Chapter 9
The Future of Sustainable Business: The Circular Economy

Keywords Decoupling of economic growth · Slowing · Closing · Narrowing

This Chapter's Learning Goals
- You know the concept of circular economy and its three fundamental strategies.
- You know the meaning of circular economy at the macro and micro level.
- You know the relevance of circular economy for future ecological and economic development.

9.1 The Concept of a Circular Economy

The latest **IPCC report** on climate change has made it clear once again. We are not on track to meet our environmental targets, and stabilizing the climate will require fast action. Carbon intensity declined by 0.3% per year in the 2010s; a 3.5% reduction would be needed for 2 °C, and a 7.7% reduction for 1.5 °C. Achieving the 1.5 °C Paris target means that global coal use must decline by 95% by 2050 compared to 2019. Oil consumption must decrease by 60% and gas consumption by 45% over this period. In all scenarios, there is no room for new, unabated fossil fuel projects (e.g., power plants), and most existing projects must be shut down more quickly than planned. Removal of greenhouse gases from the atmosphere is required in all scenarios because residual emissions from some sectors of the economy are always assumed (The Economist, 2022).

These targets will be all the more difficult to achieve because population growth and rising incomes will lead to a sharp increase in demand for goods and services in the coming years. As a result, global **material consumption** is projected to more than double to 167 Gt by 2060. This will have a direct impact on the environment, as more than half of all greenhouse gas emissions are caused by material management activities (OECD, 2019). To meet environmental targets, it will therefore be central that we use existing materials more efficiently. Accordingly, the future of sustainable

M. Fischer et al., *Sustainable Business*, SpringerBriefs in Business,
https://doi.org/10.1007/978-3-031-25397-3_9

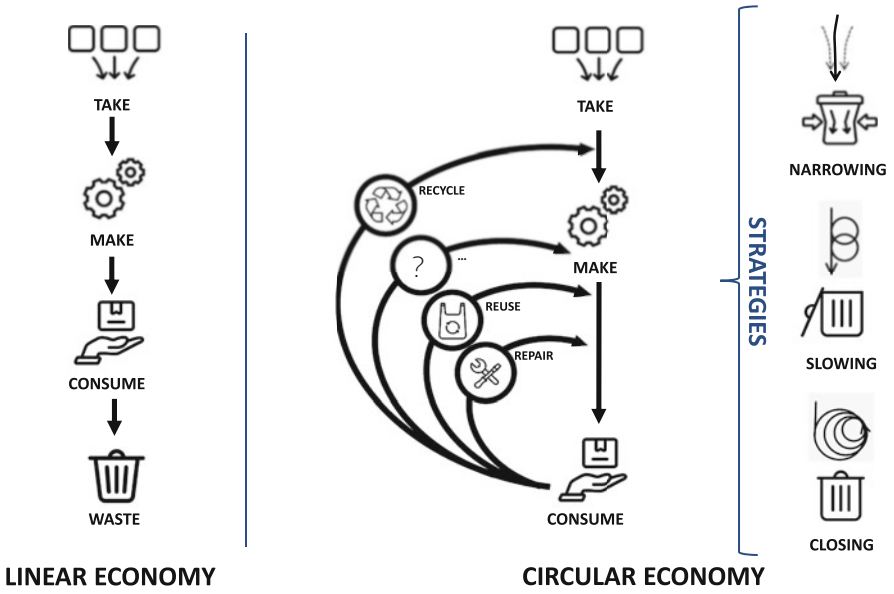

Fig. 9.1 Linear vs. circular economy (source: own representation)

business will be closely linked to our ability to build a **circular economy**. Companies today usually work with linear business models that assume that goods are disposed of by consumers after use and thus become waste (see Fig. 8.1). In contrast, the idea of a circular economy is to maximize the benefits of everything that already exists (Esposito et al., 2017).

In a circular economy, resources should be used as long and as efficiently as possible; once materials and products have nevertheless reached the end of their life cycle, they should be recycled, thus avoiding waste products and keeping resources in the cycle. However, circular economy is not only about recycling, its main focus is on the reuse, reprocessing, refurbishment, repair, and upgrading of products, components, and material (see Fig. 9.1). It also requires the use of solar, wind, biomass, and waste energy along the entire product value chain (Korhonen et al., 2018). Although the social dimension can also be taken into account, the concept of a circular economy focuses primarily on environmental sustainability.

Compared with a linear approach, a circular approach is characterized by the following **three fundamental strategies**: it tries to (a) **slow** resource loops by extending product life, (b) **close** resource loops through recycling and stimulating reuse, and (c) **narrow** resource flows by using fewer resources per product, i.e. increase resource efficiency (Bocken et al., 2016). **Technological change** discussed in Sect. 4.3 is a key component of a circular economy. Circular economy is also based to a large extent on innovation activities. However, there are also clear differences between the two concepts. While technological change focuses strongly on product innovation and the production phase, circular economy is a more

comprehensive concept that explicitly considers activities along the entire production cycle and has an explicit focus on the efficient use of existing resources and the closing of resource flows, which is not the main focus of the technological change literature.

9.1.1 Macro-level Perspective

At the macro level, a circular economy focusses on the (material) exchange between the economy and the environment, on international trade and on material accumulation in economies, rather than on flows within the economy. At the macro level, the circular economy is presented as an **industrial system** that is based on different industrial sectors, such as a functioning recycling industry, a sustainable energy industry, a functioning rental industry (car, consumer goods, ...), a functioning repair industry (car, electronics, ...), etc. (see, for example, Burger et al., 2019; Van Oort et al., 2018). A transition to circular economy at macro level requires a structural shift, involving the decline of certain sectors and the rise of other sectors, which depends heavily on **technological change** (i.e., green product and process innovation) in these industries (see Sect. 4.3). Based on the known major environmental potentials (see Sect. 4.3.1), the transformation to a circular economy at the macro level accordingly requires closing the mobility, food, and building sectors, e.g. by switching to new technologies with a smaller environmental footprint. In summary, the following adjustments are relevant here: In the energy sector an increasing use of renewable sources, in the mobility sector an increasing use of public transport and a switch to electric vehicles, in the building sector an increasing reuse of existing building materials, in the food sector a reduction of food waste, and a more efficient recycling industry.

Through the use of macroeconomic indicators we can illustrate throughput of a country or a larger region in terms of interactions with the rest of the world through trade flows. In Fig. 9.2, an example of a material flow diagram is presented for the EU. The diagram shows the material flows as they pass through the EU economy. Materials such as biomass, metals, minerals, and fossil fuels are taken from the environment to produce products and assets or to be used as a source of energy and are eventually released back into the environment. Closed-loop material flows means that leftovers, the so-called side streams, do not end up as waste but are reused in the economy or used to produce secondary raw materials or for other purposes that prevent further extraction of natural resources. The fewer products we throw away and the more we reuse, the fewer materials are taken, which benefits our environment.

There are different indicators to compare the use of materials between countries. One central indicator is material productivity (see Fig. 9.3 for OECD countries). Switzerland (CHE) is one of the best countries in terms of material productivity, expressed as the amount of economic value generated per unit of materials used. However, some countries such as the Netherlands (NLD), the UK (GBR) and

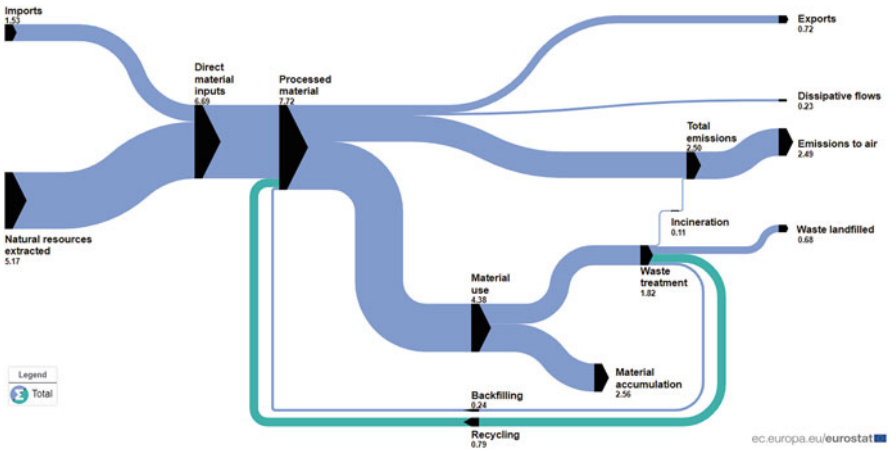

Fig. 9.2 Material flow diagrams for European Union (27 countries) in Gigatons, 2020 (source: Eurostat. (n.d.). Retrieved October 19, 2022 from https://ec.europa.eu/eurostat/web/circular-economy/material-flow-diagram)

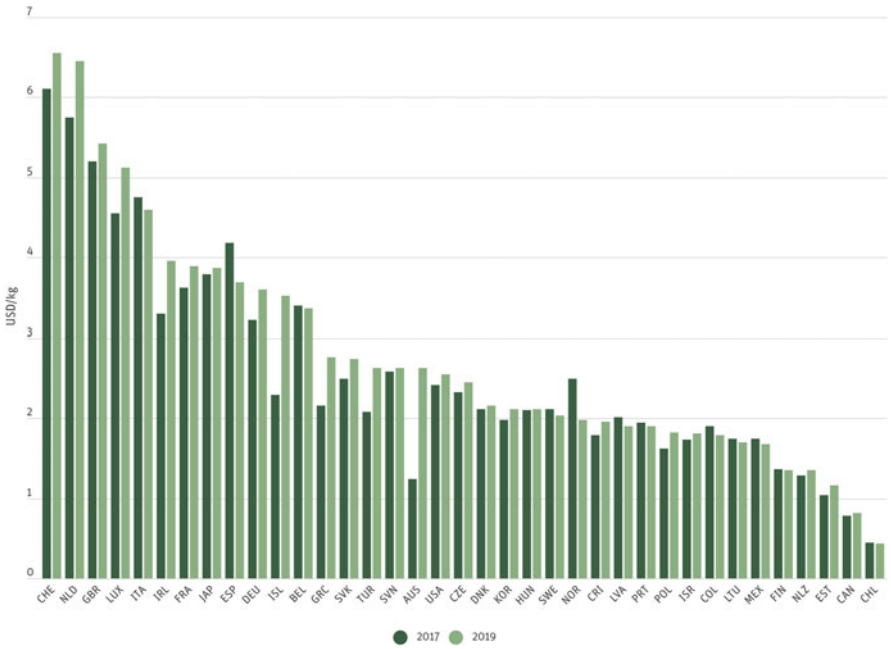

Fig. 9.3 Material productivity measured as economic value (GDP) per kg of materials used for OECD countries (source: own representation based on OECD (2022). https://data.oecd.org/materials/material-productivity.htm#indicator-chart)

especially Iceland (ISL) have caught up significantly in recent years. This trend of increasing material productivity is driven, on the one hand, by increased recovery rates (e.g., due to recycling), where Switzerland is also ranked among the best countries. On the other hand, we should not forget that it is also because western countries are increasingly offshoring material-intensive production. This means, if we look at the global values, we do not yet see a **decoupling of economic growth** and material consumption (see Fig. 1.8). Although growth is expected to decouple in the coming years due to increasing efficiency, population and economic growth will still lead to growth in absolute material consumption (OECD, 2019).

Real-World Example: Eberhard Unternehmungen
Eberhard Unternehmungen is a Swiss construction company active in various fields: deconstruction, remediation of contaminated sites, recycling, and civil engineering. This breadth forms the basis for Eberhard's pioneering role in the circular economy. At the beginning of the transformation process at Eberhard, the focus was not on efficiency but on closing material cycles. Forty years ago, the company began to move in the direction of a circular economy and installed a stationary plant for processing construction waste. This plant made it possible not only to separate and dispose construction waste from deconstruction, but also to use it as an effective production input for the creation of new building materials.

Since then, the activities have been further expanded in regular steps. Twenty years ago, Eberhard opened the largest recycling center for building materials in Switzerland in Ruemlang. Today, more than 20% of Eberhard's total investment goes into sustainability. In 2021, a new recycling center opened. This center recycles old concrete and other mixed waste from deconstruction. In this way, Eberhard has been able to further close the material cycle. Construction materials from the deconstruction of buildings are now almost 100% recycled at Eberhard, while the figure for the remediation of contaminated sites is around 70%. 50% of the recycled building materials (secondary building materials) are reused directly in road construction by Eberhard's own companies.

Source: https://eberhard.ch/

9.1.2 Micro-level Perspective

While the macro level focusses on making the material cycle in the entire economy as circular as possible, at the micro level the focus is on maximizing the circularity of individual companies. Macro-level analyses do not sufficiently cover the potential of circular economy at the micro level. Ultimately, each company has a certain scope to develop along its value chain in the direction of a circular company, for example by adjusting product development, production process, or after-sales services, but also

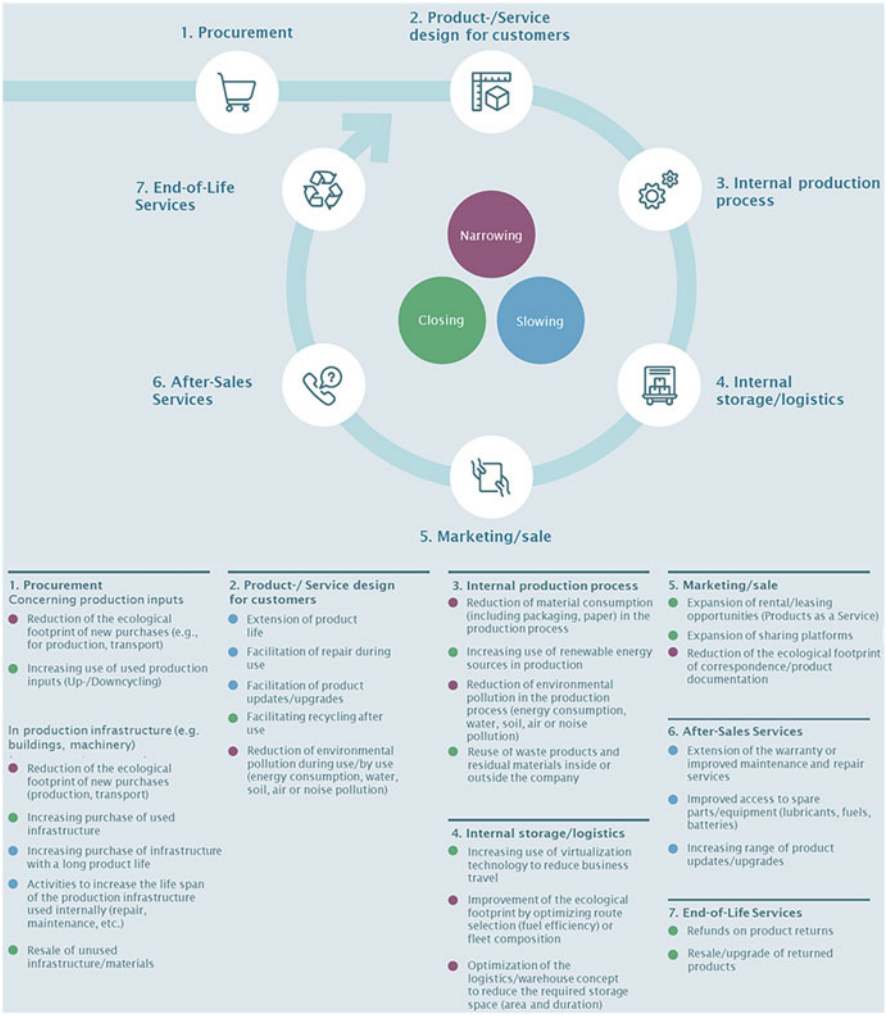

Fig. 9.4 Options for circular economy activities along the value chain of a company (source: Stucki & Wörter, 2021)

in particular by improving resource procurement, logistics, sales, and end-of-life services (see Fig. 9.4). Circular economy at the micro level is, so to speak, an extended form of technological change (see Sect. 4.3), whereby both product and process innovations along the entire production cycle are taken into account. And, in addition to efficiency (red dots in Fig. 9.4), the focus is explicitly on closing loops (green dots), and extending product life (blue dots). Hence, decisions on the use of circular economy activities are often taken within individual companies. At the macro level, it is very difficult to distinguish such intra-firm effects from other

effects, such as structural changes within an industry (Horbach et al., 2015; Meyer & Sommer, 2014). In order to be able to exploit the potential of a circular economy as much as possible, it is therefore important to include the micro level.

9.1.3 The Specific Challenges of a Circular Economy

In the end, circular economy is about minimizing waste. Purists may argue that an economy/company cannot be described as circular unless its entire value chain is circular, and no waste is produced. Such an ideal of a single circular system, while desirable, cannot be fully achieved even in the future (De Man & Friege, 2016). In the world, approximately 75% of the energy production is based on non-renewable sources. The combustion of these sources releases emissions to biosphere in forms and concentrations that nature cannot tolerate or assimilate (Korhonen et al., 2018). A completely circular world therefore seems utopian. The circular economy is rather an ideal final state, which one should approach step by step.

However, there are also certain minimum requirements for a circular economy. For example, an economy/company cannot be described as circular, simply because it makes certain efforts in terms of efficiency. Besides efficiency, closing and slowing resource flows are essential parts of a circular economy; an economy/company must be able to demonstrate efforts in all **three fundamental strategies** to be considered circular. Moreover, in comparison to increases in efficiency, where every business unit can improve its processes itself, circular economy activities are much more interlinked between different business units. Circular economy is not only about increasing recycling rates by improving after-use activities. Circular economy means that already product designs are adjusted to simplify the reuse and recovery of materials. In addition, after-sales activities such as the offering of product upgrades and repair services are required to keep the resources in the cycle for as long as possible. Hence, circular economy requires the simultaneous involvement of **different business units**. Finally, circular economy thinking is not limited to a company's own operations but affects its whole value chain. To make the material flows more circular, a recycling company, for example, will have to cooperate with a chemical company in the processing of recycled plastic into new products. Or a printing company has to cooperate with a supplier from the paper industry, to make its own products more sustainable. Accordingly, circular economy requires a lot of coordination work within and **between companies**.

Circular economy is therefore often associated with a new way of thinking and requires complex coordination along the entire production cycle. The transition from a linear to a circular economy is usually associated with high costs, triggered by existing and hard to change corporate cultures. Operational barriers such as complex administrative and legal processes, compliance with regulations/standards, or the procurement of financial resources are usually comparatively small barriers. In comparison to technological innovation, also technical barriers are usually of little

importance for the transition to a circular economy; circular economy is not so much a technical as an **organizational challenge** (Schoenmakere et al., 2019).

9.2 The Impact of the Circular Economy Transition

Implicitly, circular economy should have a positive impact on the environment. Circular economy holds promise for achieving multiple **SDGs** (see Sect. 2.4), including SDG 6 on energy, 8 on economic growth, 11 on sustainable cities, 12 on sustainable consumption and production, 13 on climate change, 14 on oceans, and 15 on life on land. However, closing material loops in a value chain does not always lead to better environmental performance. For example, if the materials for reuse must first be transported over long distance, the ecological effect of transportation may exceed the ecological savings from reuse of the materials. Circular economy should also affect economic outcome. New opportunities will emerge in various sectors, including secondary material production, repair and remanufacture, services, and the sharing economy, thereby stimulating job creation and economic growth. Such profitability-driven perspectives on the circular economy are represented by Achterberg et al. (2016) in the **Value Hill diagram**, where the value of resources is retained after use through activities categorized into reuse/redistribute, refurbish, remanufacture, or recycle. This should be especially true for countries like Switzerland, which have hardly any natural resources of their own. Accordingly, it is often implicitly assumed in the literature that circular economy automatically leads to better economic performance. However, an opposite effect may arise as circular economy aims to ensure that products are used for as long as possible, which in turn can lead to a decrease in companies' sales. It is therefore ambiguous how the circular economy will ultimately affect the economic performance of companies. Effects will likely vary according to the different dimensions of a circular economy, such as closing of material flows and extending product life. Hence, the analysis of the economic and environmental effects of circular economy is of central importance.

While there are several studies that try to identify the economic and/or ecological impact of a circular economy at the macro level, evidence at the micro level is scarce (for an overview, see Rizos et al., 2017). Based on economic models and numerous expert interviews, a study by the Ellen MacArthur Foundation and McKinsey Center for Business and Environment (2015) concludes that Europe could increase resource productivity by up to 3% per year with a closed-loop economy thanks to new technologies, which would lead to an increase in GDP of up to 7 percentage points compared to the current development scenario. Wijkman and Skånberg (2017) use an input/output model to estimate the impact of circular economy on the reduction of CO_2 emissions and job development in five EU countries. Depending on the country, a total of between 75,000 additional jobs are expected in Finland and 500,000 in France. Depending on the scenario, a reduction in CO_2 emissions of between 3 and 50% is expected by 2030. Existing studies at the micro level are limited to

investigation of cycles of specific materials or industries—whereby a generalization of the results is difficult—or they focus on pure green product and process innovation—whereby many other potential areas of circular economy activities such as after-sales services, logistics, or procurement are excluded. Overall, there is still little broad-based empirical evidence at the micro level of the economic impact of the circular economy.

9.3 Accelerating the Circular Economy Transition

9.3.1 Where Do We Stand in the Transition Process?

Large companies, such as Patagonia, Caterpillar, Hilti, IKEA, or Philips have incorporated circular economy strategies in their operations. These prominent examples are all well and good. But to achieve a significant ecological effect, a large-scale transition is needed. A representative survey for Switzerland in 2020 shows that many companies in Switzerland are still at the beginning of the transformation to a circular business model. Only about 10% of companies have implemented the circular economy as a central concept to date. This is independent of which indicators are considered: implementation in the business model, investments made in the area of circular economy, measures implemented in the area of circular economy, or the share of sales with circular products/services. Most measures have been implemented in production and procurement. In the areas after-sales and after-use—which are central to circular economy—significantly fewer measures have been rolled out. Up to now, the focus has been primarily on efficiency measures that can be implemented without major investment, the so-called low-hanging fruits (see Stucki & Wörter, 2021).

9.3.2 Political Initiatives

Politicians have recognized the importance of the circular economy. China formally accepted the circular economy concept as a new development strategy in 2002; the first law on it came into force in 2009 (Lieder & Rashid, 2016). The EU is also a forerunner in this field. In 2015, the European Commission adopted an Action Plan aimed at accelerating Europe's transition to a circular economy. For example, an eco-design directive was introduced in the EU to promote the idea of a circular economy. The aim is to cover the manufacturing of products as completely as possible and to save energy and resources with directives. However, this directive applies exclusively to energy-related products, which primarily include electrical equipment. Moreover, the focus was on the last part of the product life cycle: recycling, repair, and reuse. The scope of circular economy was expanded in 2020 under the EU Circular Economy Action Plan, one of the main components of the

European Green Deal: the new European agenda for sustainable growth. The new Action Plan takes into account more explicit initiatives along the entire life cycle of products, targeting, for example, their design, the promotion of circular economy processes, the promotion of sustainable consumption, and the goal of ensuring that the resources used remain in the EU economy for as long as possible. In addition, the focus has now been extended to sectors that consume the most resources and where the potential for circular economy is high. These sectors include electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water, and nutrients (EU, 2020).

In Switzerland, the Green Economy Action Plan 2013 and its further development 2016–2019 are intended to support the voluntary commitment of industry, science, and society to the conservation of natural resources and explicitly to strengthen the circular economy.

Overall, political activities are still focused on the macro level. This may also be due to the fact that the current data situation hardly allows monitoring at the micro level. Accordingly, the focus of measures is primarily on individual product cycles rather than production cycles. In addition, many activities are still limited to recycling, and less to other stages of production such as product design, which are likely to have a much greater ecological impact.

9.3.3 The Whole System Has to Transform

The realization of the greatest environmental potentials—nutrition, building/housing, and mobility (see Sect. 7.2.1)—is usually not hampered by individual barriers, but by complex constellations of barriers in the existing market and regime structures. Probably the biggest barrier lies in the insufficient cost transparency due to the lack of internalization of external costs, which means that economic incentives for the implementation of sustainable solutions and technologies are currently largely lacking for companies and consumers. In addition, the realization of these potentials is hampered by technological and organizational barriers and a high commercial uncertainty (see Sect. 4.3.3). Because of these multiple barriers, a **holistic systemic approach** is required, with steering at different levels and at diverse starting points. Given this, the comprehensively defined concept of the circular economy appears to be a suitable guiding paradigm on which the upcoming sustainability transformation can be oriented (Spörri et al., 2022).

As discussed in Preface, the various steering parameters behave like a system in which the individual parameters influence each other. This also applies to the circular economy. It is not enough that companies become increasingly circular and use resources more efficiently on the production side. To really achieve an ecological effect, **consumers** must also be involved in the transition. Only if consumers are also willing to use products and the associated resources more efficiently, and thus usually for longer, will the production-side measures really achieve their true potential. Consider a jeans manufacturer: the manufacturer can use

its resources more efficiently, make the products more durable, and also close resource flows. But if consumers are not willing to wear the jeans for longer, the ecological effect of these measures will be limited. Hence, as represented in SDG 12, responsible consumption and responsible production go hand in hand.

A successful circular economy transition thus requires action in all approaches to sustainability (see Sect. 2.3). The production side of circular economy, in **efficiency** and **consistency**. And as mentioned in our jeans example, on the consumption side, adjustments must also be achieved in **sufficiency**. Customers must be willing to consume less and increasingly share goods instead of owning them themselves.

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