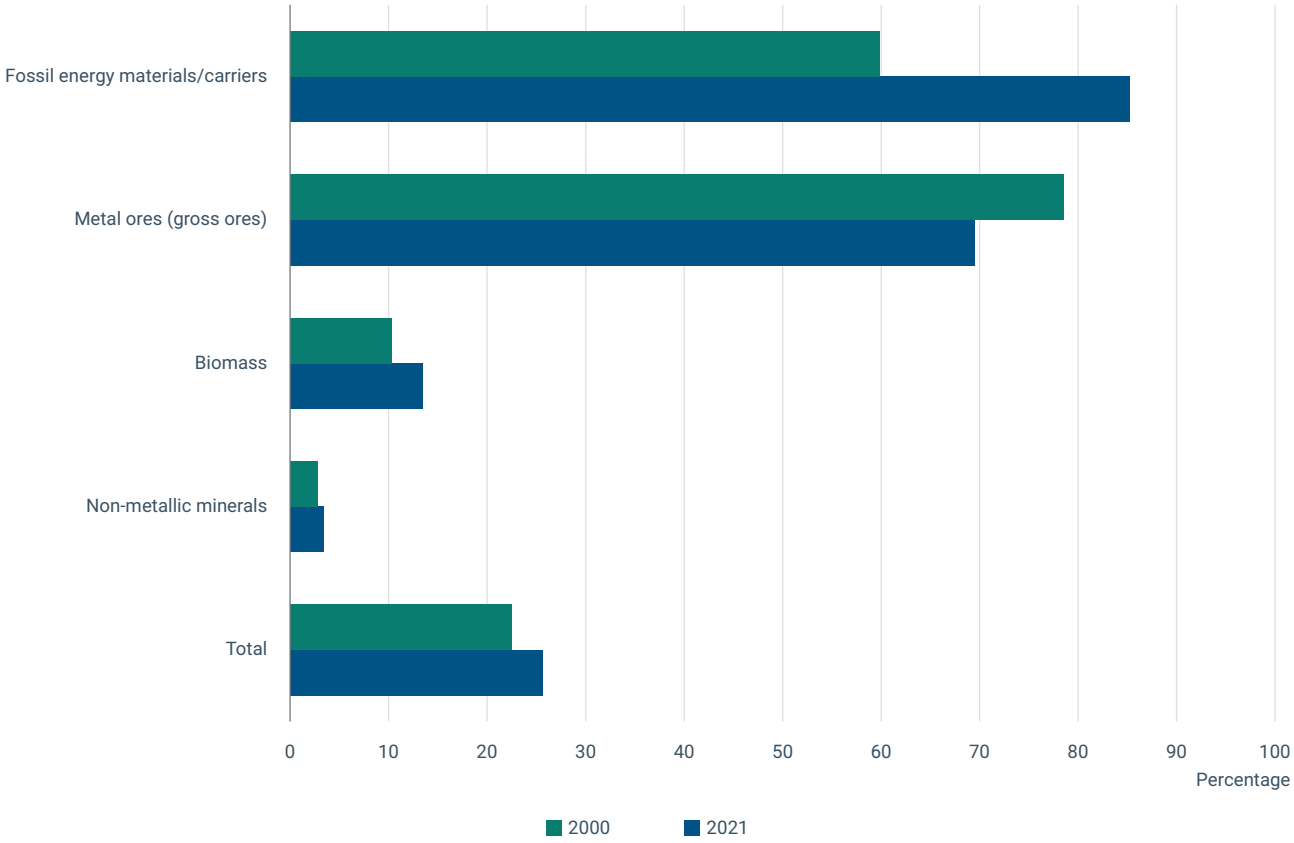
2.1 Reliance on imports in Europe

Establishing a circular economy in the EU also addresses issues regarding the security of supply of resources to the EU economy. Reducing natural resource consumption through, for instance, high recycling rates or longer use of products would mean less reliance on imports to satisfy EU raw material demand. In light of the war in Ukraine and the experiences from the COVID-19 pandemic, this issue is at the forefront of strategic policymaking, which provides additional impetus for the implementation of circular principles. Autonomy in resource supply also prevents changes in risks related to trade restrictions by third countries and unethical mining practices such as the case of cobalt artisanal mining in the Democratic Republic of Congo (EC, 2021).

Changes in the share of imports required to satisfy demand for resources in the EU is shown in Figure 2.5. The resource group that is most reliant on imports is fossil materials, followed by metals. Non-metallic minerals are heavy and relatively cheap materials, where transport costs determine a significant share of their final price. Long-distance transport of such materials does not make economic sense, therefore, which is reflected in their very low import reliance. Biomass also has a relatively low import reliance and, given that the EU is self-sufficient in terms of timber (EC, 2021), this indicates a relative self-sufficiency of the EU in terms of foodstuffs.

Transport costs' share in the final commodity price is only one of the factors that determine import reliance for resources. The availability of resources in the EU territory, social acceptance for mining and the EU's processing capacity for raw materials are other factors.

Figure 2.5 **Imports as a percentage of domestic material consumption in the EU**



Source: Eurostat.

In terms of trends, compared with 2000, fossil-based materials originate a lot more from abroad in 2021 (85% as opposed to 60% of domestic consumption). This is another reason for the EU to transform its energy system away from imports of fossil fuels such as natural gas and oil. The only resource group that shows a lower reliance on imports in 2021 compared to 2000 is metals: for all other resource groups, as well as for the total consumption of all materials, imports covered a greater share of domestic consumption in 2021 than in 2000.

Critical raw materials (CRMs) are a particular category of materials that warrant special attention. They are materials with substantial economic importance and whose import reliance is high. The supply challenges associated with CRMs make them a cohort of particular relevance to circular economy approaches, including ecodesign, to substitute with less problematic materials. Increased and extended use of existing products followed by effective collection and recycling of CRMs from end-of-life items can help to reduce demand for virgin material. The magnitude of this offset varies across materials and depends on the waste management systems in place, but a recent study in the USA estimated that secondary materials could meet up to 90% of demand for CRMs in low-carbon technologies in 2050 (Karali and Shah, 2022).

CRMs are also of concern because they are often imported from countries with sub-optimal governance levels, including weak enforcement of environmental regulations and insufficient monitoring of the social impacts of extraction (EC, 2023). It is important that the EU increases its autonomy in the supply of CRMs to reduce future dependence on these problematic supply chains. Circular economy approaches can play a crucial role in this change, as recognised in the proposal for a

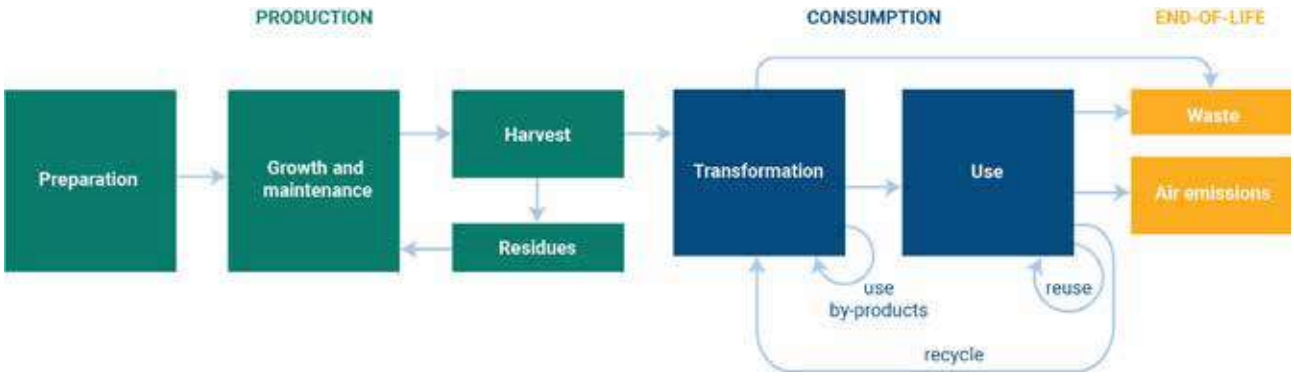
Critical Raw Materials Act ([1]), which includes provisions for promoting the circularity of 34 identified CRMs to increase secondary sources within Europe. This legislation also identifies a list of strategic raw materials that are judged to hold particular importance based on their expected application in the green and digital transition, as well as in the defence and space sectors. From a circular economy point of view, these materials will require particular attention in terms of ecodesign to ensure careful usage and effective recycling at end-of-life.

2.2 Circular bioeconomy

The bioeconomy is defined as the sectors and systems that rely on biological resources for their functions and principles (EC, 2018), including primary production using biological resources — agriculture, forestry, fisheries and aquaculture — and all sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services. From a materials perspective, biomass is of particular interest and is defined as vegetation that forms ecosystems, sequesters carbon and provides food and feedstocks for a wide range of bio-based materials (EEA, 2023). These materials are widely used in sectors such as construction, energy, packaging and textiles, and are central to the production of novel materials such as bio-based plastics.

In 2017, biomass use in the EU-27 amounted to 1.2 billion tonnes (EC, 2023) with recent trends showing a slight increase. Of this, 50% was used for food, feed and bedding for livestock, 22% for bioenergy and 28% for materials. Biomass is transferred from the environment to the primary sectors and after use is transferred between economic agents and back to the environment (Figure 2.5).

Figure 2.6 Simplified diagram showing biomass flows



Source: EEA, 2023i.

The bioenergy sector uses biomass either via direct combustion or for the production of biofuels. Biomass use in this sector has been growing since 2005 because of policy incentives. In 2021, biomass made up 56% of renewable energy consumed in the EU. Woody biomass is also used in construction, furniture manufacturing, paper production and packaging, and a diverse range of other industries that need bio-based materials to operate. Recycling of post-consumer wood is often referred to as cascading use and

([1]) Critical Raw Materials Act (europa.eu)

it adds to the wood supply beyond primary wood (EC, 2016). Biomass production and extraction can have impacts on the condition of ecosystems, including biodiversity and the capacity to sequester carbon dioxide from the atmosphere (EEA, 2023). Many of these impacts can be negative and so the use of biomass in the economy needs to be considered carefully, just as for other material types.

In terms of circularity, some aspects of the bioeconomy are different — for example, foodstuffs are not recyclable like glass or metals — but the key principles apply. Before use, careful consumption choices and design decisions should aim to prevent wasteful material use. During the use phase, every effort should be taken to maximise the utility and value of the products. Finally, after use, careful management and treatment of waste is required with a view to preventing disposal and instead returning the maximum material value into the economy. In 2018, industrial and household biowaste generated in the EU-27 amounted to 147 million tonnes of dry matter, of which 90% was recovered and either recycled or incinerated (EC, 2023). Of household biowaste, 60% was food waste, representing 173 kg per EU citizen per year (EEA, 2020).

The benefits of shifting to bio-based materials include lower climate and environmental impacts, improved material functionality and benefits for the local (rural) economy. These depend, however, on the material substituted, the type of biomaterial replaced with and how it was produced. There is a growing interest in using more bio-based materials in several key value chains of the circular economy, including construction, textiles/plastics and packaging (EEA, 2023). In addition, biomass is used as an alternative to fossil fuels. However, there is a critical concern when it comes to sustainable supply, with projections for future demand ranging from stable to a doubling and even tripling of demand by 2050 (EEA, 2023). European biomass supply is limited by factors such as land availability and vegetation growth rates, and so there is an urgent need to make decisions on biomass management in Europe to balance projected demand with negative trends in ecosystem quality (EEA, 2023).

Regenerative sourcing is a concept taken from agriculture. It refers to practices that have lower or even net positive environmental and/or social impacts than conventional agriculture. However, a widely accepted definition does not yet exist (Newton et al., 2023). Such practices mainly aim to restore degraded soils and ecosystem functions, as well as carbon sequestration in soils. Within the circular economy, regenerative therefore applies to the sourcing of bio-based materials not only from agriculture but also from forestry and fisheries. This concept is still rather new and needs further exploration.

Overall, the circular economy can benefit the bioeconomy in three ways (EEA, 2023). First, circular economy measures such as rethinking business models, extending the lifespan of bio-based products and recycling biomaterials can help reduce demand for primary bio-based resources and thus improve the balance between demand and supply of biomass in Europe. Second, cleaner cycles that use less hazardous chemicals in biomaterials increase recyclability, which helps lower demand for primary resources. Third, more environment-friendly sourcing and supply of biomaterials can reduce impacts on natural systems and promote regenerative practices, which in turn allows for more sustainable supply of biomaterials.

There is a strong overlap between a circular economy and the bioeconomy, yet there are also limitations concerning circular economy measures and what they offer to the bioeconomy. For example, it is difficult to reuse or recycle some parts of the bioeconomy such as food or feed. Similarly, cascading is an issue for some types of materials and applications. This means they can only be recycled as a lower value product. In conclusion, to be successful, the European bioeconomy needs to have circularity at its heart to achieve a more sustainable balance between supply and demand for European biomass.

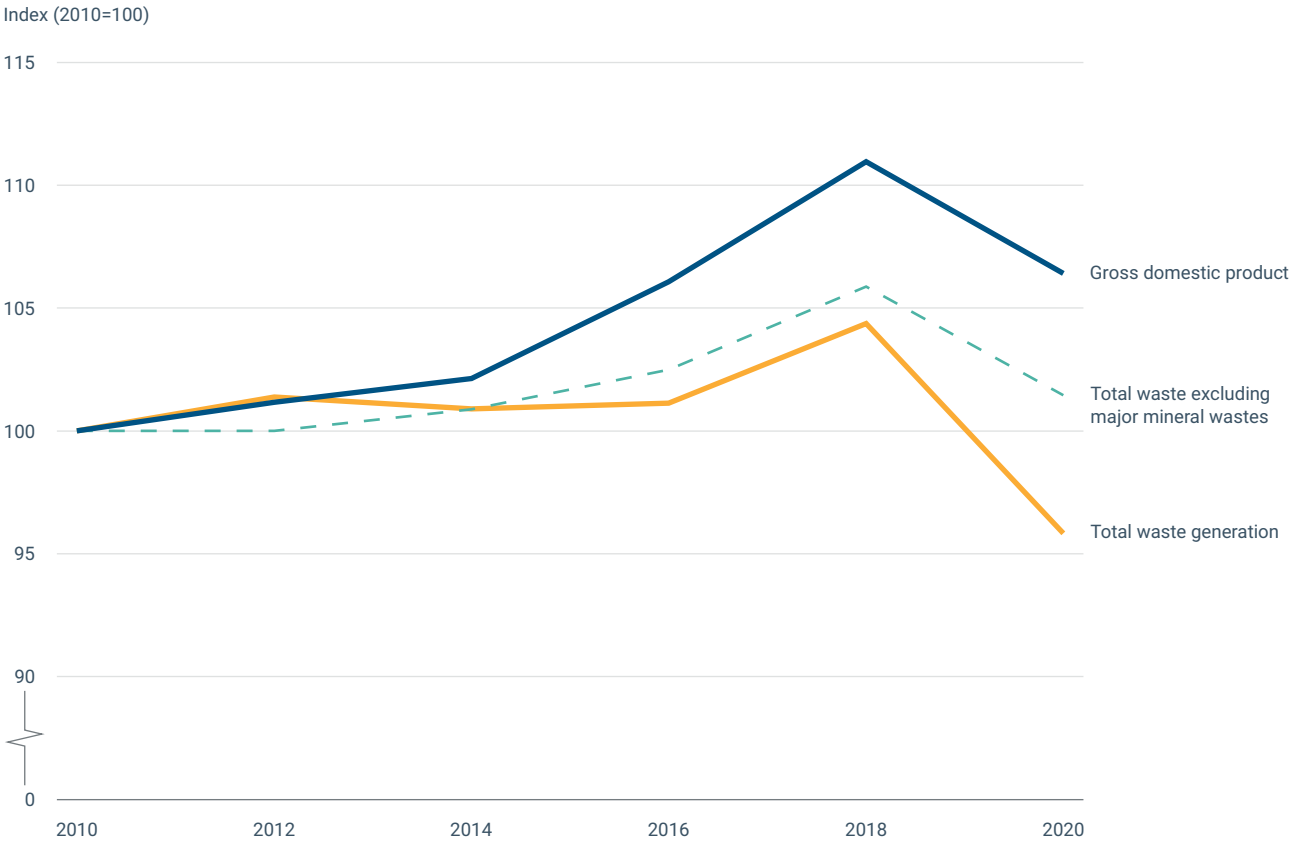
2.3 Waste generation and the environment

In a circular economy, waste generation represents a 'system leak'. In an economy where products are kept in use for a long time and the value of material is high, only truly unavoidable waste is generated. When this happens, a circularity-focused economy aims for high-quality recycling of the materials available in waste so they are suitable as secondary raw materials for the manufacture of new products. A primary aim of the circular economy policy in the EU is to substantially reduce waste generation, by keeping materials and products in use for longer and avoiding disposal of resources that could be recovered for further usage.

Waste generation is undesirable because inefficient use of natural resources increases the need for raw material extraction and the associated environmental burden. Despite the resource value within end-of-life goods and materials, unmanaged waste is itself a type of pollution, as reflected in the EU's Zero Pollution Action Plan that calls for, inter alia, a substantial reduction in waste generation. Moreover, all waste management activities cause direct environmental impacts, such as air pollution and carbon emissions from the transport and processing of waste.

Many factors influence waste generation, including economic growth, technological developments and even fashion trends. In a truly circular economy, only unavoidable waste would be generated after all options to keep materials and products in the economy have been exhausted. This translates to minimised waste generation at levels significantly lower than the ones registered today. Recent data show that waste generation in the EU — excluding major mineral waste ([2]) — increased between 2010 and 2020 by 1.45% (Figure 2.7). However, this includes a sharp decrease in 2020 due to the economic slowdown from the COVID-19 pandemic measures and so the underlying increase is likely to be higher.

Figure 2.7 Waste generation and decoupling per capita in the EU-27



Source: EEA, 2022i

([2]) Major mineral wastes, such as hard rocks, concrete, soils and others — that are mainly produced in the mining and construction sectors — feature in large quantities in relation to other waste types. This alters the interpretation of trends. They also usually represent an environmental issue of less concern.

Reducing waste generation has been a policy objective in the EU since the 2008 Waste Framework Directive and it is reiterated in various recent policy documents, including the CEAP. These objectives are gathered into the concept of waste prevention which describes measures that are taken 'before a substance, material or product has become waste, that reduce: the quantity of waste, including through the reuse of products or the extension of the life span of products; the adverse impacts of the generated waste on the environment and human health; or the content of harmful substances in materials and products' (EU, 2018a).

The approach to prevention is multi-dimensional and not only concerns resource, environmental and health perspectives but also targets the system, product and material levels. While addressing the design phase of a product or system where initial resource use and waste generation can be avoided, it also promotes the best available techniques in the processes of production, extraction of minerals and their further processing (EC, 2018a). EU countries have been taking measures to promote waste prevention since 2013, when they were required to put in force national programmes aiming at curbing waste generation. Measures address multiple waste streams and different stages of a product's life cycle ([3]). They are implemented by promoting sustainable consumption models, encouraging reuse and repair activities and awareness campaigns. Monitoring the effectiveness of waste prevention measures has been a challenging task since the policy was introduced, but the EEA and European Environment Information and Observation Network (Eionet) member countries have developed a framework to track the progress of waste prevention efforts (EEA, 2023j).

Waste generation in the EU generally follows trends in GDP. However, as evident in Figure 2.7, there is a widening gap between waste generation and economic growth that indicates a relative decoupling of these factors. The circular economy is a strategy that is intended to operate within the context of a growing economy and a population with increasing purchasing power. This implies that for waste generation to decrease, an absolute decoupling of waste generation from economic growth needs to occur. To date, absolute decoupling of the two trends has not been observed and as economic activity rebounds from the slowdown of 2020, waste generation will probably rise again. Under these conditions, it seems unlikely that the objective for a significant reduction in waste generation within the EU by 2030 can be achieved ([4]).

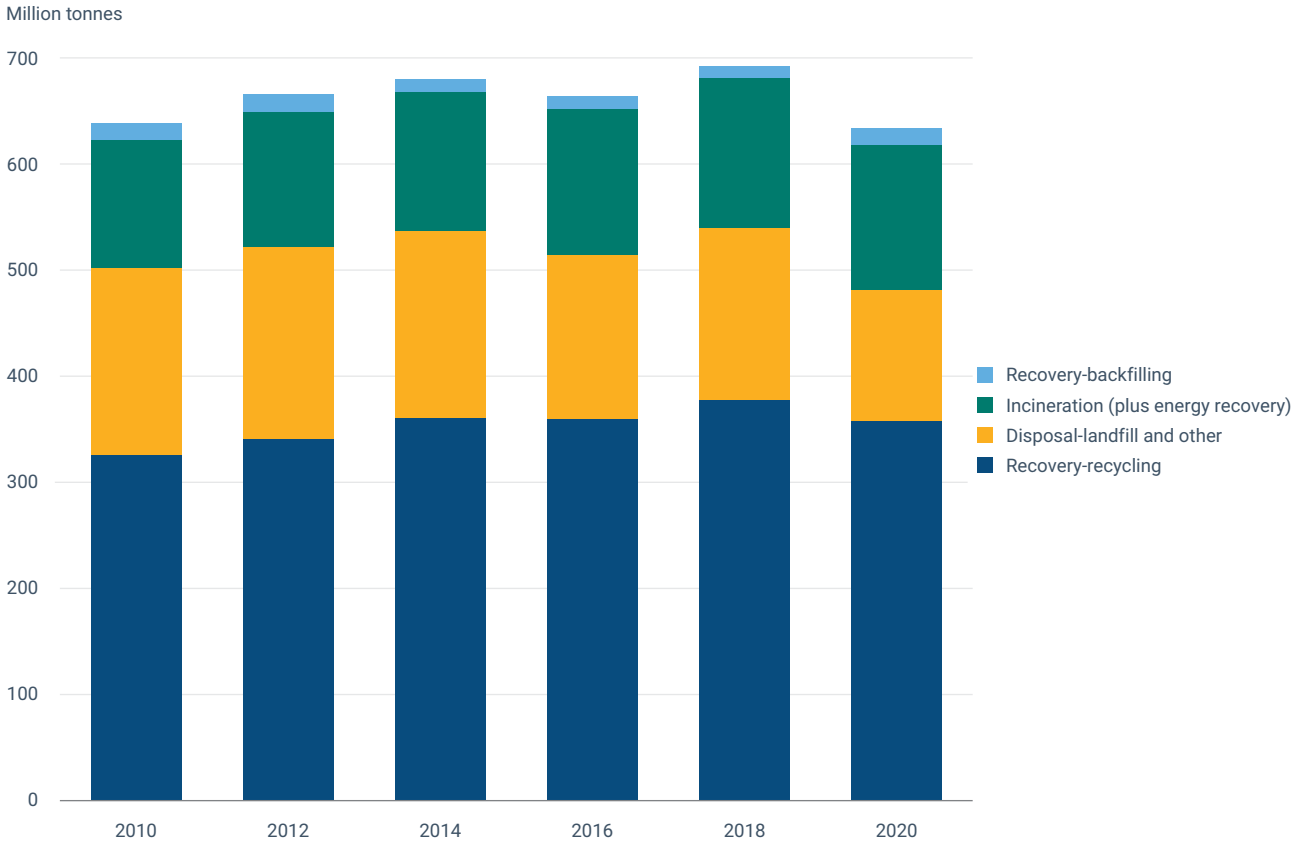
2.4 Waste management for a circular economy

Once products and materials are discarded, waste management processes are activated to collect and process the waste. In a circular economy, some elements within the waste can be returned to use following repair, cleaning and checking in a process known as preparation for reuse. Where this is not feasible, the valuable resources within the waste, such as metals and plastics, are carefully recycled and made available as secondary raw materials. The current situation regarding waste treatment in Europe is illustrated in Figure 2.8.

Though recycling is preferable to disposal, processing waste nonetheless requires energy and chemicals. Importantly, the resulting secondary raw materials are generally produced with a lower environmental impact than extracting primary materials from the ground. Moreover, recycling of waste overwhelmingly takes place within the EU ([5]), which means the resources recovered from waste reduce the need to import their primary equivalents, strengthening the EU's resource autonomy.

([3]) Progressing towards waste prevention in Europe – the case of textile waste prevention
([4]) Waste generation in Europe (8th EAP)
([5]) Linking cross-border shipments of waste in the EU with the circular economy

Figure 2.8 **Waste treatment in the EU-27 (total waste excluding major mineral wastes)**



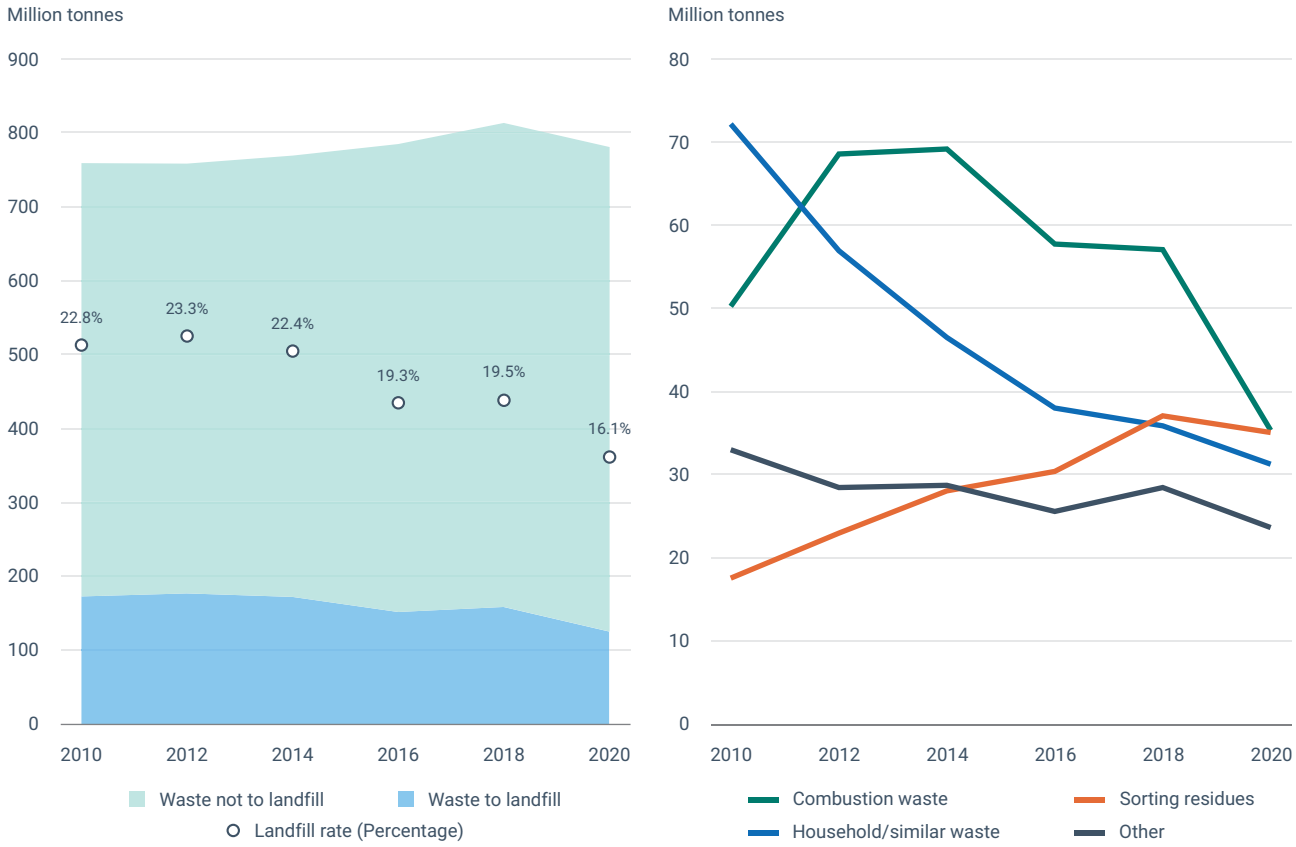
Source: Eurostat.

However, sometimes recycled materials have inferior properties to primary materials and may not present a viable option unless key material properties can be maintained throughout the recycling process.

Recycling requires effective waste collection systems to be in place. These systems need to aim at capturing all the waste resources generated, regardless of the source, and ensure waste is collected in such a way that the value of the resources in the waste is preserved (e.g. functionality and technical properties). Failures of collection systems might lead to irreversible loss of valuable resources, such as the dissipation of rare and precious metals in waste from electrical and electronic equipment. Recognising the value of recycling, the EU has adopted extensive legislation promoting this type of waste treatment through a variety of interventions, including setting legally binding targets for particular streams such as packaging. With this legislation providing a powerful driver, recycling of waste in the EU has increased significantly and currently almost half of waste generated is recycled (EEA, 2023l). Heavily regulated waste streams, such as packaging waste, demonstrate even more impressive results, with almost two-thirds of that waste stream recycled (EEA, 2023l).

In line with increasing recycling rates, disposal rates are declining, and this can be particularly observed for the landfill rate. Driven by EU policies, landfilling has been consistently falling, reaching an all-time low of 16% in 2020 as shown in Figure 2.9. The diagram also shows growth in the generation of sorting residues, which is associated with more waste being sent to recycling operations, where this type of waste is generated.

Figure 2.9 Amounts and share of waste deposited in landfill, by waste category



Source: EEA, 2023m.

However, EEA data also reveal that recycling rates appear to be stagnating, suggesting that, for many countries, the 'low-hanging fruit' of recycling have been picked and more effort is needed to increase recycling rates. Clearly, to capitalise on the benefits of a circular economy recycling rates need to be maximised in order to reduce reliance on primary resource extraction. Despite improved performance in terms of recycling for common waste streams, there is room for improvement (EEA, 2020) and a recent assessment concluded that many EU Member States are at risk of missing waste recycling targets (EEA, 2022).

2.5 Secondary raw materials

Secondary raw materials (SRMs) are outputs from a recycling process that are no longer waste and cannot be distinguished from a primary raw material. They can be traded in the same way as other commodities and are key to delivering a circular economy in the EU.

High-quality recycling

A core tenet of a circular economy is maintaining the value of materials for as long as possible. In waste management systems, this translates not only into achieving very high levels of separate collection of waste for recycling, but also into protocols for recycling operations focused on preserving and capturing the value of resources available in waste. Although the EU's Waste Framework Directive requires Member States to promote high-quality recycling, it does not provide a definition or a method

to assess this concept. Roosen et al. (2023) define recycling quality as 'the extent to which, through the recycling chain, the distinct characteristics of the material are preserved or recovered so as to maximize their potential to be reused in the circular economy'.

There have been many proposals for methodologies to account for recycling quality, and each of these has been developed in a specific context with a focus on different recycling quality aspects. Recent published work by the Joint Research Centre (Roosen et al., 2023) includes a framework that breaks down the concept of recycling quality into three key components:

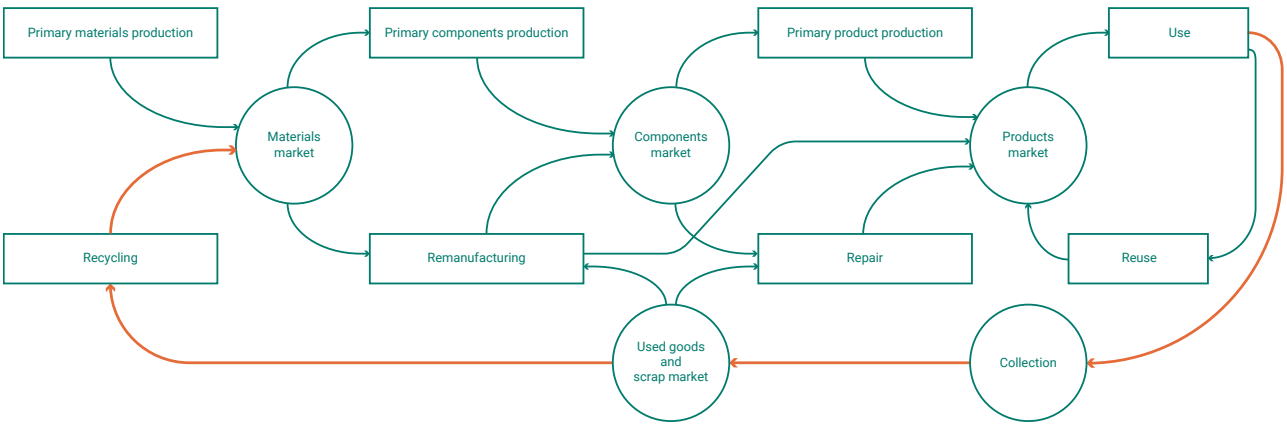
- **Long-term in-use occupation:** The availability of recycled material for further recycling in the future. This represents the further recycling potential of a product made with the recycled material in question.
- **Environmental impact:** If a recycled material can be used in two applications, one of which brings higher environmental benefits, this should be reflected in the recycling quality calculations.
- **Total substitution potential:** This indicates the level of functionality the recycled material offers compared to its virgin material alternative. This should estimate how much of the material functionality is preserved after the recycling process is complete.

Secondary raw material markets

The circular economy concept provides a framework to shift from the 'waste push' scenario, involving diversion of waste from disposal or recovery towards recycling, to a 'market pull' situation focused on producing resources from waste for which there is a market. Functioning markets for secondary raw material (SRM) ensure the timely circulation of good-quality recycled materials in the European economy, which in turn minimises the need to extract natural resources (EEA, 2022).

An SRM market is an economic and logistical space linking waste management operations and the industrial raw material system. SRM moves within a complex system of interconnected markets that facilitate trade in materials, components and products (Figure 2.10).

Figure 2.10 SRM flow in context of a system of interconnected markets



Source: Zink and Geyer, 2017.

This value creation approach needs to be structured so the right choices are made along the recycling value chain, in order to achieve high-quality outputs from recycling. Recent work from the EEA determined that for SRM markets to improve from their current suboptimal state, three key developments are required (EEA, 2022c):

- Products need to be designed with recycling in mind. This ensures that materials arrive at the waste management system in a state that makes them suitable for easy separation and that guarantees a high level of performance after recycling. This would reduce processing costs and make SRMs more competitive. Design for recycling can be promoted by ecodesign requirements, as foreseen in the proposed Ecodesign for Sustainable Products Regulation and the proposed Packaging and Packaging Waste Regulation, or be incentivised through economic instruments, for example by applying eco-modulation to producer responsibility fees.

- SRM needs to gain the trust of manufacturers. Efforts on standardising the performance of SRM coupled with recycled content requirements in new products can create trust in SRM and support uptake from manufacturing industries. Moreover, this facilitates investments in new, better recycling technologies that ensure more functionality in the produced materials.

- A functioning market for SRM is required within the EU, operating in a similar way to mainstream commodity markets. Critical enablers for this development include establishing end-of-waste criteria for all SRM and ensuring the free movement of SRM within the EU, recognising that waste intended for recycling is a resource like any other and should therefore have equivalent policy treatment.

The EEA has developed a framework for assessing SRM market functionality (EEA, 2022). Of the eight SRM markets assessed under this framework, only three are classified as well-functioning: aluminium, paper and glass. These markets were established a long time ago, are international and open and occupy a significant market share of their respective material supply. Five other SRM markets were assessed and found to be not well-functioning: wood, plastics, biowaste, aggregates from construction and demolition waste, and textiles. The main reasons for this are their small size, weak demand — even with increasing supply — and inadequate technical specifications. Despite a strong policy push to increase recycling and the resulting steady supply of recyclates, the supply side of SRM markets remains challenged due to problems including insufficient specifications and end-of-waste criteria. The demand side, on the other hand, was found to be hampered by a lack of trust in SRMs.

Overall, functioning SRM markets are the key mechanism for ensuring that the waste management system offers high levels of circularity, by ensuring high recycling rates and the production of materials to be supplied back to manufacturers. The fundamental change required is to transform the waste management sector from a business model based on collection and disposal of unwanted end-of-life materials into a new paradigm as a value chain that produces high-quality feedstock materials for industry.

2.6 Assessment

Europe's reliance on natural resources to provide materials, food and fuel comes at a cost of significant environmental degradation. Following steep increases in resource consumption in the past, this trend has more or less stabilised in recent years. A slight absolute decoupling of EU resource consumption from economic growth can be observed, with total consumption of materials dropping slightly while EU GDP increased. However, this improvement does not refer to the demand created by EU consumption for resource extraction elsewhere, with EU dependence on global imports for supply of metal ores and fossil-based materials increasing. Waste generation is also showing a relative decoupling from economic growth, but it is unlikely that a significant reduction in waste generation by 2030 can be achieved. Recycling has increased over time, but rates have stagnated in recent years. To underpin circularity ambitions, increased efforts are needed to regain momentum, along with a systemic shift towards high-quality recycling. Effectively closing the loop requires functioning markets for secondary raw materials, but markets for many materials are not performing well, reflecting a pressing need to tackle challenges on pricing, standards and supply stability.

3 Policy leadership

Key messages

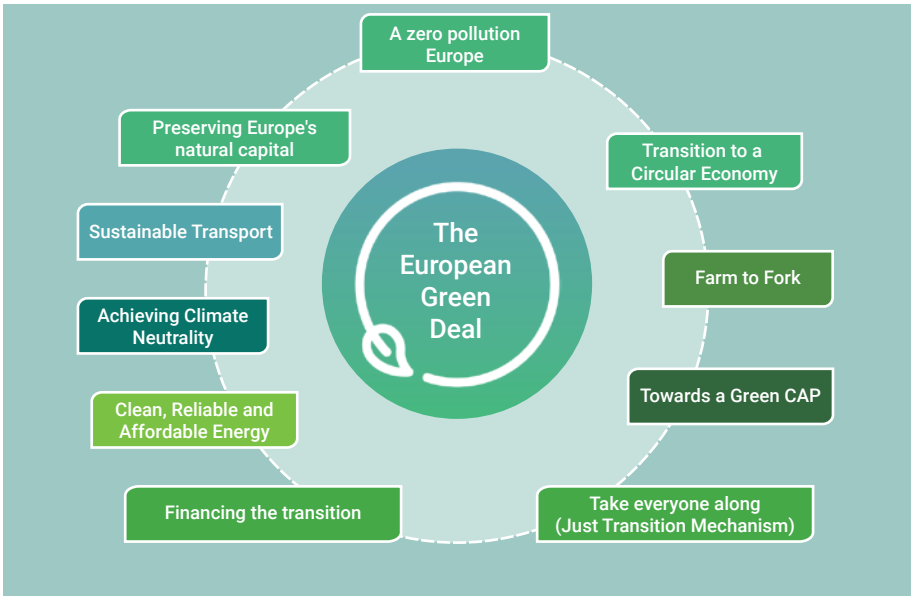
- A comprehensive set of new circularity policies has been introduced at EU level.
- National actions have intensified but many are still at the early stages of implementation.
- Monitoring the circular transition is critical and continued development of reporting systems is required at EU, national and sectoral level.

To foster the circular economy, effective policies must be put in place to make it possible and easier to move to improved circularity. These policies provide the foundation for coherent strategic direction and coordinated development of the circular economy across all sectors of the economy and society. Successful development of a circular economy requires a systemic approach promoted in a coordinated and integrated manner, to maximise success and prevent unintended consequences. Strong policies in other areas, such as climate change mitigation, could favour the transformation to circularity — for example, if they lead to the internalisation of environmental costs into virgin material prices and thus make circularity more competitive.

3.1 EU-level strategic and active leadership

At the EU level, Europe's agenda for sustainable growth is presented in the European Green Deal, and the circular economy is a key component of this policy (EC, 2019). A range of policy instruments, initiatives and communications have been produced for the circular economy, some of which directly tackle the issue and others that are embedded within policy measures targeting other strategic objectives.

Figure 3.1 Policy objectives of the European Green Deal



Source: EC, 2019.

Before 2015, the underlying concept of a transition from a linear towards a circular economy was clearly reflected in many fragmented EU policies, notably via the waste hierarchy in the Waste Framework Directive (2008/98/EC). Other policy documents also reflect the genesis of the circularity concept, including the Directive on Packaging and Packaging Waste (94/62/EC), the Raw Materials Initiative (COM(2008) 699) and the Communication on Raw Materials — Tackling the challenges in commodity markets and on raw materials (COM(2011) 25).

European circular economy policy was explicitly launched in 2015 with the Circular Economy Package. This package consists of the Commission's communication *Closing the loop – An EU action plan for the Circular Economy* with a list of follow-up initiatives and corresponding timelines and four new legislative proposals on waste. The key objective was given as a 'transition to a more circular economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised'. It was also in line with other EU priorities, including jobs and growth, climate and energy, the social agenda and industrial innovation, and with global efforts on sustainable development. The follow-up Circular Economy Action Plan – For a cleaner and more competitive Europe' was launched in 2020, as part of the wider framework of the European Green Deal, which was introduced in 2019. As before, Member States are encouraged to adopt or update their national circular economy strategies, plans and measures in the light of its ambition. The plan articulates related initiatives and concepts towards greater circularity across seven key dimensions:

- sustainable product policy framework;
- key product value chains;
- less waste, more value;
- making circularity work for people, regions and cities;
- cross-cutting actions;
- leading efforts at global level;
- monitoring the progress.

The CEAP also highlights some material and product streams where resource use is high and the potential for circularity is strong. These are termed the key value chains and comprise electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, and food, water and nutrients. These areas are given special attention in terms of the development of new measures to improve circularity.

The priorities identified by the CEAP have prompted a number of legislative instruments such as the Directive on single-use plastics, which aims to tackle marine litter and inefficient resource use by restricting the use of single-use plastic products. In addition, the recent proposal on rules promoting the repair of goods is an example of clear circular actions being brought forward into European law.

In economic terms, the European Semester process provides an important political mechanism for better coordination of policies with an economic focus. In recent

years, circular economy principles have been included in the European Semester as part of a drive to ensure that macroeconomic policies are sustainable not only economically but also environmentally and socially. Documents produced through this process recognise that resource efficiency and the circular economy contribute to sustainable economic recovery and job growth in many ways. The 2023 *Annual Sustainable Growth Survey* highlights concerns including supply chain issues and steep rises in inflation. It also notes the importance of promoting resource efficiency and the circular economy in response to these challenges.

Uptake of a circular economy in recent EU policies

Along with the specific objectives and goals of the CEAP, the principles of circularity are increasingly being included within other strategic initiatives. This is a welcome development and can be expected to significantly contribute to mainstreaming circular practices across Europe's economy and society. Some examples of recent major EU policy initiatives with a strong circular economy element are described below.

Industrial policy strategy

EU industrial policy strategy calls for twin ecological and digital transitions that will require new technologies, with matching investment and innovation to create new products, services, markets and business models. Building a more circular economy is identified as one of the pillars of this new industrial strategy, with a view to fostering a cleaner and more competitive industrial base by reducing environmental impacts, alleviating competition for scarce resources and reducing production costs. The strategy notes that applying circular economy principles has the potential to create 700,000 new jobs across the EU by 2030, many of which would be in small and medium-sized enterprises. The proposed Critical Raw Materials Act highlights sustainable and circular materials as one of its four pillars.

Ecodesign for Sustainable Products Regulation

Launched in March 2022, this will build on the Ecodesign Directive, which currently only covers energy-related products (EC, 2023c). The regulation will establish a framework for improving ecodesign implementation and is strongly aligned to circular economy ambitions. New legislative measures are indicated to include setting requirements on product durability and reparability, obligations on recycled content and removal of substances that inhibit circularity.

EU strategy for sustainable and circular textiles

Textiles are a key product value chain with strong potential for the transition to circular business models. The 2022 Strategy for Sustainable and Circular Textiles creates a framework for the transition of the textiles sector so that products are long-lived and recyclable; made of recycled fibres, and free of hazardous substances. The initiative aims to prolong the service life of clothing through phasing-out of fast fashion business models and increasing consumer penetration for repair services; while also ensuring items are recycled at end-of-life (EC, 2022).

Box 3.1

European Circular Economy Stakeholder Platform

The European Circular Economy Stakeholder Platform was established in 2017 as a joint initiative by the European Commission and the European Economic and Social Committee to engage with stakeholders to support the exchange of good practices towards the development of a circular economy.

The platform brings together stakeholders active across the circular economy in Europe. As a 'network of networks', it goes beyond sector-focused activities to also highlight cross-sectoral opportunities. It provides a meeting place for stakeholders to share and scale up effective solutions, identify specific challenges and give feedback to policymakers. It brings together leaders from business, public authorities, NGOs, knowledge communities and other civil society organisations to advance the transition to a circular economy. It is a forum to showcase successes and discuss new challenges such as the link between the circular economy and biodiversity, circular procurement and food waste.

The platform acts as a bridge between existing initiatives at local, regional and national level, to support a deep implementation of the circular economy. A good example of its role of is the leadership group on textiles that has organised a series of talks on key issues, including extended producer responsibility and circular design. This demonstrates how the platform can bring together stakeholders over the whole value chain to address common challenges and opportunities.

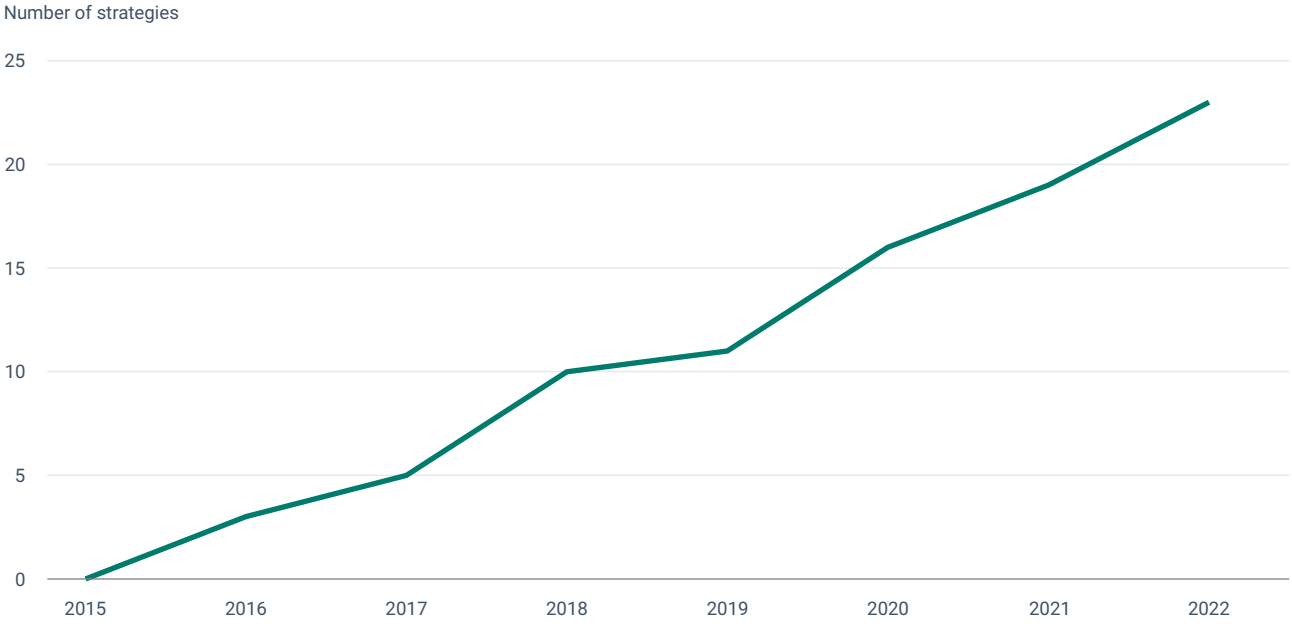
The EEA is an active contributor to several of the leadership groups, especially on textiles and the circular economy-biodiversity nexus.

3.2 Policy: national implementation

As noted above, the European Commission encourages Member States to develop national strategies to support and complement EU-level strategy. In 2022, the EEA conducted a study on the implementation of circular economy policy at national level (ETC, 2022). This found that beginning from the launch of the first CEAP in 2015, a significant number of national circular economy strategies, roadmaps and action plans have been adopted in 23 EU Member States (Figure 3.2).

Through this study, countries reported major institutional challenges in developing circular economy strategies. This likely reflects the substantial effort and consensus building needed to develop and adopt such strategies in concrete policies. It appears that many Member States consider their first plan to be a starting point only, as is reflected in the fact that several Member States have already adopted second circular economy plans. A tendency to adopt a generic circular economy strategy first and then define detailed action plans after wide-reaching stakeholder involvement can be observed in many countries. All Member States reported that they are integrating circular elements in other policies such as those relating to waste management, climate and public procurement. National circular economy policy documents carry a variety of names, including strategy, roadmap and action plan, reflecting national norms or a particular emphasis being given to the policy. However, analysis of these documents indicated that most follow a similar general structure, as shown in Figure 3.3 below.

Figure 3.2 **EU Member States with adopted national circular economy strategies (2022)**



2015	2016	2017	2018	2019	2020	2021	2022
	Belgium	Italy	Denmark	Poland	Germany	Cyprus	Romania
	Finland	Portugal	France		Latvia	Czechia	Austria
	Netherlands		Greece		Malta	Ireland	Bulgaria
			Luxembourg		Spain		Estonia
			Slovenia		Sweden		

Source: EC, 2019.

Figure 3.3 **Building blocks for a circular economy strategy**

Source: Developed by EEA based on ETC, 2022.

In terms of focus areas for measures, a number of priority areas were observed frequently across the countries, including food, textiles, plastics and construction, as shown in Figure 3.4. These areas are also identified as key value chains within the CEAP and so a good alignment can be observed here. It is interesting, however, to see less focus on other key value chains from the CEAP, with some mentions of packaging and electronics and relatively little attention to vehicles and batteries.

Figure 3.4 **Popular priorities listed within national circular economy policies**

Source: Developed by EEA based on ETC, 2022.

Regarding innovative approaches and good practice for public policy, research and innovation has been identified as a key area. Fourteen Member States reported examples of funding for research programmes and innovation hubs to support the testing, development and upscaling of circular solutions. Thirteen countries shared examples of educational and training initiatives, awareness raising, financial support programmes and public procurement action. Extended producer responsibility (EPR) schemes are also reported to be an increasingly used instrument.

Eighteen countries reported on developing circular economy initiatives in the context of post-COVID national recovery plans. Several countries are also preparing measures and plans to support large, medium-sized and small enterprises and start-ups to develop more circular business models and activities, or measures to stimulate and expand interdisciplinary collaboration and partnerships. Although financial support programmes were often mentioned as good practice, it was noteworthy that only two countries referred to the sustainable finance taxonomy. The survey highlighted the complexity and interdisciplinary nature of the transition to a circular economy and the need for co-creation of cohesion policies. It revealed the need to improve the collaboration, complementary work and exchanges between institutions, institutional levels and stakeholders.

The institutional challenge involved in developing policy for a complex cross-sectoral issue is still considered the main obstacle to transitioning to a circular economy. Further, Member States perceive market reluctance to accept and/or use recycled resources as a more important barrier to circularity than companies' ability to grasp opportunities. The survey showed that developing policies is only a first step and that the major challenge is in fully implementing these plans.

A development in the role of government — from being mainly a regulator to also acting as a facilitator for the circular economy domain — is evident, as shown by many examples of good practice in innovation and wide-reaching stakeholder involvement. An interesting new development is that some countries and regions are embedding circularity more broadly in their strategies and legislation, going beyond the transposition of EU directives. Examples of legislative measures to support the circular economy transition are shown below.

- **France**
  In 2020, the law against waste and for the circular economy was adopted with 50 measures (Loi no 2020-105). Its aims include promoting reduced consumption of non-renewable resources, reuse of waste as a resource, recycling of 100% of plastics and strengthened provisions against food waste (French Government, 2020)

- **Ireland**
  The Circular Economy Act defines the circular economy for the first time in Irish domestic law. It underpins Ireland's shift to a more sustainable pattern of production and consumption that retains the value of resources in the economy for as long as possible. Measures in the legislation include incentivised use of reusable and recyclable items and a National Food Waste Prevention Roadmap (Irish Government, 2022).

- **Romania**
  Romania has adopted Governmental Decision no 927/2023 on the circular economy action plan. The document includes horizontal actions and sectoral objectives for agriculture and forestry, the auto industry, construction, food and drinks, packaging, textiles, electrical and electronic equipment, batteries and accumulators, waste, and water and wastewater (Romanian Government, 2023).

- **Spain**
  In 2019, the Circular Economy Law (Law 7/2019) of Castilla-La Mancha was published, the first legal regulation of its type to be approved in Spain. It was issued with the aim of promoting a more innovative, competitive and sustainable development model in the region. It was followed by the adoption of the Castilla-La Mancha Circular Economy Strategy 2021-2030, which covers, among other things, the areas related to the efficient management of resources, production, consumption, waste and innovation (Castilla-La Mancha, 2019).

Actions to promote circularity

The EEA found that countries that launched circular economy policies at the end of 2020 or 2021 mostly report measures or actions that have only just begun or whose implementation is yet to happen (ETC, 2022). This is also the case for countries that have created an action plan following up on their circular economy strategy. Nonetheless, some of the early circular economy policy adopters were able to report some implementation or evaluations. Examples are shown below.

- **France**
  France has adopted a wide range of innovative measures to promote circularity. These include establishing four new EPR schemes for construction products, do-it-yourself products, sports products and toys. Other measures include a repairability index for electrical and electronic goods and a ban on destroying unsold new products across a range of product types. There is now an obligation on the home appliances sector to offer second-hand spare parts to maintenance and repair services, along with the establishment of minimum availability periods for spare parts for certain products.

- **Germany**
  The development of ProgRess III, the German Resource Efficiency Programme, was supported by a citizens' dialogue, which focused on measures that are particularly relevant for citizens and in whose implementation they can be involved. The resulting citizens' advice has been attached to the programme as an appendix.

- **Netherlands**
  The 2017 Raw Materials Agreement was signed by more than 400 parties from government and industry and sets out what is to be done to ensure that the Dutch economy can run on renewable resources. Additionally, in 2018, the government and the signatories to the agreement drew up Transition Agendas, focusing on sectors and value chains that are important to the economy but also carry a high environmental burden: plastics, consumer goods, manufacturing, construction, and biomass and food.

- **Portugal**
  At the national level, initiatives were based on dedicated policy instruments such as green taxation, voluntary agreements and the Portugal 2020 environmental network. The seven macro activities introduced other complementary initiatives that aim to contribute to making the classification of by-products and the application of end-of-waste criteria more expeditious through new waste legislation, reducing primary consumption of single-use plastic produced from fossil sources and promoting the extraction and regeneration of value-added materials from waste streams.

- **Sweden**
  National actions implemented in Sweden to date include establishing a national platform for sustainable fashion and textiles that provides support and education to actors along the value chain, including good practice examples. Authorities are also advancing with actions for a sustainable textile value chain with a focus on the environment and chemicals. Plans include establishing a national coordination action with the aim of disseminating knowledge about plastic and microplastics, and strengthening knowledge on non-toxic production through industry support.

Box 3.2

Circular economy beyond the EU

The circular economy is also actively promoted at the international level, including through work by international organisations with the participation of and promotion by the EU institutions and countries. Beyond the EU, other EEA member countries have reported moving to circularity and there are significant policy movements in other major global economies, including China, Japan and the United Kingdom. Some of these initiatives were introduced some time ago. For example, the Chinese law for the promotion of the circular economy entered into force in 2009.

In an international context, the UN has built on well-established support for greater sustainability with a specific resolution on enhancing the circular economy. This resolution recognises the role of a circular economy in achieving sustainable consumption and production in the context of contributing to addressing climate change, biodiversity loss, land degradation and the impact of water stress and the impact of pollution on human health (UN, 2022).

The OECD has also been active on the circular economy and has produced a series of studies and reports examining the role of circularity in areas such as trade and producer responsibility. A recent focus area for the OECD has been cities and regions, which have a key role as promoters, facilitators and enablers of circularity. This work highlights the importance of having adequate economic and governance conditions in place to unlock this potential.

In 2015, the G7 Alliance on Resource Efficiency was established with the aim of advancing policy discussions in support of resource efficiency, circular economy, sustainable material management and the 3Rs (reduce, reuse, recycle). The G7 Berlin Roadmap on Resource Efficiency and Circular Economy was published in 2022, committing the G7 countries to continue working on issues such as resource efficiency indicators, food waste, green public procurement and product lifetime extension policies.

More recently, the G20 established the Resource Efficiency Dialogue. The main objective of this process is to make the efficient and sustainable use of natural resources a core element of G20 talks. In doing so, the member countries agreed to promote sustainable consumption and production patterns within the G20 and beyond in order to achieve the global Sustainable Development Goals.

3.4 Monitoring implementation of circularity

The overall ambition of the CEAP to prompt far-reaching changes in Europe's economy and society will require significant effort and investment. As such, effective monitoring is crucial to inform and support policymaking, business decisions and consumption changes. The CEAP emphasises the need for metrics such as consumption and material footprints to account for environmental impacts associated with prevailing production and consumption patterns. In addition, there is a need for data and knowledge to highlight the links between circularity and the key environmental challenges of climate, biodiversity loss and pollution. Some key goals and ambitions articulated within the CEAP include:

- doubling CMUR in the coming decade;
- decoupling economic growth from resource use;
- keeping EU resource consumption within planetary boundaries;
- reducing the EU consumption footprint;
- reducing total waste generation;
- halving the amount of residual municipal waste within a decade.

These are non-binding ambitions without baselines and timeframes and are mostly unquantified. They serve a useful purpose to provide inspiration and direction on implementing policies and allow a degree of flexibility with regard to achieving the goals, which was especially helpful in the early stages of circular economy policy development. However, this approach comes at the cost of reduced incentive and rigour. Previous experience in environmental policy has shown that binding targets can provide a powerful force for change. Strong targets must be underpinned by strong data and, to date, monitoring systems may not have been sufficiently focused on circularity to provide adequate datasets to determine performance against binding targets. As circular economy monitoring matures, introduction of hard targets in selected areas would undoubtedly accelerate implementation.

EU monitoring framework for the circular economy

In 2018, the European Commission launched the Circular Economy Monitoring Framework (CEMF) ([6]) which uses statistical data gathered through ongoing reporting activities. This approach offers considerable advantages in terms of good data availability, established reporting channels and quality assurance measures, but it also imposes limits on the choice of indicators to be reported. In 2023, the framework was strengthened with additional indicators to better address the production side of the economy, the circularity contribution to the EU's open strategic autonomy ambition and aspects such as material and consumption footprints. It also now includes a horizontal dimension about global sustainability and resilience that addresses the nexus between circularity and climate neutrality. The structure of the CEMF is shown in Figure 3.5.

([6]) https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework

Figure 3.5 Circular Economy Monitoring Framework indicators

CIRCULAR ECONOMY MONITORING FRAMEWORK				
Production and consumption	**Waste management**	**Secondary raw materials**	**Competitiveness and innovation**	**Global sustainability and resilience**
Material footprint	Recycling rate of municipal waste	Circular material use rate	Private investments	Consumption footprint
Resource productivity	Waste recycling rate — excluding major mineral wastes	End-of-life recycling input rates — aluminium	Persons employed	GHG emissions from production activities
Green public procurement	Recycling rate of overall packaging	Imports from non-EU countries	Gross value added	Material import dependency
Total waste generation	Recycling rate of plastic packaging	Export to non-EU countries	Patents related to waste management and recycling	EU self-sufficiency for raw materials — aluminium
Waste generation — excluding major mineral waste	Recycling rate of WEEE separately collected	Intra EU trade		
Municipal waste generation				
Food waste				
Packaging waste generation				
Plastic packaging waste generation				

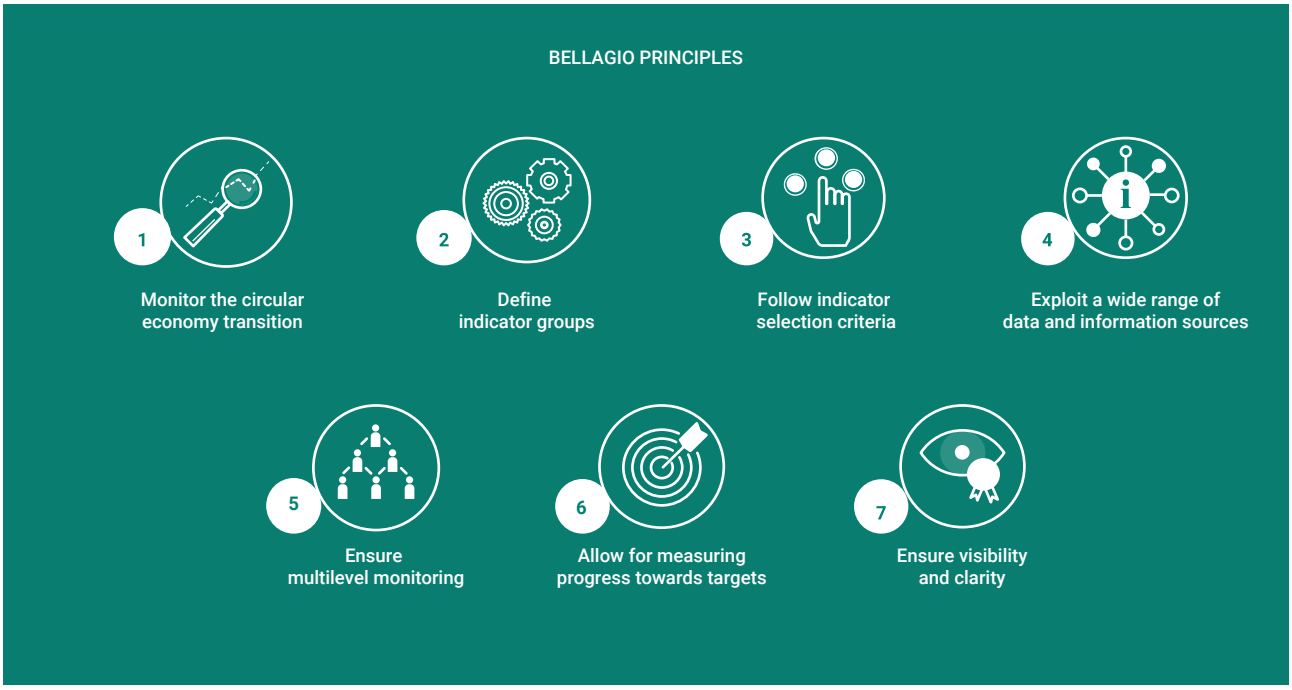
Source: Eurostat, 2023d.

EEA work on circular economy monitoring

The Bellagio Declaration on principles for monitoring the circular economy was established in 2020 as the culmination of a process led by the EEA and Italy's Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA). The Declaration was endorsed by the EPA Network ([7]) and mentioned by the Council of the European Union in the Council conclusions on Making the Recovery Circular and Green ([8]). The declaration articulates a set of seven principles capturing the essential elements of a monitoring framework for the transition to a circular economy, as shown in Figure 3.6.

([7]) Meeting of the Network of the Heads of European Environmental Protection Agencies, December 2020
([8]) Council conclusions as approved by the Council at its 3,782nd meeting, December 2020.

Figure 3.6 **Bellagio principles on monitoring the transition to a circular economy**



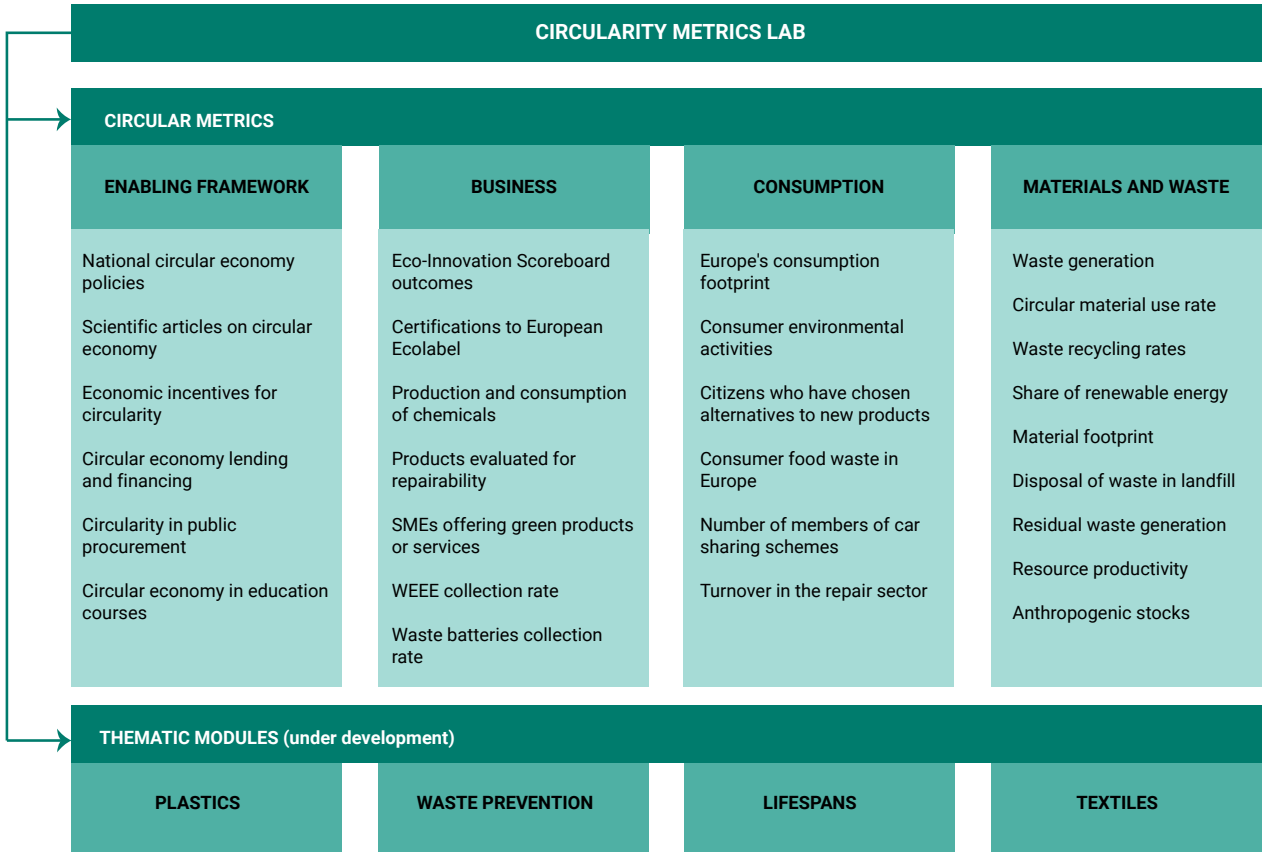
Source: EEA, 2020f.

These principles provide an overall framework to groups towards the development of circular economy metrics as well as for the development of a conceptual monitoring framework. They have informed and supported indicator development within the EU and in international organisations such as the OECD and UNECE. The EEA and ISPRA are currently contributing to the joint work of the United Nations Economic Commission for Europe – Conference of European Statisticians (UNECE-CES) Task Force on measuring the circular economy and the OECD Expert Group on a new generation of information for a resource-efficient and circular economy. Within its core set of environmental indicators, the EEA also maintains three indicators to support the monitoring of the trend towards a circular economy: CMUR, Europe's material footprint and Europe's consumption footprint. These are complemented by other relevant metrics on topics such as waste management and recycling.

EEA Circularity Metrics Lab

The EEA recently established the Circularity Metrics Lab (CML) which uses an experimental approach to capturing the initiatives and innovations that characterise a functioning circular economy. While the CEMF sets out a series of top-level indicators to track the state of the circular economy, there is also a benefit in building an understanding of other more operational activities that reflect progress towards circularity and attempt to fill the gaps of official statistics by experimenting with data and information not regularly reported to Eurostat. The CML is an online dashboard that presents the metrics sets according to four thematic areas: enabling framework, business transformations, consumption patterns and materials and waste. The CML gathers a diverse group of metrics ranging from well-established and EU-wide 'indicators' to other less substantive 'signals', which include scientific studies, surveys and country-level datasets. The CML also uses novel data-gathering techniques such as web-scraping to source new insights. Initially, the CML comprised a set of 28 metrics (Figure 3.7) and it will be continuously updated and elaborated as new data and metrics become available.

Figure 3.7 **Schematic of EEA Circularity Metrics Lab**



Source: Circularity Metrics Lab.

Looking ahead, the CML will be developed to present thematic modules on areas of particular interest for monitoring the circular economy. These will present sector/material-specific data and assessments; the first modules on plastics and waste prevention will be published in 2024.

International efforts on circular economy monitoring

The UNECE-CES Task Force on Measuring Circular Economy started work in 2021 with the mandate to:

- find a widely accepted definition for the circular economy and define the measurement scope;
- understand how to measure the physical and monetary aspects of a circular economy;
- learn from each other and obtain advice on how to go forward with measuring the circular economy in their own organisation;
- use synergies with other international expert groups;
- develop a globally harmonised terminology and methodology for measuring the circular economy.

Building on earlier work on sustainable materials management and sustainable consumption and production measurement, the OECD focused on the transition towards a circular economy in 2017. It did so through the establishment of the OECD Expert Group on information for a resource-efficient and circular economy, which is closely coordinated with the work of the UNECE-CES Task Force. The OECD group leads on providing the policy background and developing a conceptual monitoring framework and related indicators, while UNECE-CES leads the work on the measurement framework, statistics and data sources.

National efforts on circular economy monitoring

In the course of the EEA study on national implementation of circular economy plans, 15 countries reported the development of monitoring frameworks, often based on or containing indicators from the EU CEMF, complemented with additional metrics of national interest. Compared to a previous assessment of progress in this area (EEA, 2019), more countries have introduced consumption-based indicators such as material footprints. Additionally, 18 countries have introduced circular economy targets, and several countries have already adopted long-term targets for their circular material use rates.

3.4 Assessment

Leadership on circular economy at EU level has generated a robust and dynamic set of policy ambitions and underpinning actions. National implementation of this transformative approach is following, with national plans mostly in place, although progress is variable. Realisation of circular ambitions will require targeted investment and improved technical capacity at Member State level. In general, the policy framework for circularity is in a good position, although Member States will need time to convert high-level policy ambitions and legislative requirements into national measures.

The task of reprogramming an entire economic system is mammoth and will require continued attention and effort in the coming years and decades. Member States will need continued support and direction to drive the implementation. At present, the CEAP and its related instruments have set relatively few hard targets, which could lead to circular actions being deprioritised in favour of other areas where targets are in place. Introduction of targets would raise the priority of circular economy actions for national authorities and ensure focus on implementing actions that generate measurable outcomes.

The EU policy signal has also prompted national-level policy innovations, and several Member States have introduced interventions to further their circular ambitions. There is a good opportunity to leverage this innovation, as many of these could also be applied in other Member States. Establishing knowledge exchanges and mentoring frameworks would allow front-runners to share experiences on the successes and challenges for introducing novel circular actions.

Monitoring of circularity is being done in a variety of ways, from Eurostat's high-level indicator framework to national-level monitoring initiatives and the EEA's Circularity Metrics Lab. There are challenges in comprehensively measuring the circular economy, although existing statistics provide good information on some aspects. In other areas, however, existing sources only provide partial information, are slow to respond to change or are vulnerable to confounding factors. Resolving these challenges will require further attention, including harmonisation of definitions and potentially additional reporting activity.

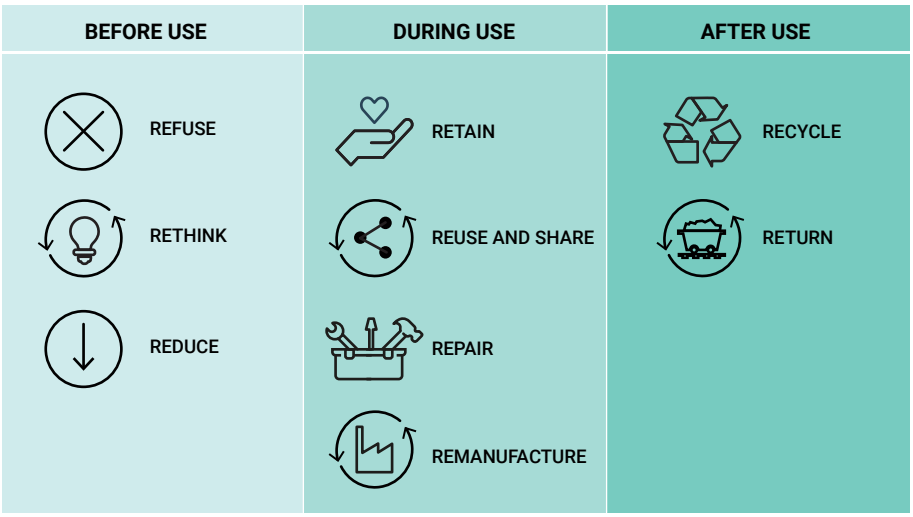
4 Implementing circular actions

Key messages

- Circularity approaches that reduce raw material demand should be prioritised, including the activation of eco-design requirements and promotion of product service system models.
- Extending the lifetime of consumer products is important in a circular economy and this will require attention to managing costs and increasing trust in repaired and upgraded items.
- The waste sector must transition towards a business model focused on providing high quality recycled materials as feedstock for industry.

Responding to circular policy involves implementing measures through the actions introduced in Chapter 1. A successful transition to greater circularity will require coherent developments across all of the aspects represented in the 'before use, during use and after use' framework.

Figure 4.1 **Actions for increased circularity**



Source: Developed by EEA based on Potting et al., 2017.

4.1 Before use

Demand for new products drives the extraction and processing of raw materials, which creates a heavy environmental and climate burden. The subsequent manufacture and distribution of these products causes further stress in the immediate term and into the future. In this context, the decisions and actions taken prior to a product's creation are a critical aspect of building a sustainable circular transition.

Refuse

Avoiding unnecessary consumption by organisations and individuals is fundamental to managing our environmental footprint. The prevailing economic model grounded in acquisition of increasing stocks of products cannot be sustained without continuing environmental harm. Consumption — individual and corporate — that involves buying additional products due to trends and styling, adding to household and public stock, should be minimised, and unsustainable business models such as fast fashion should be restricted. Greater attention must be given to sufficiency as an alternative viewpoint, whereby supply and purchasing decisions are carefully made with regard to avoiding unnecessary production and consumption. In this approach, individuals and organisations need to consider meeting their needs through products already available to them before purchasing additional products and services. At the same time, marketing should be constrained for products that do not provide additional value for society.

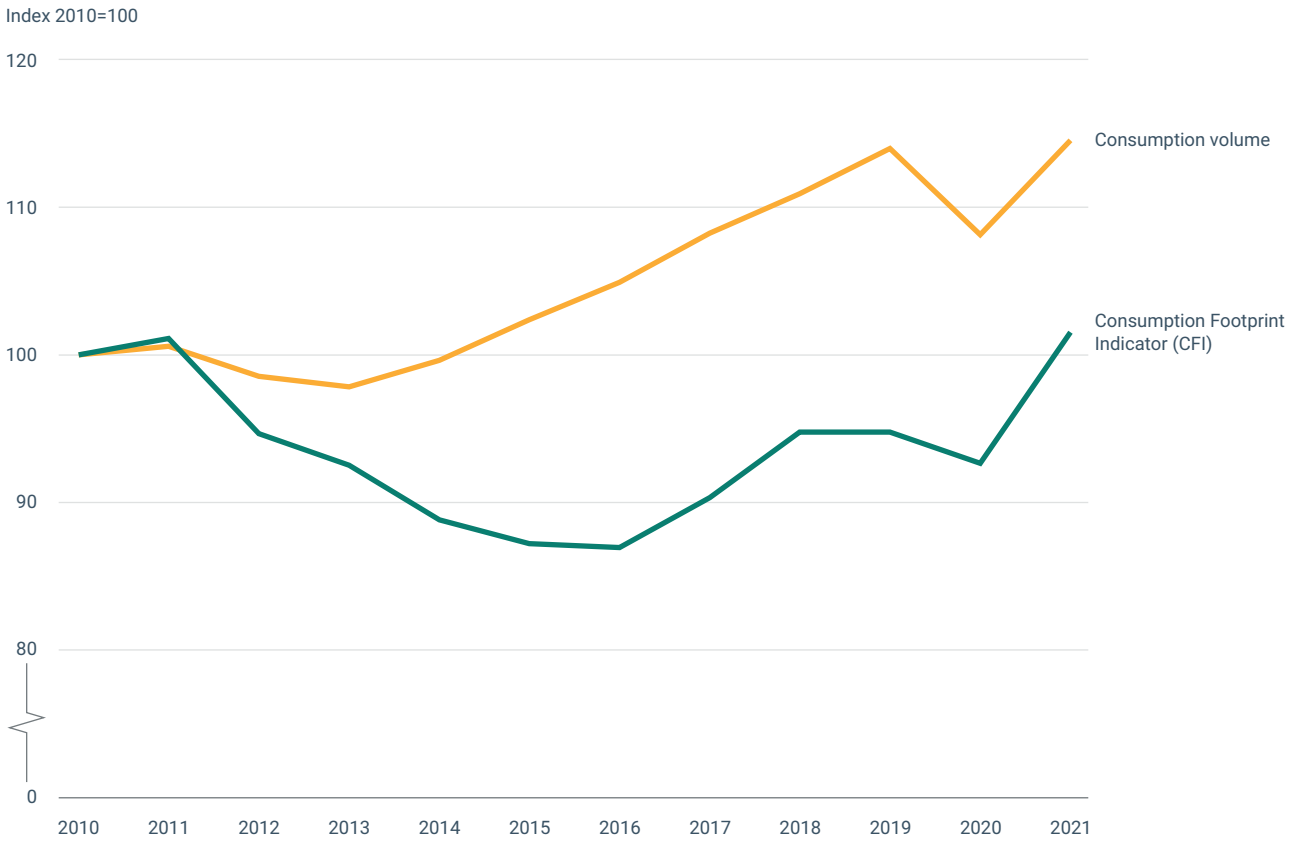
Illustrative example: consumption footprint

A consumption footprint comprises a set of indicators to assess the environmental impact of consumption. It aggregates several indicators in a single score that represents all types of impacts on the environment and climate caused by consumption of goods and services. Overall, the EU-27's consumption footprint is considered high, as it exceeds the planetary boundaries for several impacts, including on climate change and land use. The largest element of consumption is housing; other key elements are food, household goods, mobility and services. Starting from 2010, the consumption footprint decreased until 2015, remained constant in 2016 and increased again until 2021 with a dip in 2020. Macro-economic analysis suggests two main drivers for this trend (ETC, 2023).

First, the consumption volumes to satisfy EU-27 final demand are growing in line with increased affluence, with some contribution from slight population growth. In each domain, the volume of consumption shows an upward trend; however, growth is less up to 2015 and accelerates from 2016 onwards, with a dip due to COVID-19 measures. Increased consumption volumes have an overall upward effect on the consumption footprint. However, despite a 30% increase in the volume of consumption, it increased only slightly between 2010 and 2021.

The second driver relates to changes in the consumption footprint per volume unit of consumption and gives some explanation to this smaller than expected rise in the footprint. The influence of this driver reflects environmental efficiency gains due to improved production efficiency, reduced emissions resulting from technological advances and policy impetus. The reduction in the consumption footprint per volume unit of consumption is evident along the time series, but it is more significant up to 2015.

Figure 4.2 EU Consumption volumes and consumption footprint



Source: ETC.

The combined effect of these two drivers is illustrated in Figure 4.2, showing an upward trend in consumption volume, with a widening gap between the two curves. Due to the effect of the first driver, changes in consumption volume affect the footprint. This is visible in how the curve of the consumption footprint broadly tracks the movements of consumption volume. The gap between the lines is due to the second driver: a reduction in the consumption footprint per unit of consumption volume. Since the effect of this driver is weaker post-2015, the growth of the gap slows down in that period. This indicates that while environmental improvements in production are influencing the footprint, they are not sufficient to cancel out the consequences of increasing consumption volumes in the EU-27.

Rethink

Initial design decisions such as what materials are used and how parts are connected affect the lifetime of a product and whether it can be repaired, remanufactured or recycled. The product design phase can thus be considered the most important phase in successfully creating circular lifecycles (EEA, 2017). Good circular product design is the critical innovation point that makes possible implementation of circular business models, such as take-back systems, remanufacturing, repair and recycling. A key requirement for successful implementation of circular design strategies is that design decisions are driven by market and user requirements. Design for durability, for example, might require the use of high-quality materials, which increase the quality and lifetime of a product. This is acceptable for premium segments of the market but may not be tolerable for price-conscious consumers.

The introduction of digital product passports at design stage would improve recycling by recording constituent materials and configurations, while also supporting lifetime extension by informing maintenance, repair and upgrade strategies. They are envisaged under the ESPR but will require careful development to ensure that underlying systems deliver long-term access and comparable data while also protecting commercially sensitive product details.

Performing a function or providing a service does not always require ownership of a product by the user. An alternative approach is provided by product-service systems, whereby the focus is not on the physical object performing the function but on the desired experience or outcome. This concept is well-established in areas such as linen rental in the hospitality industry and offers potential for applications in other sectors. Similarly, sharing economy models reduce the need for every user to own a specific product and so reduce overall product demand. Digitalisation can enable effective pathways for this. In both cases, there is a risk of non-sustainable offerings, such as customer packages that offer a 'free' upgrade every year. When it comes to specific resources used in products, manufacturers can use their decision-making power to influence raw material supply chains by selecting the most sustainable suppliers based on the principles of sustainable and, when possible, regenerative sourcing.

Illustrative example: car sharing

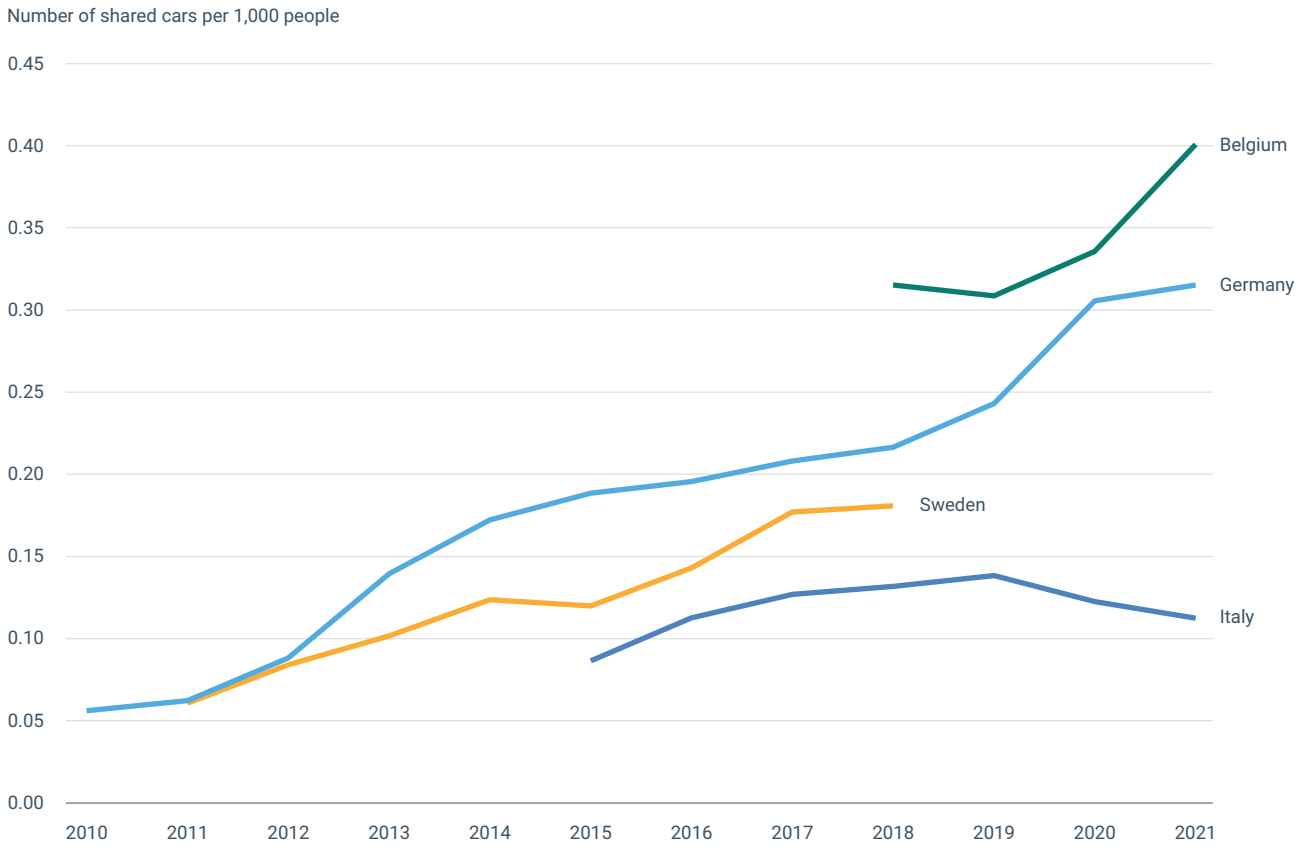
Car sharing is an example of a Rethink measure that helps societies move from an ownership model to a service model, facilitating service provision with reduced resource consumption. Typically, cars are owned and are often only partially used; in 2020, the passenger car fleet of the EU Member States reached 250 million. Car sharing schemes enable cars to be used more efficiently and reduce the number of cars being purchased. Available data for this sector suggests that car sharing is becoming more established in EU countries (see Figure 4.3), although market penetration remains very low in terms of overall car ownership rates.

Also relevant to product design is the choice of materials, which can offer the opportunity to reduce the use of certain materials or to favour recycled materials. A key goal is to strive for clean material loops that allow reuse and recycling without recirculating hazardous substances. Policy is an important trigger for change and can include measures such as banning substances of concern or implementing economic measures that affect material demand in the value chain, such as minimum inclusion rates for recycled material and product standards.

Reduce

In the production phase of the life cycle, the most relevant circular goal to pursue is reducing resource use. There are several ways to achieve lower resource use in the production and distribution phase, including by increasing the resource efficiency of production processes, integrating the use of remanufactured components and using secondary raw materials. Applying ecodesign principles when a product is being manufactured will ensure a long-lasting, reusable and recyclable product that avoids the use of toxic substances, while a persistent focus on efficiency can reduce the environmental impacts from manufacturing. Safe and sustainable by design is an approach to reduce risks to human and environmental health from chemical pollution by minimising the use of hazardous chemicals, which will also enable later recycling of materials in a clean material loop. During manufacturing, circular principles call for product designs that minimise material use, through processes that limit polluting emissions and increase the use of by-products within the same process or in complementary applications.

Figure 4.3 Evolution of number of shared cars per 1,000 people

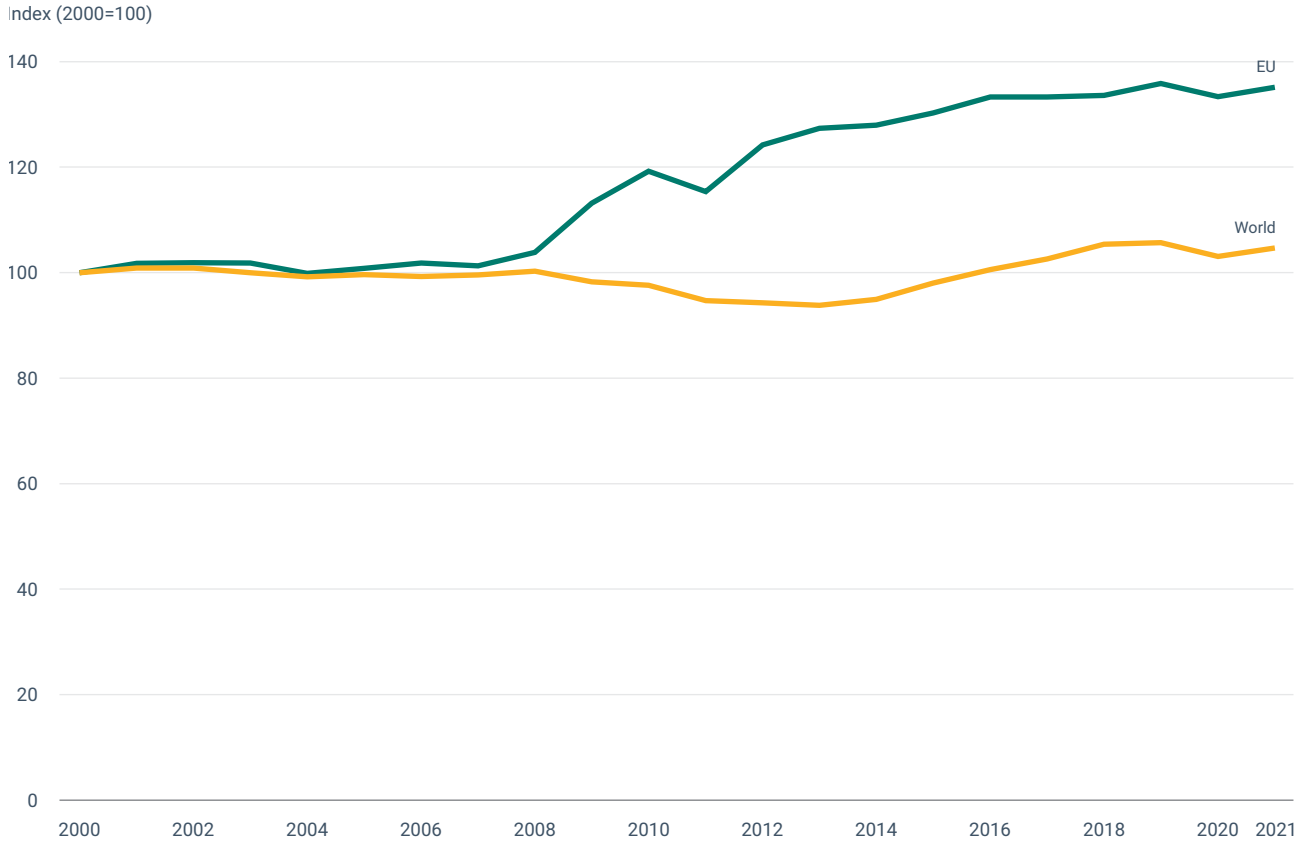


Source: EEA.

Illustrative example: resource productivity

The rate at which an economy produces value from every tonne of resources extracted from the ground is a good proxy to measure resource efficiency. In this case, the economy's resource efficiency is represented by the concept of resource productivity that measures the value created for every kilogram of resources extracted. Figure 4.4 shows that between 2010 and 2021, the EU economy's resource productivity increased by 42%, reflecting the ability of the economy to produce more value for the same amount of resources and indicating that it is possible to grow without imposing extra demand for natural resources on the planet. However, this improvement only refers to the EU economy itself and not to the demand created by EU consumption for resource extraction elsewhere in the world. After stagnation and a period of decline, global resource productivity began to see improvements starting around 2012. These gains have since plateaued resource productivity, with an increasing gap to European performance. In this context, some of the increase in EU productivity is likely to be due to increasing offshoring of production to less-efficient economies across the world.

Figure 4.4 **Resource productivity for the EU-27 and the global economy**



Source: Eurostat, 2023f; IRP, 2024.

4.2 During use

Once a product is created, the optimal course of action is generally to ensure that maximum utility is gained from it, through keeping its functionality high for as long as possible and by seeking ways to increase the intensity of its use. Products owned by individuals and organisations represent an investment in return for an expected period of useful and trouble-free service life. When a product is no longer suitable for its intended purpose, actions such as repair and remanufacturing can restore it to a useful state. Prolonging the use of existing products through the approaches below has significant environmental benefits: it prevents resource extraction and processing, the manufacturing processes required to produce new products and the environmental impacts these entail.

Retain

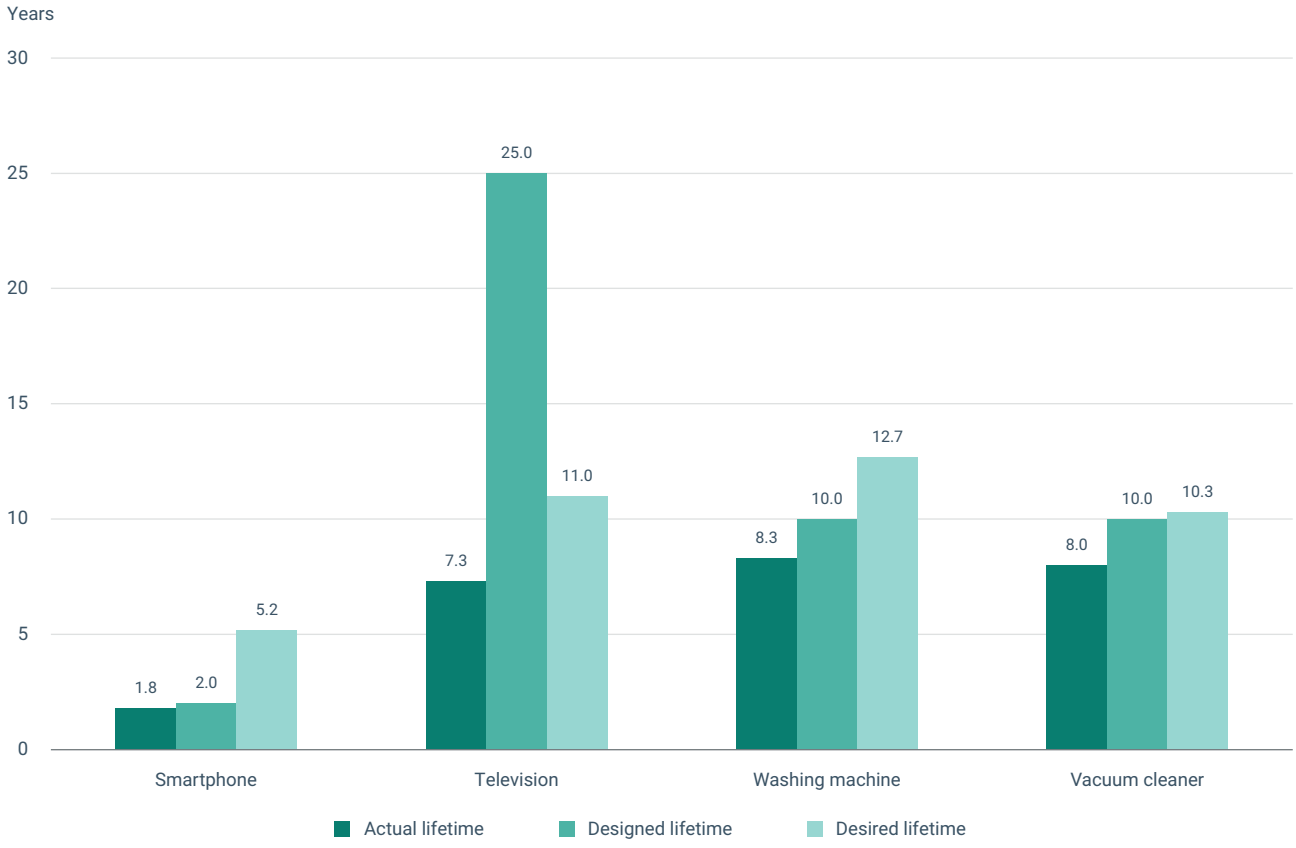
How products are used and maintained is a major determinant of a product's service life. Careful use and preventive maintenance are important actions by users or service providers to ensure products are suitable for their purpose for the maximum time. Therefore, responsible ownership delays product obsolescence and increases service life, providing significant benefits in preventing production of new goods. The situation is not straightforward, and sometimes well-maintained products become obsolete due to technological advances or tighter regulations.

Consumer intentions to retain products can be undermined through marketing campaigns by companies encouraging replacement of items with new products due to minor styling or performance enhancements. In addition, there are instances of planned obsolescence whereby suppliers deliberately control product service life, such as the removal of technical support for older products, forcing consumers to replace working products. Retain is a critical focus area for the circular economy; circularity-minded users should not replace products before the service lifespan is exhausted. Maintenance often requires skills, attention and time, which can be in short supply both for private and public or corporate users.

Illustrative example: product lifetimes

Sometimes social norms and other influences work against the principles of the circular economy, e.g. ever-shorter life span of products reflecting the desire to always own the latest model. Figure 4.5 below illustrates the actual, designed and desired lifetime of smartphones, televisions, washing machines and vacuum cleaners.

Figure 4.5 **Lifetimes for smartphones, televisions, washing machines and vacuum cleaners**



Source: EEA, 2020d.

Except for televisions, a product's desired lifetime is always longer than the designed and actual lifetime. This suggests that consumers throw away products before they are broken, even though they would prefer a longer product lifetime, thus underlining the importance of raising awareness about the environmental impacts of unnecessary consumption.

Reuse and share

When the first user no longer requires a product, new users with similar needs can continue using it for its original function, without any further treatment. The environmental footprint of acquiring goods through reuse is generally minimal, as the products already exist and require no further processing other than relocation ([9]). In some cases, products can reach a point where ongoing reuse is not warranted due to significant technological improvements that mean replacement offers a superior environmental outcome, but this should be informed by life-cycle analysis. Reuse of products spans a wide range of interactions: from informal exchange of items between friends to the large-scale movement of goods donated to the charity sector, many of which are then offered for reuse. Sometimes the transfer of goods involves payment but in many cases it is free. Online platforms are transforming this sector with webstores and peer-to-peer exchange platforms bringing new life to used products. Care should be taken when used goods are exported to other regions, where those used goods may distort local production and cause unfair market competition (EEA, 2023).

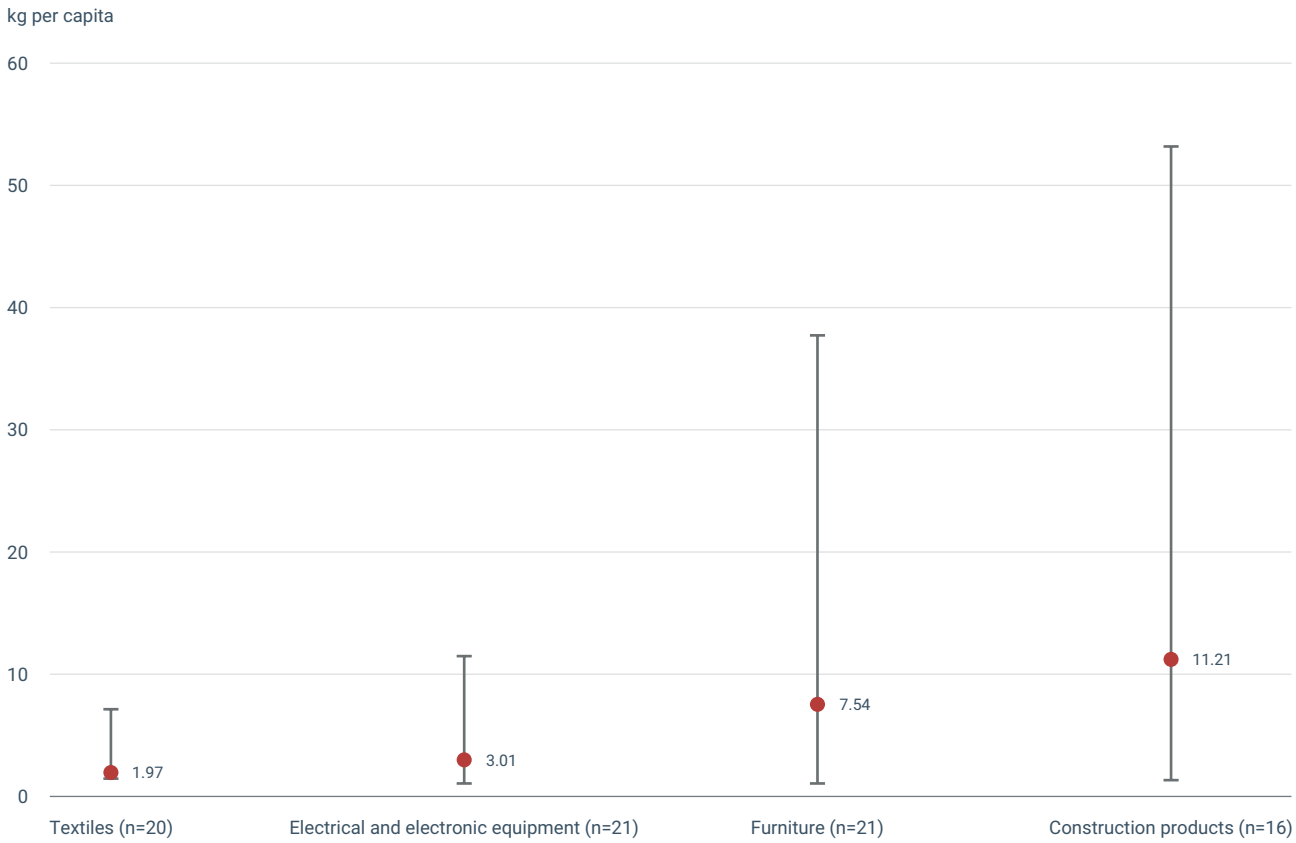
Sharing is a variation on reuse in which the product does not change owner, but an arrangement that allows for its reuse by another person or other people. Like reuse, sharing is widely practised on an informal peer-to-peer basis between friends and families and via online platforms. It can also be realised via monetary agreements in the relatively new business sector known as the sharing economy. Innovations in this area could also be considered as rethinking how function can be provided to a user without needing product ownership — as shown in the car sharing example above (Figure 4.3). Successful implementation of sharing economy models is being assisted by advances in digitalisation that allow users and suppliers to connect and conduct business online.

Illustrative example: EU reuse reporting

The Waste Framework Directive established an obligation for Member States to encourage reuse as part of their waste prevention programmes and to monitor and assess the implementation of this activity. The legal act giving ground to such reporting obligation is Commission Implementing Decision (EU) 2021/19, which sets out a common methodology and a format for reporting on reuse for both qualitative and quantitative aspects. The reporting happens every three years for the quantitative aspects and annually for the qualitative elements. Figure 4.6 presents data gathered in the first round of reporting from this process.

([9]) If items need to be cleaned or repaired prior to reuse, this is defined as 'preparation for reuse'.

Figure 4.6 **Average reported per capita reuse amounts in EU Member States**



Source: EEA, 2024.

The reporting process is new and the methodology is still in development, but data presented above provide the first insights into reuse activity in EU member states. As the reporting process matures, this data stream will provide important evidence on high-level circular action and help to inform policy direction and guide the implementation of support measures.

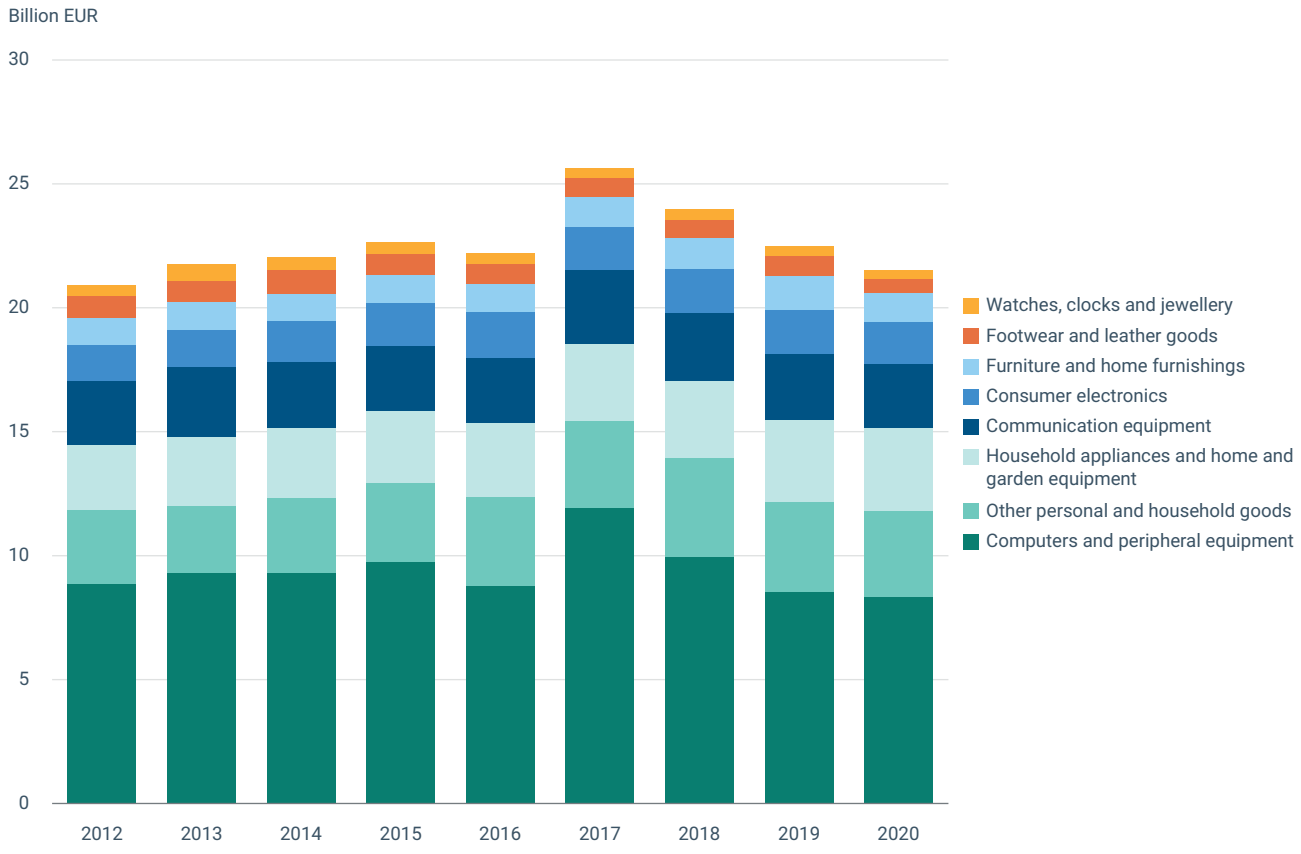
Repair

Repair is an important part of the transition to a circular economy (Lechner et al., 2021), which can lead to extended product use and efficiency, reduced consumption of natural resources and materials and minimised production of waste (Potting et al., 2017). Repair has a high potential to maintain value within the economy, as repaired products have a higher value than the materials extracted from them through recycling at end-of-life (EC, 2016). By 'slowing down' the resource loops, repair can lead to reduced resource use and a more circular economy (Bocken et al., 2016). By fixing defective products to return them to their original functionality, repair enables extended product use, and so leads to reduced consumption of natural resources and materials and minimised waste generation. Ecodesign is crucial to facilitating repair by ensuring that products are suited to repair actions and spare parts are available for the lifetime of the product. Refurbishment is closely related to repair and refers to the upgrade of products that function but may be worn or soiled.

Illustrative example: repair sector activity

Turnover in the repair sector increased between 2012 and 2017 from EUR 20.9 billion to EUR 25.6 billion, aside from a dip in 2016. Following a sharp increase in 2017, turnover then fell to EUR 21.5 billion in 2020 (Figure 4.7). Changes in total turnover are mainly caused by changes in the two largest categories: repair of computers and peripheral equipment (EUR 8.3 billion in 2020) and repair of other personal and household goods (EUR 3.4 billion in 2020). Despite a favourable policy environment, activity levels in the repair sector have been declining since 2017. One reason could be complex legal, strategic and technical issues related to repair activities, while societal behaviour can strongly influence consumer take-up. The high price for repair driven by wages, logistics and spare parts, the unavailability of spare parts and the increased complexity of products are typically considered the main barriers. Often the repair cost is too high compared to the price of a new product, which demotivates customers from choosing repair. Specifically for textiles, the low quality of apparel can be a technical barrier.

Figure 4.7 **Turnover of the business-to-consumer repair sector by product category**



Source: ETC, 2022a.

Remanufacture

Remanufacturing is a value-retention process positioned high up the waste hierarchy, implying a preservation of product functionality, lifespan extension and minor material losses. A number of definitions have been developed to describe this activity and the delineation between remanufacturing and other value-retention processes such

as refurbishment is not clear-cut. The use of the word 'remanufacturing' also varies between countries and industrial sectors. In general, a remanufactured product should be of at least the same quality as the original product and have a warranty. The process typically involves dismantling a product, restoring and replacing components and testing the individual parts and whole product to ensure that it meets its original design specifications. Performance after remanufacturing is expected to be at least to the original performance specifications. From a customer viewpoint, the remanufactured product should be considered the same as a new product. In some instances, the reconditioning process can allow for the introduction of new technologies and may even result in a product with superior performance to the original.

Illustrative example: remanufacturing market size

Many companies are not necessarily aware that they are engaged in remanufacturing; as it often occurs as a B2B activity, remanufacturing is not well known to the public either. In 2015, the ERN Remanufacturing Market Study (Parker et al., 2015) summarised that in the EU, remanufacturing generated around EUR 30 billion in turnover and employed around 190,000 people. Table 4.1 presents conclusions from follow-up research with literature sources and industry experts which suggests remanufacturing markets have not grown significantly between 2014 and 2021 (ETC, 2021). Nonetheless, there are indications of growing interest in some sectors and an increasing number of companies are introducing remanufacturing into their business models.

Table 4.1 Estimates of remanufacturing market sizes by sector

Sector	Estimated remanufacturing market size (EUR bn)		
	2014	2021 (low end)	2021 (high end)
Aerospace	12.4	15.2	16.3
Automotive	7.4	9.1	11.9
Heavy-duty and off-road equipment	4.1	4.2	-
Electric and electronic equipment	3.1	4.4	-
Medical equipment	1	1.32	1.4
Machinery	1	1.04	1.4
Rail	0.35	0.43	0.56
Furniture	0.3	0.42	-
Marine	0.08	0.08	0.16

Source: ETC, 2021.

There is limited reliable and comparable data available at sectoral, national or EU level on market volumes for remanufacturing, which makes detailed market analysis challenging. With the exception of aerospace, where the remanufacturing intensity is estimated to be greater than 10%, the present penetration in the focus industries is likely to be closer to 5%. The largest sectors appear to have mostly maintained a stable market value in recent years, with automotive, marine and rail sectors expected to offer future growth (ETC, 2021).

4.3 After use

After service, end-of-life products are discarded and enter the waste management system for preparation for reuse, sorting for recycling or disposal due to the presence of hazardous materials or other complications. Recycling alone will not solve the environmental pressures of the current economic model, but when applied with other circular actions it is undoubtedly important. Once recyclates are produced, the critical next step is to return them for productive use in the economic cycle.

Recycle

Europe continues to generate large amounts of waste but is increasingly moving towards recycling to realise the resource value in discarded materials. Through mechanical, biological and chemical processes, valuable materials contained within waste are isolated and purified into feedstock for new manufacturing. Although these processes bring additional energy and material usage, recycling is important for improving sustainability, due to the generally lower impacts of recycling processes compared with raw material extraction and primary production. With many recycling techniques available, life-cycle assessment provides an important tool to select the most appropriate process to optimise quality and cost-benefit ratios while avoiding lock-in situations (e.g. high dependence on recycling rather than alternative actions). Across the sector, increased application of advanced technologies for logistics, handling and traceability is crucial to shifting from waste management services to a business model focused on sustainable materials supply (ETC, 2020).

Some of the major sources of secondary raw materials are already widely recycled; however, vast amounts of valuable resources remain uncollected in residual waste streams. To optimise recycling operations, good collection systems must be established along with processes to address potential contamination by hazardous or problematic substances. Moreover, for each material resource available in waste, recycling operations need to be optimised so that the operations themselves cause the least environmental harm. Such developments will require significant investment in infrastructure, stimulated by strong policy drivers and a functioning market for recyclates.

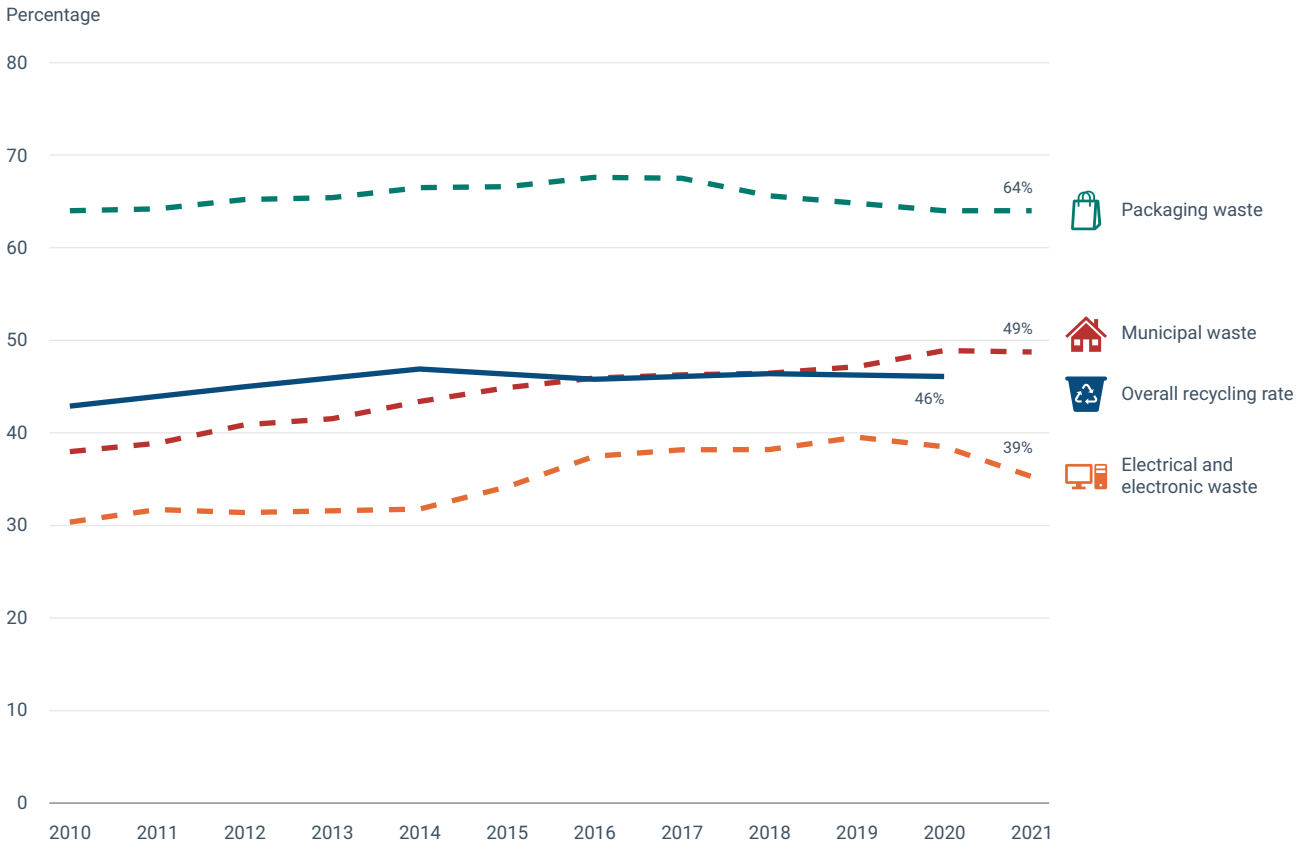
At the end of a product's life, there are good opportunities to develop circular business models, in addition to possibilities for recycling materials, such as the opportunity to dismantle a product and repurpose its components. The fundamental concept in this regard will be changing the nature of the waste sector to a resource management business model. The financial value entrained in discarded products is significant — for example, materials in electronic devices no longer in use are estimated to be worth USD 57 billion annually (WEF, 2020). However, the economics of intensely sorting and recycling waste can be challenging compared to current business models where only selected high-value materials are targeted; further policy measures and investment support may be needed to establish profitability for this activity (EIB, 2023).

Illustrative example: recycling rates

In the EU, the recycling rates of municipal waste, packaging waste and waste electrical and electronic equipment (WEEE) have in general been slowly increasing, indicating a move towards a more circular economy. The overall recycling rate, the ratio of total waste generated excluding major mineral wastes to the quantities managed through recycling, was 46% in 2020. The highest recycling rate was registered for packaging waste at 64% in 2021, followed by municipal waste at 49% and WEEE at 39%, also in 2021.

Until recently, progress on these three key waste streams has been more significant than progress in overall recycling. This reflects the importance of the strong EU policies in driving improvements in waste management. However, the recycling rates for all three waste streams have stagnated and the increasing trends for packaging waste and WEEE have reversed ([10]). Moreover, the overall recycling rate shows little progress in general and still stands below 50%, meaning the majority of generated waste is disposed of in landfills and incineration plants.

Figure 4.8 Recycling rates in Europe by waste stream



Source: EEA, 2023.

Return

Efforts to collect and process materials from waste streams into recyclates are futile unless these materials return to the product value chain as secondary raw materials and replace virgin feedstocks. Recycling technologies need to result in a raw material that has well-specified technical characteristics, so it can be trusted by manufacturers. Finally, the application that uses the secondary raw materials should ensure its availability for future recycling by facilitating easy separation from other materials and avoiding contamination with hazardous substances.

Establishing well-functioning markets for this raw material stream is a fundamental part of achieving a meaningful shift to a circular economy and will be characterised by a consistent stream of materials produced to a suitable specification and at the right

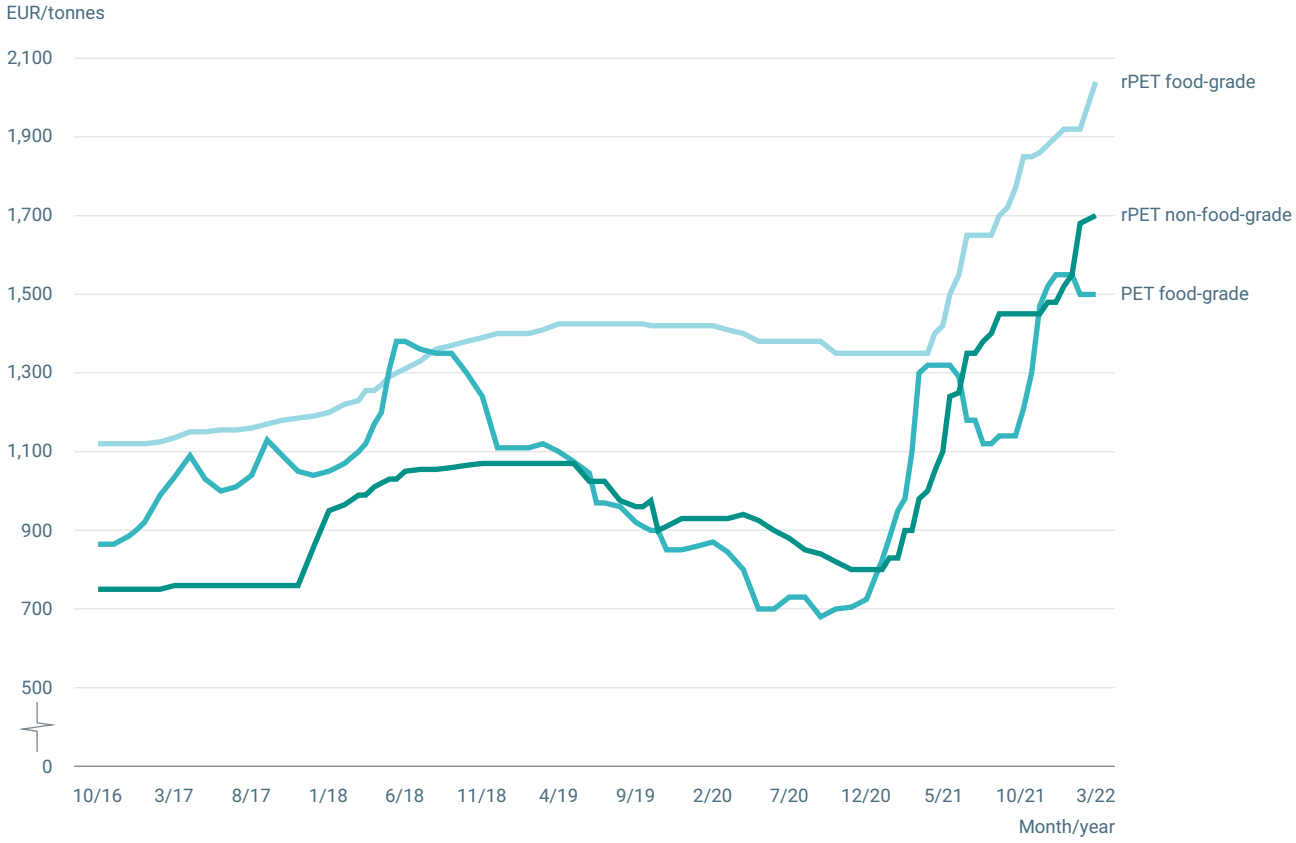
([10]) The methodology for calculating recycling rates for packaging and municipal waste changed for the 2020 data reporting and onwards, with several EU Member States reporting lower recycling rates as a result.

price. The recovery of the materials from waste will be increasingly important in terms of securing the supply of raw materials, especially for those materials that are critical to the functioning and competitiveness of the EU economy. In the future, the extent to which demand for raw materials can be met with recycled materials will depend both on developments in the generation and management of waste and on the quality standards that industry and policy can achieve. Further actions to promote returning materials from waste to production include introducing technical standards and certifications and addressing the price competition between secondary raw materials and primary resources by introducing measures to consider environmental externalities.

Illustrative example: market prices for recycled plastic

Market dynamics are complex and subject to many forces, including consumer preferences and regulatory pressures such as targets on recycled content. One of the recyclates most in demand is polyethylene terephthalate (PET), which is recyclable, is often collected separately and has a wide range of applications. As a result of this strong technical performance, along with increased focus on the use of more sustainable materials, market competition for recycled PET (rPET) is high and has created a previously unseen scenario, shown in Figure 4.9, whereby this recycled plastic commands higher prices than its virgin equivalent (Kahlert and Bening, 2022).

Figure 4.9 **Market prices for rPET food-grade, rPET non-food-grade and PET food-grade**



Source: Kahlert and Bening, 2022.

4.4 Assessment

The circular actions are well defined and represent a good roadmap for progression towards improved circularity. Implementation across the full range of actions is crucial — at before-use, during-use and after-use phases.

At before-use, continuing growth in consumption is a cause for concern. Technological improvements can somewhat offset this but must be supported by adoption of ecodesign principles and a shift to product-as-a-service models.

There is evidence of increased circular activities in EU Member States (ECA, 2023) but there continue to be limited case studies of thriving circular business models, especially for the during-use actions. This is particularly evident in terms of models with the potential to disrupt the status quo by causing large-scale change across an entire sector. This points to an ongoing need for policy and regulatory pressure to accelerate take-up of circular actions within businesses. In addition, a range of support interventions, from fiscal measures to awareness raising, are required to shape consumer behaviour towards a circular economy outlook.

After-use actions are arguably the most mature aspect of the circular economy, reflecting long-standing policy focus on improving waste management practices. Building on previous efforts to improve waste management and increase recycling rates, the focus should now shift to ensuring the production of high-quality recyclates that can perform in materials markets against virgin feedstocks.

5 Consumption in a circular economy

Key messages

- EU material consumption shows a modest relative decoupling from economic growth but consumption levels per capita remain too high.
- The aspirations and affluence of EU citizens are undoubtedly a factor in high consumption rates and more effort is needed to change their behaviour.
- Business operators are introducing more circular product offerings, but the pace is slow and stronger policy action may be needed to speed up this change.

The activity of producing goods to meet customer needs has existed from the earliest human societies. It is a fundamental element of providing the goods needed for safe, comfortable lives and provides a model for building prosperity. In the current economic model, consumption is strongly correlated with the production of goods and, as such, is a fundamental driver of resource extraction and the associated environmental and climate impacts. However, it is also true that in the current economic paradigm, the productive sector significantly influences consumers to increase their purchasing, thus boosting company profits. Stimuli can range from marketing campaigns encouraging ownership of newer or additional products to planned obsolescence strategies that force consumers to replace functioning products. As humanity grows in population and wealth, society is increasingly consuming — and therefore producing — in a manner that is not sustainable.

5.1 Consumption

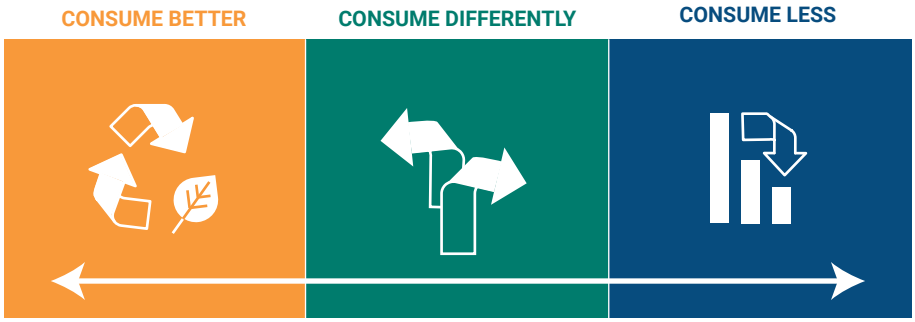
In a consumption context, circularity is about organisations and individuals making sustainable purchases and use of the products and services, and about companies supplying products and services in circular ways. The goal is to ensure responsible consumption and production patterns to sustain the livelihoods of current and future generations, in line with the aspirations articulated in the Sustainable Development Goals (Goal 12). Consumption volumes within the EU continue to grow (see Figure 4.1). A drop was observed for 2020 but this is likely due to the effect of measures to address the COVID-19 pandemic (EEA, 2023). In the absence of high levels of circularity, this increasing demand for products and services is inevitably matched by a significant increase in demand for raw materials.

Understanding and managing consumption patterns plays a crucial role in moving towards the circular economy. Reduced environmental pressures from consumption will be achieved through actions across all of the product cycle, but particular

focus is warranted on the before-use aspects. The consumption contribution to refuse, rethink and reduce actions are reflected in three core principles for circular consumption (EEA, 2023):

- **Consume better** by using products that enable circular consumption and reduce environmental impact.
- **Consume differently** by embracing new practices such as the sharing economy or second-hand goods, or by shifting to goods and services with less negative impacts.
- **Consume less** by buying only what is needed and keeping existing products in use for longer.

Figure 5.1 **Principles of sustainable and circular consumption**



Source: EEA, 2023b.

These principles provide a strong model for leveraging the principles of the circular economy to realise a responsible consumption paradigm within Europe. Education and awareness raising are important to inform consumers — individuals and organisations — about their role, but governments and businesses need to act to enable the move to sustainable consumption. More circular and sustainable goods and services must be supplied at prices competitive to linear economy options, adequate collection schemes and recycling infrastructure must be provided and consumers must be informed of the benefits of returning used products for recycling as part of good waste management. Across each of the three aspects, all consumers, from individual shoppers to corporate procurement specialists, must be informed and empowered to make decisions that bring consumption levels and habits within sustainable limits.

Consume better

The key to enabling circular consumption lies in product design; this applies both to products manufactured within the EU and those manufactured in other countries and placed on the EU market. By adhering to ecodesign principles, products can be created to have a longer lifespan, be easily repairable and easy to recycle. This aligns with the Rethink strategy, which emphasises the need to reconsider traditional product design approaches. By implementing these principles, products can be made available that are durable and long-lasting and contribute to a more sustainable and circular economy. In addition, ecodesign can result in products

containing reduced, or no, toxic substances, thereby enabling a clean material cycle with improved consumer safety (Reduce strategy). In many applications, consumers can choose products made with renewable materials, enabling them to reduce environmental impact without sacrificing functionality. At organisational level, these factors can be formally integrated into purchasing decisions by applying green criteria in procurement processes, for both public and private sector organisations. While ecolabels aim to inform consumers and encourage them to make sustainable choices, product policy has the power to make sustainable products the norm (Lorek et al., 2021).

Consume differently

Shifting consumption to alternative, more sustainable and less material-intensive options is an additional way to reduce the environmental effects of consumption. Circular business models offer opportunities for producers and consumers to reduce overall consumption in terms of material or product use (Rethink strategy). Collaborative consumption models, for example, allow consumers to participate in sharing or renting, providing temporary access to a product instead of permanent ownership (Luri Minami et al., 2021). As multiple people have access to the product or service, the purchase costs and possible maintenance costs are shared. Apart from business initiatives, expanding accessible and affordable public services can also reduce the need for private consumption and allow existing and new forms of community-based and shared consumption. Many examples already exist, such as public transport and libraries, but to increase consumers' commitment to sharing, businesses need to implement easy-to-use sharing platforms and make them widely available. Digitalisation has further promoted the adoption of collaborative consumption models by the emergence of a broad range of applications, such as sharing platforms and second-hand marketplaces (EEA, 2023).

Consume less

As noted, European consumption levels are high, growing and resource-intensive. Even with relative decoupling of environmental pressures from economic growth, growing consumption and associated production continue to drive resource extraction to unsustainable levels that cannot be adequately addressed through increased recycling alone. Adhering to the principle of consuming less, purchasing decisions at an organisational and personal level should follow consideration of whether a new product or service is needed. This approach aligns with the Refuse strategy, which emphasises the importance of actively declining unnecessary purchases and reducing unnecessary supply by companies. In addition, consumers and producers can help others to avoid purchases by participating in reuse systems (Reuse strategy), which can include donating to and buying from charity, selling and buying at second-hand marketplaces or peer-to-peer exchanges of surplus equipment between organisations, citizens and businesses. Extending a product's lifespan by enhancing its durability and repairability is key to reducing the material use associated with consumption (Repair strategy) (Konietzko et al., 2020). Apart from physical durability, products should be designed and marketed for emotional durability so that consumers want to keep them in use for longer.

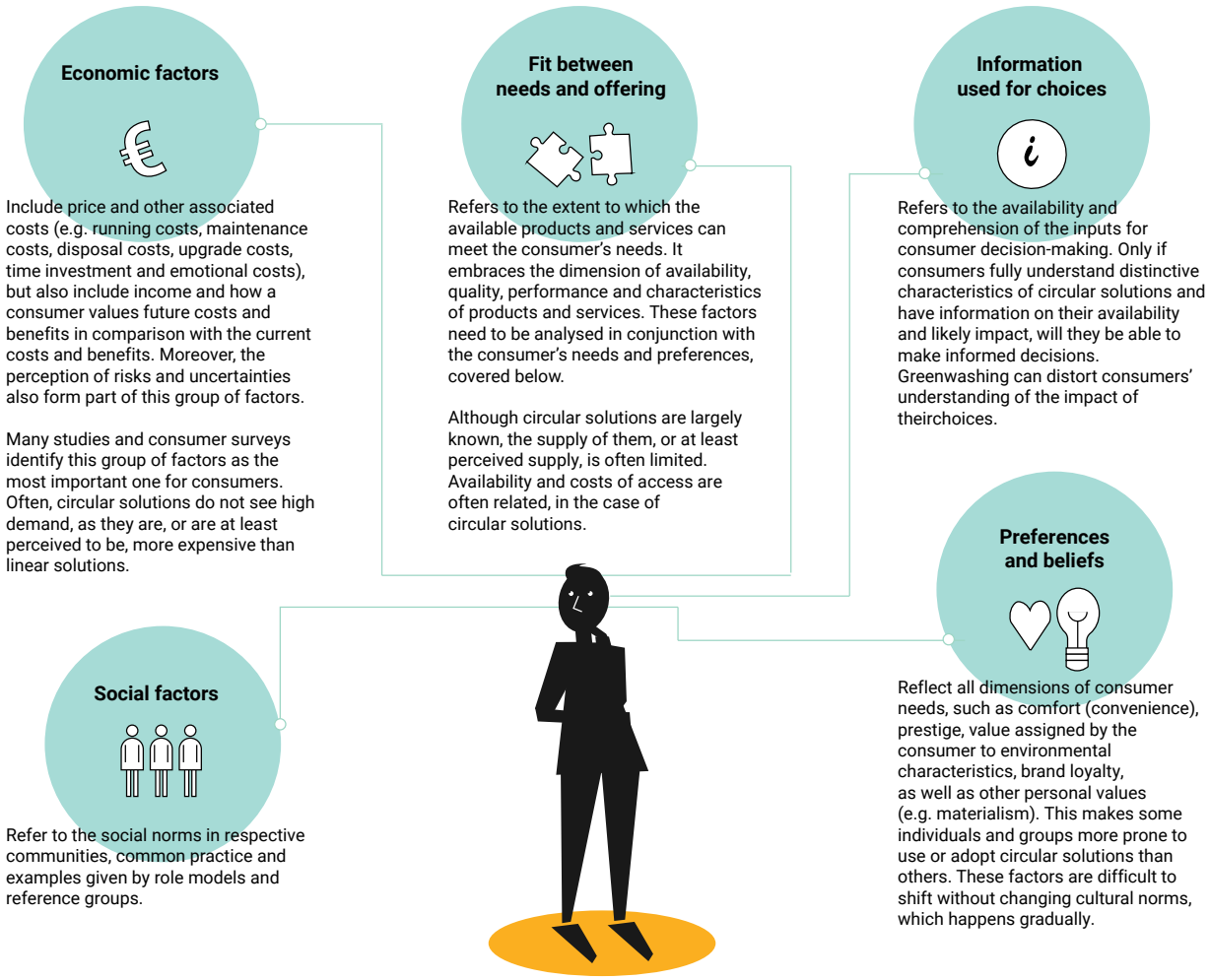
5.2 Circular buyers

Household consumption volumes in the EU increased sharply between 2000 and 2019 (EEA, 2023). Volumes increased by as much as 47% for household goods and services (household equipment, appliances and ICT) and 43% for services

(health, education, finance, recreation and other). Between 2012 and 2019, household consumption expenditure increased by 11.2% in the EU. It now accounts for approximately 52.4% of EU gross domestic product (Eurostat, 2022). The EU policy objective around consumption, as expressed in the 8th Environmental Action Programme, calls for a significant reduction in the EU consumption footprint to bring consumption-related impacts within planetary boundaries (EU, 2022).

Changing consumption habits and trends is difficult, as they fulfil individual and social functions that have become central to modern life. To transition towards more sustainable and circular consumption, it is necessary to understand why Europeans consume the way they do and what sustainable alternatives can be provided that address the functions fulfilled by current consumption. Environment policymaking in Europe increasingly recognises the value of influencing consumers to make more sustainable choices, while respecting the right to choose. However, to design effective consumption policies, the factors shaping consumer behaviour need to be properly understood. These factors are shown in Figure 5.2, with economic factors generally regarded as most influential (EEA, 2022).

Figure 5.2 **Main groups of factors affecting consumer behaviour**



Source: EEA, 2022a.

Several studies have found that the intention-behaviour gap plays a significant role for consumers in a circular economy (Tan et al., 2022; EEA, 2022). Respondents in a survey questioning the attitudes of consumers might indicate that they want to implement several R strategies, but in reality they are not applying them. Some studies estimate that intentions are only translated into actions half of the time (Sheeran and Webb, 2016), which has serious implications for the development of effective policy interventions.

Clearly, it is difficult to change social factors and personal attitudes towards consumption behaviours that may seem austere and undesirable to citizens. Private sector marketing strategies are actively working through tools including advertising or social media influencers to promote unsustainable product offerings such as fast fashion (EEA, 2021). Policymakers can affect these factors by developing measures that target excess consumption or by scrutinising environmental claims to curb 'greenwashing'. However, it is important to acknowledge that developing policy to change consumption patterns is not enough to reduce impacts if businesses do not engage with the sustainability agenda and offer more responsible products and services.

Beyond individual consumers

The drive to change consumption patterns is often focused on the actions and habits of individuals. However, organisations in both the public and private sector are also very active in the procurement of goods and services and have an important role in the circular transition.

Government spending on providing services for the public such as education, healthcare and environmental protection are also part of final consumption. Public authorities across the EU are major consumers, spending approximately EUR 2 trillion on the purchase of services, works and supplies each year, which represents 14% of the EU's gross domestic product (EC, 2023). As such, improving the circularity of this expenditure would support market development for goods and services with improved environmental performance. Green public procurement is concerned with the purchase by public authorities of goods, services and works that have a reduced environmental impact throughout their life cycle. This has high potential for driving the circularity transition, as the volume of public procurement is large enough to create a significant market share for circular products and services. However, a recent analysis of almost 1 million contract notices issued in the Tenders Electronic Daily database for the period 2006-2017 found that the proportion using green criteria was only 7.2%. (Rosell, 2021), with significant variation between countries. Sapir et al. (2022) refer to green public procurement as a 'neglected tool' and highlight skill gaps as a key barrier in terms of reworking legal frameworks, calculating life-cycle assessments and setting environmental criteria.

Companies also have a critical part to play in the circular transition, as consumption patterns are heavily shaped by the products and services offered and marketed by businesses. This applies not just to individual consumers but also to corporate purchasing and procurement by governments and institutions. For consumers to be able to buy refurbished or remanufactured products, these goods have to be produced and marketed. In addition, although not counted within final consumption, the immense purchasing power of private sector companies in business-to-business transactions represents a key opportunity for increasing circularity. Influencing the diverse range of stakeholders across the breadth of the private sector is challenging but targeted policy measures and increased emphasis on environmental, social and governance commitments provide important signals to corporate purchasers.

5.3 Circular sellers

From a business perspective, the new circular economic paradigm offers benefits by decoupling profit from the risks of natural resource depletion, pollution and climate change, while delivering improved competitiveness and responding to changing customer demands. Several studies have proposed frameworks of drivers for companies to adopt more circular business models (Geissdoerfer et al., 2023; Hina et al., 2022; Santa-Maria et al., 2021). Based on these models, and perspectives from other stakeholders, the following are identified as key drivers for businesses to evolve to circular business models.

Policy and regulation: The current policy focus on sustainability is also reflected in changing consumer attitudes and habits; circular businesses can thus build a positive image in the marketplace and attract new customers. As the policy and regulatory setting evolves towards a more sustainable model, circular business practices provide an operational model rooted in compliance with emerging requirements.

Stakeholder stimulus: Authentic messaging on sustainability is an increasingly powerful marketing tool that is relevant for shoppers with environmental concerns and procurement specialists using mandatory environmental criteria in tender documentation. In addition, corporate commitments on sustainability are receiving more attention, while circularity principles offer a route to profit with reduced environmental and climate impact.

Commercial incentives: Circular approaches to extending product life will generate significant new commercial opportunities in areas such as maintenance to prolong product service life, repair of faulty equipment and remanufacturing of components at end-of-life. In addition, digitalisation and changing consumer behaviour are already opening novel markets such as sharing economy offerings, which focus on access and experiences over product ownership.

Sustainability and climate issues: Urgent action is needed to reduce the burden on human health and nature from our current consumption model and the production that comes with it – with various emerging and potential tipping points identified and imminent. To provide a long-term model for human prosperity and well-being, the extraction, processing and disposal of natural resources must be curbed as this directly influences all three facets of the triple planetary crisis: climate change, biodiversity loss and pollution.

Supply chain resilience: Recent global shocks such as the COVID-19 pandemic and the war in Ukraine have highlighted vulnerabilities associated with Europe's high resource consumption and dependency on imported raw materials. In this context, circularity becomes a business imperative for economic resilience by retaining the value and function of resources that usually end up degraded and dispersed as waste. Developing greater circularity makes supply chains more resilient and lessens the risks for European industries due to dependence on international markets for raw materials.

Circular business models

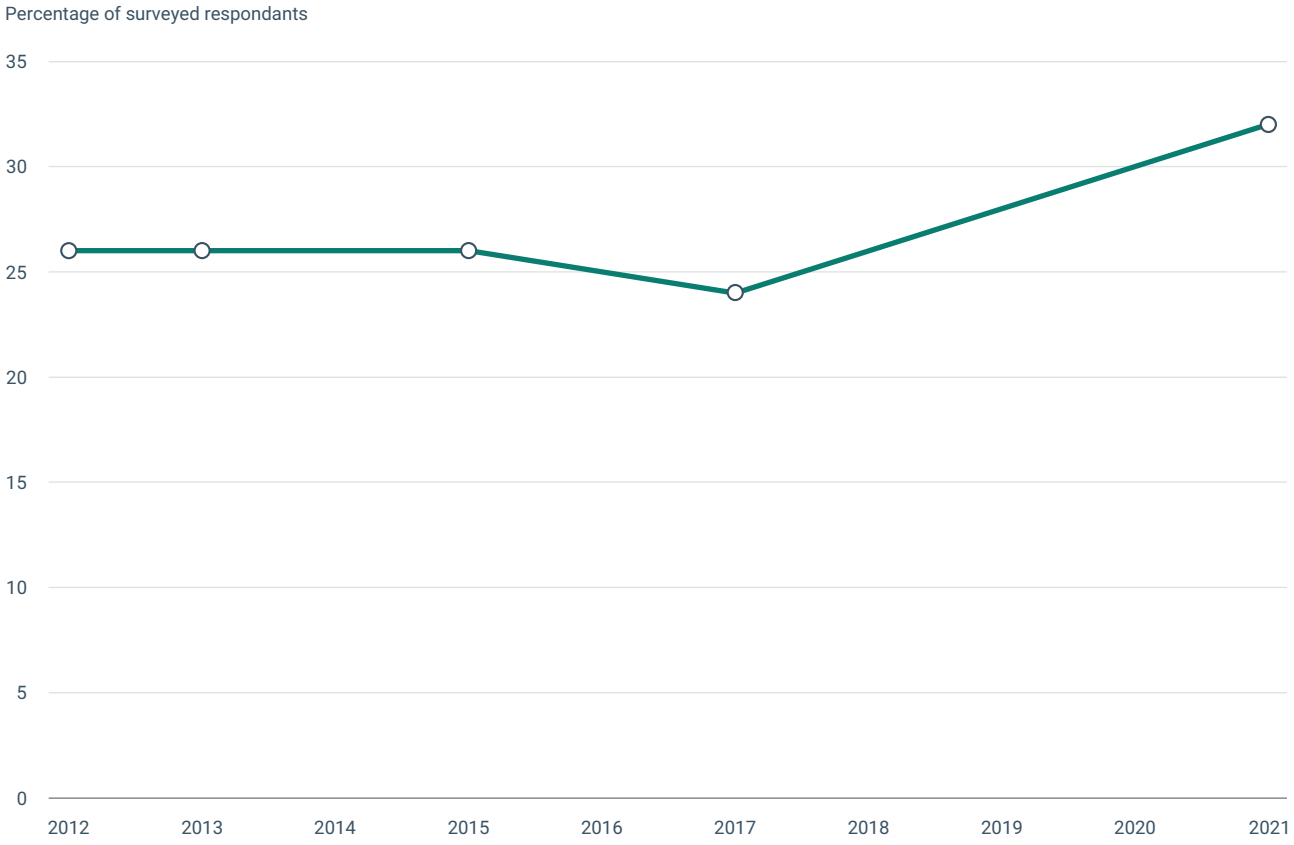
Business model innovation is a term used for innovation in value proposition, creation and delivery and value captured by a company (EEA, 2021a). To implement and upscale new business models to align with circular principles, circular goals need to be agreed by policymakers, technical and social innovations must be conceived, and new business models need to be developed by companies. Circular business model innovation could involve developing a completely new business model or introducing a business model that is new to a company, even if it is considered fairly common in other companies or sectors (EEA, 2021a; ETC, 2021).

To identify starting points for the development of circular business models, companies first need to understand what constitutes a circular model in their sector. In general, moving towards circularity means that a company implements one or more circular goals (reuse, repair, recycling, etc.) in an economically feasible way. Business models that are commonly considered circular can be categorised and the OECD proposes a useful typology (OECD, 2018):

- **Circular supply:** Replacing raw material inputs with sustainable options.
- **Product life extension:** Prolonging the use period of existing products.
- **Sharing economy:** Facilitating collective and intensive use of products.
- **Product service systems:** Selling functions and services rather than products.
- **Resource recovery:** Recycling waste into secondary raw materials.

It is likely to be within Europe's 23 million small and medium enterprises (SMEs) where much of the pioneering and ground-breaking circular business developments will happen. Responses to Eurobarometer surveys indicate that more SMEs are offering green products and services (Figure 5.3) although the increase is gradual. These 'green' activities are defined as products and services with a predominant function of reducing environmental risk and minimising pollution and resources. While not all of these will be focused on the circular economy, it is nonetheless relevant in terms of a broader shift to more sustainable business models.

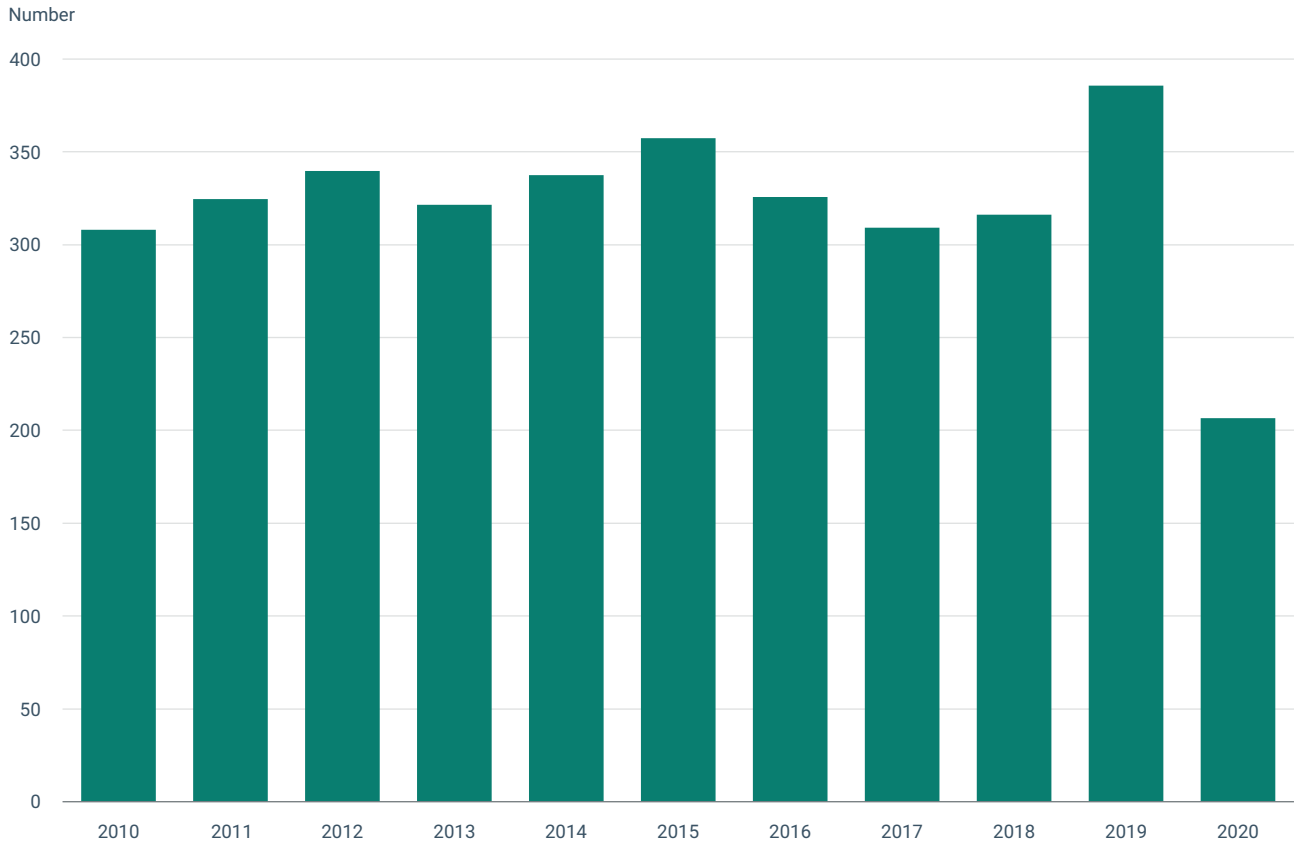
Figure 5.3 Share of SMEs offering green products or services



Sources: Eurostat, 2022 (Flash Eurobarometer 342; Flash Eurobarometer 381; Flash Eurobarometer 426; Flash Eurobarometer 456; Flash Eurobarometer 498).

Eurostat presents patent data about recycling and secondary raw materials. The trend for this data, as shown in Figure 5.4, is broadly flat, which is surprising given the strong policy focus in recent years. These statistics suggest that the innovation pipeline is not flowing strongly, and that further intervention is warranted to stimulate greater activity in terms of developing novel business offerings.

Figure 5.4 Number of patents related to recycling and secondary raw materials



Source: Eurostat, 2023g.

5.4 Support framework

To support take-up of new circular practices by consumers and businesses, a range of supporting processes must be in place. Some key areas of support are presented below.

Finance

The European Green Deal puts focus on the need to divert investment to fund the green transition. As with any other economic activity, availability of financing is essential to support investment and enable the development of new, sustainable and circular business models and associated technologies. Targeted financing must be available from institutions that understand the circular economy paradigm and associated characteristics including terminology, timescales and priorities. Through grants, subsidies and targeted taxation, public finance systems are an important enabler of early-stage circular businesses by addressing market failures and de-risking investment. Private-sector financing complements this with loans for sustainable technologies and new business models. Establishing and scaling up the circular economy will require substantial investment: for example, a European Investment Bank (EIB) study indicated that there is a more than EUR 6.7 billion investment gap for increased capacity and innovation in the design, collection, sorting and recycling of plastics to meet Europe's recycling targets (EIB, 2023).

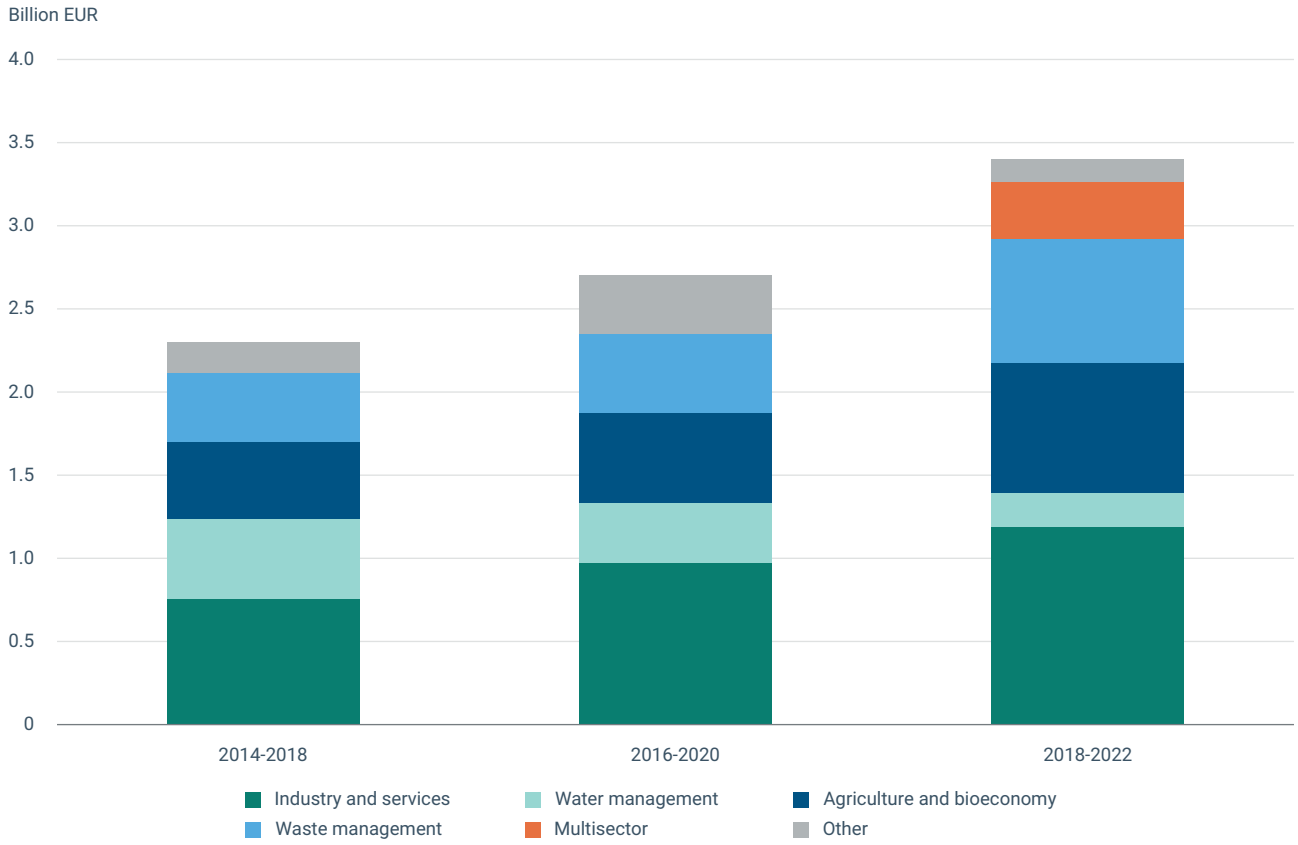
Introduced in 2020, the EU taxonomy is an important strategic development in terms of setting a credible investment framework through establishing conditions under which specific economic activities, and therefore investment in them, are recognised as environmentally sustainable. The classification is based on its relevance to a list of six environmental objective, one of which is the transition to a circular economy. The taxonomy should facilitate increased investment in circular technologies and businesses by providing companies and investors with definitions of activities that can be considered environmentally sustainable.

Green bonds offer an effective way to finance projects, assets or business activities that address environmental issues for both private and public entities. Although there are no specific data for circular economy green bonds, issuance has increased tremendously in the EU between 2014 and 2022, from 0.6% to 8.9% of total bonds issued ([11]), indicating a growing interest among investors to invest in the green economy.

The EIB began implementing an investment support programme for circular economy projects in 2014. Its support for the circular economy covers a range of sectors: industry and services, water management, agriculture and the bioeconomy, waste management, mobility, urban development and energy, with loan amounts increasing (see Figure 5.5). The EIB is also active in capacity building by providing financial and technical advisory support to improve the 'bankability and investment-readiness' of circular economy projects, along with work to develop and share knowledge on financing for circular economy projects. An example of this is the Joint Initiative on Circular Economy launched with a group of development banks and institutions, with the goal of investing at least EUR 10 billion in the circular economy by 2023.

([11]) Green bonds indicator (8th EAP).

Figure 5.5 EIB circular economy lending by sector



Sources: EIB, 2020; EIB, 2021; EIB, 2023a.

In parallel with activity by the EIB and others, private sector banks are becoming more active in this area, with initiatives ranging from broadly defined 'green' lending schemes to specific commitments to support lending for the circular economy. In 2018, three leading Dutch banks, ABN AMRO, ING and Rabobank, published guidelines on the role of finance in the transition to a circular economy. A recent assessment determined that the circular economy financing market is 'taking off'. It attributed this to a growing recognition that circularity is a part of the solution to climate change and other environmental, social and governance issues that have become key topics for asset managers, banks and other financial services firms (Ellen McArthur Foundation, 2020). This increase in activity is reflected in other findings that the number of public equity funds with a circular economy focus grew tenfold between 2018 and 2020, while the annual issuance of corporate and sovereign bonds with a circular economy focus increased fivefold between 2019 and 2021 (BNP Paribas CIB, 2022).

Skills for a circular transition

The circular economy requires different skills from the linear economy, such as expertise in repair and maintenance. This brings a financial cost for new equipment and systems, as well as the need for upskilling and training of employees or potentially a changed workforce, depending on the shift in required skills (Old et al., 2022). Labour force skills for the circular transition play a crucial role in two respects. First, skill shortages in specific dimensions of the circular economy

might result in the creation of bottlenecks in the development and deployment of a circular economy. Second, a clear understanding of the skills required in the circular transition is needed to identify losers and winners from the circular transition.

Actions in this respect operate over a number of dimensions. Circle Economy (2021) proposes a series of interventions, starting from the inclusion of circular skills as the set of skills provided by basic and advanced formal education. Moreover, reskilling and upskilling of incumbent workers, employed both in circular and non-circular value chains, facilitate job-to-job mobility.

Institutional support for providing skills for the circular transition in terms of education and reskilling/upskilling of the labour force is a crucial intervention. This will remove barriers to the full deployment of circular business models related to circular skill gaps, facilitate successful job-to-job transition of the 'losers' towards circular value chains and limit wage premiums for jobs at the core of the transition. These barriers to provision of education and training, in general and for the sustainable/circular economy in particular, have been acknowledged and addressed by the European Commission, public agencies (e.g. CEDEFOP), national and regional governments of EU countries.

Skill gaps in the circular economy represent both a threat to a successful circular transition and a likely source of inequality in labour markets. A limited supply of 'circular skills' represents a barrier for companies that decide to reshape their business model to close the loop of materials. Skill shortages coupled with growing demand for circular skills makes the recruitment of workers with these skills expensive for companies and contributes to slowing down the roll-out of circular business models. A recent report by Circle Economy (2021) provides a comprehensive overview of the skills needed for the circular economy, with a focus on specific industries such as construction. One of the interesting findings of this report is that the circular transition requires a combination of transversal skills — digital, green, individual, personal and methodological — and skills specific to each functional area of the circular economy. Popp et al. (2021) also find that employment in occupations that are expected to be displaced by the green transition, such as fossil fuel-related occupations, display a similar set of skills to those needed in green occupations, suggesting a possible smooth transition between 'brown' and 'green' occupations. Lobsiger and Rutzer (2021) assessed skills shortages; their results show that the green skills gap is, on average, large in Europe, with substantial heterogeneity across countries. The largest was noted in Croatia, Germany, Belgium and Norway, with the smallest in Portugal and Cyprus.

Regulation

In the context of a circular economy, the regulatory focus should be not only on reducing the environmental impact of a specific facility but also on practices that can mitigate environmental impact elsewhere in the material value chain. Circular economy techniques often involve altering resource flows towards reuse of products and recycling of materials after their initial productive life. Historically, this would be regarded as waste management and is tightly controlled. However, regulation can also serve as a driver for innovation by promoting and/or facilitating uptake of emerging techniques. With regard to regulating for novel processes and business models, it is important to balance the need for innovation and trialling without compromising human health and environmental protection.

Ecodesign principles for products have a central role in facilitating circular practices. They ensure that products are designed to deliver extended durability and to be suitable for value retention processes such as repair, remanufacturing and recycling, including designing out hazardous substances. The Ecodesign Directive has been in place since 2009, addressing energy-related products. The proposed Ecodesign of

Sustainable Products Regulation widens the scope to nearly all physical products on the market and extends the range of requirements based on the sustainability and circularity aspects listed in the CEAP, such as product durability, reusability, recycled content and reparability (EC, 2022).

Barkhausen et al. (2022) analysed the coverage of functional and informational circular economy requirements in the 27 product groups regulated by ecodesign implementing measures from 2008 to 2021. The work concluded that the number of product groups covered by Ecodesign Regulations under the Ecodesign Directive has expanded and that an increasing number of these regulations include circular economy requirements.

With more than 50,000 industrial installations operating in accordance with an integrated permit, the Industrial Emissions Directive (IED) is undoubtedly pertinent to the development of the circular economy. A recent assessment of the contribution of the IED to meeting circular economy objectives (Ricardo, 2020) suggested that the IED supports these only to a 'low' or 'very low' degree but with potential for improved performance. The study notes that this is not surprising, as the goal of the IED is to reduce harmful industrial emissions and many circular processes such as repair, remanufacturing and recycling generate emissions. The current revision of the IED and the ongoing process of revising sectoral BAT Reference Documents (BREFs) provides a good opportunity to embed circular principles within effective environmental regulation. The IED revision process is under way and includes specific objectives relevant to improving circularity:

- Increase investment in new, cleaner technologies taking into account energy use, resource efficiency and water reuse while avoiding lock-in to obsolete technologies.

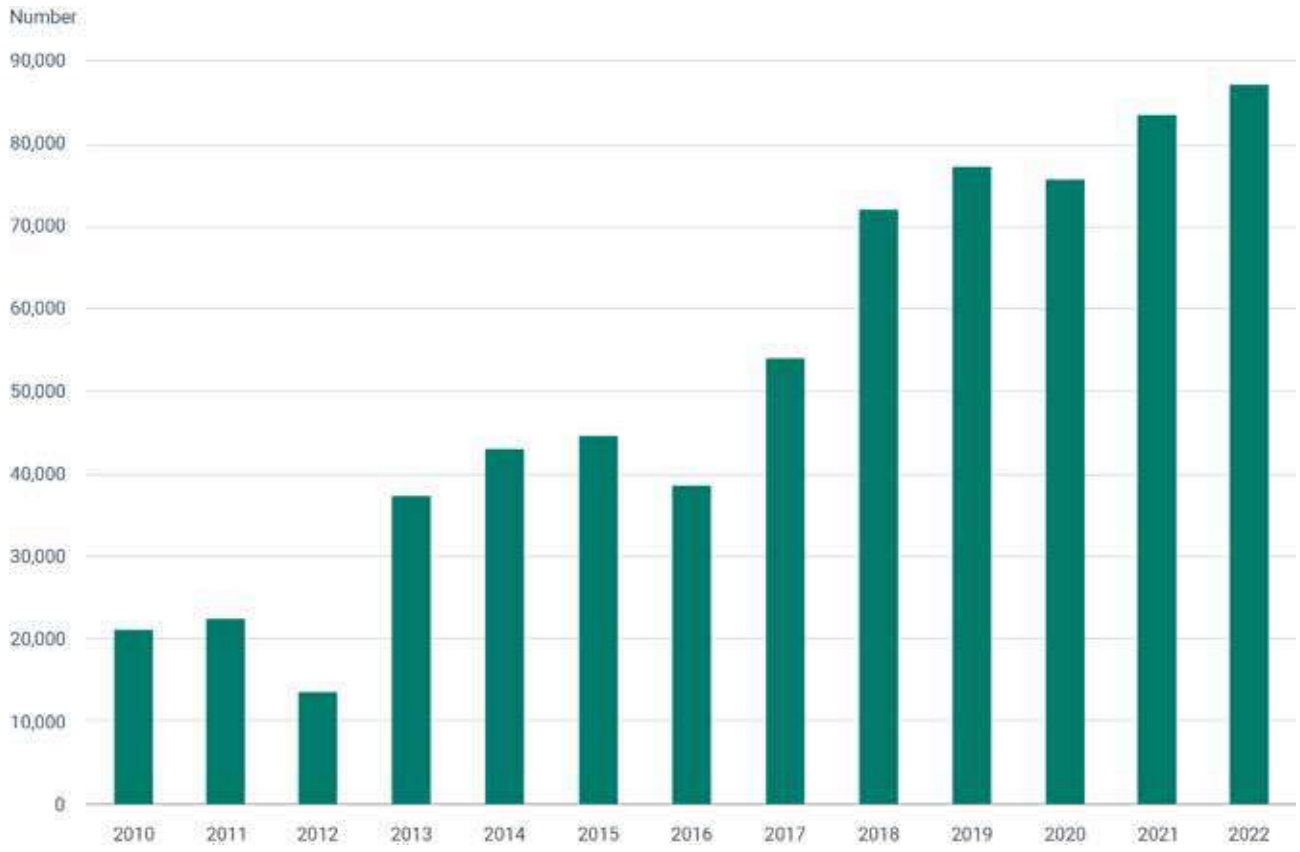
- Support more sustainable growth of sectors that are key to building a clean, low-carbon and circular economy.

Standards and labels

Standards and labels play an important role in driving innovation towards improved sustainability and promoting fair competition between suppliers. Products and components manufactured to common standards are more straightforward to use in remanufacturing and repair operations, thereby supporting increased circularity. Trust in the performance of secondary raw materials and of circular goods such as refurbished products and remanufactured components is essential in developing a functioning market that supports circularity. Verified environmental credentials for 'green' products are vital to building this trust and to supporting the wider ambitions of the European Green Deal.

The European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardization (CENELEC), designated under EU rules as European Standardisation Organisations, are actively working on the circular economy through topic groups, best practice workshops and standard development activities — especially in the areas of batteries and plastics (CEN-CENELEC, 2020). Other significant actions on standards for circularity are being carried out by bodies such as the International Standards Organisation (ISO). The ISO approach is focused on advancing in three key areas: 1) defining the principles of the circular economy; 2) the transition from linear to circular business models; and 3) assessing circularity at different levels. The EN 4555X standard series further develops common definitions and calculation methods for ecodesign aspects, such as for the repairability, reusability and durability of 'energy-related products' with new material efficiency aspects. By providing a common method to measure repairability, this approach is fundamental to facilitating the ambition to present a repairability index on product labelling (ECOS, 2020).

Figure 5.6 Number of Ecolabel products (goods and services) in the EU



Source: EC, 2023i.

The European Ecolabel is the official EU label for environmental excellence. It reflects the environmental performance of products and services, accounting for the potential impacts at all stages of their life cycle: extraction, manufacture, distribution and disposal. While not all criteria are directly relevant to increased circularity, many indicate a more efficient use of resources. Indeed, the Ecolabel encourages companies to develop durable, easy to repair and recyclable products and, as such, gives an insight into progress towards having more circular products on the market. The number of products, both goods and services, certified by the EU Ecolabel has grown from more than 21,000 in 2010 to more than 83,500 in 2021, as shown in Figure 5.6, a fourfold increase. This is a promising trend in the development of business models towards more circular products, although in the context of the breadth of products available on the EU market, there is still clearly much more progress to be made.

5.5 Assessment

Consumption levels in the EU are high and continue to rise, leading to growing raw material demand and production activity, which drives increasing environmental impacts. Fundamental changes to consumption behaviour are required, including favouring products with lower environmental impacts, and shifting to reuse, sharing and product-as-a-service models. Underlying these changes is a fundamental need to reduce product consumption from current unsustainable levels, but current trends in

the EU are, unfortunately, moving in the opposite direction. Given the strong influence of marketing on purchasing decisions, there is a need for legislative changes to stimulate a shift away from consumption culture. As buyers, individuals have an important role to play and should be informed about the consequences of consumption choices through awareness raising actions. In addition, organisations have a high potential to shape the market in a more circular way, but corporate buying and public procurement needs to accelerate the move to responsible sourcing.

In terms of the supporting framework for the transformation, there are encouraging signs of increasing availability of financing for circular projects, albeit from a low starting point. This is complemented by increasing attention to the skills needs for the circular economy, revision of regulation, novel research and the development and use of standards and ecolabels.

6 Just transition to a circular economy

Key messages

- Circular economy systems are not inherently socially beneficial just because they are circular.
- A successful circular transition requires full societal engagement but there is currently limited analysis of social equity, inclusion and accessibility issues.
- The impact of transitioning to a circular economy on communities and livelihoods in the global south must be considered to avoid exacerbating existing inequalities.

Circularity offers pathways to more sustainable production and consumption systems. Through careful considerations, it can also provide benefits to society. The technical and economic aspects of the circular economy have received significant attention, but there is a need to reflect on social considerations to move towards an economy that does not exacerbate existing inequalities and instead positively contributes to social issues. This entails consideration of how to ensure that the shift to a circular economy respects the principles of a just transition as envisaged in the European Green Deal. In this context, it is important to strengthen the job creation potential of the circular economy while minimising negative consequences such as exacerbating regional and global inequalities. This requires navigating the potential synergies and trade-offs between the social, economic and environmental dimensions of a circular economy.

It is important to recognise that circular economy systems are not inherently socially beneficial just because they are circular. For example, the shift does not automatically generate more jobs and better working conditions — such co-benefits need to be actively designed into circular economy actions.

6.1 Leave no one behind

There is relatively limited research available on what a just transition means in the context of the circular economy. Circular economy literature has little focus on the social dimension, with one study noting that only 17% of research articles were from social sciences and humanities, despite practitioners viewing cultural issues as the main barriers to a circular economy transition (Friant et al., 2020; Kirchherr et al., 2018). The European Green Deal places key emphasis and focus on the just transition, through the 'Leave no one behind' component. It also introduces the Just Transition Mechanism as a key tool to ensure the transition towards a climate-neutral economy happens in a fair way (see Box 6.1). The importance of a just transition is also reflected in the CEAP, which states that scaling up the circular economy entails leaving no one behind. It includes a section on 'Making circularity work for people, regions and cities' with references to job creation, updating skills, awareness raising, inclusion and exchange of information. Another example is the European Pillar of Social Rights, a social strategy to make sure the transitions of climate neutrality, digitalisation and demographic change are socially fair.

Box 6.1

Just Transition Mechanism

The Just Transition Mechanism is a key tool to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind. It provides targeted support to help mobilise around EUR 55 billion over the period 2021-2027 to alleviate the socio-economic impact of the transition in the most affected EU regions.

The mechanism focuses on the regions, industries and workers who will face the greatest challenges, through three programmes:

- Just Transition Fund;
- InvestEU Just Transition scheme;
- a new Public Sector Loan Facility.

Source: EC, 2020a

In addition to the legal and moral reasons for pursuing a just transition to circularity, it is also a critical factor in terms of delivering a successful economic transformation. In the absence of careful consideration of socio-economic issues, the magnitude of change required for this deep transition may exacerbate existing inequalities, leading to disengagement and even resistance from EU citizens. Securing broad societal support requires an inclusive process with careful anticipation of the broader social and economic impacts associated with the large-scale changes that the circular transition entails. Failure to manage these aspects will certainly leave some groups behind, which would lead to a sub-optimal outcome for the circular economy.

6.2 Regional and sectoral effects on employment

By its nature, the transition towards a circular economy is disruptive and impacts value chains across regions in varying ways. While this can lead to improved sustainability of a product life cycle in one location, it might also remove another region from the production chain, bringing employment losses and potentially exacerbating inequalities. For example, when it comes to raw material extraction, in particular fossil fuels, regions that are economically dependent on resource extraction are likely to face disadvantages in a more circular economic paradigm (OECD, 2020). To achieve a sustainable balance that leaves no region behind, it is necessary to consider the social implications and trade-offs at the regional level from various perspectives. A just transition must take into account the geographical distribution of positive and negative consequences, both direct and indirect, to ensure the social benefits of circular economy solutions are spread widely (Schröder et al., 2019).

It is also important to consider which countries, regions and even sectors are most likely to be 'winners' and 'losers' and under what conditions, in order to provide support for stakeholders and citizens in need of adaptation. There is often an assumption that regions with higher education and skill levels will have a suitable workforce for new manufacturing processes. However, this analysis should also consider the potential for different types of skills, for example in the provision of repair and reuse services, which do not necessarily require high levels of formal education.

A 2018 study commissioned by the European Commission highlights that the 'winners' in terms of employment opportunities of a transition to a circular economy include waste management, service providers and repair and maintenance operations ([12]). The 'losers', or those who suffer employment losses, could include construction, non-metallic mineral production and motor vehicle manufacturing.

On an aggregated international level, job losses from the circular transition are expected to be low and more than compensated for by job creation in other sectors, with a slight net increase in jobs in OECD countries (OECD, 2020). An explanation for this is that raw material extraction and production, which will likely be hit hardest, does not represent a very large part of global employment. Four material-intensive sectors — construction, food products, primary metals and non-metallic minerals, and power generation and distribution — account for 90% of global material use but only 15% of global employment (OECD, 2020). However, for regions dependent on these sectors, the circular economy could be a severe challenge for employment.

The transport sector provides a further interesting example. The circular transition may lead to both employment losses and gains as businesses reduce the distance between different parts of the value chain, for technical or economic reasons or to align with consumer preferences for 'local' products (Hofstetter et al., 2021). This also applies to lifetime extension strategies, such as repair, which are generally undertaken close to the user's location. This means that jobs related to the trade of raw materials from within and outside Europe may be reduced. On the other hand, it could lead to more employment in repair and remanufacturing, as well in transporting products to be reused, repaired, remanufactured or recycled. This illustrates how, while employment creation can happen within one region, other regions may suffer from being removed from the value chain. On a global scale, this may be exaggerated by current EU policies, with the example of the Critical Raw Materials Act, which aims to secure resource supply for strategic manufacturing processes through increased domestic material extraction and increased use of secondary materials.

It is important to stress that, despite model predictions, it is too soon to assess the actual impacts on sectors and jobs of a transition to a circular economy (Chateau and Mavroeidi, 2020). As the transition moves forward, there is a need to further support economic diversification, such as creative labour adjustment programmes, compensation schemes and education programmes to support upskilling and reskilling, and for getting people back in employment for those sectors and industries that will eventually lose out in the transition to a circular economy.

There are a number of measures being undertaken that will leverage the potential negative employment impacts of a transition towards a circular economy. The Just Transition Mechanism and Just Transition Fund add an important socio-economic dimension to the European Green Deal, supporting regions that rely heavily on carbon-intensive activities. These policy initiatives mainly support the energy domain, and there is a lack of similar initiatives for other resource-intensive sectors such as food, mobility or housing, which may face disruption in Europe.

([12]) According to data from the RREUSE network, a social enterprise active in reuse and preparation for reuse today creates on average 70 jobs per 1,000 tonnes collected with a view to reuse. Most social enterprises employ between 45% and 80% disadvantaged groups in their operations.

6.3 Global context

To achieve a truly just transition, it is important to also consider the implications of the circular economy for communities and livelihoods in the Global South (Schröder et al., 2019). The shift in production and consumption dynamics associated with the transition to a more circular economy may have positive and negative global implications. Positive implications include lower environmental pressures resulting from reduction in European production and consumption. Currently, the largest environmental costs of European production and consumption are felt outside Europe's borders (ETC, 2023b). A circular transition will lead to lower demand for primary resources and thus help to reduce the unequal environmental burden the rest of the world bears from European consumption. Negative implications are related to changes in supply chains and the potential loss of jobs from a lower demand for raw materials.

Impacts on employment and livelihoods beyond Europe

A transition to a circular economy provides opportunities in all locations to develop localised circular economies. This can enable the creation of new types of employment and workforce upskilling, as well as potential contributions to carbon and energy savings through reduced transportation needs. Less industrialised countries could benefit from building on existing circular business models, including those that have emerged in the informal sector (IRP, 2018). On the other hand, while the Global North may benefit from the creation of high-skilled jobs, the Global South, with more limited access to relevant education and training opportunities, may experience job losses as traditional methods are phased out from value chains (Old et al., 2022). Indeed, the concept of the circular divide (Box 6.2) refers to the growing gap between developed and developing countries in their ability to transition to a circular economy. Consequently, the European transition to a circular

Box 6.2

Preventing a circular divide

A circular divide refers to the growing gap between developed and developing countries in their ability to transition to a circular economy. Advanced industrialised nations have a competitive advantage in this transition, which is expected to increase as global economic competition and systemic risks intensify. Unequal power relations in value chains and historical legacies contribute to the unequal opportunities faced by different actors. This divide is reinforced by feedback loops between existing divides, such as the digital divide, innovation divide, bargaining power divide, access to circular economy-oriented finance and the focus on immediate development challenges in low- and middle-income countries.

The growing circular divide has significant consequences. First, it results in resource wealth accumulating in the Global North. Second, industrialised economies have an advantage in scaling up circular economy technologies and improving supply chain traceability through digital technologies, giving them a competitive trading edge over developing countries. Lastly, the circular divide means industrialised economies are less affected by global supply chain shocks, increasing their economic resilience. In contrast, developing countries, already vulnerable to climate change and biodiversity loss, face challenges in achieving circularity and experiencing severe impacts.

To bridge the circularity divide, it is important to shift the focus towards addressing global inequities and recognising the interconnectedness of the global economy. This can be achieved through greater multilateral collaboration, strengthening international cooperation programmes and identifying win-win circular trade mechanisms. Providing financing for circular economy transitions in developing countries and bridging the digital skills gap are also crucial. Furthermore, international policy coordination and capacity building on ambitious circularity standards are necessary to prevent trade barriers and ensure harmonisation.

Source: EC, 2020a

economy can bring about negative changes in the labour market, both in Europe and beyond.

Jobs and livelihoods may be lost in places where it is not easy to find other employment. This may lead to increased inequality, as improvements in supply chain circularity are made. For example, the implications of the circular economy shift in textiles is likely to have far greater consequences in low- to upper middle-income countries (up to 756,000 job losses) relative to the associated boost to employment in the EU (up to 85,000 jobs gained) (Repp et al., 2021).

By carefully considering the distribution of benefits and ensuring inclusivity, the circular transition can be managed to create positive outcomes for both established players and marginalised communities in the Global South (Schröder et al., 2019). Managing EU waste within the bloc will lead to fewer informal workers potentially exposed to hazardous materials (Old et al., 2022). In addition, Fråne et al. (2021) have shown that some sectors can offer social benefits to developing countries, through employment, transfer of knowledge, innovation and development in local communities.

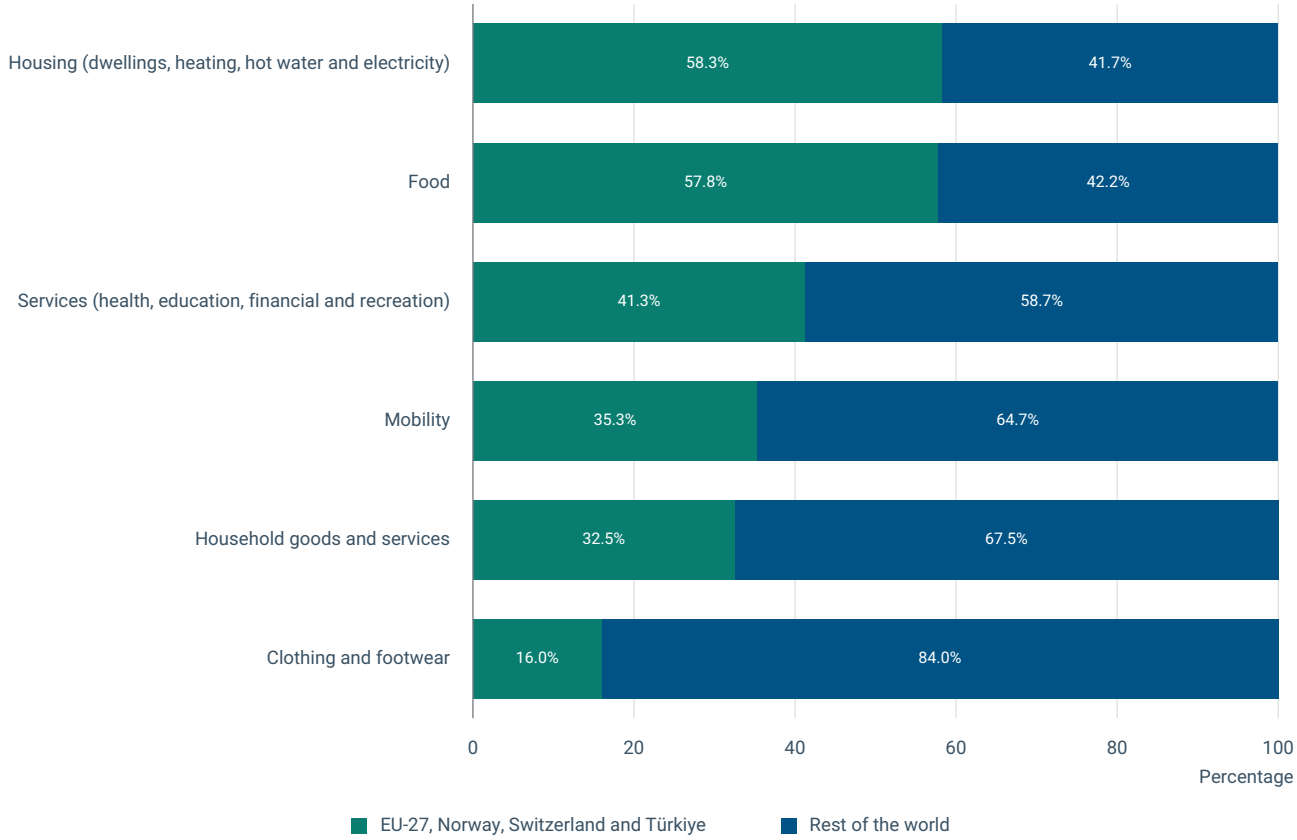
Finally, a just transition to a circular economy should enable technology transfer and capacity building outside Europe. This needs to be a global approach facilitated by intergovernmental organisations such as the OECD and the United Nations Industrial Development Organization.

Impacts from the European consumption footprint

The shift in production and consumption dynamics associated with a transition to a more circular economy may have positive and negative global implications. The impacts of circular economy policies may be most acute in the Global South, which has been supplying Europe with raw materials and low-cost, mass-produced goods for many years (Hofstetter et al., 2021). Currently, the largest environmental costs of European consumption are felt outside Europe's borders (ETC-CE 2023; IRP 2019), offsetting the socio-economic benefits it creates ([13]). There is an extremely unequal distribution of environmental cost and socio-economic benefits between lower and higher income countries. The share of materials imported from third countries considerably varies across Europe's final consumption domains (Figure 6.1).

([13]) In 2022, more than half of global land-related biodiversity loss occurred in Africa and Latin America, due to the extraction of biomass (agriculture and forestry), a great share of which was consumed in higher-income countries. Less than 5% of global value added was generated in those regions. Conversely, almost half of the total global value added of resource use was generated in Europe and North America, where less than 10% of global water stress and biodiversity loss occurred (IRP, 2024).

Figure 6.1 **Share of material use in household consumption**



Source: ETC, 2023b.

6.4 Moving forward on the just transition

The just transition is not only about reducing inequalities, or distributional justice. It is also about the underlying process to articulate this change, or procedural justice. The latter highlights the importance of securing an inclusive process that represents a broad set of perspectives and stakeholders. By not having an inclusive process, a transition to a circular economy risks alienating parts of society from the process and fuelling resentment and resistance to change. In an inclusive transition, it is crucial that communities that are particularly adversely affected by the transition are included in discussions at an early stage, to ensure that social justice considerations are considered (Schröder, 2020). There is also a need to better understand potential trade-offs. For example, design for durability might require the use of high-quality materials, which increases the quality and lifetime of a product but consequently also the purchase price. This, in turn, may impact price-sensitive consumers more than others, thereby creating negative distributional effects.

These issues and others point to a need for further development in the assessment of the just transition. One pending issue is the need for further data and information on the multiple issues related to the just transition — from intergenerational equity and gender equality to social opportunity (Old et al., 2022). Developing indicators to measure progress on such issues within and outside Europe is needed. Another important step is to develop a framework for assessing the multiple dimensions of the just transition.

6.5 Assessment

There is strong potential in simultaneously contributing to a variety of technical shifts and societal benefits through the design of circular economy activities. However, a lack of measurement of the wider value of social benefits associated with the circular economy (Hofstetter et al., 2021) and lack of comprehensive integration of social aspects (Mies and Gold, 2021) mean that further improvements may not be implemented. A circular economy will not, by itself, generate better working and other societal conditions. This needs careful consideration and to be designed into the circular economy transition.

Impact on employment is an area needing particular attention. While some studies have argued that the overall impacts are relatively small (OECD, 2020), a transition to a circular economy may have a detrimental effect on certain local communities within and outside Europe. This includes areas heavily dependent on resource extraction and with few possibilities to find alternative employment. A better understanding of which areas are likely to be impacted most could help to develop responses that mitigate these impacts.

Achieving a just transition is a crucial aspect of the transformation to a circular economy. Without this, the magnitude of change required for this deep transition may exacerbate existing inequalities and fuel resistance. Better assessments and information on these areas can help support the societal benefits of a circular economy and accelerate the transition.

7 Outlook and future considerations

Key messages

- The circular economy concept has gained political momentum but further measures are needed to realise changes in consumption and production patterns.
- Targets are important for driving and measuring change, however, assessment of current circular ambitions indicates a low or moderate likelihood of them being achieved in the coming years.
- Near-term actions to accelerate the circular transition include setting clear targets, supporting emerging secondary raw material markets and further developing circularity monitoring.
- The circular transition will require moderation of current consumption patterns, effective extension of product lifespans and widespread use of recycled materials as sustainable feedstocks for industry.

This final chapter turns attention from assessing the current state of circularity in Europe to what lies ahead. Building on the conclusions from earlier chapters, it begins with a near-term outlook assessment for Europe's circular economy to 2030 and proposes measures that could be applied in the near term to accelerate progress towards a circular economy. The subsequent section is envisioned as a discussion platform to consider what future circular societies could look like. The final part presents closing reflections on underlying shifts that are needed to consolidate the transition to a circular economy across the before-use, during-use and after-use phases.

7.1 Implementation assessment

Policy leadership for the circular economy by the EU institutions has been strong to date, including the significant package of measures and ambitions articulated through the European Green Deal. Although government measures are only part of the solution in effecting this transition, they provide a powerful framework for change. The transition momentum established within EU institutions is filtering down through the Member States. The key issue now is implementation of EU-level policy as specific economic and social interventions that engage and shape behaviours of citizens and businesses across Europe.

Many developments in this area build on long-established actions to promote waste prevention, improve waste management and recycling and increase resource efficiency. Policy successes in this respect include a relative decoupling of economic growth from waste generation, and a significant reduction in landfilling. However, the circular economy as a distinct policy field is still relatively new, with the first CEAP only eight years ago. This means that the outcomes of the intensive policymaking around a circular economy are yet to fully materialise. National-level implementation is gathering pace, with circular economy plans enacted in most Member States, although

implementation is at different stages across the bloc. This point is underlined in the EEA's early warning assessment exercise, which reported a mixed picture for meeting recycling targets — a cornerstone of the circular economy. In its recent report on the circular economy, the European Court of Auditors noted there was an increase in circular activities by Member State governments, but that the pace of progress was slow (ECA, 2023).

Although there are some signs of a circular transition in the business sector, change is coming gradually. Accelerating the pace will require a stronger focus on innovation for circular business models, corporate sustainability reporting, corporate social responsibility and sustainable supply chain management. The introduction of regulations and market-based incentives would support and guide these developments. There are certainly business opportunities within the circular economy paradigm and there are examples of front-runners in the market, but widespread take-up of circular business models is not yet evident (ECA, 2023). Shifting away from maximising product volumes sold towards new models of service provision will be central to achieving circular profits. However, these companies are still mostly in the start-up phase or focusing on niche markets. The stagnating level of patent applications related to recycling and secondary raw materials is a cause for concern, although there is a brighter picture at research stages, suggesting that the innovation pipeline is still at a lower readiness level.

Financing is a critical enabler of the change and there is evidence of gathering momentum on this aspect, albeit from a low level. The recent EU taxonomy process includes objectives on the circular transition and provides a framework to increase circular investment by clarifying environmentally sustainable activities and preventing greenwashing.

Consumption has a very significant influence on resource extraction and production activity via individual, corporate and public purchasing. While there are some signals of increased greening of corporate and public procurement, data are lacking to confirm this picture. For citizens, there is some evidence of growing concern for environmental and climate problems, but there is a substantial effort required to transform this concern into changed behaviours, especially in the context of engaging communities in the concept of sufficiency. European household expenditure rose 69% between 2000-2019, and then dropped by 8% between 2019 and 2020, mainly as a result of the COVID-19 pandemic (ETC, 2023b). The general increase in household expenditure is expected to continue, although some level of decoupling of economic activity and some of the environmental and climate pressures has been observed (EEA, 2023d).

Zooming out to a global view, there are some megatrends that also influence the pace of development of the circular economy. Worldwide economic output is projected to triple in the 2010-2050 period, while the world's population is expected to increase to 9.7 billion in that time. These factors will clearly bring increased competition for resources and will drive change in economic patterns, but in the near term this is unlikely to significantly affect production and consumption volumes within the EU. More immediate issues in a circularity context include geopolitical shocks such as the war in Ukraine, which seriously disrupted economic activity and supply chains, particularly for some of Europe's critical raw materials. These factors have led to greater interest in increasing the EU's strategic autonomy and the reshoring of manufacturing. A circular economy and increased resource efficiency can contribute to lower dependence on imports and thus play a central role in building towards strategic autonomy.

As the EU moves forward with the circular economy, it is important to keep in mind its limitations. Achieving 100% circularity is simply not possible. In the current society, a large share of primary material throughput comprises foodstuffs and energy carriers such as fossil fuels, which are fundamentally degraded through use with limited possibility of recycling (EEA, 2021). For other materials such as paper and plastics, there are limits to how many times they can be recycled (Grosso et al., 2017). Finally, there are thermodynamic limitations to circularity, as recycling processes themselves consume energy and materials.

As the circular economy takes root and resource efficiency increases, there is a risk that this could actually lead to increased consumption through the rebound effect.([14]) While improving resource efficiency and recycling are positive developments, they are not enough to alleviate the negative environmental impacts associated with the high level of production and consumption in the EU. Indeed, resource efficiency gains can be offset by higher resource consumption (Bianchi and Cordella, 2023) and so concepts such as sufficiency and 'doughnut economics' will need to enter political discourse and strategic planning.

7.2 2030 outlook on circularity

In considering a near-term outlook for Europe's circular economy to 2030, there are a number of key metrics that provide insights into the pace and reach of the transformation. These metrics provide valuable data that capture macro-scale changes in the economy and the associated material flows. While there is good coverage of the after-use aspects of the circular economy, there is less data available for the before-use and during-use phases. Strengthened monitoring and reporting are required to fully understand and support these activities, and in this context the recent establishment of reporting on reuse is a welcome development. To develop this outlook assessment, indicators were selected based on ambitions articulated in the CEAP. The assessments cover current trends and the likelihood of reaching 2030 ambitions, and they are provided based on data where possible, supported by expert judgment.

This assessment reflects the current trajectory for circular economy development in Europe. It highlights that more is needed to achieve its full potential of lowering primary resource demand, increasing material efficiency and reducing environmental pressures. It is also a reflection that major changes take time and that many circular policies are relatively new and not yet fully implemented at national level. Fundamentally changing production and consumption systems is an enormous adjustment and will only fully materialise over some time.

Doubling circular material use rate (CMUR)

Current trend: **Improving**
2030 outlook: **Low**

The CMUR has been highlighted in the CEAP as an overarching indicator of the circularity state of the economy. The ambition is to double the rate in the coming decade. Recent analysis by the EEA shows that in 2004 the CMUR was 8.3% and that the trend since then has been basically flat, standing at 11.5% in 2022 (EEA, 2023a). This indicates that with the current pace of improvement, the EU is not yet on track to achieve its ambition. The assessment suggests that doubling the rate will require rapid and intense implementation of multiple ambitious strategies. For example,

([14]) Efficiency gains may lead to lower prices, which in turn can induce higher levels of consumption. This is a phenomenon referred to as the 'rebound effect' and has been shown to happen in the case of energy consumption (EEA, 2022). Something similar could happen to circular economy, if resource efficiency would lead to higher absolute levels of resource consumption (Zink and Geyer, 2017).

an EEA scenario suggests that increasing recycling from 40% of all treated waste to 70%, decreasing material inputs into the economy by 15% and cutting fossil fuel resource use by a third would increase the CMUR to 22% by 2030, almost meeting the target (EEA, 2023). It is clear, however, that each of these actions represents in itself a highly challenging goal.

Decoupling economic growth from resource use
Current trend: **Stable**
2030 outlook: **Moderate**

The EU's material footprint refers to the amount of material extracted from nature, both inside and outside the EU, to provide the goods and services consumed by EU citizens. From 2010 to 2020, the EU's material footprint remained relatively stable, despite a growing economy. It fell by 7% from 2010 to 2016 and increased by 5% from 2016 to 2019. In 2020 it fell by 5%, but these data are heavily influenced by the economic slowdown due to the COVID-19 pandemic. The stable trend of the past 10 years is a cause for concern, as it shows that the EU is not likely to significantly reduce its material footprint in the coming decade. So, although relative decoupling has been achieved, absolute decoupling seems unlikely in the coming years. Increasing CMUR is one way to lower the material footprint, which can be exemplified by the relative low material footprint of the Netherlands (EEA, 2023n).

Keeping EU resource consumption within planetary boundaries
Current trend: **Negative**
2030 outlook: **Low**

An EEA study exploring Europe's environmental footprint with regard to the estimated 'safe operating space' considered four planetary boundaries: nitrogen cycle, phosphorous cycle, land system change and freshwater (EEA, 2020c). It found that Europe exceeds its planetary boundaries for nitrogen cycle by a factor of 3.3, phosphorous cycle by a factor of 2 and land system change by a factor of 1.8, while freshwater use was not exceeded. Food, energy and mobility are believed to be the root causes of exceeding these boundaries. A similar study by Sala et al. (2020) assessed the impacts of the EU's production and consumption in 2010, compared to the Earth's ecological limits and carrying capacity. It found that EU's per capita planetary boundaries were exceeded from four times for fossil resources to 20 times for particulate matter. The European Commission's Consumer Footprint Calculator, provides a comparison of 16 climate and environmental impacts of EU consumption with the Earth's capacity. It found that four impacts — ecotoxicity, particular matter, climate change and resource use (fossil) — were significantly beyond a safe operating space (Sala et al, 2019). Consequently, it is apparent that EU citizens are not living within the limits of our planet, which is a goal of the European Green Deal. Food is often singled out as a key factor, with food consumption representing 35% of the total carbon footprint of an average EU citizen and 3.4 times higher than it should be to stay within the planetary boundaries, which has been set at around 1 tonne of CO_2eq per citizen per year.

Reducing EU consumption footprint
Current trend: **Stable**
2030 outlook: **Low**

The consumption footprint refers to the environmental and climate impacts resulting from the consumption by EU citizens of goods and services, whether produced within or outside the EU. Overall, the EU's footprint is considered high and exceeds planetary boundaries in several areas, such as climate change and land use. It is also growing, with household consumption volumes in the EU rising by more than a quarter between 2000 and 2019 (EEA, 2023). Growing consumption levels have not led to a higher

consumption footprint, and in the period 2010-2020, it decreased slightly, by around 4%. However, this overall trend resulted from a substantial decrease between 2010 and 2016 (-14%) driven by significant reductions in air emissions (NOx and SOx) following successful policy actions (EEA, 2023). Given the relatively small overall reduction in the consumption footprint in the last decade and the fact that it has in fact increased since 2016, the EU faces a significant challenge in achieving its aim of significantly reducing the consumption footprint by 2030. To achieve this, the EU would need to shift to the consumption of goods and services that have a lower impact on the environment and make significant efforts to reduce its overall consumption of goods and services. Promoting circular business models based on sharing or product-as-a-service systems could help. Countries including Cyprus have demonstrated that reducing the consumption footprint is possible without having to reduce GDP.

Reducing total waste generation
Current trend: **Positive**
2030 outlook: **Low**

The EU's zero-pollution ambition includes an objective to significantly reduce total waste by 2030 (EC, 2021b). Between 2010 and 2020, total waste generation per capita decreased by 4.2% in the EU-27 to about 4.8 tonnes per capita (EEA, 2023), and in the same period GDP increased by 6%. This indicates a slight relative decoupling, although waste generation continues to follow trends in GDP, albeit at a slower pace. The prospects of meeting the ambition are not strong given that the observed decrease in waste generation is very recent (2018-2020) and largely coincided with the economic slowdown due to the COVID-19 pandemic.

Halving the amount of residual municipal waste
Current trend: **Positive**
2030 outlook: **Moderate**

The CEAP aims to halve the quantity of municipal waste not recycled or prepared for reuse by 2030. Since 2004, the amount of residual municipal waste has decreased by 16%, reaching a plateau in 2016 and amounting to 113 million tonnes in 2020. This ambition is unlikely to be met. Even if all EU Member States reach the binding 60% recycling target for municipal waste by 2030, current trends indicate that the amount of residual municipal waste could exceed 80 million tonnes, missing the target by more than 23 million tonnes (EEA, 2022). If municipal waste generation continues growing, at least 72% of waste generated would need to be recycled to meet the CEAP target — a rate that has not been achieved yet by any Member State. Alternatively, the target could be achieved by reducing the amount of waste generated by around one-third or through a combination of these approaches.

Municipal recycling rates of 55% by 2025, 60% by 2030 and 65% by 2035
Current trend: **Positive**
2030 outlook: **Moderate**

Driven by EU and national policies, municipal waste management in the EU has slowly improved, with the share of recycling increasing from 38% to 49% in the period 2010-2020 (EEA, 2022b). However, progress in recycling rates has recently slowed. The EEA early warning assessment indicates that 18 Member States are not on track to meet the binding 55% target set for 2025 for increased recycling of municipal waste. Nevertheless, many Member States recently introduced major changes to their municipal waste management system that are still to be fully implemented and bear fruit. This includes improving or introducing separate collection and subsequent recycling of municipal waste, especially bio-waste, which accounts for 37% of all municipal waste on average, introducing or increasing landfill taxes and introducing landfill bans (EEA, 2023g).

Overall assessment

There is a positive trend across several of the indicators noted above, suggesting that circular economy policies have started to pull Europe in a positive direction. However, the likelihood of reaching the 2030 targets is either low or moderate, which suggests that more work needs to be done to accelerate the emerging positive trends. It perhaps also reflects the inherent lag between policymaking and achieving measurable changes. Many circular policies are relatively new and some have not been fully implemented at national level. Moreover, even when implemented, the impact of novel local measures takes time to filter through to changes on a macro-level. The assessment is also a reflection of the very broad scale of some of the circular economy-related ambitions, such as 'Decoupling economic growth from resource use', 'Keeping EU resource consumption within planetary boundaries' and 'Keeping EU resource consumption within planetary boundaries'. These are very high-level and influenced by diverse economic and social forces. Introducing specific ambitions for key areas of circularity would allow for more targeted assessments of how far the EU has come on the circular transition and would facilitate identification of areas where further attention is needed.

7.3 Accelerating the circular transition

This section presents interventions and measures that could be deployed in the near term to accelerate the uptake of a circular economy. They are presented across the main circular group areas: before-use, during-use and after-use, with an additional cross-cutting category. Recent work by the EEA (ETC, 2023a) on policy innovation and good practice in Member States produced a list of circular economy policies, which Eionet countries have proposed or implemented. From this report, a longlist of about 20 options was identified, which was narrowed down to the accelerators below following discussions and feedback from Eionet countries. The intention of this section is to introduce inspirational examples. The proposals have not been subjected to life-cycle or cost-benefit analysis by the EEA.

Cross-cutting

Introduce binding, quantitative circular economy targets, specifically on resource use

There are currently few binding targets that directly assess the state of the circular economy. For example, the doubling of the CMUR in the CEAP and the call for a reduction of the EU's material footprint in the 8th EAP are voluntary aspirations. Quantified binding targets have been shown to be powerful drivers of change in other policy areas such as energy and climate. They could be introduced in the form of new dedicated targets or by integrating the circular economy into existing actions, e.g. as part of climate targets. New targets should focus on particular material streams or sectors and include monitoring assessments and evaluation of performance, to allow for adjustments and improvements as necessary. Several national circular economy strategies include targets on, for example, CMUR or primary raw material consumption. Reduction of primary raw material consumption is central to the circular economy and helps prevent significant environmental and climate burdens (IRP, forthcoming). This could be pursued through a range of policy options. The proposals below aim to lower demand for primary materials: directly, by targeting the consumption of primary raw material; or indirectly by boosting demand for secondary raw materials.

1. Binding targets on primary raw material consumption, corresponding to the CEAP's aim to keep the EU's material footprint within planetary boundaries. This could be in the format of specific targets on domestic material consumption (DMC). For example, Austria has committed to a target to reduce its DMC by 25% to 14 tonnes per capita per year by 2030. It also has a target to reduce its material footprint

by 80% to 7 tonnes per capita per year by 2050. See also Belgium (Flanders) ([15]), Finland ([16]), the Netherlands ([17]) and Spain ([18]). Concerns to be addressed include how to effectively monitor performance against the target, the need for common standards and definitions, the need to consider supply chain impacts outside of EU and accounting for the different density of materials.

2. Converting the CEAP ambition to double the CMUR within a decade into a hard target, or a series of binding targets, to boost the use of secondary raw materials. This could be minimum recycled content requirements on certain types of products (e.g. recycled content requirements for PET bottles in the Single-use Plastics Directive), or a common EU target on the CMUR for individual material flows. This needs to be distributed in a fair and equitable manner among Member States in a similar way to energy efficiency or climate mitigation targets. Several countries have already set targets to increase their CMUR, including Estonia (30% in 2030), Finland (double CMUR by 2035), Ireland (above EU average by 2030), Latvia (11% in 2027) and Lithuania (13% by 2025) (ETC, 2022).

Continue awareness raising, education, financing and building skills for a circular economy

Awareness raising around the circular economy is important for a range of stakeholders to become more involved, as well as to increase understanding and buy-in for the changes it will bring. One of the objectives is to break down circularity into practical aspects that are relatable to citizens, while highlighting the benefits that follow increased circularity. Several EEA member countries are offering customised training and capacity building sessions to educate stakeholders about the benefits of a circular economy, e.g. Belgium, Finland, Germany, Malta and the Netherlands (CE good practices). Similarly, the European Circular Economy Stakeholder Platform (see Box 3.1) brings together stakeholders to share circular insights and experiences and discuss related issues. Other suggested actions in this area include ambassador programmes, education in schools, skills and capacity raising programmes and consumer behaviour change campaigns. Considerations include the importance of targeted activities for specific groups and recognition that awareness raising in itself does not lead to change but needs to be coupled with effective interventions and inducements. Lastly, accelerating the circularity transition requires the availability of funding opportunities for implementing circular economy measures, investing in circular technologies and business models, and scaling up circular initiatives.

Before use

Leverage the concept of sufficiency to limit unnecessary demand and supply

There is a need to leverage the concept of sufficiency in order to limit unnecessary demand and supply to a level that helps move Europe within its planetary boundaries. There are already a number of restrictions on specific substances and categories of consumer goods, e.g. bans on certain types of single-use plastics, tax on sugar in certain products (e.g. Estonia, Finland, France, and Spain) and tax on meat to reduce environmental impacts. A more systematic approach to reducing absolute levels of consumption within key areas, such as housing, is more far-reaching and thus needs careful consideration. An initial focus here could be to support multifaceted research on

([15]) Target to reduce material footprint by 30% by 2030.
([16]) Productivity of resources/GDP will double by 2035 relative to 2015.
([17]) A 50% reduction in raw material consumption by 2030.
([18]) Reduce DMC relative to GDP by 30% by 2030, relative to 2010.

how this could be achieved, from restrictive actions such as bans to novel approaches such as reduced work hours. Considerations include the complexity of changing consumer behaviour, distributional impacts on certain groups, impacts of potential lower state revenues and a potential populist backlash against restrictive measures.

Stimulate circular public and corporate procurement

One way to foster long-term demand for circular solutions is to promote circular procurement for public and corporate purchasing. Public procurement is recognised as a tool for an improved marketplace for circular products and services, though renewed attention is warranted to increase implementation. In addition, the scale and relative flexibility of corporate purchasing should be leveraged through voluntary agreements on circular sourcing. Support could include measures to ensure products live up to circular design principles and have appropriate recycled content, promoting sharing of products and providing extended lifespans through proper maintenance, reuse, remanufacturing or repair. Examples of good practice include circular procurement guidelines from Flanders and mandatory objectives for certain projects in Denmark, Greece, France, Iceland, Malta, Slovakia, Slovenia and Sweden (ETC, 2022). Important considerations here include the need to develop guidelines and criteria and to monitor the number and value of contracts and their impacts. An essential factor for success will be building capacity on circularity not only for professionals working in procurement but also for auditors who have control over the factors that comprise an acceptable purchasing decision.

Accelerate the uptake of circular design

Design is a critical area for attention, with an estimated 80% of all product-related environmental impacts determined during the design phase of a product (EC, 2023g). This is in line with the findings of the European Court of Auditors' special report on circular economy (ECA, 2023), which highlights that more actions should be undertaken to accelerate uptake of circular design. There was strong support across Eionet members for more emphasis on ecodesign, with several countries supporting swift adoption of the Ecodesign for Sustainable and Circular Products Regulation (ESPR). Concrete measures include incentives for the use of more durable materials in manufacturing, market incentives such as eco-modulated EPR schemes, labelling schemes such as France's repairability index for electrical and electronic equipment and enhanced material traceability such as digital watermarks. Considerations include the risk of greenwashing, challenges in effecting design rules for products sourced outside the EU and a risk of harming the competitiveness of EU businesses.

Shift from income tax towards tax on extracted raw materials

With Europe's ageing population and the need for product prices to better reflect their environmental costs, there is an argument for shifting from income tax towards more tax on extracted raw materials (EEA, 2022). 52% of total tax revenues in EU come from labour taxes, compared to 6% from environmental taxes — a figure which itself is 17% lower than it was 20 years ago (EEA, 2022). Examples of a tax on raw materials include the Danish tax on raw materials (sand, gravel, stones, peat, clay and limestone), which helped increase recycling of construction and demolition waste from 12% in 1985 to 94% in 2004 (The World Bank, 2022). Increasing tax on raw materials could be tied to the carbon border adjustment mechanism to prevent unfair competition from outside the EU. An alternative to taxing primary raw materials is subsidising secondary raw materials, removing harmful subsidies for material extraction or reducing tax on environmental-friendly products. Considerations here include the fact that higher material prices could lead to more shared ownership, a focus on priority sections such as critical raw materials, and the fact that tax and fiscal systems are difficult to change and could clash with legislation proposals that aim to increase resource extraction in Europe.

During use

Establish a reuse action programme at EU level

Building on the model of the circular economy stakeholder platform, a reuse action programme could provide leadership to encourage a reuse culture across the bloc. It would facilitate knowledge exchange between Member States on successful approaches to building reuse activity, including reuse centres, online platforms and second-hand shops. It could also work on collaborative issues, such as a manual that would define operating protocols to ensure that products offered for reuse are of good quality and clarify approaches for establishing drop-off centres that allow citizens to provide products for reuse. Continuing work to strengthen the collection of metrics on reuse will provide critical evidence for this activity and allow estimates of the environmental benefit from increased reuse of products.

Build capacity and demand for longer product lifespans

Longer and better use of products is a key part of unlocking the potential of the circular economy. To foster longer product lifespans, there is a need to both build capacity, including skills training and infrastructure, and to provide economic incentives to do so. Measures here include engaging and enabling public and private sector operators to extend product lifespans through reuse, e.g. via awareness raising, legislation on shifting from single use to reuse and establishing prepare-for-reuse centres. This should also include measures on carrying out preventive maintenance on products, improving repair and remanufacturing options, incentivising take-back schemes and creating favourable conditions for more sharing of products (e.g. through IT platforms, repair cafes, etc.). Considerations to be addressed here include the need to resolve liability issues for repair cafes and increasing the number of skilled technicians available to operate an expanded repair sector.

Encourage consumers to extend product lifespans, rather than buying new

Economic incentives are a key factor in encouraging consumers to opt for actions that extend product lifespans instead of buying new. Such interventions should address the situation whereby repair or reuse options are less economically attractive and should remove barriers, such as the lack of suitable spare parts. Several countries are exploring actions in this regard. For example, Austria has a repair voucher for repair of electronic devices, while Belgium, Czechia, Finland, Luxembourg, Slovenia and Sweden have reduced VAT on repair of certain items (ETC, 2022). In Poland, to increase the competitiveness of businesses operating under circular business models, there is a reduced VAT rate for recycling and disposal services, shoe and leather goods repair services and repair and alteration services for clothing and household textiles. In France, the home appliances sector is obliged to offer second-hand spare parts to maintenance and repair services. Considerations include the difficulty of changing perceptions around buying new models, building trust and acceptability of repaired products and measuring the effectiveness of measures to extend product lifespans.

After use

Develop criteria and a hierarchy to categorise recycling quality

Current recycling targets are focused on the weight of material processed but do not take into account the value and utility of the recovered materials. This can lead to low-quality recycled outputs that meet current policy objectives but in reality may prove difficult to market, except at a steep discount. In addition, some recycling operations result in materials of lower value or utility than the original and/or materials

that are impossible to recycle again. To stimulate the consideration of secondary raw materials as an alternative to virgin feedstocks, it is imperative that there is a sustained and predictable flow of high-quality materials from recycling operations. A common practice hierarchy to ensure products are recycled to the same value would help strengthen the secondary raw materials market across Europe. Common EU criteria on quality should be introduced based on characteristics of secondary raw materials, the potential for further recycling and the environmental impact of the recycling process.

Introduce temporary supports and catalysts to kickstart secondary raw material markets

Markets for raw materials are well-established and purchasers are typically reluctant to move to alternative material sources unless there is a significant incentive to do so. While in the long term, secondary raw materials must perform on an equal footing with virgin materials, a set of interim interventions could help to foster acceptance of these materials alongside virgin materials from well-established sources. These interventions should address both supply and demand for secondary raw materials. Supply-side actions include stimulating the separate collection of waste, introducing end-of-waste criteria and standardising secondary raw materials. This action could be complemented with demand-side measures including circular public procurement protocols, minimum recycled content requirements and taxing of primary raw materials (EEA, 2022).

Apply and strengthen extended producer responsibility schemes for more products

By incorporating the future environmental costs associated throughout the product life cycle into the market price, extended producer responsibility schemes have demonstrated effectiveness at prompting good practices in collection and processing of waste material. Although these schemes bring some administrative burdens, they should be considered for application to selected additional product streams where environmental impacts are high and potential for recovery of materials from waste is strong. In line with the wider ambitions of the ESPR, these new schemes should be established from the outset with the eco-modulation ([19]) of fees in place to strengthen incentives for design change by producers, such as repairability and durability.

7.4 Imaginaries and the broader context

This section uses the EEA's *Scenarios for a Sustainable Europe* to outline different ideal types of approaches to the circular economy (EEA, 2022j). It also brings up a discussion on how to balance some of the underlying approaches to achieving circularity. Imaginaries ([20]) are based on previous work by the EEA on sustainability and serve as a platform to explore some of the underlying discussion that shape how the circular economy will work, for example on sufficiency versus technological innovations.

The imaginaries were developed by the EEA and Eionet to offer engaging, plausible and contrasting images of what a sustainable Europe could look like in 2050. The four imaginaries are called 'Technocracy for the common good', 'Unity in adversity', 'The great decoupling' and 'Ecotopia'. They all carry elements that are visible today but represent different narratives on how sustainability can be established. 'Technocracy for the common good' advocates national state-led technological innovations as the key solution to achieving sustainability in Europe. 'Ecotopia' promotes a back-to-nature

([19]) Eco-modulation of fees is a way to incentivise a products environmental performance, by lowering extended producer responsibility fees for attributes such as recyclability, repairability and durability.

([20]) 'Imaginaries' is a tool for forward-looking analysis and assessment, they were initially developed to offer engaging, plausible and clearly contrasting images of what a sustainable Europe could look like in 2050 (EEA, 2022j).

and communitarian solution. 'The great decoupling' focuses on a neoliberal path towards solving all challenges economically, while 'Unity in adversity' suggests strong top-down EU policy as the central key for sustainability (EEA, 2022j).

In the following section, the main premise of each of the imaginaries is kept but modified into a circular economy context. The four imaginaries, albeit somewhat exaggerated, can help map varying narratives and navigate the many different and sometimes competing views on how a circular economy should work. They are not intended as a precise prescription of how a circular future should or will look. They are more reflections on alternative future states and aim to inspire a broader discussion around how a circular economy could work.

Technocracy for the common good

In this imaginary, Member States have turned away from global processes and increasingly prioritise national interests. A key priority is strategic autonomy — securing access to resources and protecting the resources already within one's borders. A turn to strong government has meant that selected experts, and the public sector, have been given more power to solve key social challenges, at the expense of some democratic principles. Enforcing circularity has been enabled by a very detailed and almost all-encompassing monitoring infrastructure, through advances in digitalisation and artificial intelligence. The long reach of the state is also seen in the business sector, which is dominated by large state-owned companies that control the strategically important areas of the economy and material flows. The EU is reduced to servicing partnerships among strong, like-minded governments that lean towards deglobalisation and a very protectionist interpretation of strategic autonomy. The reach of the government is evident in everyday life, where there are caps on material use and resource optimisation behaviour is controlled through nudging and choice editing. Recycling is a central feature of the circular economy, with highly efficient and centralised waste management facilities ensuring the highest possible recycling rate. Secondary raw materials are produced to high technical standards and are available via online platforms and so they are sought-after in both public and private procurement.

Unity in adversity

Faced with multiple environmental, economic and geopolitical crises, Europe has become much more unified. However, rather than putting national states first, Member States have empowered the EU to provide leadership as it is seen as the only political entity able to manage the transnational nature of these crises and ensure that Europe lives within planetary boundaries. The circular economy is seen as an essential tool to ensure that Europe achieves this. Circular economy actions have the specific purpose of reducing the environmental footprint of products associated with European lifestyles while increasing resilience to natural and geopolitical shocks. A strict interpretation of the precautionary principle and financial consequences for environmental damage provide further control mechanisms. Businesses operate in a system with less focus on achieving high growth and 'planet, not profit' is the mantra for operators. This means that circular economy actions that aim to reduce consumption or individual ownership are less reliant on delivering profitability. There is a strong demand for recycled materials to comply with strict policies around environmental damage and live up to environmental footprint requirements, determined by life-cycle assessment. Secondary materials are valuable and desired, while the use of new raw materials is perceived as the inferior option and is avoided. The ways in which materials are sourced and supplied matter. Nature is not only something to preserve but also a very active part of the solutions. Nature-based solutions have become essential and within the circular economy, regenerative actions have become a key addition to the original mantra of reduce-reuse-recycle.

The great decoupling

Innovative businesses are the heroes of this imaginary and have driven the establishment of a highly circular economy. Technological breakthroughs, especially in the bioeconomy and chemical recycling, have enabled the circular economy to help decouple economic growth from adverse environmental impacts, without the need for radical change to consumption trends or deviation from the growth paradigm. Rather than changing consumption, the emphasis is ecodesign for reduced impact from production underpinned by effective recycling and closing material loops. In place of strict regulation, policy focus is on research and development and investments in innovation. A shift to bio-based and synthetic materials means the continual growth in production and consumption has not led to increased use of primary resources. There are few strict top-down regulations, as voluntary measures and nudging are perceived to be more effective to change public behaviour, allowing companies and households to find their own best circular solutions. Technological developments have enabled circular lifestyles with new habits and circular routines, from smart waste bins that optimise sorting to signals from products on when and how to repair the unit to extend its life. Circularity and resource efficiency are a part of everyday life and consumption patterns have not changed radically because technological advances are lowering their environmental impacts. However, there is concern that the reduced product footprint has led to a rebound effect, leading to higher overall levels of consumption.

Ecotopia

In this imaginary there has been a strong societal urge to reconnect to nature and the local community. Rather than relying on game-changing advancements, technology is used sparsely. Society is characterised increasingly by bottom-up structured local societies with central and transnational organisations having a diminishing role. Civil society groups have gained a key role. Businesses are managed with the involvement of diverse stakeholders and bottom-up decision making. The circular economy has been shaped by this approach, and the focus is on 'slowing the loop', with rethink, reuse and repair seen as critical concepts. A key function of local authorities is to facilitate circularity for products and services, with share centres and repair shops widespread in towns and cities. Social development has witnessed a radical change and the 'addiction' to consumerism has been replaced by people striving for a 'good life' in which they are free to pursue non-material fulfilment. There is much less waste produced due to lower levels of consumption and the taboo of discarding products. Material loops are both narrower and slower: when products stop working, they are either repaired or remanufactured.

Competing underlying perspectives on the circular economy

Across the four imaginaries, there are a number of contrasting perspectives on the broader issues around how a circular economy should, or could, operate in the long term. Each of the imaginaries highlights specific aspects of the circular economy and therefore only provides parts of the 'solutions' towards a circular economy transition. Each of them also represents a political voice and reasoning in the policy process; ignoring any of them completely means excluding proponents from the policy process and can reduce its perceived legitimacy.

Mapping these can help outline underlying aspects and discussions that will inform the circular economy, for example whether it necessitates a very top-down or bottom-up approach ([21]), or if it requires radical change or can be achieved through incremental change ([22]). The following section presents an exploration of one of the pivotal debates on the social dynamics.

([21]) Essentially, whether centralised governmental control with strict regulatory approaches or decentralised and more voluntary-based approaches are the best fit for circular transition.

([22]) This refers to a debate on whether a circular transition can be achieved by changing the current system or whether a complete systemic change is necessary.

Technological innovation versus sufficiency

This debate considers whether technological fixes will suffice to address environmental challenges or if consumption levels must be cut to mitigate the environmental impacts of consumption and production systems and move within the planetary boundaries. For proponents of a circular economy founded on technological innovation, the main advantage is that it would not require extensive changes to our consumption patterns and behaviours. It also builds on a long legacy of technological improvements and human ingenuity to solve key challenges. However, this would require stakeholders across the economy to align their interests on transforming to a circular economy and would make society very dependent on technological innovations fulfilling their promise. For critics, this would likely exacerbate the growing technological inequalities and lead to an overreliance on technology and a high vulnerability to greenwashing.

Sufficiency approaches, on the other hand, are essentially about reducing overall consumption levels and 'slowing the loops'. This would mean significantly lowering consumption and thus material flows in the economy. If technological innovation does not deliver, this may be the only alternative to reduce the impacts of our production and consumption systems (Bianchi and Cordella, 2023). Critics would argue that fulfilling Ecotopia would be the equivalent of going back in time and forfeiting technological advances and lifestyle comforts that society benefits from. Indeed, shutting down innovation and growth could lead to more environmental degradation rather than more technological economic models. Moreover, this might have cataclysmic impacts on society, as lower growth would mean reduced public funds for schools and hospitals (EEA, 2021). Underlying this approach is the fact that behavioural changes are notoriously difficult to implement and wide acceptance hard to achieve.

Looking ahead, a circular economy arguably needs both sufficiency measures and scale-up of technological innovations to help move production and consumption within the planetary boundaries. None of the circular economy imaginaries are fully desirable from a broad stakeholder perspective and thus none should be pursued on their own. Getting the balance right needs continued discussions and the balance will likely look quite different from country to country. Only innovative combinations of bureaucratic measures, risky entrepreneurship and technological progress alongside frugality and solidarity can deliver successful circular and sustainable outcomes.

Box 7.1

Closing reflection on establishing Europe's circular economy

The period after the 1950s marks a unique period of unprecedented and accelerating human-induced global socio-economic and environmental change, which has become known as 'the Great Acceleration' (Steffen et al., 2015). In this period, affluent societies embraced consumerism driven by low-cost and disposable goods and established a resource-hungry model that developing countries are rapidly following. In this context, it is unlikely that a long-lasting, absolute decoupling of economic growth from environmental pressures and impacts can be achieved at a worldwide scale (EEA, 2021), with implications for global sustainability.

It is also important to realise that the potential for achieving very high levels of circularity is curtailed and that a 100% circular economy is simply not possible (EEA, 2020). There are a number of reasons: a large share of primary material throughput is composed of energy carriers and other materials that are degraded through use and cannot be recycled or can only be downcycled; the inherent requirement for energy to recycle materials in itself creates resource demands; and the dissipation of resources through use can make recycling logistically and economically unviable. In addition, the build-up of stocks in the economy, especially in infrastructure, restricts the potential flow of secondary raw materials back into production. These points underline the importance of taking actions at the before-use and during-use stages, along with after-use material management.

Having had a leading role in the charge towards excess consumption, it is fitting that Europe is now also working to show leadership towards a new economic model focused on high environmental quality and human well-being that offers a sustainable way of life for future generations. The transition to this new paradigm is substantial, and looking across the before-use, during-use and after-use stages, some fundamental shifts can be identified.

BEFORE

This report has noted that increased wealth brings greater consumption and that European consumption levels are well beyond the planet's capacity. In addition, greater wealth has been identified with a desire to acquire new products rather than reusing existing products or buying products that incorporate recycled materials.

Responsible consumption is a critical action in terms of shifting to a sustainable and circular economy. In particular, over-consumption must be curbed, as this causes unnecessary use of resources through frivolous purchasing of products. Using single-use and short-life items squanders resources and creates waste management issues and must be stopped. We simply cannot afford the cost of consumption.

Consumers, both organisations and individuals, must always question whether acquiring an additional new product is the appropriate response to an expressed need or desire. Similar functionality can be achieved by rethinking how products are used, or by simply deciding that that need can be left unmet.

Given the finite stock of resources available for future generations and the impossibility of achieving 100% circularity, it is imperative to reduce resource extraction and consumption. Production systems founded on promoting excess purchasing must be discouraged.

DURING

The vast stock of materials contained within the products, buildings and engineering works across Europe represents a valuable asset for current and future generations. As much of the environmental impacts are associated with resource extraction and manufacture, once products are in use, these assets should be worked as hard as possible for an extended lifetime.

Activation of circular actions such as reuse, repair and remanufacturing is essential to ensuring these products function correctly and for the maximum period to avoid them being unnecessarily discarded into the waste stream. In parallel with developing skills and infrastructure to support these activities, building a culture of trust and acceptability around reconditioned and shared items is a fundamental requisite.

Box 7.1

Closing reflection on establishing Europe's circular economy (cont.)

Safety and environmental protection must be integrated into this approach and will require careful attention. For example, issues such as the presence of hazardous substances or efficiency gains can mean that the useful life of an item is shorter than its design life, and so careful stock management and waste management are important.

Existing stocks of products should be used intensively and for an extended lifetime to maximise the utility of previous production and to avoid the need for replacements. Trust and pricing issues for repair must be addressed to build greater societal acceptance.

AFTER

Given the negative impacts of disposal such as pollution and resource dissipation, the end-of-life stage of the product chain has rightly received significant attention. Improved waste management and recycling is broadly in evidence across the EU, informed by the waste hierarchy. This has seen a sharp reduction in landfilling of waste and good progress on improving recycling rates.

The emphasis now must be on establishing waste streams as a source of raw materials for European industry. The goal of waste policy needs to evolve from a focus on tonnages of recycled waste to supplying the materials needed by producers, in predictable quantities, with appropriate quality and at the right price.

There is still a need for a waste sector to deal with dangerous and problematic substances, but the main activity of the sector must be reoriented to a resource supply perspective. This shift to a high-quality recycling model will be demanding and will take time. However, it can be achieved through policy leadership, industry investment and consumer engagement. Europe's economy will only be truly circular if end-of-life materials actually find their way back into the production cycle.

Returning substantial quantities of high-quality, safe secondary raw materials to productive use is fundamental to large-scale implementation of the circular economy. Waste management and recycling activities must be optimised at a sectoral level towards a material-supply business model.

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