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Sustainable Business

Managing the Challenges of the 21st Century

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Sustainable Business

Managing the challenges of the 21st century

Preface

The Business School at Bern University of Applied Sciences (BFH) has set itself the goal of becoming a business school with a sustainable impact. In concrete terms, this means that we want to make a significant contribution to the end of the age of fossil fuels. Or to put it in the words of the Wuppertal Institute: we want to enable the transformation to a "climate-neutral and resource-light society."

This means that we want our students to understand anthropogenic global warming and the other grand challenges of the twenty-first century, and to know the central steering parameters that can be used to contribute to a more sustainable world. This applies at the individual level (e.g., how much CO_2 pollution is caused by air travel), at the organizational level (e.g., what requirements should campus catering meet), or at the macro level (e.g., aligning the energy sector with renewable energy).

We want to prepare our students for these grand challenges when they graduate and become leaders in business and society. This reader is designed to provide a solid foundation for sustainable business and to provide systems, goals, and transformational knowledge for the necessary social and economic change processes. The reader was developed over 2 years in collaboration with the Business School's Institute for Sustainable Business and thus represents the combined knowledge of institute members.

The Institute of Sustainable Business is concerned with sustainable entrepreneurship, its underlying values and stakeholders. Our institute takes a holistic systems perspective and is aligned with the United Nations' Sustainable Development Goals (SDGs). We focus primarily on corporate sustainability, circular economy, sustainable consumption, and social innovation. These topics also form the core of the reader.

At this point, we would like to mention that we also relied on external support in the preparation of the reader. The authors gratefully acknowledge the financial support from the WWF Funding SDSN Network. In addition, the authors would like to thank Susan Müller, Pascal Dey, and Jörg Osterrieder for their contributions

and helpful comments on the chapters on social innovation and sustainable finance. Many thanks also to Raphael Zaugg, who helped us with the design of the graphics.

Transformation processes are highly complex and take place in the interplay of technological and social innovations, political and social frameworks, and cultural norms and values. We therefore try to live sustainability as individuals and as an institute, even if we do not always succeed. Our motto is "sustainable mindset in action." We hope that this reader will help to accelerate and expand action in this area.

Bern, Switzerland
November 2022

Tobias Stucki
Ingrid Kissling-Näf

Introduction

We are regularly confronted with examples of how we are exceeding the ecological boundaries of our planet: whether it is by chopping down rainforests, emptying the oceans, or emitting so much CO_2 that we face rising sea levels, melting permafrost, droughts, and crop failures. Our society also faces major social challenges such as poverty, social injustice, violent conflict, and child exploitation. It is undisputed that the pressure on our planet, our livelihoods, and our standard of living will increase as the world's population continues to grow, and that current trends seriously threaten the very existence of many of our societies as they stand.

In the chapters that follow, we will learn more about the major global challenges that threaten our existence and examine the reasons science sees for our plundering of natural resources and how we can correct this unsustainable exploitation of nature. We will also explore how we can change our institutional frameworks to make businesses and our economic system more sustainable. In our sustainability efforts, there are five parameters that can steer us in the right direction (see Fig. 1). First, **civil**

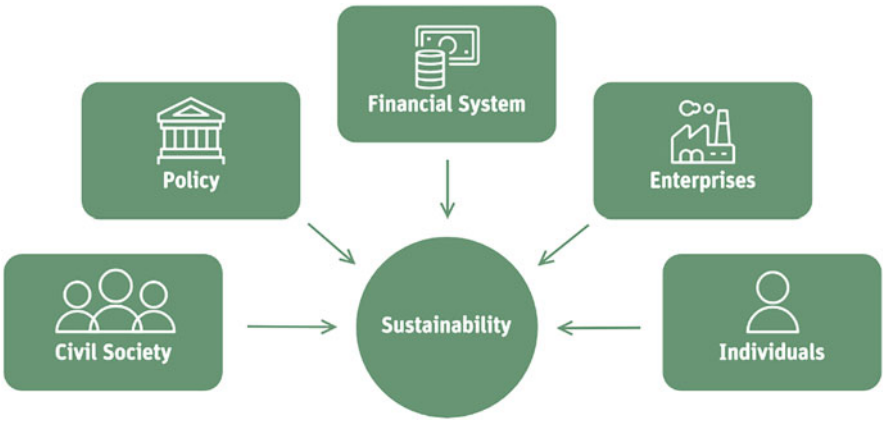

Fig. 1 The five steering parameters of sustainability (source: own representation)

society organization, that is, the contributions that community organizations can make through self-organization and social innovation. Second, government has some responsibility; by developing appropriate **policy** instruments, it can ensure that sustainability is increasingly incorporated into decision-making through the internalization of externalities. Third, the **financial** system provides the financial framework for companies and individuals and can therefore also contribute directly to sustainable development. Fourth, **enterprises** can also make a positive contribution to a more sustainable world through greener and fairer production methods and the development of sustainable products. Fifth, **individuals** also play a role, as each consumer contributes to a more sustainable world through what and how much they buy.

Of course, there are other parameters that influence sustainability, for example, the **education system**. However, compared to the other steering parameters, the effect of the education system on sustainable development is less direct and occurs primarily indirectly through the other parameters. For example, education is an important driver of technological change or the circular economy, which in turn contributes to greater corporate sustainability. Targeted research aims to increase the efficiency of policy measures, contribute to sustainable financing, or study the behavior of individuals.

As we indicate in the next chapter, the ecological and social challenges facing us are daunting. Moreover, the time remaining to deal with the environmental challenges is fast running out. We therefore need to take immediate and well-targeted action addressing all five steering parameters and follow our "**shared responsibility**" (Schneidewind, 2019).

The Intergovernmental Panel on Climate Change (IPCC) clearly emphasizes the importance of fast action in its 2022 assessment report. "Achieving the 1.5°C Paris goal means that global use of coal must decline by 95% by 2050, relative to 2019. Oil use must drop by 60% and gas by 45% in that period. The decreases needed to limit warming to below 2°C are not much lower. Under all scenarios, there is no room for new unabated fossil-fuel projects (such as power plants), and most existing ones will have to be wound down faster than they would have otherwise." (The Economist 2022)

The title of this reader is "Sustainable Business." Why then are parameters other than the company examined? The reason is that there are strong interdependencies between all five parameters. Politics sets the framework within which companies operate, for example by introducing regulations. The financial system determines the conditions under which companies have access to new capital. Consumers make purchasing decisions and thus also determine which products companies can ultimately sell on the market. Finally, society is not to be neglected; societal values form the backdrop for business decisions. It therefore makes no sense to look at corporate responsibility in isolation. Rather, the individual drivers must be understood as a **system**.

In Chap. 1, this reader starts with a comprehensive overview of the most pressing social and environmental challenges. It focuses on better understanding why sustainability is central to the development of our economy and society by introducing

the concepts of the Anthropocene, planetary boundaries, and the doughnut economy. Chapter 2 elaborates on the concept of sustainable development and explains various approaches, dimensions, and policy concepts of sustainability. To better understand the systemic problems of sustainable development, Chap. 3 introduces the theoretical concepts of the tragedy of the commons, the prisoner's dilemma, and different categories of goods.

Based on these theoretical concepts, Chap. 4 outlines a new paradigm of sustainable management. This new understanding of management is based on the integration of sustainability into different management disciplines, such as HR, finance, marketing, etc., and on three levels of sustainability (production, product, and organization). This chapter also shows how sustainability depends on corporate values and how it relates to different reporting standards and the management concept of corporate social responsibility.

After introducing new management concepts, Chap. 5 describes the role of civil society and social innovation. The implementation of social innovation through social entrepreneurship and self-organization is highlighted. By adding dimensions that impact social impact businesses, the Social Business Model Canvas enables businesses to identify what needs to be done to address their impact on society. It also shows how social innovation can be scaled and replicated; a key requirement is collaboration between the three sectors: government, business, and civil society.

Following our examination of the role of civil society, Chap. 6 describes the financial system and policy instruments in sustainable development. Based on the theoretical concepts of (negative) externalities, we discuss the importance of the financial system and policy instruments in helping to reduce negative impacts and enhance positive impacts.

Chapter 7 outlines the implications of consumption patterns for the sustainability of our economy. In this chapter, we introduce the concept of ecological footprint and explore how it can be measured. By calculating an ecological footprint, we can better understand how consumption affects our environment. Finally, we discuss several key drivers of the ecological footprint and ways to promote sustainable consumption.

Chapter 8 analyzes sustainability in a digital context. Besides the role of consumption on sustainability, the potential of digitalization in sustainable development as well as organizational sustainability is becoming more and more relevant. Not only is it becoming clear how information and communications technology (ICT) can be an enabler of sustainability. Awareness is also growing regarding the impact on society of the longevity, governance, and interoperability of digital artifacts. Who controls the right digital resources has great power to influence entire parts of society and shape societal behavior.

Finally, Chap. 9 introduces the concept of the circular economy and its basic strategies to show what the future of the sustainable economy might look like. It also describes the importance of a circular economy at the micro and macro levels for future ecological and economic development.

After finishing this reader, it should be clear that the transformation to a sustainable society can only succeed if politicians, entrepreneurs, consumers, financial

actors, policy makers, and civil society work together. Knowledge sharing between academia and practitioners is key to collaboration between different systems and actors. This will not only bring about a paradigm shift in management, but also make science an important driver for sustainable development.

Literature

Schneidewind, U. (2019). *Die große Transformation. Eine Einführung in die Kunst gesellschaftlichen Wandels*, 3. Auflage. Fischer Taschenbuch.

The Economist. (2022). *The latest IPCC report argues that stabilising the climate will require fast action*. Retrieved November 21, 2022, from https://www.economist.com/science-and-technology/2022/04/09/the-latest-ipcc-report-argues-that-stabilising-the-climate-will-require-fast-action

Further Reading

Jackson, T. (2021). *Post growth: Life after capitalism*. Polity Press, 256 p.

Mazzucato, M. (2021). *Mission economics: a moonshot guide to changing capitalism*. HarperCollins, 272 p.

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Chapter 1
Why Sustainability?

Keywords Anthropocene · Planetary Boundaries · Doughnut Economics · Economic costs

This Chapter's Learning Goals

- You know the biggest social and environmental challenges facing the world today and understand the basic processes, causes, and effects of climate change.
- You know the concepts of the Planetary Boundaries and the Doughnut Economics.

1.1 The Anthropocene

Over the past 30 years, sustainable development has become the central term worldwide in discussions about the future development of humanity and planet Earth. The struggle to define what sustainable development really means and how to achieve it, has become a central theme of national and international politics, science, and increasingly also of business and civil society. But why has the concept of sustainable development become central to many disparate debates across the world?

Compared to our grandparents and great-grandparents, we live in a much better world. Never before in history have Earth's inhabitants been so diversely networked and closely connected in vital areas of knowledge, technology, and the exchange of goods. The proportion of people living in extreme poverty has halved in the last 20 years, life expectancy worldwide has risen by 10 years since 1973, and deaths from natural disasters have seen a large decline over the past century—from, in some years, millions of deaths per year to an average of 60,000 over the past decade. At the same time, the global average literacy rate has risen from 42% in 1960 to 86% in 2015, the number of people with access to electricity has risen steadily in recent decades, and in almost all countries in the world women now have the same voting

M. Fischer et al., *Sustainable Business*, SpringerBriefs in Business,
https://doi.org/10.1007/978-3-031-25397-3_1

rights as men (Our World in Data, n.d.). This list could go on. Encouraging trends in areas such as child mortality, access to education, child labor, and hunger have also significantly improved global living standards since the middle of the last century. To a large extent, this is due to global economic growth.

This unique development in such a short period of time has been made possible primarily by oil, especially by its cheap availability since the 1950s. But this miraculous development has also brought with it serious costs. In fueling our economy oil and gas have also ignited our hunger for resources in general, thus leading to serious global environmental problems such as the greenhouse effect, species extinction, and the pollution of soil, water, and air, etc. Moreover, the benefits and costs of this growth are highly unequally distributed. While we in the rich countries mainly enjoy the benefits of cheap goods and travel, etc., those in poorer countries tend to bear the bulk of the costs.

Figures 1.1 and 1.2, first published by Will Steffen et al. in 2004 and updated in 2015, show that the dramatic increase in human, mainly economic, activity (Fig. 1.1) since the middle of the last century seems to be coupled with a profound impact on life-supporting ecosystems (Fig. 1.2). Human activity, predominantly our global economic system heavily controlled by the so-called advanced economies, is now the main driver of change in Earth's system and has significantly destabilized the state of the Earth. This is why more and more scientists do not only agree that humans are driving these changes but that the changes are so immense that since the middle of the last century we have entered a new era in Earth's history: The Anthropocene, the "Age of Man." This replaces the Holocene, the most stable climate phase for at least 400,000 years and the essential basis for the development of human civilization.

1.2 The Ecological Challenges: Planetary Boundaries

Stable systems, be they ecological, social, economic, or cultural—can usually regenerate following disturbances or shocks. For example, heavily overgrazed grasslands can recover relatively quickly. Or in the case of waters that have been severely damaged by chemical or oil spills, flora and fauna will slowly reclaim this habitat and eventually people are able to use them again without danger.

But if pressure becomes too great and too widespread, such ecosystems can also tip over and change into another system state making them extremely inhospitable. If the ecological balance of the savannah is too heavily burdened by human activities (e.g., overgrazing, firewood production, removal of the humus layer or similar), the savannah landscape is transformed into a desert (desertification); an environment that is uninhabitable for most forms of life. Moreover, a shift back to the original savannah state is impossible (just as it is impossible to turn a loaf of bread back into flour) or only possible with great effort. One of the best known and largest ecosystems that has been tilted by human activities is the Aral Sea in Central Asia. Formerly the fourth largest inland lake in the world, within a few decades, it has

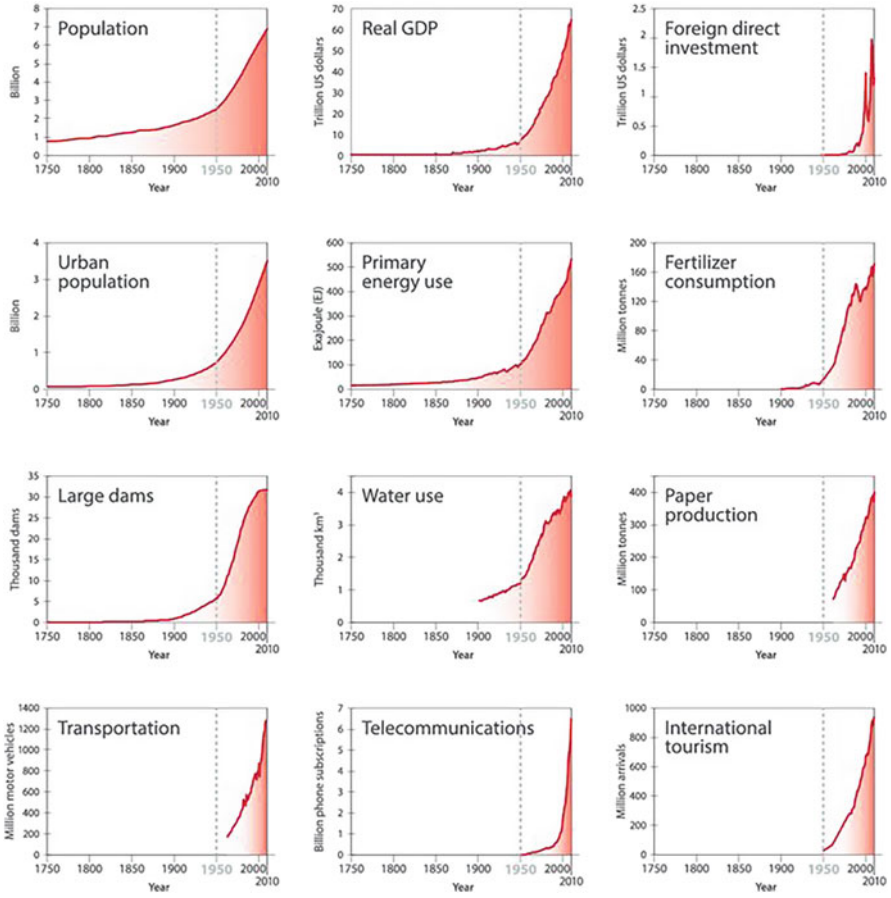

Fig. 1.1 Trends from 1750 to 2010 in globally aggregated indicators for socio-economic development (source: Steffen, Broadgate et al., 2015)

been salinated, silted up, and poisoned. The former lake bottom is now a huge salt desert where storms spread the salt over hundreds of kilometers, robbing millions of people of their livelihood. The draining and poisoning of the Aral Sea is unanimously described as one of the greatest environmental disasters ever caused by humankind.

The ability to survive crises and disturbances without permanent damage is called **resilience**. How resilient (eco-) systems are depends on various factors, which differ between systems and can change over time. You can find more information about resilience theory and resilience of (socio-)ecological systems at the end of this chapter under *Further Reading*.

The evolution of humans, the development of our societies, and our present high standard of living have been largely allowed by a stable climate, rich biodiversity, and an intact nutrient cycle. However, since industrialization, and especially in the

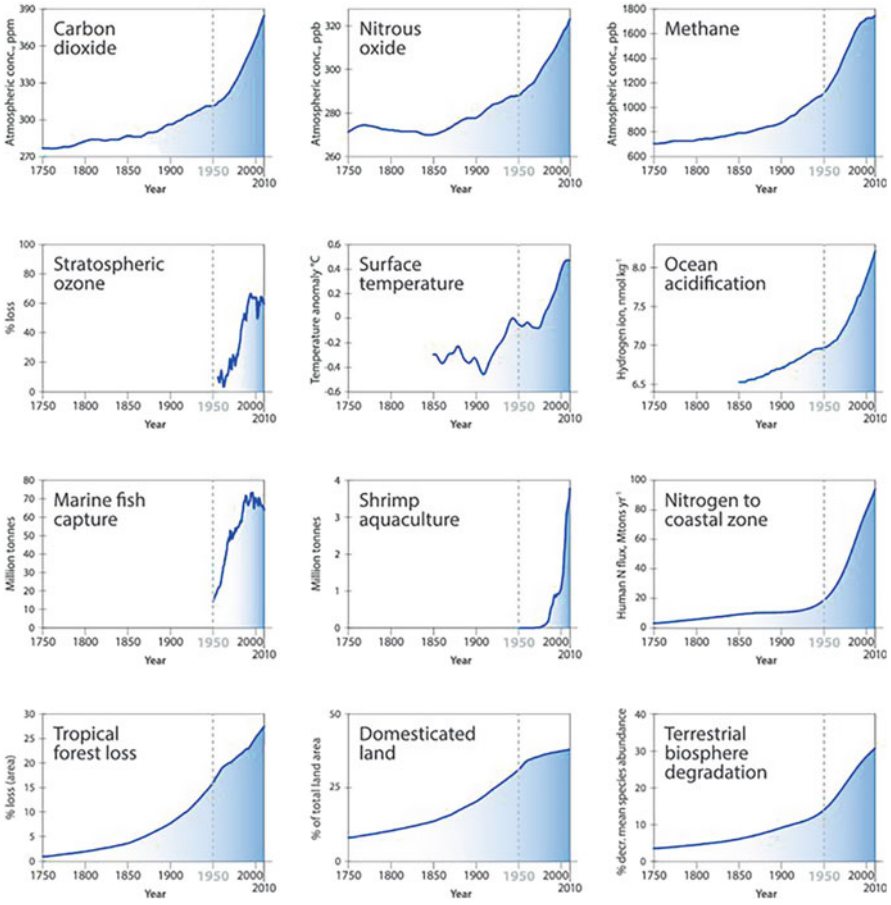

Fig. 1.2 Trends from 1750 to 2010 in indicators for the structure and functioning of the Earth System (source: Steffen, Broadgate et al., 2015)

second half of the last century, our way of life and economic activity have exposed these ecosystems, which have been functioning resiliently for thousands of years, to enormous pressures. There is a high risk that our way of life will cause Earth's ecosystems to tip into a new state and thus endanger our livelihood. However, our standard of living is not possible without natural resource extraction, land use, and emissions of harmful substances. Thus, a burden on ecosystems is unavoidable. The decisive questions therefore are: What can our ecosystems bear? At what point will humankind's activities tip ecosystems into another state that has serious consequences for life on earth?

A team of almost 30 leading scientists led by Johan Rockström addressed this question and developed the concept of planetary boundaries. Their work was first published in 2009 (Rockström et al., 2009) and updated in 2015 with new data and findings (Steffen, Richardson, et al., 2015). The concept has meanwhile become a

fixed reference point for international and national environment and development policy—especially climate policy—and is constantly being developed further through new research findings.

The concept of **planetary boundaries** identifies nine factors that are central to the stability and resilience of our planet and defines a "safe operating space" in which environmental conditions are favorable for humanity. If we move within these boundaries, the risk of dangerous, irreversible environmental changes is relatively small. If we exceed these limits, we endanger the stability of ecosystems and thus the basis of human life (including the economy). Table 1.1 lists and briefly explains the nine planetary boundaries.

Scientists have been able to quantify eight of these ecological dimensions, five have already exceeded the exposure limit (climate change, loss of biosphere integrity (i.e., genetic diversity (E/MSY); functional diversity (BII) is not yet quantified), biochemical flows (i.e., nitrogen (N) and phosphorus (P) flows to biosphere and oceans), land-system change and novel entities) and one has not yet been quantified (aerosol loading). Figure 1.3 shows the extent to which these boundaries have already been exceeded.

Earth is one single, complex, and integrated system. This means that the nine planetary boundaries are highly dependent on each other. This has profound consequences for our efforts to achieve global ecological sustainability because it emphasizes the need to address multiple interacting environmental processes simultaneously. For instance, we can only stabilize the climate if we also manage our forests sustainably and ensure stable marine ecosystems (Steffen, Richardson, et al., 2015). Thus, the individual boundaries are not separated but form a system in which there are direct interactions. Taking the example of climate change, what this means is that as biodiversity is lost due to climate change this loss will also push climate change further over its boundary. We can imagine this happening as certain pollinators are lost, plants do not thrive as well thus reducing carbon sequestration in flora. It serves to underline the complexity and interactions of the systems.

Even if the limit of resilience from a global perspective has not yet been reached in all of the ecological dimensions, the limits of the corresponding dimension may long since be exceeded at a regional level, with serious consequences for the people living there. Figure 1.4 shows the regional differences based on the dimensions Biochemical Flows (phosphorus and nitrogen cycle), Land-System Change, and Freshwater Use. These illustrations also show that reliable data are not yet available for many regions of the world, which could mean that we are burdening the corresponding ecological dimension even more than currently assumed.

Similarly, the consequences of climate change do not threaten the people of our planet to the same extent everywhere. Rising sea levels—caused by the melting of polar ice, on the one hand, and the expansion of water due to warming on the other—is primarily an existential threat to people living in coastal areas. In Switzerland, however, the consequences will mostly be economic.

Table 1.1 Short description of the nine planetary boundaries

Climate change	There are several well-defined thresholds above which rapid physical feedback mechanisms can drive the Earth system into a much warmer state with sea levels meters higher than present. Climate-carbon cycle feedbacks accelerate Earth's warming and intensify the climate impacts. A major question is how long we can remain over this boundary before large, irreversible changes become unavoidable
Changes in biosphere integrity (biodiversity loss and extinctions)	The changes to ecosystems due to human activity have been more rapid in the past 50 years than at any time in human history. This has increased the risk of abrupt and irreversible changes. The main drivers of change are the demand for food, water, and natural resources, causing severe biodiversity loss and leading to changes in ecosystem services
Stratospheric ozone depletion	The stratospheric ozone layer in the atmosphere filters out ultraviolet (UV) radiation from the sun. As this layer degrades increasing amounts of UV radiation reach ground level. This causes a higher incidence of skin cancer in humans as well as damage to terrestrial and marine biological systems
Ocean acidification	Around a quarter of the CO_2 that humanity emits into the atmosphere is ultimately dissolved in the oceans. Here it forms carbonic acid, altering ocean chemistry and decreasing the pH of the surface water. This increased acidity reduces the amount of available carbonate ions, an essential "building block" used by many marine species for shell and skeleton formation. Beyond a threshold concentration, this rising acidity makes it hard for organisms such as corals and some shellfish and plankton species to grow and survive. Losses of these species would change the structure and dynamics of ocean ecosystems and could potentially lead to drastic reductions in fish stocks. Compared to pre-industrial times, surface ocean acidity has already increased by 30%. Unlike most other human impacts on the marine environment, which are often local, the ocean acidification boundary has ramifications for the whole planet
Biogeochemical flows	The biogeochemical cycles of nitrogen and phosphorus have been radically changed by humans through many industrial and agricultural processes. Human activities now convert more atmospheric nitrogen into reactive forms than all the Earth's terrestrial processes combined. Much of this new reactive nitrogen is emitted to the atmosphere. When it is washed out, it pollutes waterways and coastal zones or accumulates in the terrestrial biosphere. A significant fraction of the used nitrogen and phosphorus makes its way to the sea and may push marine and aquatic systems to exceed their own ecological thresholds

(continued)

Table 1.1 (continued)

Land-system change	Land is converted to human use all over the planet. Forests, grasslands, wetlands, and other vegetation types have primarily been converted to agricultural land. This land-use change is one driving force behind biodiversity loss. Moreover, conversion has impacts on water flows and biogeochemical cycles of carbon, nitrogen, phosphorus, and other important elements. While each incident of land cover change occurs locally, the aggregate impacts have consequences for Earth system processes on a global scale. A boundary for human changes to land systems needs to reflect not just the absolute quantity of land, but also its function, quality, and spatial distribution
Freshwater use	The freshwater cycle is strongly affected by climate change and its boundary is closely linked to the climate boundary. Human pressure is now the dominant driving force determining the functioning and distribution of global freshwater systems. The consequences of human modification of water bodies include both global-scale river flow changes and shifts in vapor flows arising from land-use change. These shifts in the hydrological system can be abrupt and irreversible. Water is becoming increasingly scarce—by 2050, about half a billion people are likely to be subject to water-stress, increasing the pressure to seek and exploit even more water systems.
Atmospheric aerosol loading	An atmospheric aerosol planetary boundary was proposed primarily because of the influence of aerosols on Earth's climate system. Through their interaction with water vapor, aerosols play a critically important role in the hydrological cycle affecting cloud formation and global and regional patterns of atmospheric circulation, such as the monsoon systems in tropical regions. They also have a direct effect on climate, by changing how much solar radiation is reflected or absorbed in the atmosphere. Humans change the aerosol loading by emitting atmospheric pollution, and through land-use change that increases the release of dust and smoke into the air. Shifts in climate patterns and monsoon systems have already been seen in highly polluted environments. A further reason for an aerosol boundary is that aerosols have adverse effects on many living organisms. Inhaling highly polluted air causes roughly 800,000 people to die prematurely each year
Introduction of novel entities	Emissions of toxic and long-lived substances such as synthetic organic pollutants, heavy metal compounds, and radioactive materials represent some of the key human-driven changes to the planetary environment. These compounds can have potentially irreversible effects on living organisms and on the physical environment (by affecting atmospheric processes and climate)

Source: According to Stockholm Resilience Center (n.d.)

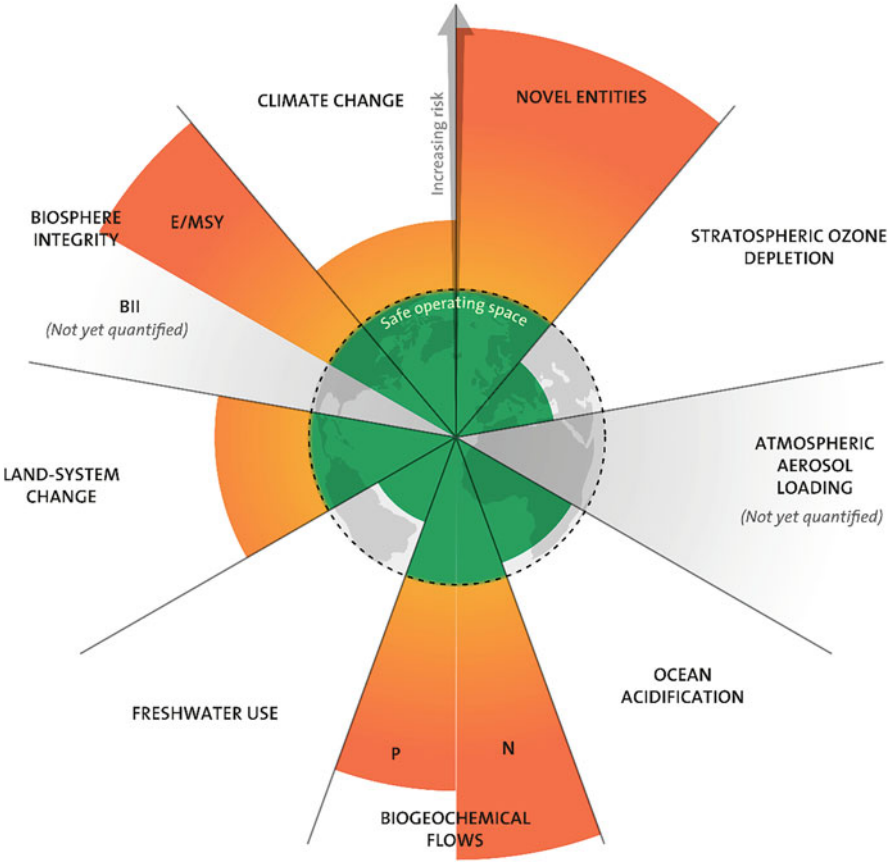

Fig. 1.3 Planetary boundaries (credit: Designed by Azote for Stockholm Resilience Centre, based on analysis in Persson et al. 2022 and Steffen, Richardson, et al., 2015)

1.3 Adding the Social Dimension

Natural resources such as water, soil, clean air, or mineral resources form the basis for our quality of life. As we have seen in the previous chapter, the overexploitation of these resources pushes the planet's environmental systems to the limits of stability. The nine boundaries and all their complex interactions are particularly important for the global ecosystem and exceeding their fixed limits has existential consequences for humanity.

There is complex feedback between our society and the ecosystem. Poverty, wars, inequality, global health issues, and oppression pose a serious threat to human society and directly or indirectly also to the ecological state of the planet. People fleeing for their lives or otherwise struggling to survive do not have the resources to focus on sustainability but rather focus on day-by-day goals. On the

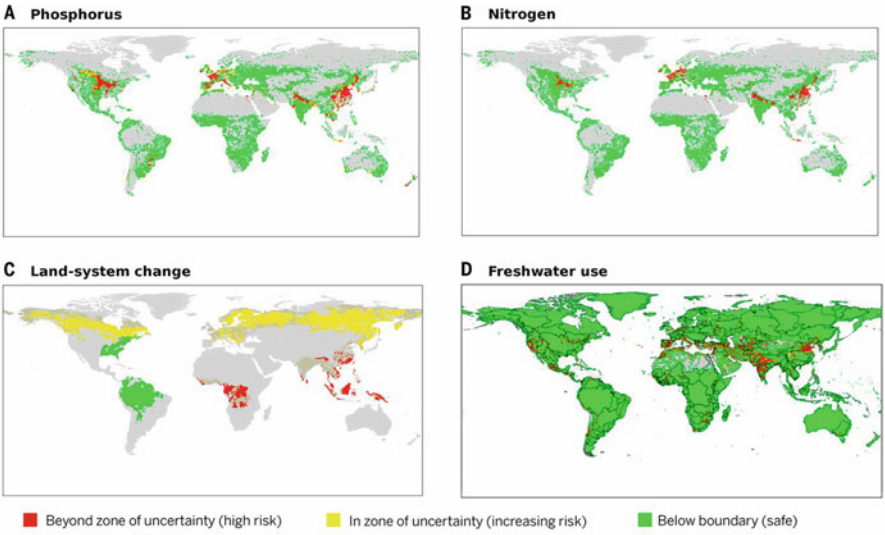

Fig. 1.4 The global distributions and current status of the control variables for (**a**) biogeochemical flows—P, (**b**) biogeochemical flows—N, (**c**) land-system change, and (**d**) freshwater use (source: Steffen, Richardson, et al., 2015)

other hand, increasing social prosperity usually leads to more consumption (meat instead of vegetables, car instead of public transport, bigger apartment, ...), which in turn can have a negative impact on the environment.

The social dimension is therefore likewise important for the path to sustainable development, which can be described as the challenge of meeting the needs of the present without compromising the ability of future generations to meet their needs (more on the definition of sustainable development in Chap. 2).

The Oxford economist Kate Raworth—frustrated over the dogmatic teaching of mainstream theory at universities disconnected from growing real-world problems—combined the well-established concept of planetary boundaries with the complementary concept of social boundaries and created a visual framework for sustainable development and for a new economic model—The Doughnut or **Doughnut economics**.

> What if we started economics not with its long-established theories, but with humanity's long-term goals, and then sought out the economic thinking that would enable us to achieve them? I tried to draw a picture of those goals and, ridiculous though it sounds, it came out looking like a doughnut—yes, the American kind with a hole in the middle. (Raworth, 2017a, p. 10).

The Doughnut (Fig. 1.5) was first presented in a discussion paper in 2012. In 2017, Raworth published the book Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist.

The Doughnut of social and planetary boundaries is a new economic model; an alternative to the current economic system, which is based on growth, materialism,

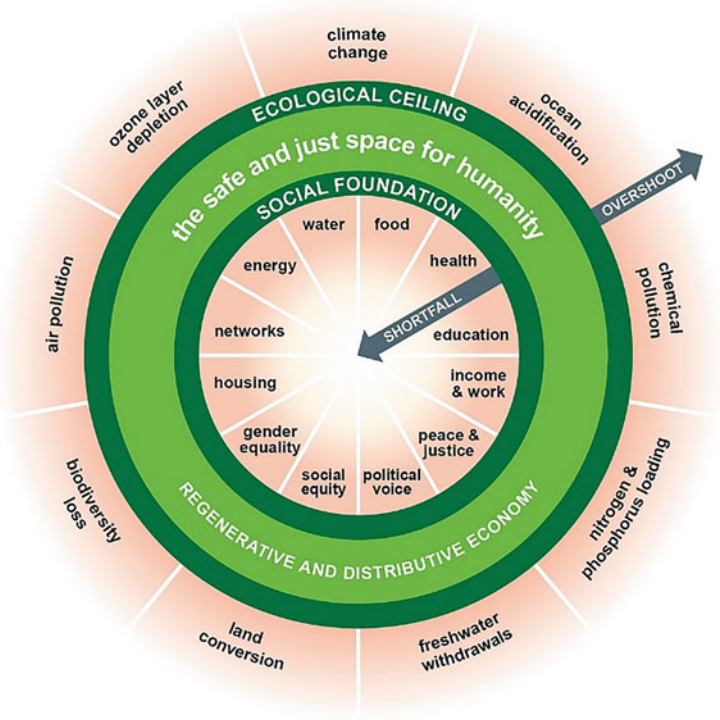

Fig. 1.5 The doughnut (source: Wikipedia. (n.d.). Retrieved September 09, 2020 from https://en.wikipedia.org/wiki/Doughnut_(economic_model))

and capitalism and does not take into account crises such as climate change, loss of biodiversity. Instead of growth targets and the standard indicators of gross domestic product, it proposes new targets and indicators that focus on human well-being and ecological boundaries.

The environmental ceiling consists of the nine planetary boundaries. The twelve elements of the social foundation are derived from internationally agreed minimum social standards, as identified by the world's governments in the Sustainable Development Goals (see Sect. 2.4). Between these social and planetary boundaries lies an environmentally safe and socially just space in which humanity can thrive (Raworth, 2012).

Despite our unprecedented progress described in the beginning of this chapter, we are far outside the doughnut's boundaries on both sides (see Fig. 1.6). Millions of people still live below each of the social foundation's minimum standards. Most people in the world live still in poverty (about two-thirds live on less than 10 international dollars per day), 11% (about 820 million people) of the global population is undernourished. Unsafe water is responsible for 1.2 million deaths each year and almost one person in three (29%) do not have access to safe drinking water (source: Our World in Data). Furthermore, one child in six aged 12–15 is not in school (the

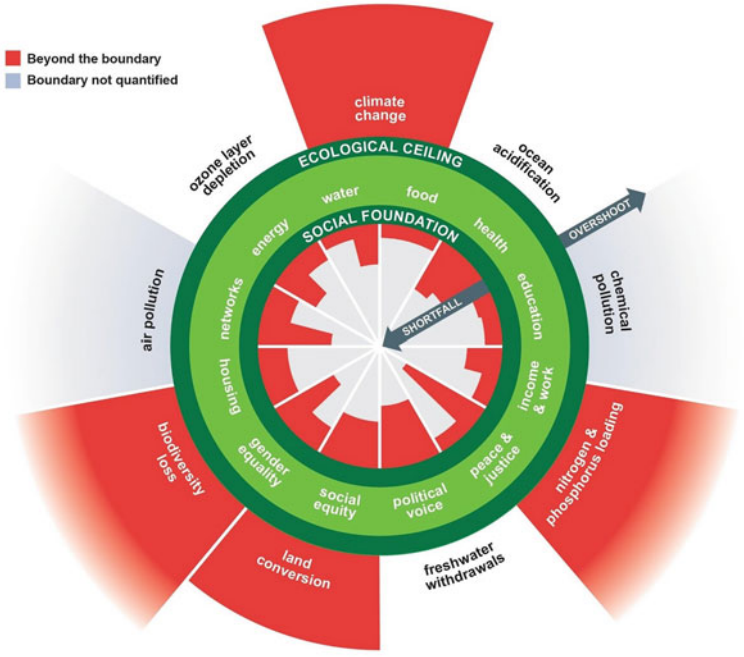

Fig. 1.6 Transgressing both sides of the Doughnut's boundaries (source: Kate Raworth. (2017). Retrieved September 09, 2020 from http://www.kateraworth.com/doughnut/#)

vast majority of them girls), one in eight young people cannot find work, and more of the world's population live in countries where people severely lack political voice or stable social institutions (Raworth, 2017a, p. 51).

Since the first publication in 2012, the doughnut model hast been widely applied within academia, policymaking, business, urban planning, and civil society as a tool for reconceptualizing sustainable development (Raworth, 2017b). It seems clear that in the long term, we cannot afford to base our performance solely on economic indicators. For a sustainable world, social and ecological aspects must increasingly be considered. It also becomes clear that the environmental dimension and the social dimension are interrelated. Due to global warming and its consequences like rising sea levels people are losing their land and the ability to produce food. This is leading to regional conflicts over water, soil, or other resources. People are having to flee or emigrate to other countries which is again causing other social challenges such as integration, employability, and social justice. This in turn not only causes ecological and social costs, but it an array of negative, also has significant negative economic consequences.

1.4 The Role of Economic Growth

Environmental sustainability is closely linked to economic growth and hence **economic costs**. Episodes of severe weather such as torrential rainfall and flooding cause substantial costs and given current climate trends, these costs are likely to increase. Hsiang et al. (2017) collected national data documenting how short-term weather fluctuations affect six economic sectors in the USA. These data were combined with a set of global climate models and used to estimate the future costs of climate change for the rest of this century. They conclude: "The combined value of market and nonmarket damage across analyzed sectors—agriculture, crime, coastal storms, energy, human mortality, and labor (. . .) costing roughly 1.2% of gross domestic product per +1 °C on average. Importantly, risk is distributed unequally across locations, generating a large transfer of value northward and westward that increases economic inequality. By the late twenty-first century, the poorest third of counties are projected to experience damages between 2 and 20% of county income (90% chance) under business-as-usual emissions." (Hsiang et al., 2017) (see Fig. 1.7).

At the same time, economic growth is also an important driver of environmental problems. As discussed in Sect. 1.1, the enormous economic growth in recent years has only been possible because of the consumption of many natural resources—especially oil. Hence, if we want to successfully address our environmental problems, we are left with two options. First, we **decouple** economic growth and resource consumption. Although some countries such as China have significantly improved their material productivity (i.e., domestic material consumption per unit of GDP) over time and other countries such as Switzerland already have a high material productivity, global material productivity remains almost constant over time at a level above 1 (see Fig. 1.8). Hence, we have not yet achieved such decoupling. To

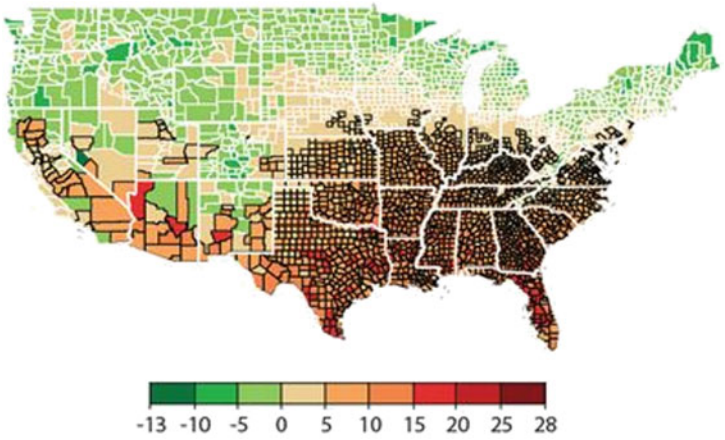

Fig. 1.7 The economic damage from climate change in the United States by 2100 (% of GDP) (source: Hsiang et al. 2017)

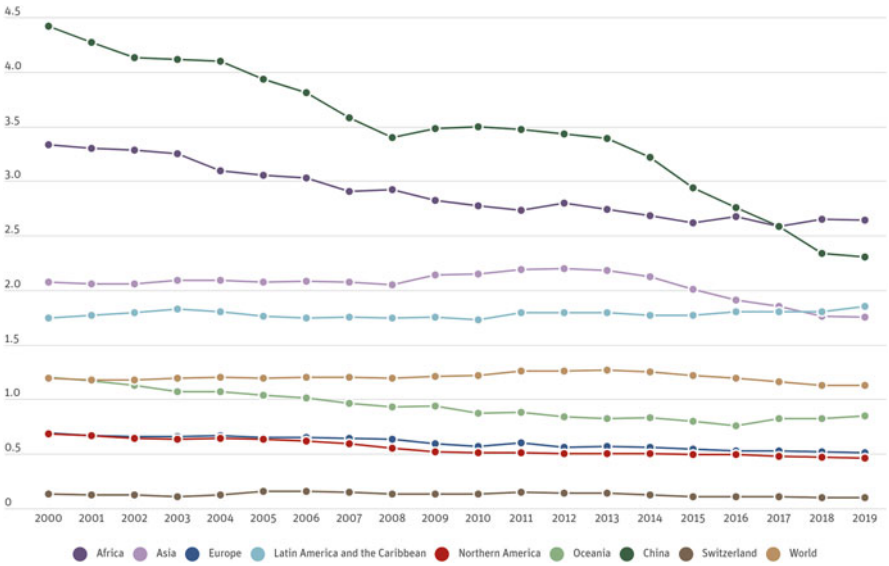

Fig. 1.8 Development of domestic material consumption per unit of economic growth (GDP) for the period 2000–2019 for different regions (source: own representation based on UNEP, 2021), The use of National Resources in the Economy: a Global Manual on Economy Wide Material Flow Accounting)

achieve this goal, we will have to use our materials more efficiently, which is the main goal of a circular economy (see Chap. 9). Second, we slow down our economic growth. This is the goal of the **post-growth economy**. Post-growth postulates that society will function better without the demand of constant economic growth: the central goal of the current—capitalist—economic system. Proponents of post-growth propose economic systems that focus on social well-being, economic justice, and ecological regeneration instead of economic growth. Post-growth economists also argue that growth in GDP cannot be decoupled from growth of environmental impacts, e.g., due to consumption saturation, the so-called **rebound effects**, and declining energy and resource **efficiency**.

Real-World Example: Economics of Climate Change Risks
In its report "Economics of Climate Change Risks" Swiss Re analyzes how climate change will affect a number of countries. The expected losses in global gross domestic product (GDP) by 2050 compared with a world without climate change (i.e., 0 °C change) are enormous:

- Minus 18% for a temperature rise of 3.2 °C, i.e. with society doing nothing to combat climate change.

(continued)

- Minus 11–14% for a temperature increase of 2–2.6 °C, i.e. if climate change stays on the currently anticipated trajectory, and the Paris Agreement and 2050 net-zero emissions targets are not met.
- Minus 4% for a temperature increase of less than 2 °C, i.e. if the targets are tightened in such a way that the goals of the Paris Agreement are achieved.

Source: https://www.swissre.com/institute/research/topics-and-risk-dialogues/climate-and-natural-catastrophe-risk/expertise-publication-economics-of-climate-change.html

Literature

Hsiang, S., Kopp, R., Jina, A., Rising, J., Delgado, M., Mohan, S., Rasmussen, D. J., Muir-Wood, R., Wilson, P., Oppenheimer, M., Larsen, K., & Houser, T. (2017). Estimating economic damage from climate change in the United States. *Science, 356*(6345), 1362–1369.

Our World in Data (n.d.). https://ourworldindata.org/

Proclim/CASS [Konferenz der Schweizerischen Wissenschaftlichen Akademien]. (1997). *Visionen der Forschenden: Forschung zu Nachhaltigkeit und Globalem Wandel—Wissenschaftspolitische Visionen der Schweizer Forschenden*. ProClim—Forum für Klima und Global Change, Schweizerische Akademie der Naturwissenschaften SANW.

Raworth, K. (2012). *A safe and just space for humanity. Can we live within the doughnut?* Oxfam.

Raworth, K. (2017a). *Doughnut economics: seven ways to think like a 21st-century economist*. Random House.

Raworth, K. (2017b). A Doughnut for the Anthropocene: humanity's compass in the 21st century. *The Lancet Planetary Health, 1*(2), e48–e49.

Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin, F. S., 3rd, Lambin, E. F., Lenton, T. M., Scheffer, M., Folke, C., Schellnhuber, H. J., Nykvist, B., de Wit, C. A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R. W., Fabry, V. J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., & Foley, J. A. (2009). A safe operating space for humanity. *Nature, 461*, 472–475.

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The great acceleration. *The Anthropocene Review, 2*, 81–98.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science, 347*(6223).

Wuelser, G., Pohl, C., & Hirsch Hadorn, G. (2012). Structuring complexity for tailoring research contributions to sustainable development: a framework. *Sustainability Science, 7*, 81–93.

Further Reading

Federal Office of the Environment (FOEN): *Resource consumption* (including information and video about Planetary Boundaries). Retrieved September 09, 2020 from https://www.bafu.admin.ch/bafu/de/home/themen/wirtschaft-konsum/fachinformationen/ressourcenverbrauch.html

Jackson, T. (2017). *Prosperity without growth—Foundations of the economy of tomorrow*. Routledge.

Paech, N. (2012). *Liberation from excess. The road to a post-growth economy*. Oekom. 144 pages.

Persson, L., Carney Almroth, B. M., Collins, C. D., Cornell, S., de Wit, C. A., Diamond, M. L., Fantke, P., Hassellöv, M., MacLeod, M., Ryberg, M. W., Jørgensen, P. S., Villarrubia-Gómez, P., Wang, Z., & Hauschild, M. Z. (2022). Outside the safe operating space of the planetary boundary for novel entities. *Environmental Science & Technology, 56*(3), 1510–1521.

Raworth, K. (2018). *A healthy economy should be designed to thrive, not grow*. TED2018 (video). Retrieved September 09, 2020 from https://www.ted.com/talks/kate_raworth_a_healthy_economy_should_be_designed_to_thrive_not_grow

Raworth, K. (n.d.). Exploring doughnut economics. Retrieved September 09, 2020, from https://www.kateraworth.com/

Rockström, J. (2010). *Let the environment guide our development*. TEDGlobal (video). Retrieved September 09, 2020, from https://www.ted.com/talks/johan_rockstrom_let_the_environment_guide_our_development

Seidl, I. (2021). *Post-growth work: Employment and meaningful activities within planetary boundaries*. Routledge. 234 pages.

Stockholm Resilience Center. (2015). *What is resilience? An introduction to a popular yet often misunderstood concept.* Retrieved September 09, 2020, from https://www.stockholmresilience.org/research/research-news/2015-02-19-what-is-resilience.html

Stockholm Resilience Center. (2018). *Introduction to Resilience Thinking by Carl Folke*. (video) Retrieved September 09, 2020, from https://www.stockholmresilience.org/research/research-videos/2018-09-17-resilience-thinking.html

Stockholm Resilience Center. (n.d.). *Planetary boundaries research*. Retrieved September 09, 2020, from https://www.stockholmresilience.org/research/planetary-boundaries.html

The Guardian. (2013). Sustainable business podcast on *Planetary boundaries: The limits of the earth* with Johan Rockström and Kate Raworth. (Podcast). Retrieved September 09, 2020, from https://www.theguardian.com/sustainable-business/audio/planetary-boundaries-limits-earth-podcast

United Nations Environment Programme. (2021). The use of natural resources in the economy: A global manual on economy wide material flow accounting. https://wedocs.unep.org/20.500.11822/36253

WWF. (2018). *Living planet report—2018: Aiming higher*. Grooten, M., & Almond, R.E.A. (Eds). WWF (Report).

Chapter 2
The Concept of Sustainable Development

Keywords Paris Agreement · Sustainable development goals (SDGs) · Ecological sustainability · Social sustainability · Economic sustainability · Efficiency · Consistency · Sufficiency

This Chapter's Learning Goals
- You know the most common definition and the basic concept of sustainable development.
- You know the framework of the Sustainable Development Goals.

2.1 "Our Common Future" or The Brundtland Report

There is no unanimously agreed upon concept of sustainability. The first globally discussed concept can be found in The **Limits to Growth**, a report for the Club of Rome in 1972, which clearly described how an exponential economic growth in a world with a finite supply of resources can lead to a variety of negative global scenarios. A political reaction to this academic debate was the United Nations report published in 1987 by the so-called **Brundtland** Commission. This report established itself as the cornerstone of sustainability and is still regularly cited, referenced, and mentioned over 30 years after its publication and despite the introduction of the **Millennium Development Goals** in the year 2000 and their successors, the **Sustainable Development Goals** in 2015.

The report defines sustainable development as follows: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development, 1987, Ch. 2, IV, 1)

With this definition, **intergenerational** ecological equality, i.e., the responsibility of one generation for the consequences of its actions on all subsequent generations, is stated explicitly. In addition, the report also makes clear that the ecological

M. Fischer et al., *Sustainable Business*, SpringerBriefs in Business,
https://doi.org/10.1007/978-3-031-25397-3_2

challenges should be considered alongside economic growth and social justice, as these aspects can have significant impact on ecological aspects of sustainability.

2.2 Three Dimensions of Sustainable Development

As discussed before, sustainability not only refers to the environment, but also to society and the economy. Although the **ecological** challenges are often at the forefront of today's discussions they cannot be considered separately, as they are closely linked to economic and **social** challenges. Droughts in one country, for example, can lead to refugee flows, which in turn create social tensions in other countries. Just as Raworth's Doughnut Economy model does, it is therefore essential to include the social dimension to achieve sustainable development. At the same time, ecological challenges also have direct **economic** consequences. For example, if the sea level rises by 5 m, many cities with millions of inhabitants will be affected by floods, which will obviously lead to huge economic costs. The three dimensions of sustainability must accordingly be understood as a system, whereby interrelationships must be considered to make efficient decisions (see Fig. 2.1).

1. Ecological Dimension
   (a) For how long will this environment be able to satisfy our needs and wants?
   (b) What can we do to increase this environment's productivity to fulfill our needs without harming it and thereby us?

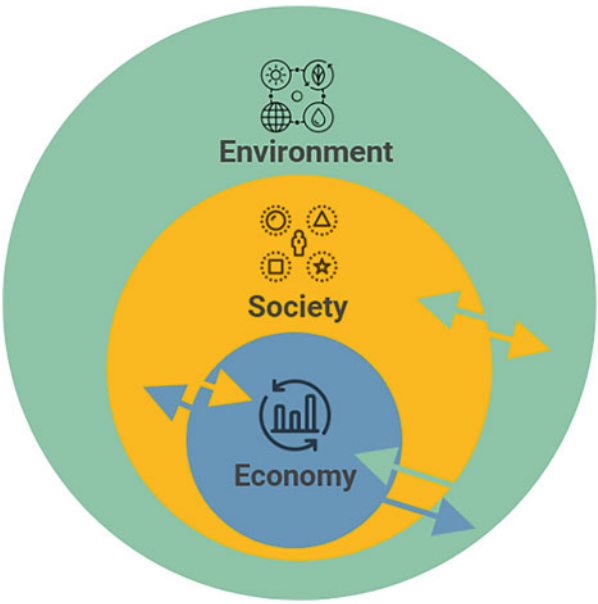

Fig. 2.1 The three dimensions of sustainable development (source: own representation)

(c) What can we do to improve this environment's resilience? Resilient environments are more stable, thus serving our needs better.
(d) When do we have to leave this environment behind and is there an alternative?
(e) How long will this environment need to regenerate before we can come back and consume from it again?

2. Social Dimension

(a) How can roles and resources in our group be allocated in a way that improves or at least maintains the group's integrity and stability?
(b) What is necessary to hold and strengthen socials bonds of trust and mutual responsibility? A fragmented group is weaker and risks in fights, even weakening it further.
(c) How can it be ensured that all individuals get an equal chance to contribute? Only then does a community benefit from a range of talents, and not just the gene-pool and ideas of the privileged few.

3. Economic Dimension

(a) How many and what resources are needed to ensure the group's survival, maybe even improve its resilience?
(b) How much can the group invest to gain a resource?
(c) How must the available resources be managed in order to meet future needs and increase resilience?

2.3 Three Approaches to Sustainable Systems

When striving to render any resource-based system more sustainable, whether in sustainable development or organizational sustainability, there are three basic approaches: (a) **efficiency**, (b) **consistency**, and (c) **sufficiency** (see Fig. 2.2). All these approaches aim to reduce resource consumption. Naturally, none of these approaches can reduce environmental impacts to zero, but if they are applied in combination, they can significantly improve the resource-related sustainability of a system.

Efficiency
Efficiency is probably the best-known and therefore most intuitive of the three approaches, and can often be seen, for example, with electrical equipment (see Fig. 2.3). It measures the effort and degree to which a source material is transformed to its target state. Low efficiency indicates that large quantities of raw materials and/or effort must be invested to create the desired quantity of the final product, i.e. lots of input little output. Therefore, low efficiency systems tend to lead to higher production costs, as resources and effort are usually the main drivers of cost.

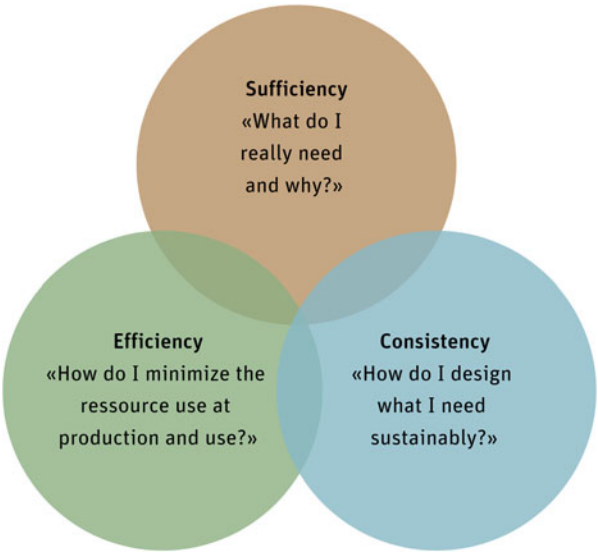

Fig. 2.2 The three approaches to sustainability (source: own representation)

Fig. 2.3 Energy efficiency ratings are used to compare different devices, buildings, vehicles, etc. (source: www.europarl.europa.eu)

Therefore, improving system efficiency is a favored approach for most corporations and other organizations and they have been applying it for decades.

The efficiency approach to sustainability means we have a convergence of economic and environmental interests.

An increase in efficiency is, however, often followed by a phenomenon called "rebound effect." It describes a common side-effect of reduced production costs: The product price is reduced in order to gain an advantage over the competition. This, in turn, leads to a higher demand for the product, as broader sections of the population can now afford to purchase it or rather the same consumers can now consume more of it for the same price. Ultimately, the increased demand leads to increased production, which in turn increases the amount of resources needed and,

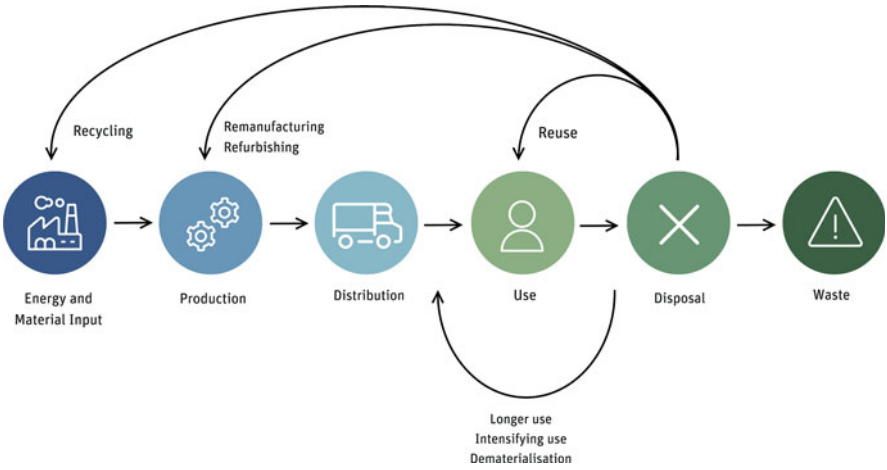

Fig. 2.4 Outline of a circular economy (source: own representation based on Geissdoerfer et al., 2020)

consequently, has a negative impact on system sustainability. In a nutshell, system sustainability can never only be appraised using relative measures but always has to take total resource volumes into consideration. E.g., the achievement of emitting 10% less greenhouse gases per car produced becomes worthless if 30% more cars are sold and driving on the streets.

Consistency

Consistency strategies do not aim to improve the amount of resources and/or effort as efficiency approaches do, but rather aim to either use infinite, renewable resources or not to allow resources to be transformed into a state where they cannot be transformed into anything useful anymore.

When taking advantage of the few practically unlimited resources, e.g., wind, sunlight, and waves, increasing resource usage does not negatively impact on resource availability. There is not less wind on this planet, because there are more wind farms. However, transforming those resources into energy requires tools to perform the transformation (wind farms, solar panels, etc.). To be 100% consistent, these tools would have to be sourced from 100% renewable resources, which is mostly not the case. As a consequence, consistency is in practice often an approximation towards its goal, trying to optimize the availability and efficient usage of renewable resources.

When addressing finite resources, the consistency approach strives to keep those resources as long as possible either in use or at least transformable for its next use. It therefore aims to create resource loops, with the goal to keep these loops as short as possible (see Fig. 2.4). The shorter the loop, the less effort and transformation is necessary and the smaller the effort to keep circularity going. E.g., investing in tool maintenance and therewith prolonging the time the tool is used by the same entity is better than having to transport it to somebody else for continued usage. Having to

refurbish the tool to adapt it to a new task takes even more resources, but taking the tool apart and salvage its materials in order to produce a different tool with them is the last step in a circular setup, as it entails the largest effort and lost energy and material. If the concept of consistency is applied to the economy, the literature speaks of a circular economy (see Chap. 9).

Sufficiency

While efficiency and consistency approaches address the production side, sufficiency addresses consumption, the basic idea being that reduced demand for a resource leads to less extraction of that resource. There are three primary variants of sufficiency:

(a) Reduction

Reduction is the simplest and most obvious form of sufficiency. The goal of this approach is a quantitative reduction of the resources used by reducing demand. If people fly less, there will be a reduction of flights and consequently a reduction of resource usage and emissions. These effects are mostly directly proportional, so if people travel 30% less, there will be roughly 30% less flights and thus 30% less resources used. As simple as this concept is, it is often the hardest to implement, as it is uncompromisingly effective and at its core contradicts the dogma of the last few decades: eternal growth and increasing consumption.

(b) Adaption

Adaption is closely related to the efficiency approach discussed above, the main idea being that resources are only supplied where there is actual demand and one can be sure that the resources will be put to use. Applied to the aviation example above, adaption could mean a minimal utilization rate below which the plane would not take off or a smaller plane would be used, since there is not enough demand for this flight. It could also mean a reduction of resource-intensive in-flight features (entertainment, food, air quality, noise reduction, etc.), if there is not a large enough demand for them. The implementation of adaption approaches has been made easier with the introduction of pay-per-use concepts, popularizing the idea of customized offers with equally optimized prices. If, for example, customers had the choice of not buying a laptop at all or buying a feature-heavy model containing 8 CPUs, a GPU laid out for heavy-duty rendering tasks and 512GB graphical memory, a huge SSD hard disk, etc., most of them would buy the laptop offering them all those things they do not need because it is the only option to get the few features, they indeed need. In contrast, an adaptable offer means a more customized product, less unwanted features, needing less energy, having wasted less resources for building and including a feature that has never been needed and will therefore not create any added value for the customer.

(c) Substitution

Substitution strives for a reduction but only in a specific aspect. Instead of staying at home, as the reduction approach would dictate, the plane is substituted by another means of transport, e.g., a train, noticeably lowering the total resource

usage and emissions. The impact of substitution measures heavily depends on what aspect is being addressed and what it is being replaced with. Replacing a flight by traveling the same distance alone in a sports car qualifies as substitution but is a relatively weak solution compared to a direct train journey. Consequently, substitution approaches have to be checked thoroughly to assess their consequences.

2.4 Policy Action and SDGs

Pollution of the environment by humans, for example through smog, mountains of waste, burning rivers, poisoned soil, and species extinction became more and more visible in the second half of the twentieth century. Environmental protection became a political issue, and through globalization it became increasingly linked to the issue of inequality between the so-called global north and global south.

In the face of these major challenges, worried citizens, scientists, and politicians began to look for new visions and solutions. This search process and the growing realization that we need a rapid change if we want to maintain our quality of life has led to the demand for global sustainable development in recent decades.

The first milestone for coordinated action at international level was the **Climate Change Convention** (UNFCCC), which was signed in Rio in 1992. For the first time, climate change and the loss of biodiversity were discussed specifically at the highest level, and thanks to the enormous media coverage the concept of sustainable development became known for the first time to a large part of the world's population. The industrialized countries committed themselves to reducing emissions and supporting developing countries in their efforts to reduce greenhouse gases and adapt to climate change, e.g., by financing projects.

The **Kyoto Protocol** supplemented the Climate Change Convention and required industrialized countries to achieve an average reduction of 5% (Switzerland and EU: 8%) for the period 2008–12 compared to 1990 levels. These commitments were legally binding, but only covered around 25% of global emissions.

At the climate conference in Doha at the end of 2012, the countries agreed on a second commitment period under the Kyoto Protocol (Doha Amendment). The industrialized countries committed themselves to reducing emissions in the period up to 2020 by 18% compared to 1990 levels (Switzerland and EU: 20%). The second commitment period, however, covered only 14% of global emissions. This is partly because certain countries withdrew from the Kyoto Protocol and partly because emissions increased in developing countries that did not committed to reducing emissions.

The **Paris Agreement** was passed in December 2015. It was the first global climate agreement that obliged all states to implement concrete measures to reduce emissions and to adapt to climate change on the basis of their responsibilities and capacities. The central goal of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping the global temperature rise

Fig. 2.5 The 17 sustainable development goals of the agenda 2030 (source: www.un.org)

this century well below 2 °C above pre-industrial levels and continuing efforts to limit the temperature rise further to **1.5 °C**.

The **CO_2-Act** is the heart of Swiss climate policy. In 2008, the federal government introduced a CO_2 tax on fossil fuels including heating oil, natural gas, and coal. The tax can be increased if CO_2 emissions do not fall sufficiently. To date, however, no CO_2 tax has been introduced on fossil fuels used in transport (gasoline, diesel).

More than two decades and more than a dozen sustainability-related UN-conferences after the Climate Change Convention, the UN General Assembly unanimously adopted Agenda 2030, which builds on the contents of Agenda 21 and whose core is formed by the 17 **Sustainable Development Goals** (SDGs). These goals "are the blueprint to achieve a better a more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice" (UN Sustainable Development Platform).

These 17 interlinked development goals for the environment, the economy, and society are intended to ensure the well-being of the earth's current and future population while protecting and preserving the natural basis of life. The 17 SDGs are specified by 169 sub-goals, whose implementation is based on 232 indicators, and should be achieved globally and by all member states by 2030. The Agenda 2030 was adopted by all 193 UN member states (Fig. 2.5).

2.5 Knowledge and Tackling Sustainability Challenges

Science has a fundamental role to play in sustainable development. Its job is to provide us with an understanding of the often interconnected natural and societal processes that govern sustainable development. In a manifesto for Research on Sustainability and Global Change (ProClim/CASS, 1997), Swiss researchers defined three different types of knowledge that are central to this understanding: Systems, target, and transformation knowledge.

Systems Knowledge ("Knowledge of What Is")
Knowledge about how our environment, society, and economy work is indispensable. For example, we need to know how the climate system reacts to higher greenhouse gas concentrations in the atmosphere, what the health implications of malnutrition, or what the ecological, economic, and societal effects are of export subsidies on agricultural production. It soon becomes clear that we need to understand the interplay between social, ecological, and economic systems.

Target Knowledge ("Knowledge of What Should and Should Not Be")
As we have seen in the section on planetary boundaries, there are very large, and mostly still unknown, risks associated with irreversible changes in ecosystems and socio-economic systems (e.g., migration, health, democracy, business cycles). To assess these risks, knowledge about thresholds, "tipping points," critical loads, etc., is central. Such knowledge must become the basis for decisions and negotiations of sustainable development goals.

Transformation Knowledge ("Knowledge About How We Get from the Actual to the Target State")
Although we have very precise knowledge of the climate system, the effects of climate change and the corresponding "safe operating space" (see the section on planetary boundaries) for decades, emissions of greenhouse gases continue to rise despite countless climate conferences, climate targets, measures, huge investments, etc. The same is true for biodiversity loss, species extinction, rising inequality, ocean acidification and pollution, and many more great challenges. All these examples show that, with respect to many sustainability goals, transformation knowledge is arguably the one of the three types of knowledge that most needs our attention today. It would seem that current socio-economic and institutional frameworks do not foster sustainable development. For example, ecological and social costs are not reflected in the prices of goods and services, and many societal, political, economic, and legal structures provide incentives for unsustainable actions. Transformation knowledge is therefore of central importance to sound solutions, laws, policies, processes, or technologies to promote sustainable development. Thus, transformational knowledge about socio-economic and institutional frameworks is fundamental in designing policies that create the right incentive structure to promote sustainable development.

Systems, target, and transformation knowledges all address different aspects of achieving sustainability. All of them are needed to tackle sustainability challenges.

Literature

Allievi, F., Vinnari, M., & Luukkanen, J. (2015). Meat consumption and production—Analysis of efficiency, sufficiency and consistency of global trends. *Journal of Cleaner Production, 92*.

BAFU. (2020). Retrieved September 15, 2020 from https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate%2D%2Dinternational-affairs.html

Friedman, M. (1970, September 13). The social responsibility of business is to increase its profits. *The New York Times Magazine,* 32–33, 122–124.

Gallaway, T. (2007). The logic of sufficiency. *Journal of Economic Issues, 41*(4), 1196–1197.

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The great acceleration. *The Anthropocene Review, 2*(1), 81–98.

Steffen, W., Sanderson, A., & Tyson, P. D. (2004). *Global Change and the earth system: A planet under pressure. The IGBP book series*. Springer.

Further Reading

Bañon Gomis, A. J., Manuel Guillén Parra, W., Hoffman, M., & Mcnulty, R. E. (2011). Rethinking the concept of sustainability. *Business and Society Review, 116*, 171–191.

Federal Department of Foreign Affairs FDFA & Federal Department of the Environment, Transport, Energy and Communication DETEC. (2018). *Switzerland implements the 2030 agenda for sustainable development*. Switzerland's Country Report 2018. Retrieved September 09, 2020, from https://www.eda.admin.ch/dam/agenda2030/en/documents/laenderbericht-der-schweiz-2018_EN.pdf

Gapminder. (n.d.). Retrieved September 09, 2020 from https://www.gapminder.org—A platform and software, which shows (international) statistics more comprehensible and interactive.

Geissdoerfer, M., Pieroni, M. P., Pigosso, D. C., & Soufani, K. (2020). Circular business models: A review. *Journal of Cleaner Production, 277*, 123741.

Meadows, D. H., Meadows, D. L., Randers, J., Behrens, W., & Club of Rome. (1972). *The limits to growth: A report for the Club of Rome's project on the predicament of mankind*. Universe Books.

Our World in Data. (n.d.). Retrieved September 09, 2020, from https://ourworldindata.org—A Scientific online platform, that focuses on large global problems presenting comprehensive research and data.

Pohl, C., & Hirsch Hadorn, G. (2006). *Gestaltungsprinzipien für die transdisziplinäre Forschung*. oekom.

Proclim/CASS [Konferenz der Schweizerischen Wissenschaftlichen Akademien]. (1997). *Visionen der Forschenden: Forschung zu Nachhaltigkeit und Globalem Wandel—Wissenschaftspolitische Visionen der Schweizer Forschenden*. ProClim—Forum für Klima und Global Change, Schweizerische Akademie der Naturwissenschaften SANW.

Rosling, H. (2006). *The best stats you've ever seen.* TEDtalk (video). Retrieved September 09, 2020, from https://www.ted.com/talks/hans_rosling_the_best_stats_you_ve_ever_seen

Schäpke, N., & Rauschmayer, F. (2014). Going beyond efficiency: Including altruistic motives in behavioral models for sustainability transitions to address sufficiency. *Sustainability: Science, Practice, and Policy, 10*(1), 29–44.

UN Sustainable Development Platform. (n.d.). Retrieved September 09, 2020 from https://sdgs.un.org

World Commission on Environment and Development. (1987). *Our common future*. Oxford University Press.

Wuelser, G., Pohl, C., & Hirsch Hadorn, G. (2012). Structuring complexity for tailoring research contributions to sustainable development: a framework. *Sustainability Science, 7*(1), 81–93.

Chapter 3
Challenges of Managing Common Resources

Keywords Common goods · Public goods · Tragedy of the commons · Collective action · Institutional economics

This Chapter's Learning Goals
- You know the four categories of goods.
- You know the concepts tragedy of the commons and prisoner's dilemma.
- You know how the concept of tragedy of the commons is relevant for global and local environmental problems.
- You know approaches how the social dilemma could be solved.

3.1 What Is Meant by Tragedy of the Commons?

The starting point of the analysis is the so-called tragedy of the commons. **Common goods** (common pool resources) are those natural or man-made resources that serve all members of a given community and its institutions. Unlike private goods such as cars or mobile phones, all members have free access to common goods, i.e., the goods cannot easily be fenced off. Examples of common goods are water, fish, pasture, irrigation system, and animal populations. In addition to being difficult to exclude, common goods are characterized by a high degree of rivalry, that is common goods can be overused and polluted unless use limits are enforced (see Fig. 3.1).

The **tragedy of the commons** is often illustrated by the freely accessible pasture, where every farmer can take their cattle (Hardin, 1968). In this parable the area of land is fixed whereas the number of livestock is variable. In the original story, it is not possible for an individual farmer in a village to exclude colleagues from common use, as this is a so-called common area that belongs to everyone (the so-called commons). In a situation where every farmer only considers their private costs, the number of users constantly increases. In economic terms, only private costs are considered, and the individual farmer's calculation does not include the cost of

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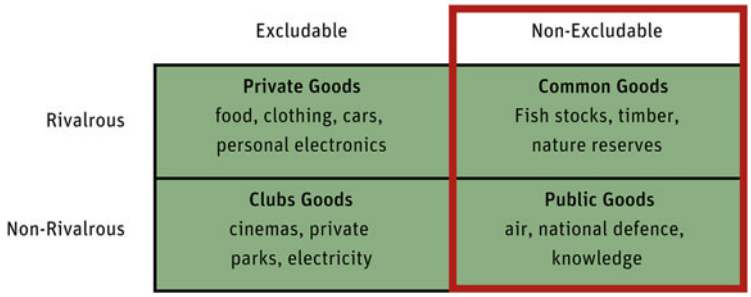

Fig. 3.1 The four different types of goods (source: own representation)

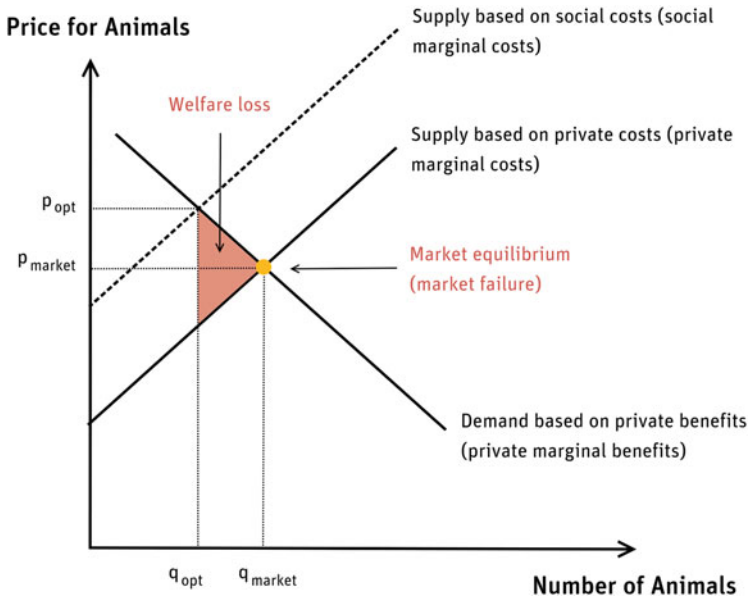

Fig. 3.2 How overuse of commons leads to welfare loss (source: own representation)

reducing the quality of the pasture. This can be depicted in a demand and supply diagram (see Fig. 3.2). Compared to a situation where farmers take into account the social, communal costs of land use, the number of animals q will ultimately be so high that the land will be overused and, from a communal point of view, too many animals will be kept ($q_{\text{market}} > q_{\text{opt}}$) ($q$ = available quantity), resulting in a loss of welfare depicted by the orange triangle. This idea can be transferred 1:1 to other examples such as fishing grounds or groundwater.

If the land belonged to one farmer, the farmer could limit the number of cattle grazing thus allowing the pasture to regenerate and sustain farming over a longer period. For sustainable land management, therefore, the area used must be limited or the ownership clearly regulated.

The problem is similar for public goods. **Public goods** cannot be excluded either. In contrast to common goods, however, there is no rivalry problem (see Fig. 3.1). Due to the lack of excludability, the problem arises here that too little of a good is provided and that there is little incentive to maintain it. This leads to individuals and groups free riding the provision of a good (e.g., education or clean air). This is something that the economist Mancur Olson wrote extensively about.

3.2 The Logic of Collective Action or the Prisoner Dilemma

Mancur Olson describes the problem in his book "**The Logic of Collective Action,**" in which he shows that a group or individuals have little interest in providing a public good such as clean air if that group/individuals cannot exclude other beneficiaries from its use. In other words: Why should someone contribute to a public good if he or she can also use it without actually having contributed to its creation?

While it would be in the interest of us all to be able to breathe clean air, there are no incentives at the individual level not to pollute the air. On the contrary, the individual incentives are such that free riding makes sense. In our example, why should a group or individual go to the effort of reducing air pollution if they know that everyone else will continue to pollute? Moreover, they know that they could benefit from other party's effort to reduce air pollution without making an effort themselves. **Free riders** pose a problem because, although individuals do not pay for the public goods (either directly through fees or tolls or indirectly through taxes or personal effort), individuals can still access or use the public goods. The goods may thus be underproduced, overused, or degraded, which is a similar outcome to the tragedy of the commons.

The **Prisoner's Dilemma** is an example from game theory which illustrates how cooperation often breaks down. It can also be used to show why a collective benefit for society may not be achieved. In this game individuals optimize their individual benefit, which is why the overall benefit for all participants is ultimately not maximized. The game situation of the Prisoner's Dilemma is as follows: Two prisoners have been accused of a string of crimes and are being interrogated separately. Since the evidence is poor, there are very few punishments for both without confession. The interrogator tries to play the two prisoners off against each other. If both confess, they both go to prison for 6 years. If neither confesses, they both have to spend 1 year in prison. If only one confesses, he goes free as a key witness and the other goes to prison for 10 years (see Fig. 3.3).

Both prisoners must now consider which strategy will bring the best result for them personally and independently of the actions of the other prisoner: should they confess or not confess? For player 1, regardless of what player 2 does, it is individually best to confess; both when player 2 confesses and when he does not confess, he will maximize his benefit ($6 < 10$ and $0 < 1$, respectively). Likewise, from an individual point of view, it is best for player 2 to confess. So, if the two prisoners act based on **individual considerations**, they will both confess and

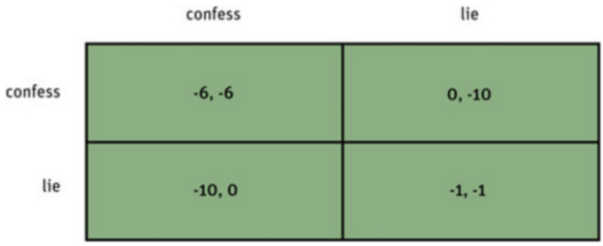

Fig. 3.3 Payoff matrix in a prisoner's dilemma (source: own representation)

accordingly both will go to prison for 6 years each. From a collective point of view, this result is not optimal. In total, the two prisoners will spend 12 years in prison. If the two prisoners would instead act as a community and both would not confess, they would only get 2 years in prison together.

In exactly the same way, although it is optimal for individual livestock farmers to keep as many cattle as possible on the common pasture, this does not lead to an optimal result from a collective point of view. If collective behavior is the desired outcome in such situations, appropriate framework conditions are needed. We will consider these framework conditions in the following sections.

3.3 Social Dilemma

Elinor Ostrom sums up this usage tragedy with the concept of the social dilemma. She defines the gap between the socially desired state and individual utility optimization as follows: "Social dilemma occur whenever individuals in interdependent situations face choices in which the maximization of short-term self-interest yields outcomes leaving all participants worse off than feasible alternatives." (Ostrom, 1998: 1)

For example, it would make sense for fishermen in a region to comply with jointly fixed fishing quotas to prevent stocks from overfishing. The collective restriction would result in a benefit for all. However, since each of the parties involved knows that they will gain more in the short term if they do not follow the rules and their colleagues behave cooperatively and in accordance with the rules, there is an individual incentive to disregard the rules. This in turn means that the outcome desired by society cannot be achieved. Examples of collective dilemmas can be found in various areas: starting with the provision of public goods such as schools or an army, through the prevention of negative environmental impacts, to the development of political conflict resolution mechanisms.

Table 3.1 How to encourage/enforce sustainable behavior

Mechanism	Market	State	Self-organization
Coordination	Entrepreneurial spirit and pursuit of profit	Power and political processes in order to internalize external costs	Ambition to maintain livelihoods; auto-organization of people
Instruments	Market and price	Economic incentives and regulations	Rules given by community
Examples	(Fair) trade products	Legislation on all levels; regulations of the commons (local and global)	Shared property; land/water/fishing communities

3.4 How to Cope with the "Tragedy of the Commons," Prisoners or Social Dilemma?

The only way to cope with dilemmas is to coordinate individual activities. Coordination can be organized by markets, state, or self-organization. Markets can be effective, providing all costs are considered. The state can regulate pollution or create new economic incentives. Self-organization is when communities, on their own initiative, create new rules to coordinate their activities. In reality, we often find a mixture of the three coordination mechanisms. Table 3.1 gives an overview of the three coordination mechanisms.

The perspective of **institutional economics** espoused by Elinor Ostrom (Governing the Commons), sees the solution to major social problems in self-organization and the combination of institutional mechanisms. Ostrom called this the third way. Based on the idea, that problems within a community are best solved by that community. The community therefore has to come to together to define and enforce rules. It is often not the market or the state that provides the central solutions for the resource management, but local and regional self-restraint, as they can be shaped by communities themselves. Classical examples of this are self-managed fish stocks, alpine management, or water regimes. Self-organization is particularly suitable for local and regional problems and represents an alternative management of public goods.

Real-World Example: Community-Supported Agriculture

In community-supported agriculture, food is no longer sold on the market, but flows into a transparent economic cycle organized and financed jointly with consumers. Specifically, this is an association of farms or market gardens with a group of private households. Producers and consumers form an economic community that meets people's needs and respects the natural environment.

Based on the estimated annual cost of agricultural production, this group agrees to pay a fixed amount to the farm each year in advance. This allows the producer to use good agricultural practices, keep the soil fertile, and produce

(continued)

according to demand regardless of market pressures. In return, buyers receive the entire harvest as well as processed products such as bread, cheese, etc. The personal connection makes people aware of their mutual responsibility. Consumers experience how their food choices not only shape the cultural landscape, but also promote social coexistence, nature conservation, and (species) diversity, thus enabling sustainable agriculture.

Source: www.solidarische-landwirtschaft.org

Literature

Ostrom, E. (1990). *Governing the commons. The evolutions of institutions for collective action*. University Press.

Ostrom, E. (1992). *Crafting institutions for self-governing irrigation systems*. ICS Press.

Ostrom, E. (1998). A behavioral approach to the rational choice theory of collective action presidential address, American Political Science Association 1997. *American Political Science Review, 92*(1), 1–22.

YouTube. (2011). Tragedy of the commons. Retrieved September 09, 2020, from https://www.youtube.com/watch?v=lwaNZgY9PCQ

Further Reading

Hardin, G. (1968). The tragedy of the commons. *Science, 162*(3859), 1243–1248.

Olson, M. (2009). *The logic of collective action: Public goods and the theory of groups, second printing with a new preface and appendix* (Vol. 124). Harvard University Press.

Chapter 4
Corporate Sustainability

Keywords Sustainable management · Levels of corporate sustainability · Technological change · Corporate values · Corporate social responsibility (CSR) · Sustainability reporting

This Chapter's Learning Goals

- You know about the new paradigm of business administration.
- You know about the three levels of sustainability.
- You know how corporate sustainability builds and depends on corporate values.
- You know the relevance of sustainability reporting and are aware of different reporting standards.
- You know the concept of Corporate Social Responsibility

As we will discuss in this chapter, companies are an important steering parameter for sustainable development as they develop new, more sustainable products and services or improve the sustainability of their organizations and internal processes. However, companies will not be willing to make a substantial contribution to sustainable development if this does not also pay off economically. According to Hahn et al. (2018) "corporate sustainability thus represents a level-spanning concept that links organizational activities to outcomes at overarching societal and natural systems in that business firms are expected to improve the general welfare of society" (Hahn et al., 2018, p. 236). Current developments suggest that corporate sustainability is becoming increasingly important in both the field of sustainability policy and the field of management. Five reasons have been identified for these developments. First, there is societal pressure on companies to do their part for sustainable development, which will lead to stricter policies and shifts in demand. Second, many new business opportunities are emerging for companies, which also makes it attractive to profitable invest in this area. Third, companies should worry about the immediate impact of climate change on their operations. Fourth, there is a growing risk of litigation over climate change (The Economist, 2020a, b). Fifth, as

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discussed in Sect. 6.2, the financial sector is also doing its part to increase the pressure on companies, in some cases banks are making harder for unsustainable companies to obtain credit. Rich Sorkin, head of Jupiter Intelligence, a consultancy, thus argues: "In ten years there won't be a large entity anywhere on the planet that does not have a handle on its climate risk. Consumers, shareholders and employees won't stand for it." (The Economist, 2020a, b).

4.1 Sustainability as the New Management Paradigm in Business Administration

For a long time the concept of Sustainability has been a mere add-on to business administration and management. In the recent years, Sustainability becomes an integrated management paradigm which is effecting all different management subjects. The three dimensions of sustainability (economic, ecological, and social) are embedded in innovative business concepts, strategic management as well as in a new business administration model which consists of various management disciplines (from finance to HR, and from marketing to supply chain management). Thereby the idea of sustainability is transformed from an add-on to an add-in approach in management and business administration. Let us have a look at the three examples of how sustainability enters into business thinking.

4.1.1 Sustainability as Innovative Business Concept

The current development of sustainability as an innovative business concept is leading to a reinvention of classical business administration and strategic management. Latest studies (e.g., Danso et al., 2019; Durand et al., 2019; or Hawn et al., 2018) show that sustainable management is not weakening the competitiveness of business, rather the opposite. Business models and strategies which integrate the material issues and dimensions of sustainability have a higher risk-adjusted return, are more attractive for employees and customers as well as are more resilient during crises. Entrepreneurs and managers alike are increasingly acting in their own interest when transforming their current business models, products, and services towards sustainability. To achieve this reorganization of business, general management knowledge needs to be developed further and a comprehensive understanding of sustainable management needs to be established. This has led to the emergence of new concepts and approaches in strategic management, finance, and human resources.

4.1.2 Strategic Management

Sustainability and profitability are no longer seen as opposing each other. In the current discussion on strategic management, the focus lies in identifying the sweet spot between the interests of business and the interests of society. Thus, managers need to identify the business interests and align these with the interests of society. In this strategic process, business formulates its purpose and defines frameworks, processes, and operational projects necessary to reach its objectives. In order to steer any management process the desired impact of the strategy needs to be clearly defined from the input to the impact (see Fig. 4.1).

Impact is understood as the long-term effect on the environment, society, and business of any strategic measure. The outcome is defined as intended changes at the systemic level (e.g., energy systems). For example, a new mobility system through car-sharing platforms and new driving systems, etc. Based on the intended impact and outcome the necessary output can be defined. The output can be calculated using standard financial KPIs plus non-financial KPIs. Through this process management is "thinking the present from the future." It designs the overall strategic process from the long-term effects on broader society (impact), via its effects on the systems and stakeholders of the business surroundings to the output which is the direct measurable effect in terms of products and services. This comprehensive strategic process aims to create value based on both purpose and business interests.

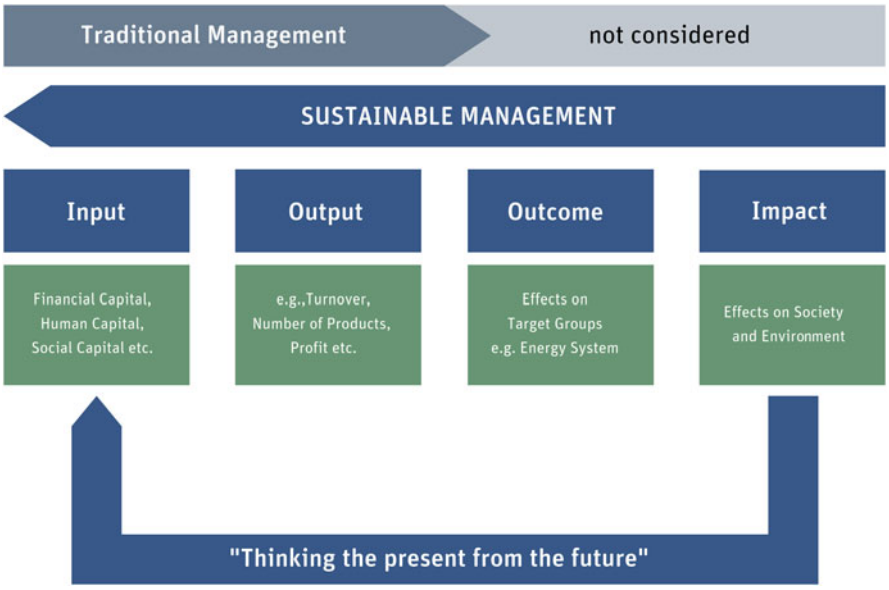

Fig. 4.1 Sustainable vs. traditional management thinking (source: own representation based on Bungard & Schmidpeter, 2022)

The final step in this planning process requires the management to define which resources are needed as input (human capital, financial capital, social capital) to achieve the goals of the process. Naturally the business will want to be as efficient as possible in all its processes. This means that as little input is used for the necessary output or to increase the output as much as possible using the available input. By being effective and efficient at the same time business aims to achieve the intended impact according to its purpose while maintaining economic efficiency. Sustainability has a major role in the definition of purpose, impact, and long-term goals of business. This way sustainability is fully integrated in the strategic management process and the derivation of business processes and functions.

4.1.3 New Business Administration Model

As discussed earlier, this new strategic alignment of business value and societal value leads to a new concept of business administration (see Fig. 4.2).

The new business administration models are based on the idea of fostering a strategic, innovative value creation in the organization. Thus, sustainability affects all business areas and functions and needs to be embedded in a wide range of management disciplines. Let us consider the case of HR management. To build an environment that enables creative strategy development and implementation, HR management needs to foster an open and transparent business culture which is based on shared values and fair working conditions. Another important HR management task is to develop the right kind of leadership skills among a diverse workforce. Diversity and inclusion plays an important role in creating an inspiring workplace, fostering creativity and promoting inclusive decision-making. Thus, HR management is not seen as a mere support function but is seen as playing a crucial role in the overall value creation process by contributing to inclusive strategy development and innovative working culture.

Studies also show that the customer increasingly appreciates sustainable products and services. Green products and production processes are becoming important in customer relationship management and developing new markets and brands. Integrating the broad perspective of different stakeholders is key to designing new products and developing innovative solutions for ever faster changing markets. Marketing can only succeed by thinking the present from the future, addressing the societal and environmental challenges as well as developing new business models which create value for both society and owners/shareholders. Innovative marketing concepts play an important role in permanently innovating the value creation process in the business accordance to the overall business strategy.

In order to continuously steer a business, controlling plays a major role. By translating the overall strategy into financial and non-financial KPIs the success and the state of a sustainable business transformation can be measured. Financial institutions and investors are more and more interested in sustainability performance as well as the impact of the business on its environment. Thus, their

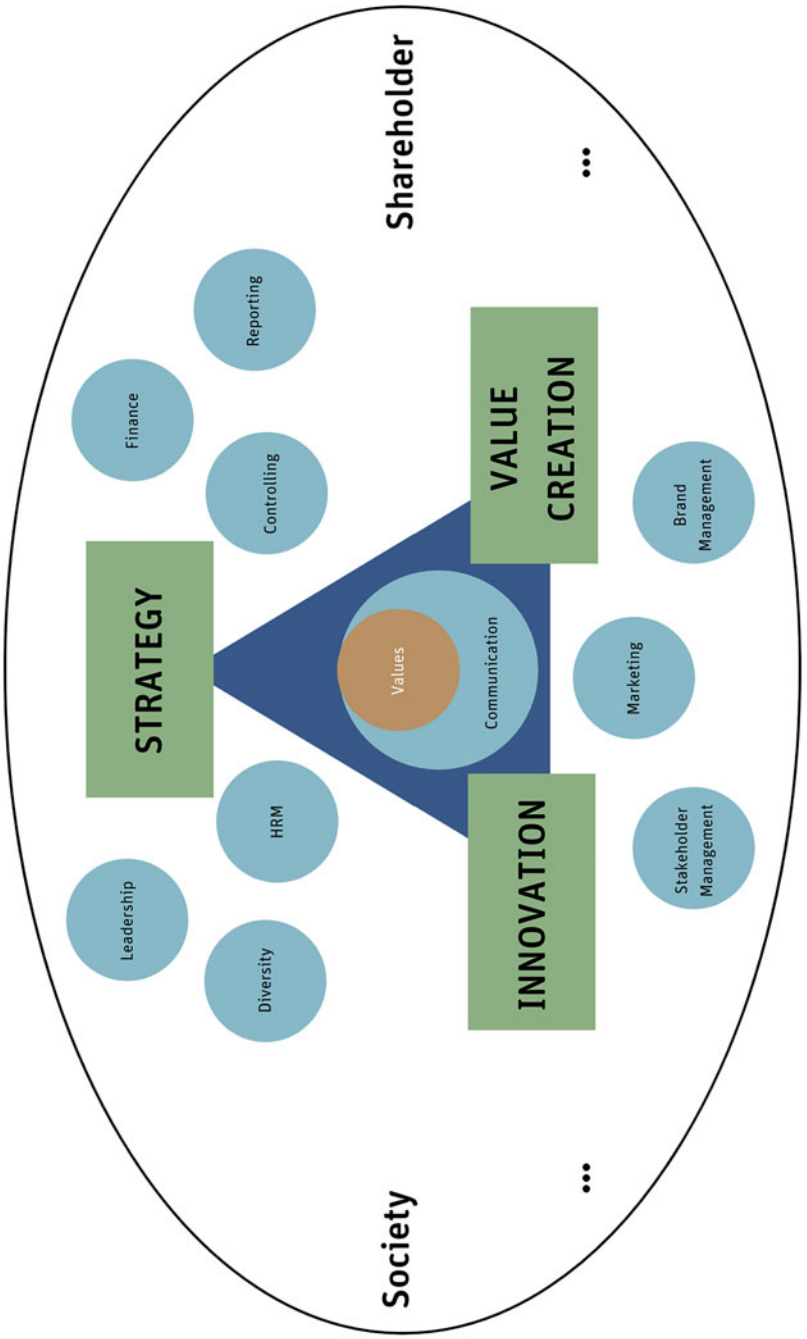

Fig. 4.2 New business administration approach (source: own representation)

controlling systems are changing rapidly. Investor relations and controlling communicate KPIs internally and externally and thereby making transparent the true value creation of the business for both the owners/shareholders as well as to the stakeholders. Through measuring and monitoring, the value creation process is linked to the strategy and vice versa. Meaning that integrative controlling plays an important part in sustainable management.

This triangle of strategy, innovation, and value creation drives entrepreneurship and business transformation towards a new sustainable business paradigm. Only if the various dimensions of sustainability are integrated into all business disciplines and departments can business overcome the old trade-off thinking between profit and sustainability. This truly integrative management thinking is on the rise and changing all business disciplines rapidly. By mainstreaming sustainability as the new management thinking a new mindset among decision-makers emerges which is able to transfer sustainability risks into entrepreneurial opportunities. Thus, business is becoming the solution rather than the problem of a sustainable development. Current studies show that people believe in the power of business and see business as both competent and ethical in order to address our most pressing social and environmental challenges. To educate our students and business leaders accordingly is the goal of responsible education.

Thinking the present from the future and overcoming the old trade-off thinking between profit and sustainability are the base for developing new business administration approaches as well as a new sustainable mindset for management. Sustainable Leadership is based on a value-oriented education and ethical reflection as well as an entrepreneurial spirit which sees business not only as a profit maximizer, but also as a driver of the sustainable development of our society. By integrating sustainability in all functions and disciplines of management and business administration, business creates value for its shareholders and society at the same time. This new business goal is leading the academic and practical progress of management science.

4.2 Three Levels of Corporate Sustainability

In addition to the three approaches towards sustainable systems discussed in Sect. 2.3 (i.e., efficiency, consistency, and sufficiency), there are three levels on where a corporation can apply its sustainability measures: (1) **production**, (2) **product**, and (3) **organization**. Each of these levels can be addressed using the three approaches in order to optimize resource sustainability.

4.2.1 Production Level

The level of corporate sustainability most commonly addressed first is production. This level includes all processes and material flows that are part of manufacturing a

good or the provision of a service. Consequently, it varies not only from industry to industry but also between different firms within the same industry, as their processes and material flows seldom completely match. The more standardized the production process is, the easier is it to achieve universally applicable results, i.e. it is relatively straightforward to calculate the impact of highly standardized mass-production in comparison to heavily localized or customized activities. For a better overview of the different factors influencing sustainability on production level, it is recommended to analyze processes and material flows separately, even when at first glance, they appear to be inextricably intertwined.

Processes
Production processes include all corporate processes involved in converting the raw material inputs into the final product. This includes the logistical processes that ensure that raw materials, production resources and the corresponding expertise are available where and when they are needed. In addition, production processes cover maintenance, repair, and replacement processes keeping technical problems at bay, while training processes keep staff up to date and ensure they are complying with the latest regulations, etc. All these processes can be analyzed from the environmental, social as well as economic perspective. As it is impossible to provide a comprehensive list of all industrial processes, a detailed analysis of the company-specific production environment and its production processes is necessary.

Material Flows
A production process usually turns incoming material into outgoing material, and ideally in doing so creating value. If there are any elements of circular production implemented, they are to be analyzed within this category. Following the chronologic material flow of a generic production process, the analysis must at least include:

- The raw materials used—including energy and emissions involved in mining, growth, harvest, refining, production, transport, etc.
- The production materials used—including electricity, fuel, coolant, lubricant, catalysts, etc., needed to fabricate the product, but excluding the material included in the product itself.
- The emissions generated—referring to unwanted, possibly even unintended material outputs of the production process. This includes heat, noise, radioactivity, smells, exhaust gas, vibrations, liquid waste, waste materials, etc.
- The material wear caused—describing any material flow resulting from the need to operate means of production (e.g., spare parts, material abrasion/attrition, production upgrades, etc.)

4.2.2 Product Level

The product level refers to the impact of the products and services while they are in use. The following bullet points cover some of the questions that need to be answered when considering use of the product.

Ecological Dimension

- What resources does the product consume? And how much of them?
- What emissions does the product cause during its life cycle?
- How much energy does the product need to operate?
- How long is the product's life cycle? Can it be recycled?
- etc.

Social Dimension

- Can the use of the product contribute to health issues or even endanger lives?
- Does the application of the product possibly expose its users to any dangers of addiction?
- How accessible (financially, but also based on training or equipment required) is the product across different social groups?
- What is the product's impact on somebody's social status and social mobility?
- etc.

Economic Dimension

- What is the product's loss in value during its life cycle?
- What are the product's operating costs?
- Can the product easily be modified to be reused for slightly different applications?
- Can the product be used independently of other products?
- etc.

4.2.3 Organizational Level

The organizational level covers any aspect of the (product- or service-) producing corporation not already covered in one the previously analyzed levels and mainly concerns aspects of work organization, financial, legal, and social standards, work risks, social benefits, etc. Again, the sheer volume of topics subsumed at the organizational level renders a comprehensive list impossible. However, the following examples give an impression of the topics that should be considered:

- How does the median wage level for different employees and subcontractors compare to the national levels?
- What are the work-related health and accident risks?

- What are the social and insurance benefits for different employee groups (paid vacation, sick leave, paid maternity leave, etc.)?
- Can employees organize themselves in unions or the like?
- etc.

4.3 Technological Change: The Role of Green Innovation

In Sect. 2.3, we discussed the three approaches to a sustainable system: sufficiency, efficiency, and consistency. Sufficiency primarily refers to consumption activities and less to corporate behavior. However, the other two approaches are both relevant in terms of corporate innovation. Through process and product innovation, companies can contribute to both greater efficiency and consistency. This chapter on technological change primarily focuses on improvements in terms of efficiency. Adjustments that lead to more consistency are then discussed in Chap. 9 on the Circular Economy.

The literature generally distinguishes between technological change that addresses social sustainability (i.e., social or low-end innovation) and technological change that addresses environmental sustainability (i.e., green or eco-innovation). In this chapter, we will focus on technological change addressing environmental sustainability.

New technologies are needed to support the achievement of environmental goals. From a technical perspective, companies basically have two ways of reducing their environmental impact. At the production level of corporate sustainability, companies can make their internal production processes more efficient, i.e. carry out **process innovation**. This includes significant modifications to techniques, equipment, and/or software. At the product level of corporate sustainability, companies can make the products and services they sell on the market more sustainable—i.e., carry out **product innovation**—and thus contribute to more sustainable consumption. This includes significant improvements to the technical specifications, components and materials, software of the product, ease of use, or other functional features. Ultimately, both forms of innovation (i.e., product and process innovation) are closely linked, as companies usually need access to existing products and services in order to improve their production processes. In the following, both forms of innovation will be summarized under the term **green innovation**.

4.3.1 Where Is the Largest Impact Reduction Possible?

As with consumption or production in general (see also Sect. 7.2.1), the areas with the largest environmental footprint are also the same for technological change: food, building/housing, and private mobility (for a current overview for Switzerland, see Spörri et al., 2022).

There is great potential in technological change that improves company **processes**, i.e. process innovation. In the **food** industry there are more and more efforts to reduce food waste, for example by reusing by-products such as whey or pomace, which are normally treated as waste. In addition, there is also enormous potential for resource efficiency in **agriculture**. In the **real estate** and **construction** sector, there are efforts to reduce resources consumption in buildings by using construction materials with a lower environmental impact, such as wood or recycled construction materials. These examples increase the efficiency of the industry's supply chain and can thus be categorized as process innovation activities.

Large **product** innovation potentials are expected in machinery, chemical, food, and automotive industry. In all these industries a large number of resource-saving products are developed. Unlike process innovation, however, the environmental impact of these innovations is not realized in the industry where the innovation is developed, but by the customers who ultimately use the technology. In the **machine** industry, for example, production systems are being developed that lead to a reduction in the use of resources and energy in the industrial manufacture of products (e.g., alternative clamping system for surface processing of metal sheets with reduced material waste). In the **chemical** industry, materials are being developed which contribute to a reduction in the use of resources and energy or lead to improved recyclability (e.g., development of lightweight plastics and composites for the automotive industry, new technologies for energy storage, or alternative products for cement). In the **food** industry, the focus is on the development of substitute products for conventional animal proteins (especially meat) for human consumption, such as alternative vegetable proteins (e.g., peas, lentils, soya), insects (also relevant for animal feed), and cultured meat. Finally, the potential in the **automotive** industry relates to the development of more efficient cars and alternative driving systems.

Real-World Example: Bühler Group

The Bühler Group is a Swiss company in the machinery industry with about 12,500 employees. Bühler's internal environmental impact is limited. According to Bühler's website "billions of people come into contact with Bühler technologies every day to cover their basic needs for food and mobility." Two billion people each day eat foods produced on Bühler equipment; and one billion people travel in vehicles manufactured with parts produced with Bühler machinery. Having this global relevance, Bühler is in a unique position to have a significant impact on global sustainable development.

Source: www.buhlergroup.com

4.3.2 The Speed of Technological Change

Patent data can be used to track the diffusion of technological innovations. Patents are always assigned to specific patent classes (see red box in Fig. 4.3). In the example below, the patent has been assigned to class F02D41. For each patent class, there are specific classifications that assign patents to different technological fields. A specific classification developed by the OECD allows the identification of green technological fields (OECD, 2012). This classification shows that class F02D41 is assigned to the field "Emissions abatement and fuel efficiency in transportation," which indicates that this patent is green technology. Similarly, all patents can be checked in an automated process and assigned either to green or non-green patents and, if necessary, to even more detailed sub-classes.

These patent data show that the development of such green technologies, after having increased relatively strongly worldwide between 2004 and 2011, has been declining again in almost all areas since 2011—in absolute terms, but also in relation to general patent activity (see Fig. 4.4 for the relative data). In 2018, the total share of green inventions in all inventions worldwide was 9.5%. Normalized by population size, Korea, Denmark, Japan, and Germany are the countries with the most green patents. Poland, Spain, Italy, Ireland, China, and Australia are among the worst performing countries. The so-called innovation champion Switzerland is just in the middle of the field (see Fig. 4.5).

If we look at innovation input (i.e., R&D) instead of innovation output (i.e., patents), the picture looks similar. R&D expenditure related to green innovation may account for only 4% of total R&D expenditure worldwide (The Economist, 2020a, b).

4.3.3 What Hampers Green Innovation?

Given the major environmental challenges, one would think that there would be a great deal of "green" patent activity and innovation. However, the data above suggests that this is not the case. There are various reasons why many of the existing potential has not yet been exploited.

A central reason is certainly the potential customers' **low willingness to pay** for green innovation. On the one hand, this is driven by the fact that energy and other environmental costs are simply not very relevant for most companies and households. Energy costs, for example, account for around 10–20% of the total physical production costs in industry worldwide (UNIDO, 2010). Energy costs are even lower in Western countries, where fewer energy-intensive companies are located (EIA, 2016). According to representative company data for Germany, Austria, and Switzerland, the share of energy costs in sales on average for all companies is only 1.3% in Germany, 2.7% in Austria, and 1.4% in Switzerland (Stucki, 2019a). The cost savings to be expected from the use of new green technologies are thus

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(54) **Method and device for controlling fuel injection into an internal combustion engine**

Verfahren und Vorrichtung zum Steuern der Kraftstoffeinspritzung in einer Brenkraftmaschine

Procédé et dispositif de commande de l'injection de carburant dans un moteur à combustion interne

(84) Designated Contracting States:
DE ES FR GB IT SE

(30) Priority: **11.08.1998 JP 22690898**

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(56) References cited:
EP-A- 0 481 964
EP-A- 0 677 655
US-A- 5 063 900
US-A- 5 605 133

- **PATENT ABSTRACTS OF JAPAN vol. 1998, no. 01, 30 January 1998 (1998-01-30) & JP 09 250426 A (TOYOTA MOTOR CORP), 22 September 1997 (1997-09-22)**

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EP 0 979 940 B1

Fig. 4.3 Front page and diagram for patent EP 0979940 B1 (Source: https://worldwide.espacenet.com)

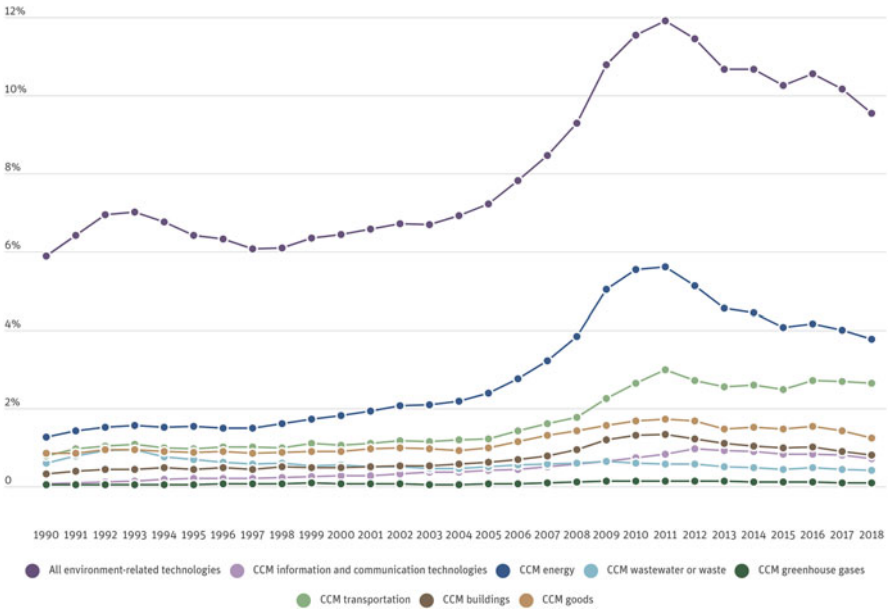

Fig. 4.4 Share of total number of patents, in terms of inventions, by area of green technologies worldwide. *CCM* climate change mitigation (source: own representation based on OECD, 2022a)

relatively small on average for all companies. So, if a company wants to increase its cost-efficiency, it is unlikely to focus on energy costs, but rather to optimize larger cost drivers such as wages or infrastructure costs. The situation looks similar for private households. The median value of the US energy burden, for example, is 3.5% of household income (ASE, 2018). Accordingly, most households primarily try to optimize their major cost drivers such as housing or health care instead of reducing energy costs. This argumentation is not limited to the energy sector alone but can be extended to most environmental issues, as the total environmental costs are unlikely to be very high for most companies and households either. It is therefore hardly surprising that, for example, the introduction of green energy-related technologies only pays off for companies with very high energy costs, but that no significant or even a significantly negative effect is observed for the majority of companies (Stucki, 2019a). Therefore, the use of green technologies seems to generate hardly any economic benefit for most companies and households, which is likely to result in a correspondingly low willingness to pay.

In addition to the low relevance of environmental costs, the customers' low willingness to pay for green technologies is accentuated by the fact that many green innovations are associated with high **up-front costs**. These investments may even pay off in the long run, but since many investors usually have a limited time horizon, many prefer to eschew these kinds of investment, which in turn results in a low willingness to pay.

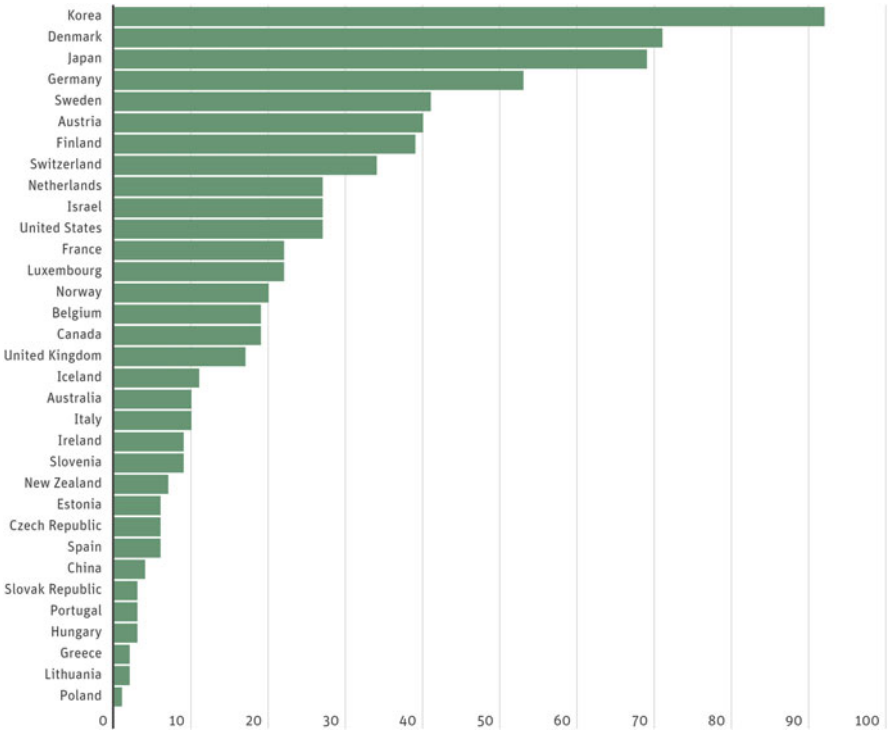

Fig. 4.5 Development of environment-related technologies, inventions per capita 2016–2019 average (source: own representation based on OECD, 2022b)

On the supply side, green innovations are usually associated with high **implementation costs**. This is due to a number of factors. Stucki and Woerter (2017) find that little knowledge can be transferred from non-green technologies to green technologies, which points to the complexity of the switch between non-green and green innovation activities. Green innovation activities are often more complex than non-green innovation activities because they are usually outside the firms' traditional technological fields of activity (Shrivastava, 1995). Consoli et al. (2016) observe that green jobs generally require more high-level cognitive and interpersonal skills than non-green jobs and also require more formal education, work experience, and "on the job training."

And the complexity does not only refer to the pure innovation activity itself. The introduction of green innovation activities to a company usually requires a restructuring of the organization and includes measures along the entire value chain. Business processes and work routines must also be adapted or even newly developed (Danneels, 2002). Green innovations often involve actors from different companies and sectors, which makes the organizational implementation of such innovations rather difficult. Moreover, companies—and above all the existing

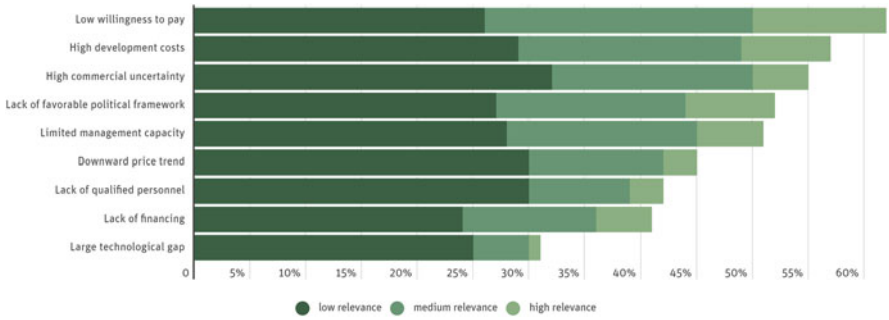

Fig. 4.6 Companies' assessments of the relevance of various barriers to green innovation (source: own representation based on Stucki, 2019b)

management—simply get stuck in their existing ways of thinking, which have often been built up over years and in which ecological aspects of products are often barely considered relevant. A fundamental change of mentality in companies is therefore usually a precondition for successfully addressing the technical and organizational challenges associated with greening a business' activities. Besides technological and organizational challenges, there are marketing challenges. Once new technologies have been developed, they must be sold. Sales and marketing represent a major challenge for many companies, since increased focus on ecological aspects of their products often addresses completely new customer segments (see Spörri et al., 2022 for a broad discussion of such technological-organizational barriers).

A good example that illustrates the complexity of green innovation are electric cars. "Research and development [. . .] costs a fortune. Daimler says that it will spend 10bn € by 2025 on just ten battery-powered models. Restructuring is also expensive. For a century, carmakers have built factories, employed workers and developed and perfected knowledge and a supply chain around the internal combustion engine. In one scenario Morgan Stanley reckons that VW's entire car business could make a loss between 2025 and 2028 as it transforms itself." (The Economist, 2017)

The relevance of these barriers is confirmed empirically. Based on representative company data from Germany, Austria, and Switzerland, Stucki (2019b) finds that the biggest barriers to green innovation are low willingness to pay and high development costs (see Fig. 4.6). The great importance of high commercial uncertainty results from unstable markets caused by, amongst other things, frequently changing political conditions and major technological changes in these markets. This uncertainty makes it difficult for companies to plan long-term investments. In contrast, the study found that personnel factors, whether at management or staff level, are much less important. The availability of financial resources—normally one of the most important barriers to innovation activities—is also relatively unimportant for green innovation.

4.3.4 The Importance of Policy Instruments

The previous discussion has shown that the economic potential of green innovation is currently relatively low, as the implementation costs for companies are usually high, and at the same time customers are not willing to pay much for these products and services. The low economic potential of green innovation is empirically confirmed. Empirical studies find that returns to investments in green technologies (at least currently) are often negative (Soltmann et al., 2015), and often lower than for traditional technologies (Marin, 2014) and other "new growth" technologies, such as information and communication technology or biotechnology (Stucki & Woerter, 2019).

Under these circumstances, it is unlikely that substantially more green technologies will be developed and offered in the future. For most companies it is simply not worthwhile investing in such technologies financially. It is thus clear that adjustments to the entire system and involving all steering parameters, such as private demand and the financial system, are needed to get the green innovation machine started. Especially relevant is an adjustment of the political framework conditions. As shown in Chap. 6, the internalization of external costs is central to this. If external costs are internalized, energy and general environmental costs automatically rise, which will also have a positive impact on consumers' willingness to pay for green technologies. In the choice of policy instruments, market-based instruments such as CO_2-taxes are generally preferred by economists. However, the literature also makes clear that ultimately a mix of different instruments is required to significantly increase green innovation activities (for a review of this literature, see Popp, 2019). Some evidence that the policy framework effectively influences the effects of green innovation is found by Dechezleprêtre et al. (2021). They investigate for the USA, whether clean innovation and innovation efficiency accord higher valuations on the stock market to those firms that engage in successful clean patenting activities. Only in the period 2006–2015, which saw sharp increases in environmental policy stringency, such a premium, was observed.

4.3.5 Green Innovation in a Spatial Context

How companies gain access to relevant knowledge and well-trained employees that help make their products or services more sustainable, depends also on where a company is located and how it is connected to the rest of the world. Place matters for innovation—even in a globalized world, where everything seems independent of place due to modern communication technologies and rapid transportation systems. Globalization has even amplified the concentration of economic activity in big cities and large urban areas and has led to the situation that "only few regions truly matter in today's global economy" (Florida, 2005, p. 48).

Agglomeration economies are one explanation for the urban domination in innovation and economic growth. Agglomeration economies reflect the phenomena that high concentrations of people and firms are more productive and innovative. This is in part because it is easier to find talented employees; clients and suppliers are more numerous and in general exchange between people with different ideas and knowledge occurs spontaneously. Hence, it is more likely that green innovations emerge in urban areas.

However, today you could argue that the Internet allows access to the knowledge necessary to develop green products and services. This is true for the so-called explicit knowledge—the knowledge, that can be written down on a sheet of paper and given access to everyone. However, the **tacit knowledge**—the knowledge that depends on personal interaction—which is key to the development of green innovations—is person and place dependent. A common knowledge base, trust, and geographical proximity between the knowledge holders all play a decisive role in tacit knowledge sharing (Boschma, 2005).

The combination of these two types of knowledge, as well as the social and creative experimentation process, is central to green innovation. However, firms do not only exchange knowledge and innovate within their own organizations but may also exchange knowledge with research institutions, partners, and other firms. This strategy is called **"open innovation"** (Chesborough, 2003). Depending on where a firm is located, it faces different opportunities and obstacles regarding open innovation.

A theoretical framework that depicts the important parts of such innovation dynamics is the "**Regional Innovation System" (RIS)** approach (see Fig. 4.7). An RIS illustrates the networks and flows of knowledge and resources necessary for innovation in a region. It comprises three different subsystems: (1) Those actors who exploit and apply knowledge to generate innovations, such as firms; (2) Those who generate and diffuse knowledge, such as universities; and finally (3) Factors that support the innovation process, such as policies or development agencies. Socio-institutional and cultural factors also play a role. Laws, regulations, value systems, and routines influence the behavior of actors and their relationship with each other. An RIS mostly relates to a locally defined functional space, and is connected to other national and international innovation systems (Trippl, 2006).

However, the preconditions for the development of a functioning RIS differ between regions. Peripheral areas often suffer from weak knowledge generation, diffusion, exploitation, and application. Networks to other innovation systems are also often weak. Regions with traditional industries are likely to experience a **lock-in**. This means, that the existing knowledge generation and diffusion subsystem as well as the firms and suppliers are highly specialized and there is no inflow of new ideas or knowledge. Finally, the lack of networks and flows within and between different actors can lead to weak innovation performance in urban areas (Tödtling & Trippl, 2005). The knowledge diffused and exploited in a RIS is mostly path dependent. Meaning it is generated based on the existing regional knowledge and institutions (Hassink et al., 2019).

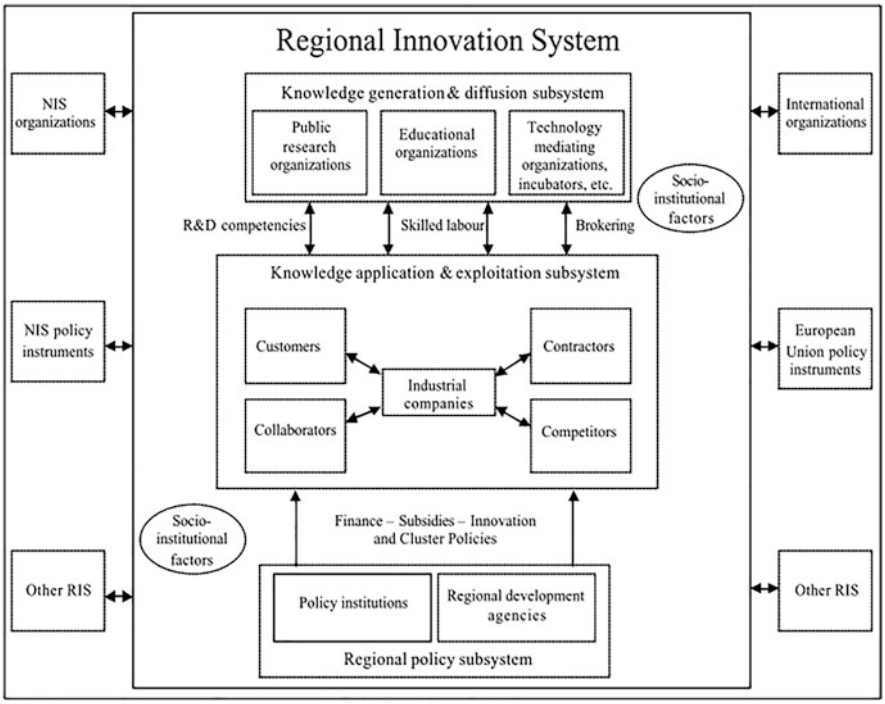

Fig. 4.7 Key elements of regional innovation systems (source: Trippl, 2006 based on Autio, 1998)

Recent studies on RIS broaden the perspective of the approach from an exclusive focus on economic growth to a broader view on societal challenges (Asheim et al., 2019). The so-called **challenge-oriented RIS** (CoRIS) includes a broader range of actors (civil society, public sector actors, users, etc.) that coordinate their innovation activities, create new networks, and also seek to induce institutional change to create innovations that benefit the environment and society. Hence, challenge-oriented innovation not only happens in companies, but also in the public sector and in communities (Tödtling et al., 2021). The further development of the RIS approach helps us to better understand the development of green innovations and the underlying dynamics in a spatial context.

Real-World Example: Regional Innovation Systems (RISs) in Switzerland

As part of the State Secretariat for Economic Affairs' (SECO) regional policy, a total of six RIS have been launched in Switzerland (see Fig. 4.8). Due to the economic power of the metropolitan Region of Zurich, no RIS has been launched in this region. These RIS organizations seek to promote regional

(continued)

innovation by offering support through networking, coaching, and assistance in finding funding for innovation projects. Moreover, they attempt to foster cooperation between universities and companies.

4.4 Sustainability and Corporate Values

In the same way, as sustainability is a value-based concept, corporate sustainability builds and depends on corporate values. However, while it is relatively clear and widely accepted that values are guiding principles that lead to certain behaviors, it is less clear when addressing corporate values. If we look at individual values, it is normally the case that the person expresses their values and then lives by those values. However, this cannot be assumed at all when talking about corporate values. A corporation (i.e., a corporate agent) does not have any values, but expresses them by acting in a certain way. This means that in contrast to a person, who can have values without currently acting on them, a corporate agent only acts according to the values some individuals (the value declarators) have previously formulated. If there is no perceivable action by the corporate agent, its corporate values become dysfunctional, which makes their continued existence a much harder task.

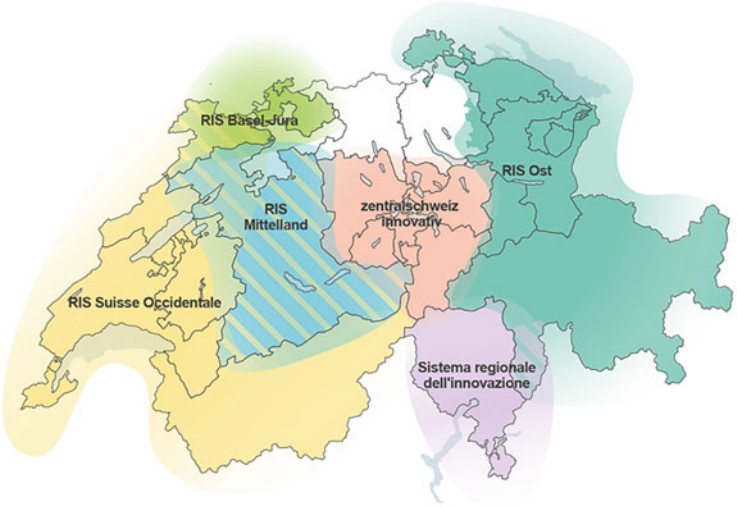

Fig. 4.8 Key Regional Innovation Systems in Switzerland (Source: SECO, 2022)

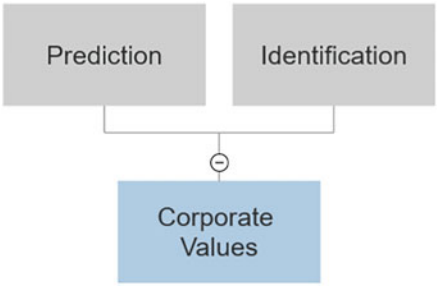

Fig. 4.9 Social functions of corporate values (depiction by author)

4.4.1 Functions of Corporate Values

In human society, values exert two main functions: foundation for predictions and foundation for identification. To be equivalent to the function values have in society, corporate values have to reliably exert the same functions as their individual counterparts, that is the foundation for predictions and identification, respectively (see Fig. 4.9).

Foundation for Predictions
A corporation, like any human being, can consider different alternatives and their consequences and then decide whatever seems best in a particular situation. Some of these decisions are quite evident to an observer, the observer can predict these decisions correctly based on their own cultural background and their interpretation of the situation. Other decisions, however, might surprise an observer because they do not have the necessary information to have foreseen this decision. The more experience and information the observer has regarding the corporation in question, the better their ability to predict future actions. Consequently, functional corporate values should provide a strong foundation for correct predictions of corporate behavior. Predictions of future actions implicitly rely on the assumption of continuity of action. Should the corporate agent suddenly base future actions on different, conflicting values, the entire accumulated experience used to predict corporate actions turns out to be worthless and the observer thereby helplessly unable to predict the company's behavior. The lower the ratio of seemingly unpredictable corporate actions to predictable actions, the less irritated and confused the observer will be. Correspondingly, the observer's confidence to correctly predict the actions of the corporate agent diminishes when inexplicable behavior makes them question their existing mental models of the company's values. The more significant the parts now in question are for the observer's ability to predict corporate behavior, the more extensive the damage to the corporate value's functionality.

Foundation for Identification
While it is not necessary for an observer to identify with a company before making predictions[1] about its behavior, prediction is easier if the observer identifies with the company in question. Identification provides the observer with additional information with which to make predictions. The empathetic bonding between the corporate agent and the observer is the strongest if the observer can identify with all basic steps of a corporate action.[2] However, not all these steps are needed for a certain degree of identification or "bonding" and can therefore remain unknown or even incompatible without totally preventing identification. The stronger the identification, the stronger the feeling that the observer and the corporation belong to the same ideological group, are like-minded, which in turn generates trust and lends credibility for future statements. Thus, a declaration of corporate values must provide enough information concerning the motivations and goals of corporate activity to allow informed identification with the corporate agent.

4.4.2 Scope of Application

Finally, corporate values must specifically identify the groups involved in value implementation, the translation of those value in actions, and their roles. This concerns two groups in particular:

1. **The groups responsible for value implementation**. By knowing the identities and roles of the groups tasked with value implementation, stakeholders know who is expected to implement what aspect of the declared value(s) and to thereby maintain the credibility of corporate values. Furthermore, information about the groups responsible for value implementation can provide insight concerning the groups' ability and resources to carry out this task. Today's corporations can feature extensive and complicated chains of supply and sophisticated networks of subcontractors and cooperations. Therefore, the question of who can be expected to actually implement a particular corporate value is important.
2. **The groups supposed to benefit from value implementation**. Additionally, it is equally important to disclose, for the same reasons, who benefits from the implementation of those corporate values, i.e. what good they do to whom. This enables observers to assess the efficacy of the corporation's efforts to benefit

[1] Prediction can only be made before the fact, based on the interpretation and projection of experiences, while identification happens during or after the fact based on the judgment of current or past experiences. Prediction focuses on anticipating actions, while identification concentrates on bonding with actions, which does not merely include the mode of the action itself, but also the action's context, the steps before and thereafter.

[2] Motivation: What drives the performance of this action?
Mode: In which manner is this action performed?
Intent: To what end is this action performed?

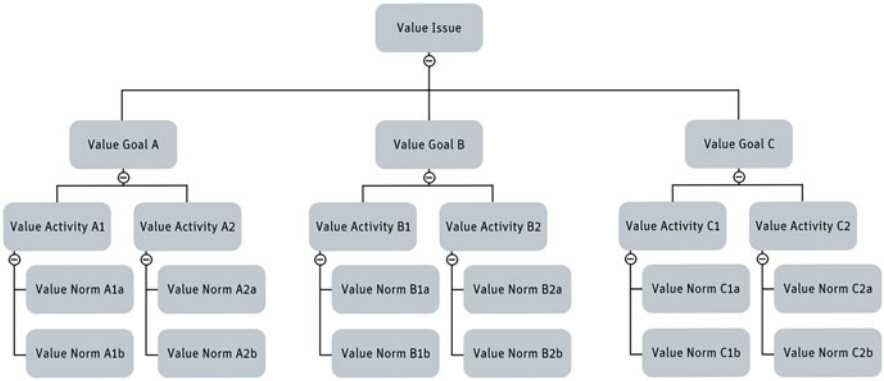

Fig. 4.10 Example hierarchy of value issues, goals, activities, and norms (depiction by author)

the recipients by addressing the declared beneficiaries and inquire whether and to what extent the objectives have been achieved. Where beneficiaries of corporate values are either not of age or non-human (e.g., forests, lakes, animal populations, the global climate, etc.), a group of advocates, responsible for representing the interests of the beneficiaries who measure value achievement, needs to be identified.

4.4.3 Vision, Mission, and Corporate Values

Corporate values do not exist in a vacuum but are supposed to be part of a corporation's identity. In the same way as the corporate vision provides an ideal the entire corporation is striving for and the corporate mission is a specific, achievable embodiment of the corporate vision, corporate values represent a declaration of how the corporate mission is supposed to be achieved. This, in turn, means that the corporation should be able to characterize each corporate value on the following four levels (see Fig. 4.10):

1. The **value issue** describes the motivation driving the specific corporate value and addresses the question of a value's importance and the corporation's stance on it. The value issue should be derived from the corporate vision and mission, otherwise there is a dangerous disconnect in the coherence of the corporate identity. A corporation producing affordable glasses could, e.g., operate with the value issue of a world where everybody needing glasses has access to them, since this is the corporation's vision.
2. The **value goal** describes what goals the corporation plans to achieve by introducing a given corporate value in order to support the value issues defined in the preceding step. Therefore, this goal needs to be achievable and concludable within a finite time frame. In addition, it must be clear how the value goal supports the previously formulated value issue. For the exemplary corporation

mentioned above, a valid value goal could be to produce on-site in as many countries as possible to keep the production cost in line with the local purchasing power, a strategy also described in the corporation's mission.

3. **Value activities** incorporate all activities that are to be performed in order to reach the value goals determined previously. They embody corporate values and are not just the code calling for them. They are therefore the often-neglected heart of corporate value implementation. As value activities are supposed to lead towards a goal, they must be functionally linked to the value goal they are expected to advance.

   For the corporation in this example, possible value activities would be the hiring of local personnel or the strict localization of end product prices.

4. **Value norms** are used to determine whether a value activity can be deemed as satisfactorily completed or not. Obviously, such value activities have to be pre-determined and must not be changed during value implementation, as this would amount to a form of evidence tampering. For the exemplary corporation, a minimal percentage for local workers or a maximal percentage for cross-border sales would be possible valid value norms.

This hierarchy ensures the functionality of corporate values, their functional implementation in everyday corporate life, by relating all elements to each other and connecting them to the corporate mission, vision and thus identity.

4.4.4 Definition of Corporate Values

The following definition of corporate values will subsequently be broken down into its elements and commented to create an understanding of functional essence of corporate values (see Table 4.1):

A corporate value is a stable, comprehensive, explicitly declared, long-term conception of the desirable, distinctive of a corporation, addressing the collectivity of all stakeholders equally, which decisively influences the selection made by all corporations within the value-defining corporation's sphere of influence from available modes, means, and ends of action and expects this selection to yield positive effects for the corporation in a pre-specified form within a predefined time frame, a corporation's ability to coherently express such a conception in actions of corporate individuals and overall corporate behavior.

Such a comprehensive and elaborate definition of corporate values ensures their functionality but obviously. However, it does also increase the amount of work that has to be invested in formulating and evolving them. What is more it takes time to read them and develop an understanding. Therefore, it might make sense to have a short and a comprehensive version of each corporate value, depending on the information depth the stakeholders are looking for.

Table 4.1 Elements of a corporate value

Definition elements	Comments
A corporate value is	
a declaration	Undeclared corporate values are dysfunctional, as they cannot ensure any foundation for prediction or identification
stable, comprehensive, explicit, and long-term	Quickly changing or only partially or implicitly declared values do not allow for reliable prediction or identification, nor do they reliably identify the scope of application
a conception of something desirable	A value is something perceived as positive or beneficial
together with other corporate values distinctive of a corporation	Corporate values form the perception of the corporate agent's character. If this character is identical with the character of other corporations, the target of identification becomes arbitrary
addressing the collectivity of all stakeholders equally	If corporate values are directed towards certain stakeholders only and remain hidden from the others, prediction of the corporation's behavior and identification with the corporation is in danger
expected to have decisive influence on corporate decisions made by all corporations within the value-defining corporation's sphere of influence regarding modes, means, and ends of action	If corporate values do not exert strong influence on corporate decisions, they become dysfunctional and thereby worthless Corporate values that are not implemented by all entities in the supply chain are unreliable and thus dysfunctional The main area of corporate value implementation focuses on the ways the corporation acts, their choice of tools and proceedings, as well as their choice of goals
. . . is expected to yield positive effects for the corporation in a pre-specified form within a predefined time frame	Without specific goals and an "achieve-by" date the processes of prediction and identification are heavily impaired
. . . dependent on a corporation's ability to coherently express such its values in actions of corporate individuals and overall corporate behavior	Corporate values do not just influence the selection and formulation of goals but also their everyday expression. Actions taken by individuals on behalf of the corporation must be covered by corporate values, otherwise the processes of prediction and identification are practically impossible. However, not only actions taken in the name of the corporation but also the result of the sum of all these actions must be subject to corporate values

Source: Frecè (2019, p. 98)

However, merely providing buzzwords or single-sentence statements as corporate values does not meet the standard required for fully functional values and consequently leaves the company with vacuous marketing slogans devoid of value.

4.5 Sustainability Reporting

4.5.1 Why Sustainability Reporting?

Increasingly, companies are publishing sustainability reports in order to give a clear picture to stakeholders of the company's efforts to become more sustainable. Today, a sustainability report is expected of corporations of almost any size and industry. This chapter illustrates why corporations should consider joining this trend and what the advantages of the sometimes laborious and complex task of sustainability reporting are.

Risk and Resilience Management

Although in this chapter risk and resilience management are discussed together, the difference between the two should be made clear beforehand.

The management of risk concentrates on two main tasks: risk identification and assessment as well as creation of risk mitigation strategies. Successful risk management is able to identify all relevant risks, assess them correctly, and come up with plans on how to react in the case of one or several of these risks occurring. The overall goal is to be prepared in case anything makes reality deviate from the project or business plans and to take appropriate measures to make plan and reality match again.

While resilience management encompasses risk management, its goals reach further. In contrast to the ambition of risk management measures to bring reality back to its previous, planned state, resilience measures aim to bring the project or corporation back to a stable state, regardless of whether this matches a previously planned state or not. This presupposes, however, that the leadership has a clear picture of what the aims and purposes of its project or corporation are and how stable states beyond the planned ones could look or in other words: it presupposes a deeper understanding of the project or corporate strategy beyond the relative narrow perspective of one specific plan.

Having well-formed sustainability reporting in place is a good indicator that the leadership has a clear vision in mind what their corporation stands for, what its values are, and how this is translated into daily actions. Compiling all relevant data and getting all necessary insights to meet and convey the complexity of functional corporate values as well as a consistent corporate character are an excellent foundation to base a resilient corporation on. A corporation which is able to weather unforeseen situations because it has a clear picture of itself and can therefore more easily reinvent itself and adapt to new situations. Without having invested time and

effort in forming this clear self-conception, consistent corporate reactions must remain limited to pre-made reactions to foreseeable situations.

Operational Efficiency
In most cases, the first steps towards making a corporation more sustainable are measures related to enhanced efficiency, which generally means better use of raw materials as well as energy and reduction of waste material to be disposed of. Both aspects—less incoming resources and less outgoing waste products—have direct positive financial impacts and are therefore important indicators for investors looking to find highly optimized corporations which do not use more (expensive) resources and do not create more (again expensive) waste than absolutely necessary. Resource prices are expected to keep rising in the years to come, caused by resource scarcity and an ever-growing demand almost across the board. At the same time, prices for waste disposal and taxes or levies on emissions in general are also expected to rise as there is a broad consensus that they have been too low in the past to have the impact they were intended to have. This outlook makes thorough reporting on how a corporation handles its resources, its resource-processing, and, finally its waste and emission management an increasingly important tool for their communication towards all sorts of stakeholders. A well-structured sustainability report is an ideal vehicle for such a reporting endeavor.

Better Insight into Value Creation
Much of the value creation leading up to a product is not visible by looking at the product itself. E.g., a shirt made by 8-year-olds in a corporate structure taking advantage of forced labor does not look or feel different from one made by adults paid and treated well. Nevertheless, for many customers knowing that they do not support child labor and forced labor is an added value to the product they are willing to pay for. Depending on their individual values, customers are also willing to pay a higher price if they know that their purchase does not foster animal cruelty or environmental destruction. In the same vein, even more customers are probably willing to spend more money on a product not containing toxic chemicals which not only endangers the health of the workers but also the customers' long-term well-being. However, most of the additional characteristics customers are willing to spend more on cannot be perceived by looking at the end product alone and an unperceived characteristic is effectively useless. Sustainability reports offer corporations a way to be distinct from their competition and demonstrate to their stakeholders what additional value their products contain, exclusively because they have been fabricated or provided by a corporation that operates based on functional corporate values. To put it briefly, sustainability reporting offers corporation to do good and talk about it.

Customer and Employee Retention
For an increasing number of industries and corporations, employees (including sub-contracted employees) with their skills and knowledge are their most valuable assets and therefore their greatest vulnerability. While the credo that everyone is replaceable is still in many managers' heads, the risks, effort, and costs related to

such a replacement often are not. Well-made sustainability reports demonstrate a corporate leadership's awareness of the importance of not only well-trained but also well-treated employees. They provides insight into how a company handles its employees and thereby shows they are valuable. This can take the form of many indicators, e.g. relative compensation, retention rates, career opportunities, diversity, etc. It is obvious that when trying to recruit sought-after talents, having trustworthy, attractive sustainability reports can be an important factor to gain an edge over the competition. However, the consequences of well-implemented social sustainability strategies go beyond that. According to a decade-long study entitled "The Happiness Advantage (see literature list at the end of this chapter)," employee happiness raises sales by 37%, productivity by 31%, and accuracy on tasks by 19% in comparison to employees not experiencing happiness in the workplace. This is not only important for the employees themselves but also for the customers. Happier employees get better results, so it is only natural to take one's business to a corporation where employees are happier in order to get better results. Better customer retention and recruitment in turn leads to more business and higher revenue, which is turn makes getting investors interested in the corporation much easier.

4.5.2 Sustainability Reporting Standards

For a few years now, companies based in the EU and with more than 500 employees have been obliged to report on their sustainability efforts. The EU's Corporate Sustainability Reporting Directive defines the guidelines for this. In Switzerland, similar proposals have been discussed in the wake of the Corporate Responsibility Initiative.

There are several sustainability reporting approaches. The most popular framework is the Global Reporting Initiatives (GRIs). However, there are several alternatives, for example the UN Global Compact, the Common Good Balance Sheet developed by the social movement Economy for the Common Good (GWÖ), the OECD Guidelines for Multinational Enterprises, The Sustainability Code (Deutscher Nachhaltigkeitskodex), the ISO 26000 Guidance on social responsibility, or the IIRC International Framework. In the rest of this section, we will briefly describe the GRI and some of these other common standards.

Global Reporting Initiative (GRI)
The Global Reporting Initiative (GRI) is a non-governmental organization striving to standardize organizational sustainability reports with two main goals:

1. Implement a structure for organizational sustainability reports providing guidance through this complex, multi-topical subject area, allowing not only large organizations, with the financial means to hire a team of reporting experts, to produce high-quality reports.
2. Provide all stakeholders of the reporting organization with an orientation where to find the specific information they are looking for. By familiarizing themselves

with the design of their reports, stakeholders can more easily assess whether the statements they are looking for are included in a sustainability report and what their extent is.

The GRI Framework is revised on a regular basis. Rather than being monolithic, GRI standards use a modular structure which allows some flexibility in reporting. It starts with three universal Standards (GRI 1–3) followed by Sector Standards (currently GRI 11–18) and Topic Standards (GRI 200–4xx) (see Fig. 4.11). The **Sector Standards** provide information for organizations about their likely material topics depending on the industry it operates in. The organization uses the Sector Standards that apply to its sectors when determining its material topics, and when determining what information to report for the material topics. The **Topic Standards** contain disclosures for the organization to report information about its impacts in relation to particular topics. They cover a wide range of topics. The organization uses the Topic Standards according to the list of material topics.

An organization preparing a report in accordance with the GRI Standards can—depending on the degree to which the GRI Standards have been applied—choose one of two options: Core (only selected number of disclosures from the Topic Standards) or Comprehensive (disclosure of all GRI Topic Standards). For each option, there is a corresponding claim, or statement of use, that the organization is required to include in the report.

Although very widespread in its usage, GRI has also received some criticism: Its continuous evolution makes it hard to compare and rate reports over the period of several years. Furthermore, GRI is providing little or little accessible instructions on how to report sustainability performance. And third, deciding to report according to GRI guidelines can have unintended impacts on management practices and goals.

International Organization for Standardization (ISO) 9000, 14000, & 26000

Out of the thousands of standards defined and managed by the International Organization for Standardization (ISO) a few are widely used for assessing and reporting a corporation's sustainability. ISO 9000 was the first to be used when the topic of sustainability came into public awareness in the early 1990s and, subsequently, the need for some kind of standardized sustainability assessment arose. While ISO 9000 has been quite popular in the early years of corporate sustainability standardization efforts, it lost its appeal with the appearance of the ISO 14000 and ISO 26000 standards and is therefore less and less used with regard to sustainability assessments. The ISO 14000 standards—first released in 1996—follow the path laid out by the ISO 9000 standards, however with an exclusive focus on environmental aspects.

In 2010, ISO 26000 was established to expand the focus of ISO standards (that up to date only acknowledged the economic and ecological dimension) to also include the social one. While ISO 9000 and ISO 14000 are certification standards that can indeed be certified, ISO 26000 is merely meant to function as a guidance. Nevertheless, this does not prevent quite a few corporations claiming to be ISO 26000-certified.

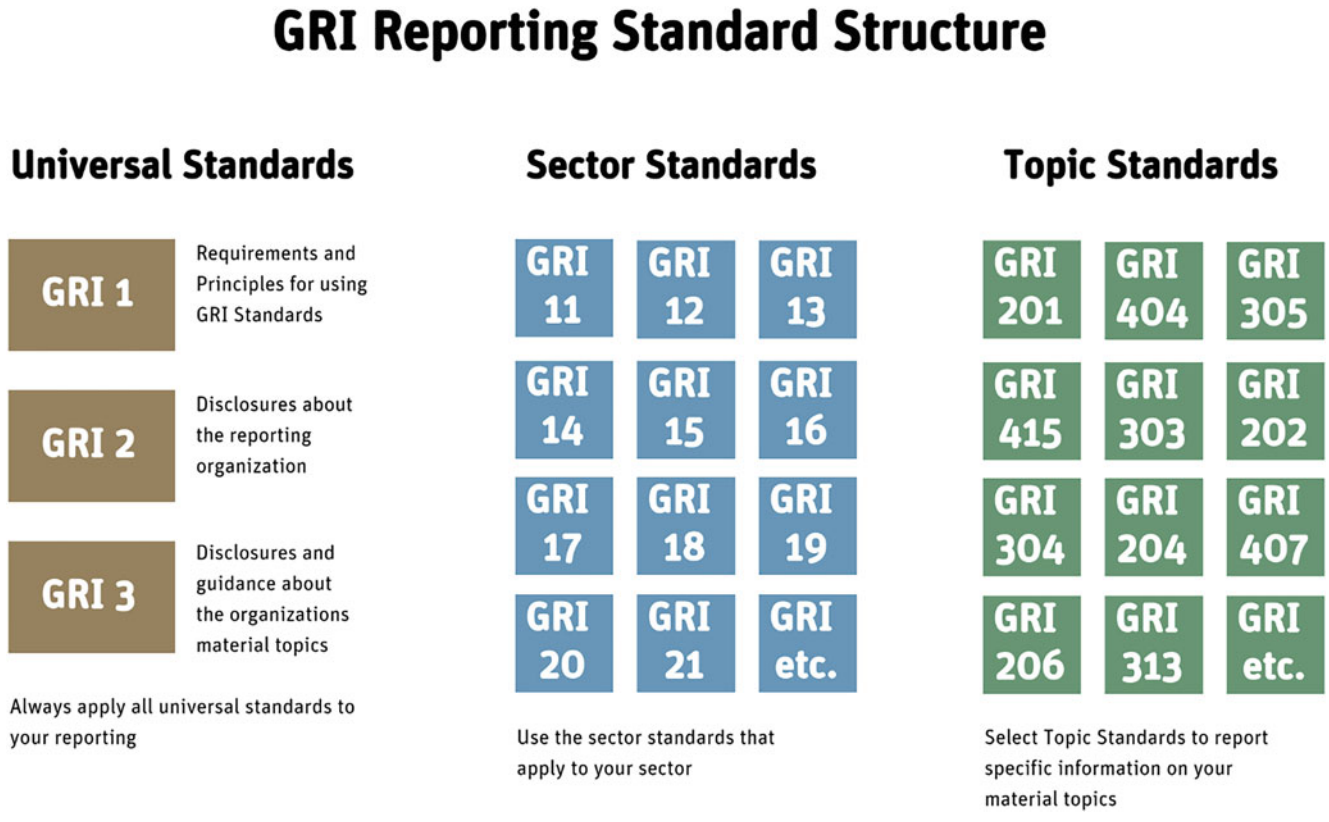

Fig. 4.11 GRI standards overview (source: own representation based on https://www.globalreporting.org/)

United Nations Global Compact
The United Nations Global Compact is a non-binding league of corporations declaring to respect and implement the ten principles covering, among other things, human rights, child labor, freedom of association, discrimination, corruption, and environmental responsibility.

The United Nations Global Compact is not a certifiable standard, and neither is it a regulatory body, tracking and verifying claims made by their member organizations. As such, it factually amounts to little more than a declaration of intent and an expression of interest in the topics of sustainability.

Sustainability Accounting Standards Board (SASB)
Reporting adhering to the standards of the Sustainability Accounting Standards Board (SASB) focused on the financial impacts of sustainability. It provides an industry-specific tool with the aim of helping businesses identify and manage their sustainability issues and opportunities. It provides other players in the market with a standardized, transparent way to obtain sustainability-related information. The reporting scheme is based on 77 industry-specific reporting approaches across 11 sectors, grouping industries according to a Sustainability Industry Classification System (SICS) and thereby companies by their sustainability risks and opportunities. In July 2020, GRI and SASB announced that they plan a closer collaboration.

World Business Council for Sustainable Development (WBCSD)
The World Business Council for Sustainable Development (WBCSD) is the result of the merger of its two predecessors, the Business Council for Sustainable Development (BCSD) and the World Industry Council for the Environment (WICE). Membership in the WBCSD, however, is quite exclusive with less than 200 members worldwide (among them Nestlé, Royal Dutch Shell, DuPont, and BP).

Despite the organization's declared goal to support the worldwide process of sustainable development, a lot of criticism has been brought up not only by Non-Government Organizations (NGO) like Corporate Watch or Greenpeace but also by members of the scientific community. These organizations have accused WBCSD of greenwashing rather than being concerned about sustainability.

Integrated Reporting Approach
Sustainability reporting takes two forms:

- All data, statements, and topics relating to sustainability are reported in a separate sustainability report as part of the general report. As some data are also relevant in other contexts, it might additionally show up outside the separate sustainability report.
- The information relating to sustainability is integrated in the general report. It is not grouped together but can rather be found across the chapters of the general reports, merely adding an additional perspective to topics like human resources or resource usage.

Although there is not one superior reporting approach, the different approaches have distinct advantages and disadvantages for both the corporation compiling the

report and the reader attempting to evaluate the company's sustainability effort. In general, the more advanced the implementation of sustainability in the corporate structure and strategy is, the more likely an integrated approach is the appropriate way to demonstration this inclusion and embedding of sustainability.

4.6 Corporate Social Responsibility (CSR)[3]

Corporate Social Responsibility (CSR) is a highly contested managerial concept. To this day, researchers, politicians, managers, civil society representatives, and the media have not found an agreement on what CSR entails. At the same time, however, CSR has evolved from a marginal to a mainstream phenomenon. CSR is now at the center of management and academic discourse and is accorded high strategic relevance in the boardrooms of most companies worldwide. Three developments have led to the recent mainstreaming of CSR (see Risi, 2017, p. 37):

- *First*, during globalization, the political influence of nation states vis-à-vis companies has diminished. Today, national governments have limited control over globally active companies and are therefore not always in a position to secure the welfare of citizens.
- *Second*, civil society has become more environmentally and socially conscious. This novel awareness often comes from campaigns of civil society representatives. Such political campaigns offer an efficient way to address socio-ecological matters, for example, discrimination or climate change.
- *Third*, the higher relevance of financial markets for economic success and the increased mobility of companies have caused an economic shift. For example, companies will often relocate their headquarters to countries considered tax havens to avoid high taxes.

These three developments, reinforced by the media and information technology, have led to a broad-based demand that companies assume greater environmental, social, and ethical responsibilities. Many, including company representatives (e.g., WBCSD, 2021), politicians (e.g., State Secretariat for Economic Affairs of Switzerland, 2020), and academics (e.g., Matten & Moon, 2020), thereby regard CSR as *the* blueprint for companies to fulfill this very responsibility.

[3]This section widely draws on the chapters "1 What is Corporate Social Responsibility (CSR)? Scope, Issues and Definitional Clarity" and "2 Why Would Business Firms Engage in CSR? Motives and Drivers Beyond the Business Case" from Wickert and Risi (2019a, p. 1–43).

4.6.1 The Business Case for CSR

The debate surrounding CSR revolves around "doing well by doing good." The idea here is that social or environmental commitment finally pays off financially and thereby adds to a company's competitiveness. Wickert and Risi (2019a, 2019b, p. 28) point to a set of factors that can help us understand why CSR contributes to long-term business returns.

- *First*, in terms of internal stakeholders, CSR helps attract talent and increase employee motivation, positively contributing to a company's productivity. For example, CSR is the top reason young people choose their employer.
- *Second*, in terms of external audiences, CSR can increase consumer and investor confidence and support in products and brands. This enables the creation of a favorable reputation, higher sales, and the possibility of charging a price premium for ethically, environmentally, and socially sustainable products.
- *Third*, in terms of operations, CSR can support the reduction of costs. For example, implementing eco-efficiency measures potentially results in energy savings.
- *Fourth*, CSR can serve to increase the efficiency of managing social and environmental risks. For example, commitment to a voluntary CSR initiative, such as the United Nations Global Company (UNGC), can preempt legislation and safeguard a company's independence from the government.

Many studies have addressed the CSR business case, focusing on the relationship between CSR and financial performance theoretically (why should CSR pay off?) or empirically (what contribution do CSR activities actually make to economic performance?). In each case, the studies focused on the relationship between CSR activities and financial performance (meta-analyses include, for example, Wang et al., 2016). However, the results are inconsistent. Some have uncovered a positive linear relationship, where CSR is understood as a means to increase corporate competitiveness. Other studies found a linear negative relationship, where CSR is more of a disadvantage associated with potentially not profitable costs for a company in the long run.

These inconsistent results suggest that a clear causal relationship between CSR and financial performance has not yet been demonstrated. As Barnett (2007, p. 794) puts it: "...after more than thirty years of research, we cannot clearly conclude whether a one-dollar investment in social initiatives returns more or less than one dollar in benefit to the shareholder." One possible explanation is the methodological problem that arises with measuring CSR. We have seen how difficult it is to find a single definition of CSR, as there is still no agreement on the scope and content of CSR. Apart from these methodological issues associated with the business case for CSR, Wickert and Risi (2019a, 2019b) point out two critical fallacies of the business case for CSR, which they label "ethical fallacy" and "managerial fallacy."

4.6.2 The Ethical Fallacy of the Business Case for CSR

CSR geared towards making a profit rather than a positive socioenvironmental contribution refers to the "ethical fallacy," reflecting the normative deficiency of the business case for CSR (Wickert & Risi, 2019a, 2019b, p. 31). This deficiency does not do justice to CSR, being an inherently normative concept based on moral value considerations about "the right thing to do" (e.g., Risi, 2022; Risi et al., 2022a). From this ethical perspective, Scherer and Palazzo (2007) refer to the normative deficiency as reducing CSR to nothing more than another "success factor," empty of intrinsic moral value or consideration for less powerful stakeholders. This deficiency might promote opportunistic corporate behavior as companies only engage in CSR if a business case exists.

The ethical fallacy arises from the following moral tension: What if something is ethically desirable but does not create financial profits for the company? What if something is morally wrong but brings significant profits for the company? The business case for CSR does not address what happens when the consideration of stakeholder interests leads to outcomes that misalign with profit motives of a company's shareholders. The business case for CSR suggests prioritizing profits over some social benefit, whereby the latter only matters when it aligns with profit interests. The ethical fallacy of the business case is that it reduces the assumption of moral responsibility to an instrument to create value rather than to solve or avoid ethical problems.

4.6.3 The Managerial Fallacy of the Business Case for CSR

The managerial fallacy with the business case for CSR stems from the fact that CSR is no longer a competitive advantage but a competitive necessity. The reason for this lies in the transformation of CSR into a mainstream concept.

Today, nearly all companies, from small to larger corporations, are engaged in CSR. In a situation where "everyone is doing it," and many companies are pursuing somewhat similar paths of CSR, justifying the CSR business case becomes difficult. With more companies engaging in CSR, the ability to create a convincing business case erodes. This leads to the following dilemma: "the more societal and competitive pressure there is to engage in CSR, the more difficult it becomes to create a unique CSR profile that allows a firm to 'stand out' and thus generate a sustainable competitive advantage from CSR engagement. Thus, the more firms engage in CSR because they see a business case for it, the more complicated it is to sustain exactly that business case." (Wickert & Risi, 2019a, 2019b, p. 33).

So, to explain the reasons behind corporate engagement in CSR, we need to draw on different aspects that go well beyond business case arguments.

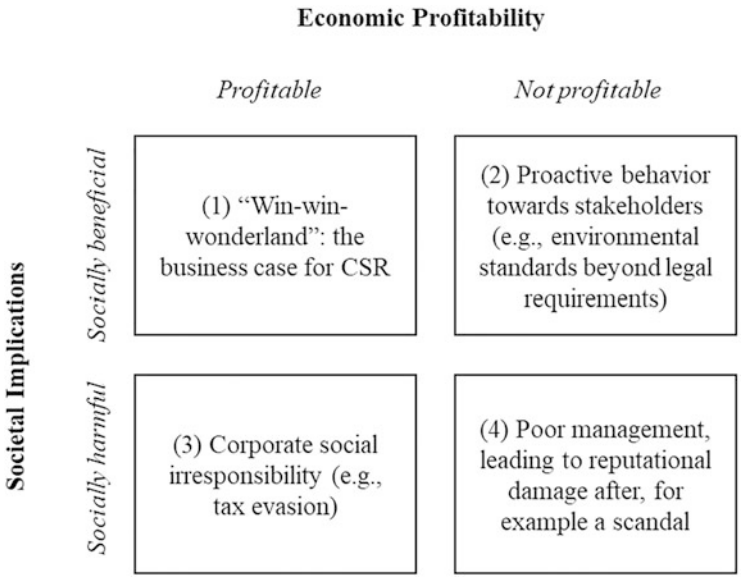

Fig. 4.12 Economic profitability and societal implications (own illustration after Wickert & Risi, 2019a, 2019b)

4.6.4 Overcoming Business Case Thinking: Extending CSR

The ethical and managerial fallacies of the business case for CSR suggest that economic profit-making considerations are insufficient to fully capture the rationale for corporate CSR engagement. Consequently, we must ask which other factors are relevant for such an engagement.

To approach the question of why companies engage in CSR, we begin to reflect on the following matrix, consisting of four boxes. Each box represents a constellation that is either socially harmful or beneficial and either unprofitable or profitable (see Fig. 4.12; see Karpoff, 2014).

The first box (1) indicates the constellation suggested by the business case. This approach mirrors the "win-win-wonderland," assuming environmental, ethical, and social matters pay off financially for a company. The second box (2) expands the scope and content of CSR further towards more complex stakeholder expectations, going beyond the mere consideration of shareholders. This stands for a situation where a business practice is not profitable but socially beneficial—for example, high environmental standards, which are correspondingly costly and exceed legal requirements, or wages above the legally required minimum wage. A business practice that is not profitable but socially beneficial mirrors proactive behavior towards stakeholders, as their expectations are systematically incorporated into business conduct. The third box (3) stands for business conduct that is profitable but socially harmful, i.e. corporate social irresponsibility. This involves disregarding stakeholder

expectations, as in the case of companies that commit tax evasion, environmental pollution, or consumer fraud. An exemplary case of corporate social irresponsibility is the practice of CSR decoupling, in which companies overvalue their CSR performance in their public relations to increase their recognition among stakeholders (Risi et al., 2022a, b). The fourth box (4) represents business conduct that is neither profitable nor socially desirable. Ultimately, this is weak management, leading to reputational damage, for example, after a boycott or scandal.

This two-by-two matrix presents a robust framework as it takes into account that the business case applies in some scenarios. It, however, also depicts that the business case approach ignores trade-offs and only mirrors situations where CSR pays off economically. As mentioned by the second and third boxes, situations where tensions between financial profits and CSR arise remain unreflected in the business case approach. Hence, the matrix presents a useful "analytical tool to examine why the 'market for virtue' is not big enough to make it in the interest of all companies to be socially responsible" (Wickert & Risi, 2019a, 2019b, p. 32). In fact, the second and third boxes have gained relevance because of the growing demands from societal stakeholders. Many firms engage in CSR because of external stakeholders rather than because of financial calculations. Consequently, to fully understand CSR, we need to know about the different actors that influence and direct what CSR entails and what companies must do to consider CSR.

4.6.5 The CSR Arena and Its Various Players

In addition to companies, different actors influence what exactly CSR encompasses and how companies should deal with CSR. These actors each pursue their own interests and actively represent their ideas around CSR, thus influencing corporate practice accordingly. There are six kinds of actors: international organizations, civil society organizations, company-driven self-regulatory initiatives, cross-industry multi-stakeholder initiatives, governments (Wickert & Risi, 2019a, 2019b), and CSR professionals (Risi, 2016, 2017; Risi et al., 2022a, b; Risi & Wickert, 2017).

- *International organizations,* including the International Labour Organization (ILO), the Organization for Economic Co-operation and Development (OECD), the United Nations (UN), and the World Bank, are all highly relevant actors. They have proposed and successfully established ideas and policies encompassing CSR rules for companies worldwide. These rules are called soft law because they are voluntary and non-binding. The United Nations Global Compact (UNGC) is the most popular soft law.
- *Civil society organizations* push companies to engage in CSR activities. Locally or globally active non-governmental organizations (NGOs) strive to exert influence over companies where governments fail. A well-known example is the NGO Greenpeace, whose goal is to protect nature and raise awareness for ecological matters such as deforestation and how companies should address this matter.

Another famous NGO is Amnesty International that advocates for human rights around the world.

- *Company-driven self-regulatory initiatives* tackle various CSR challenges, allowing the private sector to take on a quasi-governmental role. Such initiatives develop soft laws to regulate working conditions. Popular examples are the World Business Council for Sustainable Development (WBCSD) and the Business Social Compliance Initiative (BSCI). For example, the WBCSD is an initiative led by CEOs of around 200 multinational companies to promote knowledge about how businesses may successfully engage with sustainable development.
- *Cross-industry multi-stakeholder initiatives* (MSIs) overlap in their objectives with corporate self-regulatory initiatives. However, they not merely draw on private sector members but also include civil society representatives. Compared to self-regulatory initiatives, MSIs are thus more democratic and much more participatory. The Forest Stewardship Council (FSC) is among the most well-known initiatives, addressing the regulatory gap of protecting forests on a global scale by fighting deforestation and furthering sustainable management of forests. The FSC includes renowned companies such as IKEA, NGOs like Greenpeace, and various minor human rights activists and representatives of Indigenous peoples.
- *Governments* have an essential role in CSR. For example, in 2001, the European Commission published its first CSR definition, conceptualizing it as "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis." To emphasize the relevance of CSR, in 2011, the European Commission removed voluntariness from the definition, referring to CSR as "a process to integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders." Likewise, governments are coming back into the game by realizing laws and regulations because many market-based initiatives failed or were inefficient. Consequently, we can observe a trend from "soft law" (i.e., non-binding and voluntary) to "hard law" (i.e., binding and not voluntary).
- *CSR professionals* are experts who have acquired relevant expertise in the field of corporate responsibility and earn a living by applying their specialist knowledge. They work as CSR consultants, analysts, or managers, for example. CSR managers have an impact on how companies deal with environmental, social, and ethical responsibility by applying a range of influencing strategies to drive the implementation of CSR within the company (see, e.g., Wickert & Risi, 2019a, 2019b). In each case, they work closely with the various corporate departments (human resources, procurement, accounting, etc.) and support each of them in the specialist implementation of social, environmental, and ethical concerns.

4.6.6 *Towards a Comprehensive Definition of CSR*

Because of the complexity and dynamics of social, environmental, and ethical issues and the high number of actors in the CSR arena, it seems impossible to find an appropriate definition of CSR. Matten and Moon (2008) indicated three reasons underlying this difficulty: First, CSR is understood and applied differently depending on the group of people and the context. Second, there is an overlap between CSR and other related concepts, such as business ethics or corporate sustainability. Third, CSR as a management concept is extremely dynamic. Even though these three reasons make a uniform conceptualization of CSR difficult, a comprehensive CSR definition is nevertheless central. Here, we draw on Wickert and Risi (2019a, 2019b, p. 22):

- Corporate Social Responsibility (CSR) is an umbrella term to describe how business firms, small and large, integrate social, environmental, and ethical responsibilities to which they are connected into their core business strategies, structures, and procedures within and across divisions, functions as well as value chains in collaboration with relevant stakeholders.

This CSR definition reflects that there is still no unanimous opinion on what this responsibility encompasses, how it is to be exercised, and what role companies ultimately assume and should assume in society. According to Wickert and Risi (2019a, 2019b), this definition nevertheless captures some key characteristics of CSR.

- *First*, the definition does not emphasize the voluntary nature of CSR. While many prominent definitions, such as those formulated by the European Commission, refer to the voluntary nature of CSR in terms of actions outside the law, CSR has become a de facto requirement in the global business environment, and new regulations on CSR have emerged. Also, CSR has become an integral part of doing business and a precondition for ensuring the "license to operate."
- *Second*, a variety of actors and interest groups determine what CSR is. Companies must therefore respond to what these different groups bring to the table and consider their various interests in their approach to CSR.
- *Third*, the definition does not use "corporation" but "business firms, large and small." This makes it clear that CSR concerns not just large multinational companies but also small and medium-sized enterprises.
- *Fourth*, CSR is conceptualized as multidimensional. While the definition includes "social," CSR incorporates also environmental and ethical responsibilities. This recognizes that the commitment that companies have to society encompasses four key issues: Human Rights (see the Universal Declaration of Human Rights), Labor Rights (see the ILO Declaration on Fundamental Principles and Rights at Work), Environmental Principles (see the Rio Declaration on Environment and Development), and Anti-Corruption (see the UN Convention against Corruption).

Literature

Achor, S. (2018). *The happiness advantage*. Currency.

Adler, P. (2019). *The 99% economy*. Oxford University Press.

Aghion, P., Dechezleprêtre, A., Hemous, D., Martin, R., & Van Reenen, J. (2016). Carbon taxes, path dependency, and directed technical change: Evidence from the auto industry. *Journal of Political Economy, 124*(1), 1–51.

ASE. (2018, November 6). *Low-income households pay a lot for energy. Efficiency Can help cut costs*.

Asheim, B. T., Isaksen, A., & Trippl, M. (2019). *Advanced introduction to regional innovation systems*. Edward Elgar.

Autio, E. (1998). Evaluation of RTD in regional systems of innovation. *European Planning Studies, 6*, 131–140.

Barnett, M. L. (2007). Stakeholder influence capacity and the variability of financial returns to corporate social responsibility. *Academy of Management Review, 32*, 794–816.

Baron, J., & Spranca, M. (1997). Protected values. *Organizational Behavior and Human Decision Processes, 70*(1), 1–16.

Beermann, M. (2011). Linking corporate climate adaptation strategies with resilience thinking. *Journal of Cleaner Production, 19*(8), 836–842.

Boschma, R. (2005). Proximity and innovation: A critical assessment. *Regional Studies, 39*(1), 61–74.

Bouten, L., & Hoozée, S. (2015). Challenges in sustainability and integrated reporting. *Issues in Accounting Education, 30*(4), 373–381.

Bungard, P., & Schmidpeter, R. (2022). Future of work and sustainable business models: How sustainable entrepreneurship can create added value. In J. Talapatra, N. Mitra, & R. Schmidpeter (Eds.), *Emerging economic models for sustainable businesses*. Springer.

Chesborough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.

Child, J., & Rodrigues, S. B. (2004). Repairing the breach of trust in corporate governance. *Corporate Governance, 12*(2), 143–152.

Combe, C. (2022). *Introduction to global sustainable management*. Sage.

Consoli, D., Marin, G., Marzucchi, A., & Vona, F. (2016). Do green jobs differ from non-green jobs in terms of skills and human capital? *Research Policy, 45*(5), 1046–1060.

Danneels, E. (2002). The dynamics of product innovation and firm competences. *Strategic Management Journal, 23*(12), 1095–1121.

Danso, A., Adomako, S., Amankwah-Amoah, J., Owusu-Agyei, S., & Konadu, R. (2019). Environmental sustainability orientation, competitive strategy and financial performance. *Business Strategy and the Environment, 28*(5).

Dechezleprêtre, A., Muckley, C. B., & Neelakantan, P. (2021). Does the market value clean innovation? Evidence from US listed firms. In *Applied operations research and financial modelling in energy* (pp. 225–261). Springer.

Durand, R., Paugam, L., & Stolowy, H. (2019). Do investors actually value sustainability indices? Replication, development, and new evidence on CSR visibility. *Strategic Management Journal, 40*(9), 1471–1490.

Eccles, R. G., & Klimenko, S. (2019). The investor revolution. *Harvard Business Review, 97*(3), 106–116.

Eccles, R. G., & Serafeim, G. (2017). Corporate and integrated reporting: a functional perspective. In *Corporate stewardship: Achieving sustainable effectiveness* (pp. 156–72). Greenleaf.

EIA. (2016). *International Energy Outlook 2016, Energy Information Administration (EIA), Office of Integrated Analysis and Forecasting*. US Department of Energy.

European Commission Green Paper (2001). Promoting a European Framework for Corporate Social Responsibility. http://europa.eu/rapid/press-release_DOC-01–9_en.pdf. Accessed 04.01.2021.

European Commission. (2011). A renewed EU strategy 2011-14 for Corporate Social Responsibility. https://ec.europa.eu/info/sites/default/files/recommendations-subgroup-corporate-social-responsibility_en.pdf. Accessed 08.07.2022.
EY & Center for Corporate Citizenship. (2013). *Value of sustainability reporting*. A Study by EY and Boston College.
Florida, R. (2005). The world is spiky. *The Atlantic Monthly, 296*(October), 48–51.
Frecè, J. T. (2019). *Corporate values—A socio-functionalist approach exemplified along corporate sustainability values*. University of Basel.
Global Reporting Initiative. (n.d.). *GRI standards.* Retrieved July 24, 2020, from https://www.globalreporting.org/standards
Hahn, R. (2022). *Sustainability management. Global perspectives and concepts, instruments, and stakeholders*.
Hahn, T., Figge, F., Pinkse, J., & Preuss, L. (2018). A paradox perspective on corporate sustainability: Descriptive, instrumental, and normative aspects. *Journal of Business Ethics, 148*(2), 235–248.
Hassink, R., Isaksen, A., & Trippl, M. (2019). Towards a comprehensive understanding of new regional industrial path development. *Regional Studies, 53*(11), 1636–1645.
Hawn, O., Chatterji, A. K., & Mitchell, W. (2018). Do investors actually value sustainability? New evidence from investor reactions to the Dow Jones Sustainability Index (DJSI). *Strategic Management Journal, 39*(4), 949–976.
Hechter, M. (1993). Values research in the social and behavioral sciences. In M. Hechter, L. Nadel, & R. E. Michod (Eds.), *The origin of values* (pp. 1–28). Aldine De Gruyter.
Hill, L., & Lineback, K. (2012). For people to trust you, reveal your intentions. *Harvard Business Review*.
Hills, M. D. (2002). Kluckhohn and Strodtbeck's values orientation theory. *Online readings in Psychology and Culture, 4*, 1–14.
Idowu, S., & Schmidpeter, R. (Series Editors). *CSR, sustainability, ethics & governance*. Springer. https://www.springer.com/series/11565
International Organization for Standardization. (2010). *ISO 26000*. Retrieved July 24, 2020, from https://www.iso.org/iso-26000-social-responsibility.html
International Organization for Standardization. (2015). *ISO 9000.* Retrieved July 24, 2020, from https://www.iso.org/iso-9001-quality-management.html
International Organization for Standardization. (2019). *ISO 14000.* Retrieved July 24, 2020, from https://www.iso.org/iso-14001-environmental-management.html
Jørgensen, A., Herrmann, I. T., & Bjørn, A. (2013). Analysis of the link between a definition of sustainability and the life cycle methodologies. *The International Journal of Life Cycle Assessment, 18*(8), 1440–1449.
Karpoff, J. M. (2014). The grey areas of firm behaviour: An economic perspective. *Socio-Economic Review, 12*, 167–176.
Leman, A. M., &. Nor Hidayah, A. (2013). Occupational safety and health: Workers and industrial safety monitoring for sustainable work environment development. *Health and Safety (May),* 34–36.
Lencioni, P. M. (2002). Make your values mean something. *Harvard Business Review, 80*(7), 113–117.
Lenssen, G., & Smith, C. N. (Eds.). (2010). *Mainstreaming corporate responsibility*. Wiley.
Linnenluecke, M. K., & Griffiths, A. (2010). Corporate sustainability and organizational culture. *Journal of World Business, 45*(4), 357–366.
Marin, G. (2014). Do eco-innovations harm productivity growth through crowding out? Results of an extended CDM model for Italy. *Research Policy, 43*(2), 301–317.
Matten, D., & Moon, J. (2008). 'Implicit' and 'explicit' CSR: A conceptual framework for understanding CSR in Europe. *Academy of Management Review, 33*(2), 404–424.
Matten, D., & Moon, J. (2020). Reflections on the 2018 decade award: The meaning and dynamics of corporate social responsibility. *Academy of Management Review, 45*(1), 7–28.

Medium. (2019). *The fourth wave of environmental innovation.* Retrieved September 09, 2020, from https://medium.com/the-fourth-wave/watch-what-is-this-fourth-wave-of-environmental-innovation-25c426c71e5a

Molthan-Hill, P. (Ed.). (2017). *The business student's guide to sustainable management*. Green Leaf.

Moneva, J. M., Archel, P., & Correa, C. (2006). *GRI and the camouflaging of corporate unsustainability.* Accounting Forum.

Najam, A. (1999). World Business Council for Sustainable Development: The greening of business and greenwash. *Yearbook of International Cooperation on Environment and Development, 8*, 65–75.

OECD. (2012). *Indicators of environmental technologies (ENV-tech indicators)*. OECD.

OECD. (2022a). *OECD environmental statistics* (database).

OECD. (2022b). *OECD Green Growth Indicators* (database).

Podcast Ed Freeman. (2020). The stakeholder podcast with René Schmidpeter. www.listennotes.com/de/podcasts/the-stakeholder/rene-schmidpeter-N8l5CDyZzi_/

Popp, D. (2019). Environmental policy and innovation: A decade of research. *International Review of Environmental and Resource Economics, 13*(3–4), 265–337.

Risi, D. (2016). Longitudinal comparison between CSR implementation and CSR function's resource access. *Academy of Management Best Paper Proceedings, 2016*(1), 25–28. https://doi.org/10.5465/ambpp.2016.69

Risi, D. (2017). *An institutional theory perspective on the implementation of corporate social responsibility within large firms: Empirical and conceptual considerations*. Difo-Druck GmbH.

Risi, D. (2022). Business and society research drawing on institutionalism: Integrating normative and descriptive research on values. *Business & Society, 61*(2), 305–339.

Risi, D., & Wickert, C. W. (2017). Reconsidering the "symmetry" between institutionalization and professionalization: The case of corporate social responsibility managers. *Journal of Management Studies, 54*(5), 613–646.

Risi, D., Vigneau, L., Bohn, S., & Wickert, C. W. (2022a). Institutional theory-based research on Corporate Social Responsibility: Bringing values back in. *International Journal of Management Reviews*, 1–21. https://doi.org/10.1111/ijmr.12299.

Risi, D., Wickert, C. W., & Tommaso, R. (2022b). Coordinated enactment: How organizational departments work together to implement CSR. *Business & Society*, 1–44. https://doi.org/10.1177/00076503221110213.

Schein, E. H. (2010). *Organizational culture and leadership* (4th ed.). Jossey-Bass.

Scherer, A. G., & Palazzo, G. (2007). Toward a political conception of corporate responsibility: Business and society seen from a Habermasian perspective. *Academy of Management Review, 32*(4), 1096–1120.

Schmidpeter, R. (Series Editor). *Managementreihe corporate social responsibility*. Springer Gabler. https://www.springer.com/series/11764

Schneider, A., & Schmidpeter, R. (Eds.). (2015). *Corporate social responsibility* (2nd ed.). Springer Gabler.

SECO. (2022). Regionale Innovationssysteme (RIS); Retrieved December 13, 2022, from https://regiosuisse.ch/regionale-innovationssysteme-ris

Sethi, S. P., & Schepers, D. H. (2014). United Nations global compact: The promise–performance gap. *Journal of Business Ethics, 122*(2), 193–208.

Shrivastava, P. (1995). Environmental technologies and competitive advantage. *Strategic Management Journal, 16*(S1), 183–200.

Soltmann, C., Stucki, T., & Woerter, M. (2015). The impact of environmentally friendly innovations on value added. *Environmental and Resource Economics, 62*(3), 457–479.

Spörri, A., Stucki, T., Zweidler, R., & von Felten, N. (2022). Die Hürden gegen Ressourceneffizienz und Kreislaufwirtschaft abbauen. Studie zum gleichnamigen Postulat 18.3509 von Ständerat Ruedi Noser. Schlussbericht im Auftrag des Bundesamts für Umwelt. EBP Schweiz AG, Berner Fachhochschule.

State Secretariat for Economic Affairs of Switzerland. (2020). Corporate social responsibility (CSR). Available at: https://www.seco.admin.ch/seco/en/home/Aussenwirtschaftspolitik_Wirtschaftliche_Zusammenarbeit/Wirtschaftsbeziehungen/Gesellschaftliche_Verantwortung_der_Unternehmen.html. Accessed 24.06.2021.

Stewart, T. A. (1996). Why value statements don't work. *Fortune, 133*(11), 137.

Stucki, T. (2019a). Which firms benefit from investments in green energy technologies?—The effect of energy costs. *Research Policy, 48*(3), 546–555.

Stucki, T. (2019b). What hampers green product innovation: the effect of experience. *Industry and Innovation,* 1–29.

Stucki, T., & Woerter, M. (2017). Green inventions: Is wait-and-see a reasonable option? *Energy Journal, 38*(4), 43–71.

Stucki, T., & Woerter, M. (2019). The private returns to knowledge: A comparison of ICT, biotechnologies, nanotechnologies, and green technologies. *Technological Forecasting and Social Change, 145*, 62–81.

Sustainability Accounting Standards Board. (n.d.). *Standards overview*. Retrieved July 24, 2020, from https://www.sasb.org/standards-overview/

The Economist. (2017). *Volts wagons—Electric cars are set to arrive far more speedily than anticipated.* Retrieved September 09, 2020, from https://www.economist.com/business/2017/02/18/electric-cars-are-set-to-arrive-far-more-speedily-than-anticipated

The Economist. (2020a). Business and climate change. Retrieved September 22, 2020, from https://www.economist.com/special-report/2020/09/17/the-great-disrupter

The Economist. (2020b). *Green innovation—Innovation is an essential part of dealing with climate change*. Retrieved November 02, 2020, from https://www.economist.com/leaders/2020/10/31/innovation-is-an-essential-part-of-dealing-with-climate-change

Thomsen, S. (2005). Corporate governance as a determinant of corporate values. *Corporate Governance, 5*(4), 10–27.

Tödtling, F., & Trippl, M. (2005). One size fits all?: Towards a differentiated regional innovation policy approach. *Research Policy, 34*(8), 1203–1219.

Tödtling, F., Trippl, M., & Desch, V. (2021). New directions for RIS studies and policies in the face of grand societal challenges. *European Planning Studies, 30*(11), 1–18.

Trippl, M. (2006). Cross-border regional innovation systems. *SRE—Discussion Papers* (Vol. 2006/05).

UNIDO. (2010). *Global industrial energy efficiency benchmarking*. United Nations Industrial Development Organization.

United Nations Global Compact. (n.d.). *Ten core principles.* Retrieved July 24, 2020, from https://www.unglobalcompact.org/what-is-gc/mission/principles

Veleva, V., & Ellenbecker, M. (2001). Indicators of sustainable production: Framework and methodology. *Journal of Cleaner Production, 9*, 519–549.

Wang, Q., Dou, J., & Jia, S. (2016). A meta-analytic review of corporate social responsibility and corporate financial performance: The moderating effect of contextual factors. *Business & Society, 55*(8), 1083–1121.

WBCSD. (2021). CSR in action. Available at: https://www.csr-in-action.org/. Accessed 04.01.2021.

Webley, S. (1999). Sources of corporate values. *Long Range Planning, 32*(2), 173–178.

Wickert, C., & Risi, D. (2019a). *Corporate social responsibility: Elements in business strategy*. Cambridge University Press.

Wickert, C. W., & Risi, D. (2019b). Implementing corporate social responsibility as institutional work: Exploring the day-to-day activities of CSR managers in multinational corporations. In A. Sales (Ed.), *Corporate social responsibility and corporate change. Institutional and organizational perspectives* (pp. 101–122). Springer.

World Business Council for Sustainable Development. (n.d.) World Business Council for Sustainable Development. Retrieved July 24, 2020, from https://www.wbcsd.org/

Chapter 5
Social Innovation (or Why We Need the Civil Society)

Keywords Social practice · Institutional economics · Social entrepreneurship · Social business canvas · Self-organization

This Chapter's Learning Goals

- You know what social innovation is, why it matters and how you can measure it.
- You know how social innovation can be implemented in practice, specifically through social entrepreneurship and self-organization.
- You know what differentiates a social enterprise from other organizations, and can apply the social business model canvas.
- You know that social innovation can be scaled and replicated using certain models.

Activities enacted by economic and governmental actors at various levels will not be sufficient to achieve the necessary turnaround of our consumption patterns and economic systems. What is needed instead are orchestrated, multilevel, and possibly cross-sectoral approaches that offer new solutions to the grand challenges we are currently confronted with (Ferraro et al., 2015). There is growing recognition among scholars that civil society plays an important role in addressing so-called "wicked" social, economic, and environmental problems.

For instance, Schneidewind (2019, 208ff.) from the Wuppertal Institute therefore points out that, in addition to the state and private enterprise, **civil society** will have three central tasks in this change:

- Serving a **warning function** in which civil society actors point to and create public awareness for ecological dangers and inequalities. Recent examples comprise the "Fridays for Future" or "Black Lives Matter" activists.
- **Mediating** society initiatives, such as anti-racism, development, and environmental organizations, stand up and fight for superior values and concerns of society.

M. Fischer et al., *Sustainable Business*, SpringerBriefs in Business,
https://doi.org/10.1007/978-3-031-25397-3_5

- And finally, the **driving function**, where civil society actors create new solutions and structures that fundamentally drive change processes.

In this chapter, we are particularly interested in the **driving function of civil society** and particularly in its relationship with **social innovation**, conceived of as innovation explicitly geared towards creating value for society by "stimulating transformational processes to advance societal well-being" (Stephan et al., 2016, p. 1250).

5.1 Social Innovation: What Is It and How Can It Be Measured?

Although social innovation might be driven by actors other than those in civil society, it is widely acknowledged that existing social innovation is often closely linked to, or even emerges from civil society actors. Societal or social innovation has thus become a guiding concept in modern or post-industrial societies.

Social Innovation as a Guiding Concept of Modern Society

For some time, technological innovation has been the main driver of social change. Thus, governments have been promoting cutting-edge technologies as a way of making our (working) lives more convenient, productive, and efficient. However, technological innovation will not be sufficient to meet major societal challenges such as climate change, nor to solve social problems at local and regional level. This is reflected in recent pleas for a "social turn" in innovation that "creates space for a multidisciplinary and multi-actor discussion of innovation that significantly extends beyond economics and management studies, and that highlights human creativity from the proposition of ideas to their diffusion beyond a focus on products and services for markets" (Ziegler, 2017, p. 389).

Consequently, the understanding of innovation processes in the literature has been adapted to societal challenges and defined more comprehensively (see, e.g., Howaldt, 2019, 17f.):

- The focus of innovation changes: whereas in industrial society it was still entirely focused on technology, the focus is now **shifting to social practices** of how we live, work, and consume together. The potential of new technologies can only be unlocked if consumer habits can be adapted or innovated by new practices.
- Social actors are not only seen as suppliers of ideas but also as **co-designers** in the development of new products and processes. An important keyword here is "open innovation," i.e. the involvement and feedback of citizens in (business) innovation activities.
- In addition, the focus on **major societal challenges**, as reflected in the EU's major funding programs, is also important.

Although there is no consensually agreed definition of social innovation, we suggest the following definition:

> Social innovation aims to generate or revive sustainable solutions for major social and ecological challenges. The inclusion of civil society as an actor increases the chances of innovation to be widely adopted in society (Kissling & Mettler, 2019).

Social innovation can be broadly thought of as an innovative problem-solving approach that introduces new ideas (in the form of new products, services, or business models; see European Commission, 2013) to (1) satisfy human needs that are presently unmet, (2) change existing social (power) relations, and (3) empower people by increasing their capacity to access resources (Moulaert et al., 2005).

As intimated above, a key feature of many social innovation definitions is that in addition to state and corporate activities, the active participation of civil society in solving grand challenges is paramount (Ferraro et al., 2015). Indeed, scholars have suggested that social innovations trying to tackle specific problems often require multisector collaborations where civil society, market and state actors pool their resources and capabilities to solve pressing environmental and societal concerns (Nicholls & Murdock, 2012).

While the term social innovation always implies the active involvement of civil society, it remains an umbrella term and leaves room for various practical ways of implementing these innovations. Social innovations can unfold in the form of social businesses, social enterprises, or social movements, among others. Later in this chapter, we will take a closer look at two of the many possible implementation formats of social innovation: social entrepreneurship and social self-organization.

Real-World Examples: Social Innovations (Ashoka, 2021)

"Ackerdemia"

Problem: Food waste, unhealthy nutrition, health problems, climate change, loss of biodiversity

Goal: To anchor applied sustainability in the education system.

With new teaching practices, experiential learning, and green learning places, a new generation would grow up that would perceive nature better—and thus also learn to appreciate it.

Innovation: Nature learning sites in all schools. The social innovators are working to ensure that every school in Germany has a green learning space outdoors to grow vegetables. Children can regularly experience and learn about sustainability there. Key to this is the educational program "GemüseAckerdemie," which can be integrated into any timetable.

"Irrsinnig Menschlich"

Problem: Up to 80% of all mental illnesses begin in childhood, adolescence, or early adulthood. Reason: Stigmatization of mental crises and difficult access to help.

(continued)

Goal: Youth services, mental health providers, and schools work together on mental health at the community level.

The interaction of these systems and prevention measures at school lead to students knowing where and how to get help.

Innovation: Mental fitness instead of mental illness. The social innovators carry out preventive work on mental health for pupils and students and dispel prejudices and fears. The exchange with people who have mastered mental crises promotes understanding and removes taboos from the subject.

Theoretical Approaches

In this section, we present three different theoretical approaches each with a different interpretation of social innovation and the role of civil society action. While Schneidewind, as a representative of the sustainability discourse and the limits to growth, pleads for the great transformation and argues on the macroeconomic and political level, Ostrom, as a representative of institutional economics, sees the solution for local and regional resource problems in the self-organization of communities. A more entrepreneurial perspective is taken by management-orientated research and teaching in social entrepreneurship.

- **Approach 1. Schneidewind** (2019) and the **Wuppertal Institute** see themselves in the tradition of the Meadows report *Limits to Growth* and the *WBGU* report, in which great transformation is viewed as a "future art" and a project of civilization for the twenty-first century. In this context, the SDGs represent the central compass for the sustainability turnaround and the planetary boundaries. The actual transformation needs to take place in seven arenas, supported by central actors who share responsibility for them (see Fig. 5.1). As described above, civil society has a key role in this. In this perspective, economic, technological, cultural, and institutional dimensions are brought together and seen as a whole that can initiate the necessary turnaround.
- **Approach 2.** The perspective of **institutional economics** (see also Chap. 2, "tragedy of the commons") especially that of Elinor Ostrom (Governing the Commons) sees the solution to major social problems in self-organization and the combination of institutional mechanisms. Ostrom called this the third way. Based on the idea, that problems within a community are being solved best by themselves and therefore have to define and enforce rules collectively, the principle of self-organization is used as a coordination principle. It is not the market or the state that provides the central solutions for the decarbonization of society, but local and regional self-restraints, as they can be shaped by communities themselves. Classical examples of this are self-managed fish stocks, alpine management regimes or water regimes. Self-organization is particularly suitable for local and regional problems and represents an alternative management of public goods. It is not the state that ensures their preservation with environmental regulations, but rather jointly defined rules that the communities set themselves.

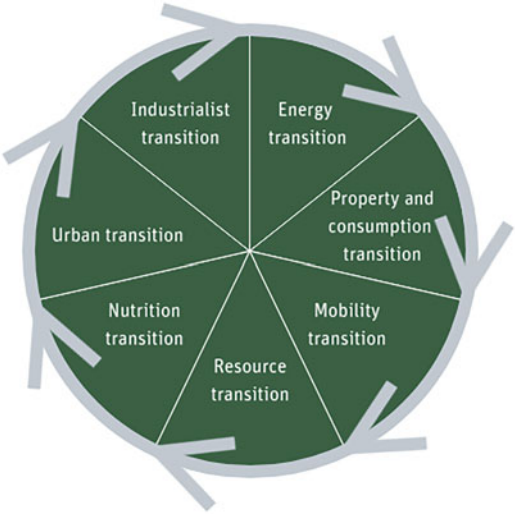

Fig. 5.1 The seven transitions for the great transformation (source: own representation based on Schneidewind, 2019)

Civil society initiatives contribute self-organized solutions to decarbonization. Whether it is the opening of a local Repair café or the establishment of a new clothes exchange, these can reduce resource throughput.

- **Approach 3.** As pointed out on the homepage of Stanford University, innovation and especially social innovation does not only happen in entrepreneurship, even if **social entrepreneurship** in particular focuses on it (Tortia et al., 2020). Since the eighties, there has been significant research interest from the fields of management, sociology, political science, etc., in non-profit organizations and non-profit management (Dees et al., 2001). Millner et al. (2013) point out that the original research interest among social entrepreneurship scholars was driven by the question of what distinguishes this so-called third sector, i.e., NPOs (non-profit organizations) from the private sector. As the figure below illustrates, the boundaries between the public, private, and third sectors are increasingly blurred or even disappearing (adoption of management principles by the state in New Public Management (NPM), the third sector), the third sector is committed to and oriented towards the market (Maier et al., 2016), and private companies are increasingly engaging in the "common good" through CSR and social innovation (Mirvis et al., 2016). These variegated tendencies give rise to different kinds of hybrid organizations which combine principles, practices, and models from the private, public, and the third sector (Doherty et al., 2014).

5.2 Implementing Social Innovation in Practice

Implementation Through Social Entrepreneurship

In practice, social innovation can be implemented in various ways. Social entrepreneurship is one of these ways and has received increasing attention in research and practice alike. Social entrepreneurship describes an entrepreneurial approach to addressing societal challenges (e.g., Jähnke et al., 2011; Müller et al., 2019). Social entrepreneurship is characterized by two traits in particular (Jähnke et al., 2011):

1. In contrast to civic engagement, which is often carried out on a voluntary and unpaid basis, social entrepreneurship also pursues economic goals, i.e. it aims to generate income or profit.
2. In contrast to the sustainability efforts of conventional companies, social entrepreneurship prioritizes the maximization of its social gains over economic ones.

Figure 5.2 illustrates the classification of enterprises along their goals and thereby highlights the balance of economic and social returns that is characteristic for social enterprises. On the left-hand side, we find NPOs that are clearly socially oriented and are not allowed to redistribute profits (redistribution constraint). NPOs differ from social enterprises in the sense that they are exclusively financed by donations and third-party funds. This is contrasted by commercial companies for which profit orientation is the focus. As social enterprises combine social and financial returns, they are positioned in the middle. The concept of a social enterprise overlaps with that of a social business in that both alleviate social problems while generating profits in the market (Müller et al., 2019). However, social entrepreneurship can be understood as a special form of organization as it refers to starting up new social businesses in particular.

Publications on social entrepreneurship and social entrepreneurs as a practical implementation of social innovation have increased significantly over the past 15 years. There has been a lively debate on public–private partnership and CSR in the past, and more recently on social entrepreneurship and innovation in particular. A specific strand of such literature, for example, is trying to consider how positive social value can be created in addition to the production of products and services by a

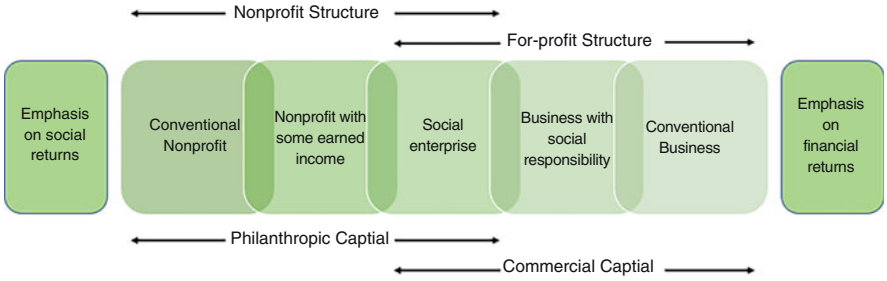

Fig. 5.2 Range of social and financial targets (source: own representation based on Brozek, 2009, S.8)

company, which is the actual economic basis (Gurtner & Hietschold, 2020). In practice, the idea of social entrepreneurship received attention from the broader public when the social entrepreneur Muhammad Yunus was awarded the Nobel Peace Prize in 2006 for his work on promoting microfinance. Today, social entrepreneurship has not yet reached the mainstream, but it is no longer an exception. This is, for example, reflected in the results of the "Special Topic Report Social Entrepreneurship" of the Global Entrepreneurship Monitor project from 2015/2016, which includes data from people who are either in the start-up phase or already own a business that is no older than 3.5 years (Bosma et al., 2015/2016). According to the results, 3.2% of all people aged 16–64 are trying to start a social entrepreneurial project (smaller social and voluntary initiatives included)—already half as many as the 7.6% trying to start a commercial business. More and more people dedicate their energy to creating new businesses that help fight poverty, prevent food waste, strengthen the rights of minorities, fight climate change and much more (Müller et al., 2019). These efforts all begin with the recognition of entrepreneurial opportunities in our social problems. This ability to recognize opportunities, as well as the way they address them and mobilize resources, not only distinguishes social entrepreneurs, but also allows their classification into three categories (Zahra et al., 2009):

- **Social Bricoleurs** use immediately available resources to address local social challenges they are directly confronted with on a small scale. Even if their solutions are not created with the intention of scaling them or increasing the impact beyond the local problem, social bricoleurs contribute to the local solutions through their specialized knowledge.
- **Social constructors** introduce innovations in response to market failures and unmet social needs. The problems are usually broader than those addressed by social bricoleurs and are tackled through scalable solutions. Social constructors can also be industry outsiders and fulfill an important role in society through their awareness of opportunities since for-profit companies may not see the incentive to address social needs.
- **Social engineers** generate the greatest impact through their solutions because they address systemic problems with revolutionary solutions. These problems can be very complex and require completely new structures, such as new financial systems. Social engineers are particularly important for social change because their actions are significant at the national and international levels.

Real-World Example: The Social Benefits of Social Entrepreneurship Are Multiple

Popular examples are the Grameen microfinance institution founded by **Muhammad Yunus**, and, locally, "**Ässbar**." Both business models create an additional social value. Grameen grants loans to the poor and especially

(continued)

women so that they can build up an economic existence and Ässbar reduces food waste through the sale of not quite fresh but still edible food. Another very illustrative example is **Sunraising**. This Berne-based association enables tenants to produce solar power—even if they do not have access to their own roof. The social benefits of this type of entrepreneurship are multiple, and the associated business model varies greatly depending on the purpose, ecosystem, and business model. For the Bern area, further examples can be found under SIBA/SNSI (www.siba-bern.ch).

Business models are considered a key success factor of any enterprise (Teece, 2007). Business models encompass the assumptions or hypotheses about how—i.e., based on which key resources, activities, cost structure, and revenue streams—a corporation creates value for its customers and for itself (in the form of profits) (Osterwalder, 2004).

Initially scholars dealing with hybrid organizations took their theoretical cues from Osterwalder and Pigneur's (2010) business model canvas (see Fig. 5.3), which offers a very practical, hands-on methodology for identifying a firm's value propositions, target customers, distribution channels, market relationships, value configuration, core competency, partner network, cost structures, and revenue model.

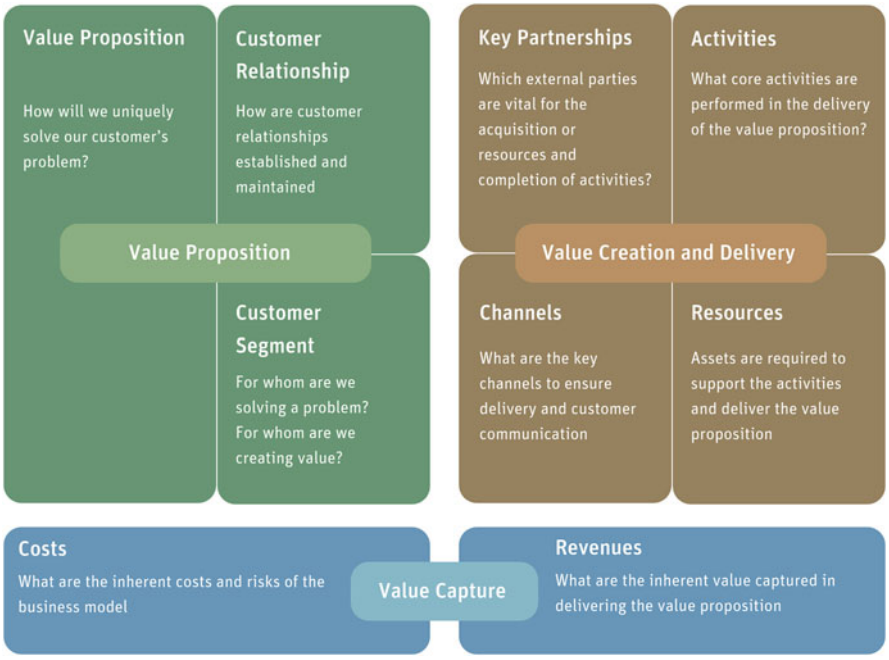

Fig. 5.3 Business model canvas (source: own representation based on Bocken et al., 2014; Davies & Doherty, 2019; Osterwalder & Pigneur, 2010)

Adapting the nine elements of the original business model canvas to the realm of hybrid organizations has allowed scholars to offer practical insights into how successful business models work to create sustainable value capture. Indicative in this regard is the research by Davies and Doherty (2019) which used an adapted version of the business model canvas (see Fig. 5.3) to explore the fair trade social enterprise Cafédirect. Their longitudinal study showed how Cafédirect had to change its business model to effectively balance its commercial objectives and to address changes in its intended environmental and societal value capture.

Implementation Through Self-Organization

How do we succeed in solving the collective dilemma in favor of a sustainable use of natural resources? Elinor Ostrom's approach to common resources is based on **self-organization** and rules defined by communities. She was inspired, for example, by the classical alpine farming (pasture) in Törbel (Switzerland) and water management all over the world; common pool institutions that have existed for centuries and have survived events such as floods, drought, wars, or plague and still operate consistently and generate social capital. The following design principles are striking in such resource management schemes:

1. Clearly defined boundaries
   Individuals and households that extract resources must be defined as well as the regime boundaries. A clear definition of boundaries is often the first organizational step towards collective action.
2. A congruent set of rules that coordinates use, provision, and local conditions
   The use of resources requires rules regarding time, place, and technology. In other words, the quantity of resource usage depends on local conditions and rules of use, and its use requires labor, material, and money.
3. Rules for collective and not only operational action
   Operational rules refer to day-to-day operations. Their development is very often an evolutionary process. They can be informal rules that can be adapted, for example, at a meeting of users or without formalities in the village pub.
4. Monitoring
   There has to be someone who takes over monitoring functions supervises compliance with the specified conditions. This function is often performed by participants in the scheme.
5. Sanctions
   In institutions that have survived, monitoring and sanctions are mostly carried out by participants in the scheme. The penalties are often small. Such an institutional design means that the costs of monitoring are relatively low. In addition, there are rotating monitoring units, e.g., in fisheries and irrigation systems, where inspectors and appropriators can swap roles and direct contact exists.
6. Conflict management mechanisms
   The interpretation of even very simple rules is difficult. A clear regulation of procedural issues helps to avoid conflicts.
7. Governmental recognition of self-organization

Governmental recognition of common property rights can, under certain circumstances, protect and legitimize them.

8. Different levels of regulation ("nested enterprise")

Rules that are fair to all local communities can hardly be designed. It is therefore likely that different levels of regulation may coexist.

However, it is possible that the self-organized local approach may not work or be insufficient. Government action is then necessary. The state has a wide range of instruments at its disposal. Depending on the type of good (see Fig. 3.1), different solutions can be found to overcome the collective dilemma. Public goods such as roads, schooling, and the regulation of markets can be provided by the state either directly by taking over production or indirectly by internalizing external costs through taxes. If communities fail to define common rules in a self-organized way for the so-called common goods such as fish stocks, pasture use, etc., the state may step in and create a system of rules that enables sustainable management. Once rights are clearly defined, they can be traded on markets. Emission certificates are a good example of this; the state first has to define the rights before they could be traded on markets. The various policy instruments will be discussed in more detail in the next chapter.

5.3 Scaling and Replicating Social Innovations

While scholars have pointed out that social value can be generated by all kinds of organizations—for-profit, hybrid, or non-profit (Mair, 2010), social value is conceived of by many as a defining feature of social entrepreneurial organizations. Social value thus includes the "fulfillment of basic and long-standing needs such as providing food, water, shelter, education, and medical services to those members of society who are in need" (Certo & Miller, 2008, p. 267; cited in Morris et al., 2020, p. 4). As expressed in this definition, social value reflects the achievement of a desired outcome or, as Santos (2012) puts it, an increase in the utility of the members of a given community or collective.

On the other hand, and more positively, the increasing interest in organizations creating social value has elicited calls to put forward appropriate methodologies for qualifying, quantifying, and comparing social value creation (Bagnoli & Megali, 2011; Grimes, 2010). There are hence some good examples of how social value can be measured. Arguably the most commonly used measurement system is the Social Return on Investment (SROI) indicator (Rotheroe & Richards, 2007), which measures the net present value of benefits divided by the net present value of investments. Alternative measurements systems include the Social Accounting and Audit (SAA) system which tries to document social enterprises' activities and measure their social performance to make those accessible to external stakeholders. Further, there is the Social Cost–Benefit Analysis (SCBA) which supports organizations in planning and evaluating their social change-oriented projects and ventures. What is

more, the Social Enterprise Balanced Scorecard (SEBS) supports social enterprises in assessing their mission accomplishment (for an overview of available measurement systems and the complexities pertaining to the assessment of social value, see Kroeger & Weber, 2014).

Literature

Ashoka. (2021). *Das hat System. Wie soziale Innovationen gesellschaftliche Strukturen verändern – 16 Beispiele*.

Bagnoli, L., & Megali, C. (2011). Measuring performance in social enterprises. *Nonprofit and Voluntary Sector Quarterly, 40*, 149–165.

Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production, 65*, 42–56.

Bornstein, N., Pabst, S., & Sigrist, S. (2014). *Zur Bedeutung von Sozialer Innovation in Wissenschaft und Praxis. Weshalb Soziale Innovationen in Gesellschaft und Wirtschaft wichtiger werden und wie der SNF dazu beitragen kann, das Thema in der Schweiz zu Positionieren*. W.I.R.E.

Bosma, N. S., Schøtt, T., Terjesen, S. A., & Kew, P. (2015/2016). *Global entrepreneurship monitor 2015 to 2016: Special report on social entrepreneurship*. Global Entrepreneurship Research Association.

Brozek, K. O. (2009). Exploring the continuum of social and financial returns: When does a nonprofit become a social enterprise? *Community Development Investment Review, 5*, 7–17.

Certo, S. T., & Miller, T. (2008). Social entrepreneurship: Key issues and concepts. *Business Horizons, 51*(4), 267–271.

Davies, I. A., & Doherty, B. (2019). Balancing a hybrid business model: The search for equilibrium at Cafédirect. *Journal of Business Ethics, 157*, 1043–1066.

Dees, G. J., Emerson, J., & Economy, P. (2001). *Enterprising nonprofits: A toolkit for social entrepreneurs*. Wiley.

Doherty, B., Haugh, H., & Lyon, F. (2014). Social enterprises as hybrid organizations: A review and research agenda. *International Journal of Management Reviews, 16*(4), 1–20. https://doi.org/10.1111/ijmr.12028

European Commission. (2013). *Guide to social innovation*. Retrieved October 14, 2020, from http://ec.europa.eu/regional_policy/sources/docgener/presenta/social_innovation/social_innovation_2013.pdf

Ferraro, F., Etzion, D., & Gehman, J. (2015). Tackling grand challenges pragmatically: Robust action revisited. *Organization Studies, 36*, 363–390.

Gauthier, C., Shanahan, G., Daudigeos, T., Ranville, A., & Dey, P. (2019). Tackling economic exclusion through social business models: a typology. *International Review of Applied Economics, 34*(5), 588–606. https://doi.org/10.1080/02692171.2019.1707785

Grimes, M. (2010). Strategic sensemaking within funding relationships: The effects of performance measurement on organizational identity in the social sector. *Entrepreneurship Theory and Practice, 34*, 763–783.

Gurtner, S., & Hietschold, N. (2020). *Auswirkungen der Corona-Krise auf Schweizer KMU* (Working Paper). Institut Innovation & Strategic Entrepreneurship, Bern University of Applied Sciences.

Howaldt, J. (2019). Soziale Innovationen im Fokus nachhaltiger Entwicklung—Die Bedeutung von Kooperationen und Netzwerken für den Erfolg sozialer Innovationen. In C. Neugebauer, S. Pawel, & H. Biritz (Eds.), *Netzwerke und soziale Innovationen. Lösungsansätze für gesellschaftliche Herausforderungen*. Springer Fachmedien.

Jähnke, P., Christmann, G. B., & Balgar, K. (2011). *Social Entrepreneurship*. (Springer Fachmedien).

Kissling, I., & Mettler, M. (2019). Retrieved October 19, 2020, from http://snsi.ch/

Kroeger, A., & Weber, C. (2014). Developing a conceptual framework for comparing social value creation. *Academy of Management Review, 39*(4), 513–540.

Maier, F., Meyer, M., & Steinbereithner, M. (2016). Nonprofit organizations becoming business-like: A systematic review. *Nonprofit and Voluntary Sector Quarterly, 45*(1), 64–86.

Mair, J. (2010). Social entrepreneurship: Taking stock and looking ahead. In A. Fayolle & H. Matlay (Eds.), *Handbook of research on social entrepreneurship* (Chapter 2). Edward Elgar.

Millner, R., Vandor, P., & Schneider, H. (2013). Innovation und Social Entrepreneurship im Nonprofit-Sektor. In R. Simsa, M. Meyer, & C. Badelt (Eds.), *Handbuch der Nonprofit Organisation: Strukturen und Management* (pp. 431–449). Schäffer Poeschel.

Mirvis, P., Baltazar Herrera, M. E., Googins, B., & Albareda, L. (2016). Corporate social innovation: How firms learn to innovate for the greater good. *Journal of Business Research, 69*, 5014–5021.

Morris, M. H., Santos, S. C., & Kuratko, D. F. (2020). The great divides in social entrepreneurship and where they lead us. *Small Business Economics*. https://doi.org/10.1007/s11187-020-00318-y

Moulaert, F., Martinelli, F., Swyngedouw, E., & Gonzalez, S. (2005). Towards alternative model (s) of local innovation. *Urban Studies, 42*(11), 1969–1990.

Müller, S., et al. (2019). Social entrepreneurship. In U. Fueglistaller & M. Müller (Eds.), *Entrepreneurship* (pp. 383–417). Springer Gabler.

Nicholls, A., & Murdock, A. (2012). *Social innovation: Blurring boundaries to reconfigure markets*. Palgrave Macmillan.

Osburg, T., & Schmidpeter, R. (Eds.). (2013). *Social innovation solutions for a sustainable future*. Springer.

Osterwalder, A. (2004). *The business model ontology—A proposition in a design science approach*. University of Lausanne.

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Wiley.

Ostrom, E. (1990). *Governing the commons. The evolutions of institutions for collective action*. University Press.

Ostrom, E. (1992). *Crafting Institutions for self-governing irrigation systems*. ICS Press.

Ostrom, E. (1998). A behavioral approach to the rational choice theory of collective action presidential address, American Political Science Association 1997. *American Political Science Review, 92*(1), 1–22.

Rotheroe, N., & Richards, A. (2007). Social return on investment and social enterprise: transparent accountability for sustainable development. *Social Enterprise Journal, 3*(1), 31–48.

Santos, F. M. (2012). A positive theory of social entrepreneurship. *Journal of Business Ethics, 111*(3), 335–351.

Schneidewind, U. (2019). *Die große Transformation. Eine Einführung in die Kunst gesellschaftlichen Wandels* (3rd ed.). Fischer Taschenbuch.

Stephan, U., Patterson, M., Kelly, C., & Mair, J. (2016). Organizations driving positive social change: A review and an integrative framework of change processes. *Journal of Management, 42*(5), 1250–1281.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*, 1319–1350.

Tortia, E., Degavre, F., & Poledrini, S. (2020). Why are social enterprises good candidates for social innovation? Looking for personal and institutional drivers of innovation. *Annals of Public and Cooperative Economics, 91*(3), 459–477.

Tracey, P., & Stott, N. (2017). Social innovation: a window on alternative ways of organizing and innovating. *Innovation, 19*(1), 51–60.

Zahra, S., Gedajlovic, E., Neubaum, D., & Shulman, J. (2009). A typology of social entrepreneurs: motives, search processes and ethical challenges. *Journal of Business Venturing, 24*(5), 519–532.

Ziegler, R. (2017). Social innovation as a collaborative concept. *Innovation: The European Journal of Social Science Research, 30*(4), 388–405.

Chapter 6
Policy Instruments and Financial System

Keywords Negative externalities · Invisible hand · Market failure · Marked-based instruments · Border taxes · Environmental, social, and governance (ESG) factors

This Chapter's Learning Goals
- You know the problem of negative externalities.
- You know the concept of the invisible hand.
- You know how policy instruments can be used to reduce externality problems.
- You know the relevance of the financial system for sustainable development.
- You know various factors that still hamper the influence of the financial system so far.

6.1 Policy Instruments

It is a central assumption of classical economics that the price correctly reflects all costs. In such a world, the price guides the economy like an "**invisible hand**." Supply and demand automatically adjust to changes in price, so that the overall economic welfare in the market is finally maximized. In such a world, the introduction of economic policy measures such as taxes or subsidies leads to a deviation from market equilibrium. Accordingly, economists expect that the introduction of economic policy measures typically leads to inefficiency in the market and thus to welfare losses.

In a world with **external effects**, however, things look different. We speak of an external effect when economic actions of one party affect the welfare of an uninvolved third party. This chapter focuses on negative external effects, i.e. costs are incurred by a third party without the polluter having to pay compensation. In the literature, such uncompensated costs are referred to as external costs. Such external

M. Fischer et al., *Sustainable Business*, SpringerBriefs in Business,
https://doi.org/10.1007/978-3-031-25397-3_6

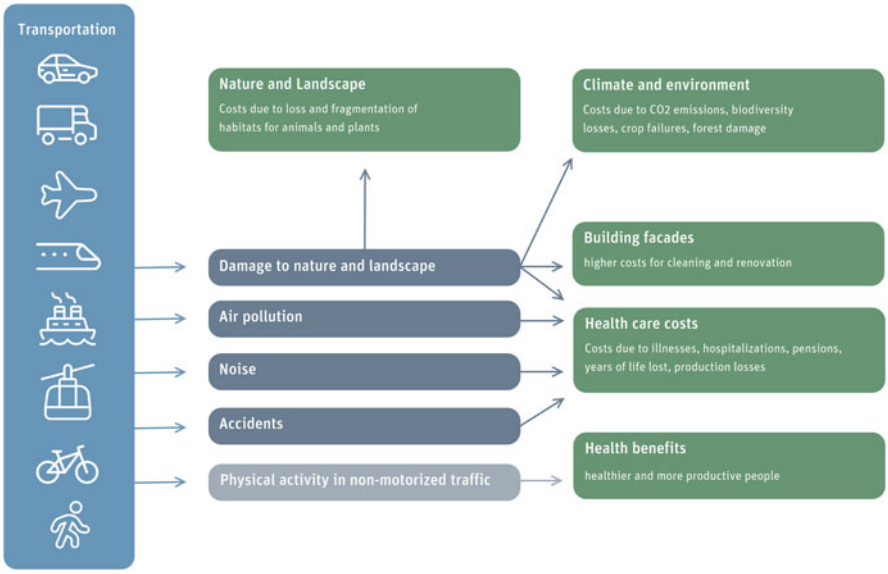

Fig. 6.1 Impact of traffic on the environment and health (source: own representation based on Federal Office for Spatial Development, 2022)

costs can be found in the transport sector, for example. Besides pure environmental costs, transport also causes noise and accidents (see Fig. 6.1).

Real-World Example: External Costs of Transport in Switzerland

In order to calculate the external costs of transport, the first step is to quantify the damage caused by transport. A wide range of scientific disciplines are involved in determining the damage. From medicine and public health, for example, we know how exhaust gases and noise affect human health. From this, we can then estimate the health costs of these health impacts. Environmental science expertise is needed to quantify the negative effects of pollutants or traffic infrastructure on animal and plant species.

The external costs of transport in Switzerland, i.e. the environmental and health costs that are not covered by the polluters, amounted to **CHF 13.7 billion** in 2018. This includes, for example:

- 17,300 years of life lost
- 87,600 tons of lost grain harvest
- 39,000 days with asthma symptoms affecting children
- 26,900 hospital days due to illnesses caused by air pollution and noise

Source: Bundesamt für Raumentwicklung (2021)

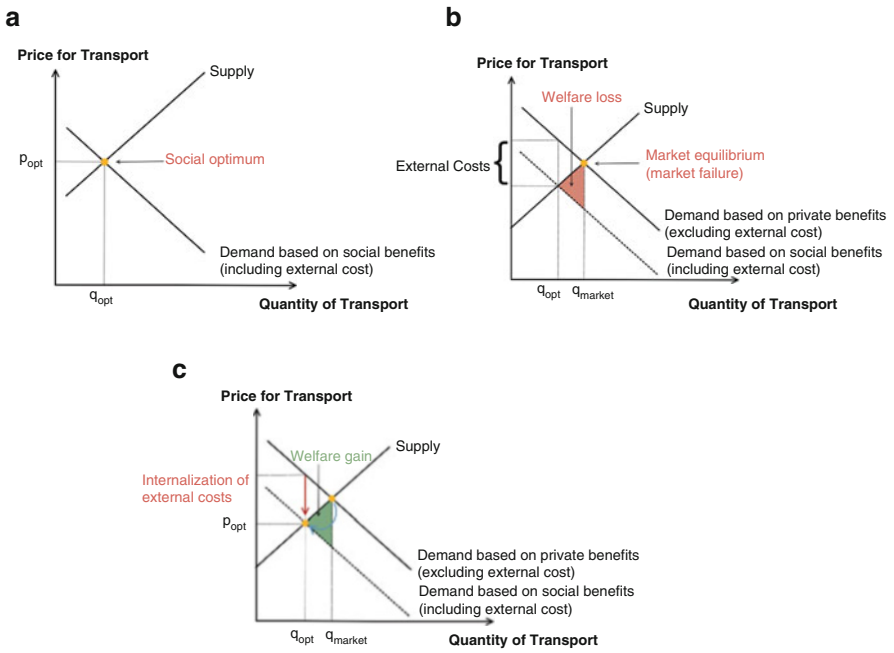

Fig. 6.2 Welfare loss due to external costs. (**a**) Social optimum. (**b**) Market outcome. (**c**) Effect of policy instruments (source: own representation). *Notes*: Panel **a** shows the social optimum, which considers external costs of transport (such as noise, etc.). Panel **b** shows the market outcome which does not consider external costs and thus leads to over-consumption ($q_{\text{market}} > q_{\text{opt}}$) and thus welfare loss. Panel **c** shows the outcome when policy instruments are used. By internalizing external costs (e.g., based on a tax: $p_{\text{demand}} = p_{\text{opt}}$ + TAX) or directly limiting the quantity of transport available on the market, the welfare loss is reduced (i.e., there is a welfare gain)

All these costs have so far been insufficiently or not at all reflected in (transport) prices. Hence, the market price for transport is effectively too low. If individuals (and companies) maximize their personal benefit, the consequence is that—from a macroeconomic perspective—they will travel too much. Some transport activities only occur because the costs are not fully included in the price; if the consumer had to pay for all the costs incurred, they would generally travel less. Consumers therefore travel at the expense of the whole society, so to speak. External effects therefore lead to a **market failure**. In contrast to a situation with perfect competition, where price always guides the market to its equilibrium, external effects prevent the market to find an equilibrium that maximizes overall welfare (see Fig. 6.2).

As discussed in Chap. 3, the external costs to the economy as a whole can be substantial. Now, if **policy instruments** are introduced to reduce this market failure and the associated welfare losses, total welfare should increase accordingly (see Panel c in Fig. 6.2). Thus, in contrast to a situation without market failure, the introduction of policy instruments in a situation with external costs should lead to higher efficiency and a better outcome from an overall economic perspective.

6.1.1 *Instruments for Dealing with External Effects*

In a situation with externalities, it may therefore make sense for the state to intervene and try to remedy the market failure. The state can, for example, try to persuade actors to adopt more sustainable behavior through **information campaigns** and **voluntary agreements**. However, more binding policy instruments are often needed to achieve significant changes (see Table 6.1).

Table 6.1 Overview of the different policy instruments

Policy type	Instruments	Description	Examples
Informational and cooperative instruments	Labeling and certification	Voluntary method of environmental performance certification and labeling	Eco-label (e.g., energy star, Bio Suisse)
	Information disclosure	Measure that provides information about the environmental harm of a particular product or activity	Information provision to recyclers; specific training programs; a specific program for collecting data
	Voluntary agreements	Voluntary agreements or commitments between the state and private actors or among private actors	Voluntary agreement made by a number of industries on a CO_2 reduction
Regulations	Mandatory standards	A legally enforceable numerical standard that usually includes a unit of measurement, e.g. mg/l	Building and energy standards such as Minergie; mandatory CO_2 emission standards for cars
	Prohibition/ban	A total or partial ban/prohibition of certain emissions, activities, products, etc.	Ban on oil heating systems
	Technological prescription	Measure prescribing the use of a particular technology or process	Use of Carbon Capture and Storage (CCS)
Emission rights	Permits	A permit to pollute the environment or to manufacture/import/export/sell environmentally harmful products	Cap and trade schemes
Taxes	Tax/levy	A tax or levy for a polluting product or activity	Carbon tax; water rates; gas taxes; advance disposal fee systems; deposit-refund system
Subsidies	Subsidy/tax reduction	A measure by which the state grants a financial advantage for a particular product or activity	R&D subsidies; renewable energy feed-in tariffs; consumer subsidies for energy-efficient or low-emitting substitutes (e.g., heat pumps, electric cars)

Source: own representation

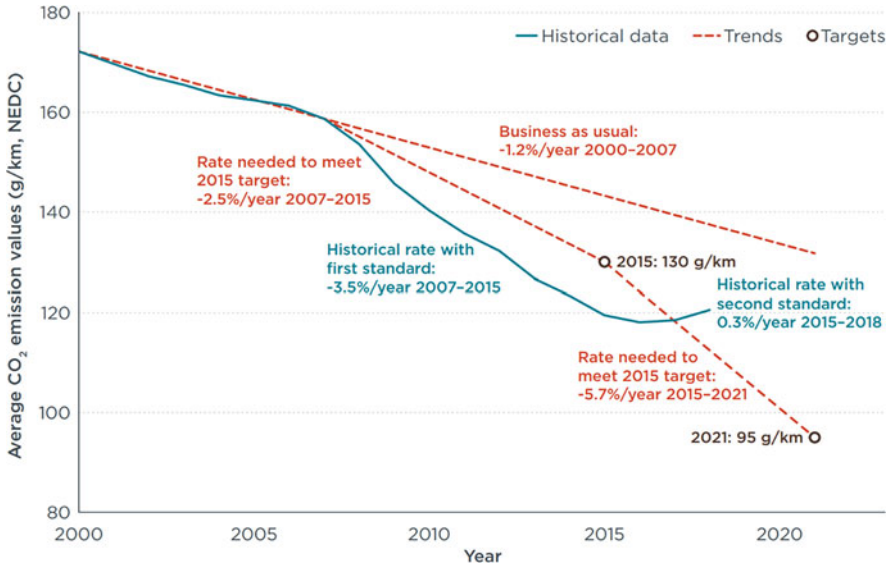

Fig. 6.3 CO_2 emissions from new passenger cars in the EU; historical average CO_2 emission values, targets, and annual reduction rates of new passenger cars in the European Union (source: Tietge, U., Mock, P., & Dornoff, J. (2019). *CO_2 Emissions from New Passenger Cars in the European Union: Car Manufacturers' Performance in 2018*)

In principle, measures can be taken in two areas: Either the state tries to influence the quantity directly or it influences the price, which in turn indirectly affects the quantity consumed/supplied. Both interventions have the objective of getting closer to the macroeconomic optimum and thus increasing overall welfare. In the following, the main policy instruments are discussed in more detail:

- **Regulations**: Binding regulations are used to directly influence the amount of external effects. In the case of negative externalities, this should lead to a reduction in (over-) consumption/production of goods and bring the market outcome closer to the macroeconomic optimum. Examples of such regulatory interventions are standards in the construction sector or car industry. Regulations usually have to be introduced specifically for individual sectors, which is why their implementation is often relatively complex and the monitoring costs are high. However, if we look at the example of passenger cars, regulations can also have a substantial impact on market results (see Fig. 6.3).
- **Allocation of emission rights**: Like regulations, the allocation of emission rights also influences the quantity. In concrete terms, the state controls how many external costs are to be tolerated based on the quantity of rights issued. A specific example is CO_2 certificate trading. Here, the state decides how much CO_2 it actually wants to tolerate and then distributes the corresponding certificates to the companies (usually free of charge). The companies can then trade the certificates on an emission exchange. This is to ensure that the certificates are ultimately used

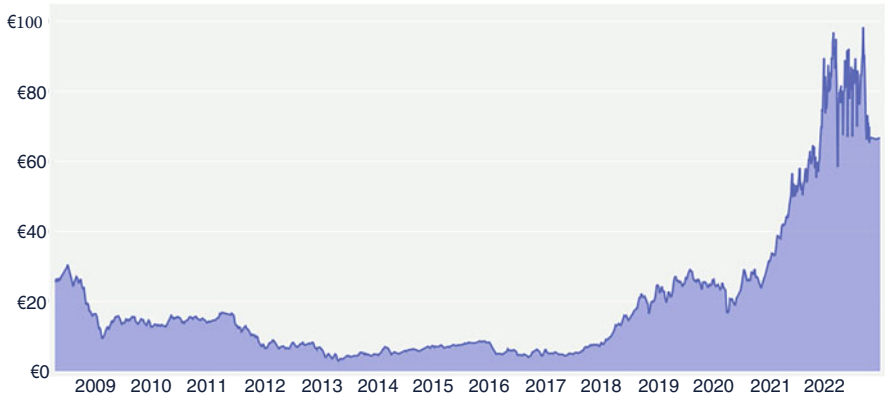

Fig. 6.4 Price development of EU emission certificates in euros per ton of CO_2 (source: https://sandbag.be, accessed November 7, 2022)

as efficiently as possible, i.e. that CO_2 is first saved where it is cheapest. Compared to regulation, where all actors in a given industry are affected equally regardless of the costs of reducing externalities, the allocation of emission rights is likely to increase the efficiency of internalizing external costs. Moreover, the implementation and control costs are also lower when emission rights are allocated, since the market ultimately regulates alone which company owns how many certificates. A central challenge with emission rights, however, is the determination of the quantity of emission rights to be issued. If too many rights are allocated, the price on the market will ultimately be so low that hardly any environmental impact is achieved. If the quantity is too small, the interventions will be too restrictive and the costs for the economy will be too high. The allocation of emission rights is therefore a tightrope walk, whereby the system usually has to be adjusted over time in order to achieve an efficient balance in the end. This is also the case with EU emissions trading. For years, the price of emission certificates in the EU was so low that hardly anyone wanted to invest in climate protection. The EU has therefore decided to reduce the number of certificates, which is why the price has risen again significantly since the end of 2017 (see Fig. 6.4).

- **Taxes**: In contrast to emission rights, taxes do not directly influence quantity of emissions but the price of the polluting product. In concrete terms, the state defines a price for causing external effects, which is then added to the market price via taxes. The external costs thus become internal costs, i.e. they are **internalized**. Such taxes are introduced, for example, on individual goods such as specific fuels or ideally as a general CO_2 tax. In Switzerland, taxes on fossil fuels such as heating oil and natural gas have been in place since 2008, but so far there have been practically no taxes on fuels (petrol, diesel).

  In the case of taxes, the fundamental question is whether they should primarily relate to consumption or production. To optimize the efficiency of taxes, taxes

should in principle be levied where the externalities arise. Since consumption ultimately best reflects our ecological footprint, the tax should be levied on consumption and not on production of the respective goods.

The central goal of a CO_2 tax is to avoid market failures and not to generate government revenue. Similar to the free allocation of emission rights, the revenues generated by a CO_2 tax should therefore be refunded. Such refunds should also be used to reduce differences in the extent to which people are affected by the tax. For example, one study finds that the rural population in Switzerland is probably more affected by a tax on fuel than the urban population, which has access to a greater range of public transport (Filippini & Heimsch, 2016). In order to reduce such inequalities, the rural population should therefore be compensated more when it comes to reimbursement.

The introduction of a CO_2 tax is often preferred by economists compared to the allocation of emission rights. Whereas a CO_2 tax directly sets the prices for negative externalities, certificates determine the emission quantity in a first step, but the prices are only indirectly derived on the market. Experience from the EU certificate market has shown that prices on such markets are very volatile and can be influenced by individual market participants. This makes it very risky for companies to make long-term investments in climate protection.

- **Subsidies**: Subsidies are de facto the opposite of a tax; instead of taxing the creation of negative externalities, the avoidance of negative externalities is financially supported. Subsidies are used, for example, to spread the use of electric cars. Norway first introduced tax incentives in the 1990s to stimulate the market for electric cars. In Norway, taxes on the purchase of new vehicles are usually so high that the purchase price of a car with high pollutant emissions is doubled. These and other taxes are waived for electric cars. Drivers of zero-emission vehicles also do not have to pay expensive road tolls, cross fjords for free by ferry, park in cities without paying, and use bus lanes to overtake other commuters. The next step is to complete a network of charging stations (The Economist, 2017).

  Subsidies are often viewed critically because they create a certain dependency, which makes it difficult to reduce them at a later date. Furthermore, subsidies—in contrast to CO_2 taxes—do not lead to a price that reflects the actual costs of a good. As a result, those market actors who cause external costs still do not pay for the damage caused. However, subsidies are an important instrument, especially for the specific promotion of research and innovation activities.

From an economic point of view, emissions trading and in particular the introduction of a CO_2 tax are the preferred economic policy instruments to address market failures caused by external costs. Compared to the other instruments, taxes and emissions trading make use of market forces and should therefore generally lead to more efficient outcomes. In the literature, these instruments are also referred to as "**market-based instruments**." Both taxes and the allocation of emission rights work by imposing costs on the environmental impacts of a particular action (such as transport), which then provides an incentive for the polluter to reduce its

environmental impact. For comparison: in the case of subsidies and regulations, it is the state and not the market that defines which technologies to invest in or how restrictive regulation should be. This presupposes that the state is well informed to make such decisions efficiently. This is often not the case.

Real-World Example: Switzerland Rejects Extended CO_2 Law
On June 13, 2021, Switzerland voted on extending CO_2 laws, which would have included CO_2 taxes on fuel, for example. The CO_2 law was narrowly rejected with 51.6% of the vote. This means that Switzerland will most likely not be able to meet its Paris commitment to halve greenhouse gas emissions by 2030 compared to 1990.

The urban–rural divide was striking. The two agricultural initiatives, which were voted on at the same time, mobilized strongly in rural areas. Municipalities with a high percentage of "no" votes to the CO_2 law had an above-average turnout. Representative figures from the canton of Lucerne: In the city of Lucerne, the law was accepted with 67% (with a voter turnout of 59%), in the municipality of Hasle in the rural Entlebuch, the law was rejected with 72% (with a voter turnout of over 80%). The Republic shows that the CO_2 law was mainly rejected where the proportion of home ownership and passenger cars is high. According to a post-election survey by Tamedia, no age group had rejected the CO_2 law more clearly than those under 35.

The outcome of the vote suggests that the higher the personal costs appear, the lower the acceptance of climate measures. In general, incentive taxes have a difficult time in public votes. All the more so if only a portion is refunded to the population.

Source: Kollmuss & Schenk (2021)

However, implementing an effective CO_2 tax or emissions trading system is not easy in practice either. As soon as a state changes the prices of certain goods in its own economy more than it is done abroad, competition can be distorted. If taxes are set on the consumption of goods, as discussed above, domestic producers may have higher costs than foreign producers due to an increase in the cost of "consuming" production inputs. This could have a negative impact on exports of these goods and could lead to the relocation of the corresponding production abroad. This is neither attractive for the business location nor does it make sense from an ecological point of view, because in the end climate change is a global problem and it hardly matters where the negative externalities ultimately arise. To avoid such distortions, a **border tax adjustment** is needed, which can take the form of a tax or duty on imports and/or rebates on exports. By offsetting the differences in the stringency of climate policy between different jurisdictions, such border tax adjustments help to ensure that the production of goods and its CO_2 emissions are not simply shifted to locations where the production of CO_2 is cheaper. Such tax adjustments, however, involve a certain

administrative effort and can hardly be implemented unilaterally by individual countries, which is why international cooperation is necessary.

Switzerland shows how difficult it is in practice to implement a broad-based CO_2 tax (see Real-World Example). Without such border tax adjustments, the room for action on taxes is very limited and other instruments will have to be used. This applies all the more if existing environmental goals are to be achieved effectively. If, for example, we want to achieve net-zero emissions by 2050, this will hardly be possible with a CO_2 tax alone. Restrictive regulations of particularly CO_2-intensive sectors such as the construction and cement industries are likely to become necessary. Bans may also be necessary in certain sectors, for example, to reduce the use of gas and oil heating. At the same time, massive financial support may also be needed to accelerate necessary technological developments. Hence, to achieve defined environmental goals, a broad mix of different policy instruments will ultimately be needed.

6.1.2 International Comparison of the Measures Implemented

To compare the effectiveness of existing policies over time and between countries, an indicator is needed that measures the commitment and stringency of each country's environmental and energy policies. Such an indicator has been developed by the Organization for Economic Co-operation and Development (OECD). The indicator of Environmental Policy Stringency developed and recently revised by the OECD (see Kruse et al., 2022) consists of three equally-weighted sub-indices, which group market-oriented (e.g., taxes, permits, and allowances), non-market-oriented (e.g., performance standards), and technology support measures (upstream (R&D support) and downstream (feed-in tariffs, auctions) measures.

The indicator shows that the stringency of policy measures in all OECD countries has increased over time (see Fig. 6.5). Particularly stringent environmental policies are observed in France and Switzerland. Luxembourg, Finland, and Norway follow closely behind, together with Finland and Norway. New Zealand, Brazil, and South Africa are the least stringent among OECD countries.

6.2 Financial System

The financial sector allocates funding to its most productive use by managing the supply of loans, equity finance, insurance, and other financial products. Therefore, by increasing the share of sustainable investments and lending, the financial system can directly contribute to the efficient distribution of wealth and the promotion of sustainable development. Sustainable or responsible investing refers to any

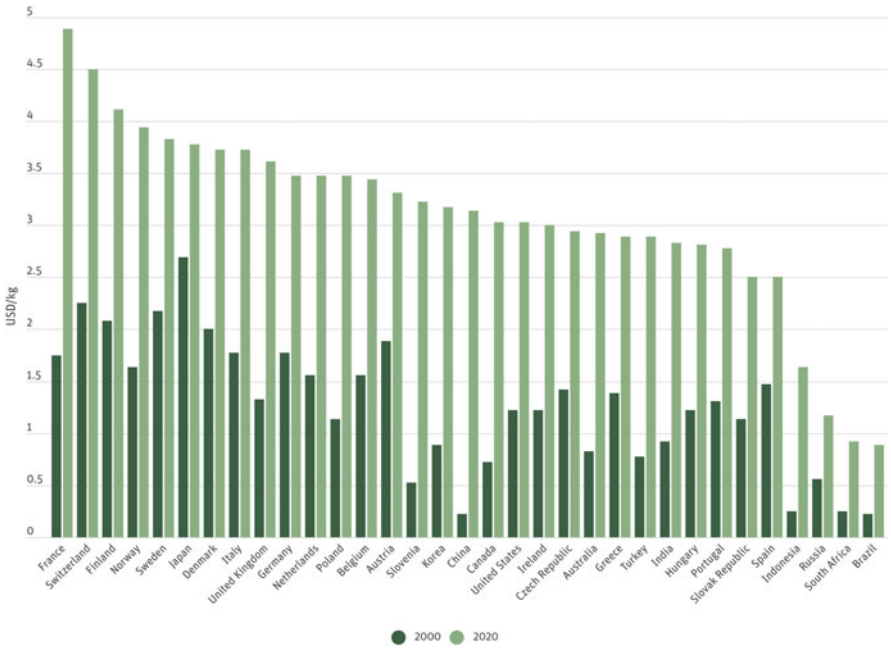

Fig. 6.5 Environmental policy stringency by country in 2020 and 2000 (source: own representation based on OECD, 2022)

investment approach that incorporates **environmental, social, and governance** (ESG) factors into the selection and management of investments.

Classical finance theory, developed in the previous century, looks to optimize economic activities with the two production factors labor and capital, whereas nature and environment usage were considered to be freely available. Shareholder maximization was at the center of the theory, as most prominently described by the Nobel-prize winning economist Milton Friedman, in his 1970 essay in the New York Times, "A Friedman Doctrine: The Social Responsibility of Business Is to Increase Its Profits," one of the most cited economics articles ever.

However, with the recognition of population increase, the depletion of natural resources, and the generation of pollution, the finance paradigm shifted from shareholder value to stakeholder value, from avoiding risks to recognizing opportunities in the context of ESG factors. The role of sustainable finance is to combine both points of view. It can help make strategic decisions on capital allocation, educate long-term investors on how to exercise their influence on companies, and help deal with inherent uncertainties by providing powerful tools to find prices for risky assets and investments.

Sustainable Finance has evolved over several stages. Investors started by avoiding risks related to ESG investments and lending. In doing so they incorporated negative social and environmental externalities into decision-making to become sustainable long-term decision-makers and contributing to sustainable development.

Therefore, financial theory has evolved from short-term profit maximization to long-term value creation over the last 50 years.

Five major areas for sustainable impact can be identified:

- Adjust **decision-making** to focus on long-term value creation, by taking environmental, social, and governance factors into account, in addition to the traditional production factors labor and capital
- For **equity investing**, move to an active investor model with an ownership stake and contribution to the company's ESG strategy
- Comprehensive **bond investing** strategies by including ESG factors in the calculation of credit and default risk as well as issuing Green and Social bonds
- Improved **bank lending** approaches: Move towards a risk and value-based lending approach by including ESG factors in the credit risk calculations and ESG-related non-monetary reasons
- Managing **long-term risks** via approaches that deal with the uncertainty of ESG-related issues on the pricing of insurance products

The literature distinguishes three different types of investments channels: (a) **investment funds**, (b) **mandates**, and (c) **asset owners** (see SSF, 2022). Funds are collective investments, where money from different investors is pooled together and spread across a wide range of underlying investments, thereby spreading individual risk. Mandates are agreements with an investment manager that set out how the money is to be invested. Asset owners include pension plans, insurance companies, official institutions, banks, foundations, endowments, family offices, and individual investors located worldwide, with pension funds typically controlling more than 50% of the assets.

6.2.1 Sustainable Finance Is Becoming More Important

Although difficult to quantify, the data indicate that recently, sustainable investing has increased sharply in some countries. The UN reports that 84% of asset owners say they pursue or actively consider sustainable investing (UN, 2019). In 2020, global sustainable investment reached $35.3 trillion, an increase of 15% in 2 years (see Fig. 6.6).

In Switzerland in particular, the role of the financial sector is central to more sustainable development. Given the scale of assets managed by the Swiss financial sector, it could play an important role in achieving sustainability within Switzerland and globally. Around 220 individual Swiss companies and organizations (asset managers, pension funds, banks, financial research institutes, insurance companies, universities, think tanks, philanthropic foundations, government organizations) are involved in sustainable finance activities, making Switzerland a major hub of sustainable finance specialists, and thus creating a favorable environment for the introduction of innovative sustainable finance products (FOEN, 2015).

Region	2016	2018	2020
Europe	$ 12'040	$ 14'075	$ 12'017
United States	$ 8'723	$ 11'995	$ 17'081
Canada	$ 1'086	$ 1'699	$ 2'423
Australasia	$ 516	$ 734	$ 906
Japan	$ 474	$ 2'180	$ 2'874
Total	**$ 22'838**	**$ 30'683**	**$ 35'301**

Fig. 6.6 Distribution of global sustainable investing assets among regions (source: own representation based on GSIR, 2021). Notes: Asset values are expressed in billions of US dollars. Assets for 2016 were reported as of 31/12/2015 for all regions except Japan as of 31/03/2016. Assets for 2018 were reported as of 31/12/2017 for all regions except Japan, which reported as of 31/03/2018. Assets for 2020 were reported as of 31/12/2019 for all regions except Japan, which reported as of 31/03/2020. Conversions from local currencies to US dollars were at the exchange rates prevailing at the date of reporting. In 2020, Europe includes Austria, Belgium, Bulgaria, Denmark, France, Germany, Greece, Italy, Spain, Netherlands, Poland, Portugal, Slovenia, Sweden, the UK, Norway, Switzerland, Liechtenstein. *Europe and Australasia have enacted significant changes in the way sustainable investment is defined in these regions, so direct comparisons between regions and with previous versions of this report are not easily made

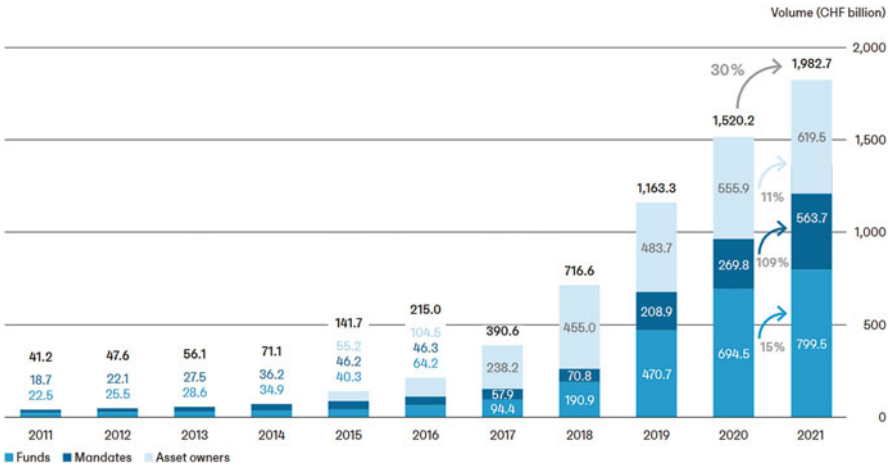

Fig. 6.7 Development of sustainable investments in Switzerland (in CHF billion) (source: SSF, 2022)

Based on responses to an annual market survey performed by Swiss Sustainable Finance (SSF), In 2021, Swiss sustainable investments total CHF 1982.7 billion (see Fig. 6.7)—this represents a 30% increase on the previous year. 70% of the 2021 investments comes from institutional investors, compared to around 30% from private investors (SSF, 2022).

6.2.2 *Accelerating the Impact of the Financial System*

To have a significant impact on sustainability, further growth is needed in the future. To achieve this, various barriers have to be reduced. First, the attractiveness of sustainable investments must be further strengthened; currently, the fees for sustainable products are often significantly higher. Second, the financial industry must improve its communication and actively advise customers to channel more funds into sustainable projects. Ultimately, however, it is also clear that sustainable investments are only possible if many sustainable projects are available for financing in the real economy. Currently, the main barrier to growth is not a lack of potential investors but often a lack of sustainable projects that offer an attractive risk-adjusted return (FOEN, 2015). Here, once again, the system dynamics come to the fore: Such sustainable projects can only be developed if there are corresponding financial resources to finance the projects and a market to sell the products, which heavily depends on the political framework conditions (see Sect. 4.3.4). Finally, we need more transparency. ESG ratings, while widely used, have serious shortcomings, failing to capture the real-world sustainability impact of investments (Popescu et al., 2021).

Real-World Example: Shareholders Put Pressure on Oil Companies
Climate change is a big issue for Shell, BP, and Total, with investors at all three energy giants calling for greater action. Shareholder resolutions to cut carbon emissions will dominate shareholder meetings this month, even as the companies put forward their own, competing proposals. An activist group is putting forward a motion at BP on May 12 and at Shell 6 days later calling on the companies to set emissions targets consistent with the Paris Agreement.

Because the votes are non-binding, they will have limited impact on strategy, but they will increase pressure on companies that still rely on fossil fuels to fund the shift to clean energy. Shell agreed in February to put its conversion plans to a vote, while Total pledged to do the same in March.

Source: Bloomberg. (2021). https://www.bloomberg.com/news/articles/2021-05-07/big-oil-braces-for-climate-votes-with-investor-pressure-mounting

Literature

Economist. (2018). *How to design carbon taxes*. Retrieved September 09, 2020, from https://www.economist.com/finance-and-economics/2018/08/18/how-to-design-carbon-taxes

Federal Office for Spatial Development. (2022). Externe Kosten und Nutzen des Verkehrs in der Schweiz. Strassen-, Schienen-, Luft- und Schiffsverkehr 2019.

FOEN. (2015). Design of a sustainable financial system. Swiss Team Input into the UNEP Inquiry. Federal Office for the Environment (FOEN); 20 pp.

GSIR. (2021). Global sustainable investment review 2020, Global Sustainable Investment Alliance.

Kollmuss, A., & Schenk, T. (Juli 2021). Warum das CO2-Gesetz abgelehnt wurde, Klimazeitung. https://anjakollmuss.com/wp-content/uploads/2021/08/Klima-Zeitung-Juli-2021-CH.pdf. Accessed 28 Apr 2023

Kruse, T., Dechezleprêtre, A., Saffar, R., & Robert, L. (2022). *Measuring environmental policy stringency in OECD countries: An update of the OECD composite EPS indicator* (OECD Economics Department Working Papers, No. 1703). OECD Publishing. https://doi.org/10.1787/90ab82e8-en.

Popescu, I. S., Hitaj, C., & Benetto, E. (2021). Measuring the sustainability of investment funds: A critical review of methods and frameworks in sustainable finance. *Journal of Cleaner Production, 314*, 128016.

SSF. (2022). *Swiss sustainable investment market study 2022*. Swiss Sustainable Finance.

UN. (2019). Financing for sustainable development report 2019. United Nations. United Nations, Inter-agency Task Force on Financing for Development; available from: https://developmentfinance.un.org/fsdr2019.

Video. https://www.youtube.com/watch?v=iTZCIjOqpXU

YouTube. (2011). *Episode 32: Externalities*. (video). Retrieved September 09, 2020, from https://www.youtube.com/watch?v=yC5R9WPId0s

Further Reading

Bundesamt für Raumentwicklung. (2021). *Externe Kosten und Nutzen des Verkehrs in der Schweiz*. Strassen-, Schienen-, Luft- und Schiffsverkehr 2018.

Filippini, M., & Heimsch, F. (2016). The regional impact of a CO_2 tax on gasoline demand: a spatial econometric approach. *Resource and Energy Economics, 46*, 85–100.

Hsiang, S., Kopp, R., Jina, A., Rising, J., Delgado, M., Mohan, S., Rasmussen, D. J., Muir-Wood, R., Wilson, P., Oppenheimer, M., Houser, T., & Larsen, K. (2017). Estimating economic damage from climate change in the United States. *Science, 356*(6345), 1362–1369.

OECD. (2022). *OECD green growth indicators* (database).

The Economist. (2017). *Sales of green vehicles are booming in Norway.* Retrieved November 22, 2022, from https://www.economist.com/business/2017/02/18/sales-of-green-vehicles-are-booming-in-norway

Chapter 7
Sustainable Consumption

Keywords Ecological footprint · Ecological overshoot · Behavioral economics · Nudging · Cost transparency

This Chapter's Learning Goals
- You know the relevance of consumption for the sustainability of a country.
- You know how the Ecological Footprint can be measured in practice.
- You know the key drivers of the carbon footprint of consumption.

7.1 SDGs and Sustainable Consumption

The SDGs, as mentioned earlier in Sect. 2.4, are blueprints for improving society's quality of life. The SDGs serve as guiding principles for the transformation to a more sustainable society. Especially relevant for this chapter is SDG 12 "Ensure sustainable consumption and production patterns." This SDG focuses on achieving economic growth and sustainable development, which requires that we urgently reduce our ecological footprint by changing the way we produce and consume goods and resources.

There is an urgent need to encourage industry, businesses, and consumers to adopt more sustainable consumption patterns. To achieve SDG 12, a much more efficient use of resources will be necessary. For example, this requires a reduction of the amount of waste in general, and especially a reduction in food waste. The world population currently consumes more resources than the ecosystems can provide. Therefore, fundamental changes are needed in the way societies, businesses and individuals produce and consume their goods and services.

SDG 12 calls for the implementation of the UN 10-year framework of programs on sustainable consumption and production patterns, which includes:

M. Fischer et al., *Sustainable Business*, SpringerBriefs in Business,
https://doi.org/10.1007/978-3-031-25397-3_7

- Environmentally sound handling of chemicals and all waste.
- Significant reduction of waste through, for example, repair, reuse, upcycling, and finally recycling at the end of the life cycle.
- Halving per capita food waste at the retail and consumer levels, while also reducing losses elsewhere in the value chain including production and post-harvest.
- Encouraging companies to adopt sustainable practices, such as energy efficiency, efficient water use, reducing wastewater, reducing climate emissions, implementing clean design in products, etc.
- Promoting sustainable procurement practices, such as the implementation of sustainability criteria in procurement and purchasing.
- Promotion and dissemination of relevant information on sustainable consumption and raising awareness.

7.1.1 The Relevance of Consumption in a Globalized World

The consideration of the sustainability of consumption is especially important in today's globalized world. In a closed economy all goods that are produced within a country are ultimately consumed there. In such a closed system the sustainability of consumption and production would therefore be intrinsically linked Citizens' consumption in this closed economy causes increases the impacts of production. In an open economy like Switzerland the picture is significantly different, its inhabitants' consumption consists of many imported goods, which means their consumption influences the sustainability of foreign production. The same goes for exports, many goods produced in Switzerland are consumed abroad and therefore do not influence the sustainability of Swiss consumption. Due to the search for ever higher profits, plus political and social pressure energy-intensive and environmentally harmful production has increasingly been outsourced from western countries to less developed countries. As a result, more and more products with high environmental impact are imported from abroad. As the example of Switzerland shows, it is therefore possible that environmental impact of consumption generated domestically is significantly smaller than the impact generated abroad (see Fig. 7.1). The foreign share has increased from 61% in 2000 to 68% in 2018. The total global environmental impact of consumption has decreased by 26% over this period but is still well above the environmental carrying capacity limit. There is still a long way to go.

7.1.2 Consumption of Natural Resources Over Time

In the 2019 SDG Report, António Guterres, the Secretary-General of the United Nations, claims that “progress is being made in some critical areas, and that some favorable trends are evident” (United Nations, 2019). Nonetheless, SDG 2019 report

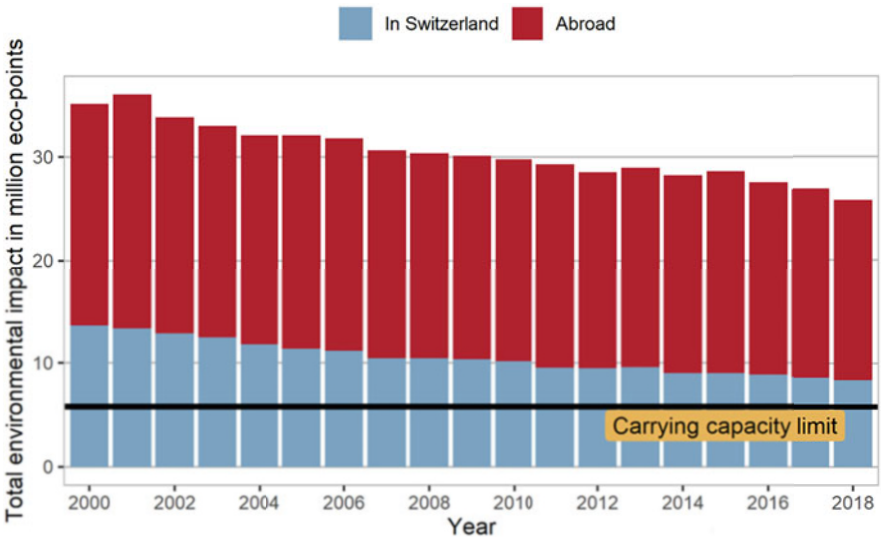

Fig. 7.1 Development of the total environmental footprint per person, according to impacts generated domestically and abroad, 2000–2018 (source: Nathani et al., 2022). Notes: Eco-points are an indicator for measuring a country's environmental footprint. An eco-point is the unit of measure of the environmental impact of a unit, product, or material

states that "we continue to use ever-increasing amounts of natural resources to support our economic activity. Globally, the generation of waste is mounting. About one third of the food produced for human consumption each year is lost or wasted, most of it in developed countries. Urgent action is needed to ensure that current material needs do not lead to over-extraction of resources and further degradation of the environment. Policies must be embraced to improve resource efficiency, reduce waste and mainstream sustainability practices across all sectors of the economy" (United Nations, 2019). In doing so, we need significant improvements at the production level (see Chap. 9 on circular economy), but also at consumption level.

The **material footprint** refers to the total amount of raw materials extracted to meet the final demand of consumers. As such, the material footprint provides an indication of the pressure exerted on the Earth's ecosystems to support economic growth and meet the material needs of the people on this planet. As already discussed in Sect. 1.4, the global monitoring of this indicator indicates that the global material footprint continues to grow at the same pace as population and GDP at the global level (see Fig. 1.8). In other words, we have not yet seen a decoupling of economic growth and natural resource use.

7.2 What Is Sustainable Versus Unsustainable Consumption?

The material footprint of the world population has a negative impact on the environment. However, it is very difficult for individuals to understand the impact of their individual consumption. Therefore, several organizations (e.g., Global Footprint Network, WWF) have been working to develop and promote a methodology for measuring the impact of human activities on the earth. Simply stated, it is the amount of the environment necessary to produce the goods and services needed to support human life and lifestyles (WWF, 2020). The indicator developed is called the **ecological footprint** and enables individuals to understand the impact of their consumption and waste on the planet. The Footprint Calculator provided on the WWF website calculates your personal footprint using the information and data you provide about your personal lifestyle and consumption. Analyses of the impacts of key areas such as nutrition, housing, mobility/transport, etc., are provided along with suggestions on what measures would help to move towards more sustainable consumption.

Sustainable consumption means that the ecological footprint is not greater than the corresponding biocapacity, i.e. consumers in a given area (e.g., a specific country) do not consume more resources than the area naturally produces and do not produce more waste/emissions than the area can naturally absorb. Consequently, sustainable consumption respects environmental boundaries (see also Sect. 1.2 on planetary boundaries). In contrast, consumption that exceeds these limits and leads to an ecological deficit, a so-called **ecological overshoot**, is called unsustainable consumption.

To achieve the goal of a world population living within the limits of our planet's resources, the **global ecological footprint** would have to correspond to the available biocapacity of the planet. Instead, we observe that we consume globally the resources of 1.7 earth (see Fig. 7.2), which is clearly not sustainable in the long run. Moreover, the amount of the earth's resources used for consumption varies greatly—and as such consumption can be more or less sustainable. The most developed industrialized countries use more than 2–4 planets to satisfy their consumption. The ecological footprint of Switzerland, i.e., the sum of the consumption of the Swiss population, for example is 2.8 Earths. Hence, an average Swiss consumer used the resources of 2.8 earths to satisfy his or her needs in 2020; the ecological capacity of the planet is significantly exceeded. This is only possible because other, poorer countries consume significantly less resources (Wackernagel & Beyers, 2019).

As discussed in Sect. 2.1, sustainable consumption has already been defined by the World Commission on Environment and Development in the report "Our Common Future" as "the use of material products, energy and immaterial services in such a way that it minimizes the impact on the environment, so that human needs can be met not only in the present but also for future generations" (World Commission on Environment and Development, 1987). More generally, sustainable

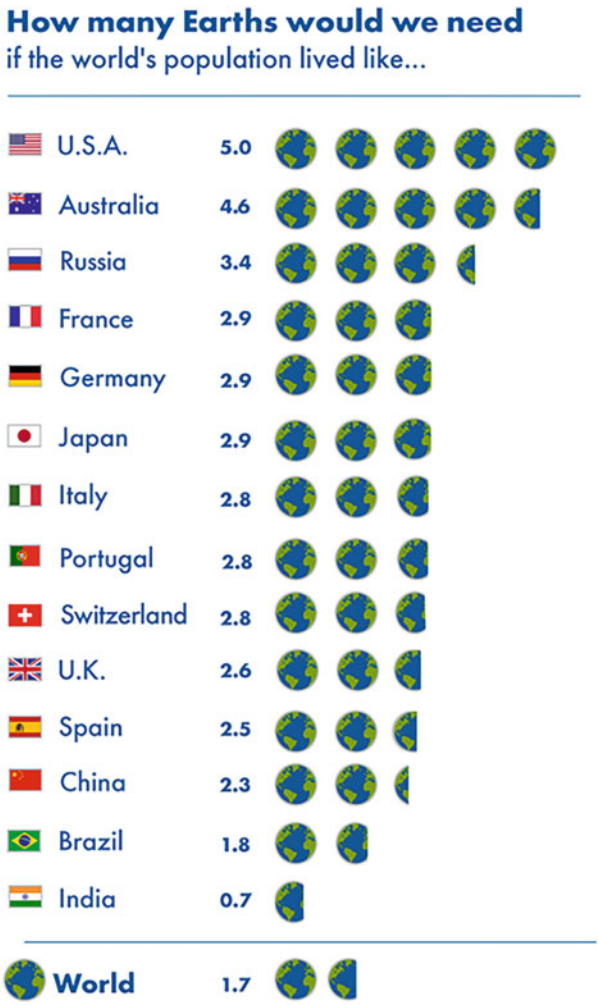

Fig. 7.2 Ecological Footprint comparison, 2021 (source: Global Footprint Network, 2021)

consumption is understood as an "umbrella term" that encompasses numerous aspects, starting with meeting the needs of consumers and improving their quality of life while improving resource efficiency, increasing the use of renewable energy sources, minimizing waste, taking a life-cycle perspective of the goods and services consumed, and the equity dimension.

The purpose of sustainable consumption is to consume goods and services to meet consumer needs and bring better quality of life, while continuously reducing damage and risks to the environment and human well-being and health (see also discussion on sufficiency in Sect. 2.3). The transformation towards more sustainable consumption therefore involves first and foremost a change in **consumption patterns**, i.e. substituting inefficient, harmful goods and services for less damaging

ones. Secondly, reduction in **consumption levels** i.e. consuming less services and lower volumes of goods.

7.2.1 Sustainable Consumption Impact Areas

To understand the drivers of sustainability of consumption, the individual ecological footprint can be divided into different areas of consumption, such as food, goods, mobility, the so-called **impact areas.**

A study carried out by the European Commission to assess the consumer footprint in the European Union (see Sala & Castellani, 2019) highlighted that **food** consumption—especially agricultural production, is responsible for a large part of the footprint. Another key driver is **housing and mobility**. Particularly in relation to climate change, the formation of photochemical ozone, the use of fossil resources, and the use of mineral and metallic resources. Household goods significantly drive the depletion of mineral and metal resources but create less of an impact in the other components of the total consumer footprint (see Sala & Castellani, 2019).

Similarly, a European project, which analyzed the environmental impact of products consumed by households, concluded that 70–80% of the total impact is related to food and drink consumption, housing (including household energy consumption), and transport (including commuting, leisure, and vacation travel) (see Tukker et al., 2005). Kerr (2012) comes to a similar conclusion in his study British consumers' carbon footprint distribution.

Nathani et al. (2022) analyze the ecological footprint of Swiss consumption (see Fig. 7.3). Similar to the studies mentioned before, they find that housing (including housing construction and furniture and household appliances) and food each accounts for about 25% of the total footprint of demand. Private mobility makes 14% of the total footprint. Thus, these three categories make up 64% of total consumption related impacts. Spörri et al. (2022) investigate the ecological impact reduction potential for specific consumption activities in Switzerland. They also conclude that the greatest potential lies in the areas of nutrition, building/housing, and private mobility. The ecological impact reduction potential of the consumption of electrical appliances and clothing is comparatively lower. This is also because the focus in Spörri's study is primarily on savings that can be attributed to efficiency gains (i.e., weak sustainable consumption), and less on consumption reduction (i.e., strong sustainable consumption). Specifically, the greatest ecological potential is found in the following fields of action:

- **Nutrition**:
  - Change to an environment-/health-conscious diet (insect-based food, cultured meat, vegetable proteins)
  - Reduction of end consumers' food waste

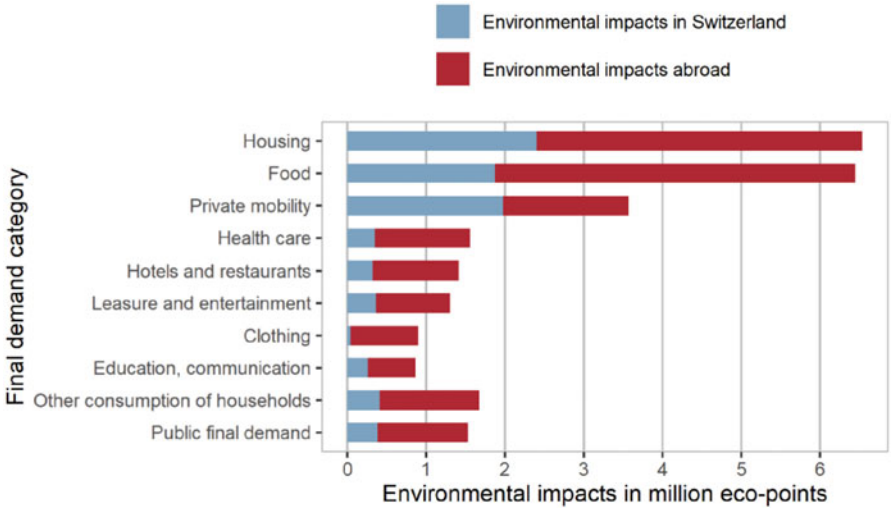

Fig. 7.3 Total environmental footprint per person by final demand category in Switzerland, 2018 (source: Nathani et al., 2022). Notes: Eco-points are an indicator for measuring a country's environmental footprint. An eco-point is the unit of measure of the environmental impact of a unit, product, or material

- **Building/housing**:
  - Reduction of living space requirements per person
  - Reduction of room temperature/adapted room climate

- **Private mobility**:
  - Reduction of car mileage (passenger cars), i.e. reduction of distances traveled (e.g., way to work)
  - Reduction of air travel
  - More economical passenger cars (lighter, smaller, alternative driving systems)

7.2.2 How to Achieve More Sustainable Consumption

Starting with the areas with the greatest potential, some specific actions to make individual consumption more sustainable include:

- **Food and drink**: buy and eat local and seasonal food, eat less meat
- **Mobility and travel**: reduce miles, reduce high impact means of travel (flights), use public transport

- **Housing and home energy:** use renewable sources of energy, choose environmentally friendly and energy-efficient housing, reduce living space
- **Waste:** reduce waste by sharing, reusing, upcycling, or recycling, reduce your food waste
- **Shopping**: think twice before shopping and use labels. Choose organic, fair trade, or other labels that protect environmental and social sustainability. You find an overview of sustainability labels here.

Further recommendations on what to do to reduce your footprint and move towards more sustainable consumption can be found on the WWF website.

7.3 Encouraging Sustainable Consumption

If we accept that we need to change our consumption patterns to reduce our impact on the environment, why do we not just change them? The list above is not particularly complicated or surprising. However, as we know, adapting our consumption patterns is not easy. Most people have a justification in mind when they make their decisions: they increase their living space because they want more privacy, they travel by plane because they want to explore the world, they eat meat because they like it. Changing consumer behavior is usually very slow processes and cannot be achieved from one day to the next. So how can this change be encouraged or possibly even sped up?

7.3.1 Behavioral Economics

Behavioral Economics is a discipline that examines how people make decisions. It emerged as a critical response to the classical economic assumption that humans always act rationally. This assumption is founded on the view that human beings are able to select the best choice in accordance with their preferences. To be rational means that human beings:

- Always seek to maximize their utility
- Possess unlimited willpower that enables them to pursue their optimum
- Are only self-interested and the well-being of others does not play a role in their decision-making (Beck, 2014).

In his work Herbert A. Simon argues that humans are not able to be completely rational since it is impossible to fulfill all these prerequisites, i.e. possess all the information in the world. As a response he developed the concept of "bounded rationality" stating that humans are not always fully rational decision-makers, on the contrary their rationality is often limited due to various factors such as emotions, weaknesses, temptation, limited information, values, beliefs, etc. (Simon, 1972).

Behavioral economics studies human decision-making whilst taking bounded rationality into consideration and acknowledging the existence of anomalies in rational choice. These behavioral anomalies show that humans often do not act in accordance with standard economic theory. They want to maximize their utility, yet their choices sometimes do not represent this desire (Just, 2013).

Human behavior and decision-making are dependent on two cognitive systems (Thaler & Sunstein, 2008). System one is defined as the automatic system which decides using rapid intuition and feeling with no thinking required. It is mostly used for daily decisions. System two, the reflective system, processes decisions with logic and reasoning and is mainly used for important decisions.

Decisions are made using the following three areas: logic, information, and heuristics.[1] Many decisions are made with system one since it requires less mental energy. System one is therefore prone to biases and heuristic decision-making. System two, on the other hand, while it uses logic and information it can also be manipulated and is fallible (Kahneman, 2011).

Thus, behavioral economics and bounded rationality accept that humans may simplify decision-making in complex situations (Furnham & Boo, 2011). People simplify otherwise too complicated and complex tasks by relying on heuristics. One of the most often used mental shortcuts is habit: humans repeat the same action in response to a certain situation. Another is default behavior which means people use the "standard, predefined" option to repeat decisions well-known to them even if the situation has changed.

When aiming to increase the sustainability of consumption, peoples' decisions and choices need to be shifted towards more sustainable choices. This is where the behavioral economics and its findings can be insightful.

This deliberate shifting of choices is known as **nudging**. The concept of nudging introduced by Richard Thaler and Simon Sunstein uses the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. This means that the consumers are "gently nudged" to choose an alternative (more sustainable) option.

How can nudging be used? Firstly, it can be used at the company level. For example, reducing plate sizes in all-you-can-eat restaurants lead to less food waste (Freedman & Brochado, 2010) or changing the default setting on a printer to double sided leads to reduced paper consumption (Egebark & Ekström 2016). Often these kinds of interventions are very similar to what marketeers have been doing for many years—they are the green equivalent of putting the chocolate next to the cashier to increase sales. The second area of nudging is in policy. The UK government even had a so-called Nudge Unit (Quinn, 2018), and while not primarily involved in improving sustainability its experimental approach showed how nudges can alter people's behavior. These insights could be applied to government policies to steer people in a more sustainable direction.

[1] A Heuristic defined as ". . .a simple decision rule or rule of thumb that may be used to approximate rational optimization when decision resources are limited" (Just, 2013).

7.3.2 *The Role of Policy*

Nudging is one possible policy measure. However, one of the key problems is that time is pressing if society wishes to even have a chance of limiting global warming to 1.5 degrees. Therefore, other more significant changes to political frameworks and policies need to be undertaken (see also Chap. 6).

A prime illustration of the need for urgent policy action is the meat industry in Switzerland and many other Western countries. While CO_2 taxes are planned or have already been introduced to some extent they are rather piecemeal; e.g. meat production in Switzerland is still massively subsidized (see also real-world example). From an environmental point of view, these subsidies have a similar effect as if Switzerland were to subsidize the processing of fossil fuels. To make a step towards **cost transparency**, meat subsidies should be eliminated as quickly as possible. As long as the actual production costs are not directly visible to consumers, it is unlikely that the majority of people will make the more environmentally friendly purchasing decision. Moreover, for complete **cost truth**, instead of subsidies, taxes would also have to be introduced which internalize the external costs incurred in meat production (see Sect. 6.1.1). If all these costs are internalized, environmentally and health-conscious nutrition will become price-competitive, and new economic incentives to invest in this area will also arise on the supply side. It is also clear that such price increases only make sense if the import of cheap meat products from abroad is prevented at the same time by introducing tariffs on environmentally unsound products.

Real-World Example: True Costs of Food in Switzerland
The food system has an impact on biodiversity, health, and environment. To get an idea of the true costs of food, such externalities must be added to the retail prices. It turns out that the true costs can be substantially higher:

- The true costs of most vegetables and fruits are larger than the retail prices (e.g., potatoes: +17%), and only some are smaller (e.g., apples: –178%).
- The true costs of animal-based products, however, are mostly much higher than retail prices (chicken: +38%; cheese: +53%; beef: +125%).

Source: Perotti (2020)

Literature

Study.com. (2013). Sustainable consumption: Definition and complexities. Chapter 16, Lesson 4. Retrieved August 2, 2020, from https://study.com/academy/lesson/sustainable-consumption-definition-and-complexities.html

Further Reading

Beck, H. (2014). Was ist Behavioral Economics? In *Behavioral economics* (pp. 1–24). Springer Gabler.

Egebark, J., & Ekström, M. (2016). Can indifference make the world greener? *Journal of Environmental Economics and Management, 76*(2016), 1–13.

Freedman, M. R., & Brochado, C. (2010). Reducing portion size reduces food intake and plate waste. *Obesity, 18*(9), 1864–1866.

Furnham, A., & Boo, H. C. (2011). A literature review of the anchoring effect. *The Journal of Socio-Economics, 40*(1), 35–42.

Geiger, S. M., Fischer, D., & Schrader, U. (2018). Measuring what matters in sustainable consumption: An integrative framework for the selection of relevant behaviors. *Sustainable Development, 26*(1), 18–33.

Global Footprint Network. (2010). *Ecological Footprint.* Retrieved August 2, 2020, from http://data.footprintnetwork.org/#/

Just, D. R. (2013). *Introduction to behavioral economics*. Wiley Global Education.

Kahneman, D. (2011). *Thinking fast and slow*. Farrar, Straus and Giroux.

Kerr, W. G. (2012). Climate change: The role of the individual. *SPICe Briefing, 12*.

Nathani, R., O'Connor, I., Frischknecht, R., Schwehr, T., Zumwald, J., & Peyronne, J. (2022). Umwelt-Fussabdrücke der Schweiz: Entwicklung zwischen 2000 und 2018, Schlussbericht, Zürich, September 2022 im Auftrag des Bundesamtes für Umwelt (BAFU).

National Footprint and Biocapacity Accounts. (2021). Retrieved July 2022, from https://www.footprintnetwork.org/resources/data/

Perotti. (2020). *Moving towards a sustainable Swiss Food System: An estimation of the true cost of food in Switzerland and implications for stakeholders*. Master thesis. https://ethz.ch/content/dam/ethz/special-interest/dual/worldfoodsystemcenter-dam/documents/MScThesis-AlessaPerotti-TheTrueCostofFood.pdf

Quinn, B. (2018, November 10). The 'nudge unit': the experts that became a prime UK export. *The Observer*.

Sala, S., & Castellani, V. (2019). The consumer footprint: Monitoring sustainable development goal 12 with proves-based life cycle assessment. *Journal of Cleaner Production, 240*(118050).

Simon, H. A. (1972). *Theories of bounded rationality, decision and organization*. CBR a. R. Radner.

Spörri, A., Stucki, T., Zweidler, R., & von Felten, N. (2022). Die Hürden gegen Ressourceneffizienz und Kreislaufwirtschaft abbauen. Studie zum gleichnamigen Postulat 18.3509 von Ständerat Ruedi Noser. Schlussbericht im Auftrag des Bundesamts für Umwelt. EBP Schweiz AG, Berner Fachhochschule.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

Tukker, A., Huppes, G., Guinée, J., et al. (2005). *Environmental impact of products (EIPRO): Analysis of the life circle environmental impacts related to the total final consumption of the EU25*. IPTS/ESTO, European Commission Joint Research Center.

United Nations. (2019). *The sustainable development goals report.* Retrieved August 15, 2020, from https://unstats.un.org/sdgs/report/2019/The-Sustainable-Development-Goals-Report-2019.pdf

Wackernagel, M., & Beyers, B. (2019). *Ecological footprint: Managing our biocapacity budget*. New Society Publishers.

World Commission on Environment and Development. (1987). *Our common future*. Oxford University Press.

WWF. (2020). *The ecological footprint*. Retrieved August 2, 2020, from https://wwf.panda.org/knowledge_hub/teacher_resources/webfieldtrips/ecological_balance/eco_footprint/

Chapter 8
Sustainability in a Digital Context

Keywords Sustainability of ICT · Sustainability through ICT · Digital artifacts

This Chapter's Learning Goals
- You know about the potentials of digitalization for sustainable development.
- You know why ICT operations can act as an enabler of sustainability.
- You know the role of sustainable ICT.
- You know about the sustainability of digital artifacts.

8.1 The Sustainability Potential of a Digital Society

Technological progress has always shaped the lifestyles, cultures, and communities of mankind. Since the first wave of industrialization that rolled from Europe across large parts of the world in the late eighteenth century, the nature of its effects on the well-being of society has been ambivalent. Correspondingly, scholars have long been concerned with the question of how the well-being of society and its individuals change in the face of technological progress, and how its ambiguity may be resolved (e.g., Ashton, 1948; Crafts, 1986).

The pressure and responsibility to find answers and provide guidance on how the technological progress may promote the transformation to a sustainable society have never been greater than today. After all, never before in history has progress accelerated at the current pace: not only is technology developing exponentially, but the extent to which technologies are shaping people's working and private lives is increasing as well (e.g., Adedoyin et al., 2020). Today, innovative technologies show a great potential to promote environmental protection, sustainable production and consumption, and social well-being for many.

- Collecting and sharing data at the local, regional and international level can reveal great potential for optimization, especially with regard to ecological aspects.

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- The potential of the novel technologies in companies and organizations is in the first place to increase the efficiency of their processes. These efficiency gains may lead to an increased sustainability of the operation and products.

Technology, especially the provision of up-to-date data and information, has great potential to improve sustainability on an individual level, as well, e.g. through better informed consumption decisions. There are a variety of apps promoting the sharing of products or services such as car sharing, tool lending/sharing, or food surplus distribution platforms. All of these if effective can reduce waste and redundancy.

Despite the complexity and diversity of today's technological innovations, the majority of innovations build on one key resource: data. Data is the "new oil" of our century (e.g., Sorescu, 2017). Thus, data has a correspondingly central role in transforming society into something more sustainable (UN, 2014). Among politicians and academics, a specific term is currently emerging for a vision of society in which data and data-driven technology is primarily mobilized for the transformation to sustainable society. The goal is to maximize social welfare and individual well-being: Society 5.0 (e.g., Cabinet Office, 2016). Expanding the idea of Industrie 4.0, the vision of Society 5.0 is that innovative technologies will now be exploited to promote for social, economic, and ecological sustainability. The aspiration for a Society 5.0 is in line with the 17 UN SDGs as sustainability and the well-being of individuals are an equally central component. For example, while SDG 12 ("Responsible Production and Consumption") specifies the direction in which efforts should be guided, in a Society 5.0, data and technology would be part of the goal's specific advancement: e.g., data provides information on the carbon footprint of products, where unnecessary production waste occurs, and what wages are paid along the value chain, data-driven technologies optimize production processes in terms of energy efficiency and waste management. The unique potential of data in addressing the SDGs is reflected in the lively research interest surrounding this topic. In the report "A World That Counts" (2014), the UN explicitly called for the mobilization of data to promote sustainable development.

Risks and Ethical Considerations in a Data-Driven Society

The transformation of a society into Society 5.0 requires one key ingredient: data. The UN sees data as "the lifeblood for decision-making and the raw material for accountability" (UN, 2014, p. 2). The importance of data for technological progress is as broad as its potential applications for socio-ecological sustainability, e.g., for operating technologies such as smart grids and autonomous navigation systems, for containing pandemics, and for quantifying poverty and living conditions. This central role of data poses various challenges, among others:

- **Violation of Privacy Rights.** Dangers include the general violation of the individual's right to privacy. The misuse of data can have extreme societal impact, as the data-driven manipulation of the 2016 US election known as the Cambridge Analytica scandal highlighted (Cadwalladr, 2018). In this context, though, a violation of privacy does not only happen with regard to data that has

been disclosed voluntarily. Algorithmic analysis also facilitates the generation of new insights about individuals by combining existing data sets. For example, social media activity patterns can lead to conclusions about mental illness or sexual orientation without this information having been specifically shared by a person.

- **Accountability of Algorithms.** Algorithms lack transparency and accountability. Generally, self-learning algorithms aim to optimize certain outputs according to predefined criteria. However, how exactly an algorithmic model optimizes an output according to these criteria, and how those criteria may automatically change over time, is mostly a black box. This lack of insight leads to ethical challenges, especially when algorithmic outputs have real-world consequences, e.g., when outputs are used to make decisions about lending, recruiting personnel, or controlling self-driving cars. The lack of transparency and accountability is further a constraint because algorithmic outputs may be socially discriminating, e.g., when a targeting process assigns too much statistical weight to an individual's zip code, members of precarious neighborhoods with low incomes could easily be assumed to have a propensity to commit crime.
- **Accountability of Digital Artifacts.** Just like algorithms themselves, their digital counterparts, the digital artifacts, are used every single day all over the world for a plethora of different tasks and jobs. Most of them, especially executable digital artifacts (i.e., software) lack transparency and thereby accountability. It is possible to analyze such an artifact and find out, albeit usually with a considerable amount of effort, what exactly it is doing by retro-engineering it. However, without access to its source code, it is almost impossible to say for sure what it is not doing and will never do. In the end, this means for the average consumer using most commercial products they have few options other than to trust blindly. This trust, however, can be and has often been abused by criminal individuals and above-the-board corporations alike.
- **Biased Data.** Data are the driver of technological progress and pose a particular threat to social sustainability. Biases in data sets can arise because prevailing biases in society are correctly measured and thus unreflectively included in the data set. Prevailing social biases may include stereotypes, racism, and unequal treatment. Consequently, data-driven outputs are optimized for those groups that have already been prioritized during data collection, e.g. white males. A scandal in 2015 involving Google provides a vivid example: A designated function in the Google Media Library automatically tagged images with their content in order to facilitate the search. The corresponding algorithm was probably trained with a data set in which black people were underrepresented. As a result, several black people claimed to have been recognized by Google as gorillas.

Hence, in any “society 5.0” that intensively uses digital technology and data, there must be accountability and transparency. This needs to be done either by increasing the accountability and transparency of the products we use or by switching to already accountable and transparent (open source) products in the first place.

Real-World Example: Digitalization Using the Internet of Things and Remote Servicing Reducing the Environmental Impact by EcoLab
EcoLab is the global leader in water, hygiene, and energy technologies and services. EcoLab's products and services help its customers keep their environment clean and safe, operate efficiently, and achieve their sustainability goals.

By using Internet of Things (IoT) technology with sensors that collect and analyze data on water consumption and/or hygiene products it is possible to use resources much more efficiently. This leads to lower resource consumption, as they are only used when needed, and consequently to a lower environmental impact of the operation.

In addition, EcoLab plans to introduce remote maintenance using digital technologies such as virtual or augmented reality to reduce trips by 50% and thus reduce CO_2 emissions.

Source: www.ecolab.com

In the following sub-chapters, the impact of the ever-growing presence of information and communications technology (ICT) on sustainability is discussed. Sustainability in the digital domain is traditionally viewed from two points of view: ICT as an enabler of sustainability, that is sustainability **through ICT**, and sustainability **of ICT** operation. Furthermore, a third, often neglected, type of digital sustainability: the sustainability of **digital artifacts** will be discussed.

8.2 Sustainability of ICT

Operating ICT has impacts like operating any kind of device does. Like any other device, ICT hardware has to be produced, maintained, and recycled and, eventually, disposed of. While in this regard, a server farm is not fundamentally different from a factory full of juice extractors, there are significant differences in the details:

- While simpler, e.g., mechanical machinery can be used for decades before the need for replacement and disposal arises, things look different for most ICT products. Usually, ICT hardware has a life cycle of a few years depending on its area of operation. While an electronic cash desk in a small store might be used for 5–10 years before it is considered outdated and replaced, things might already look different with a cloud-based point of sale used in a store chain or a laptop or desktop computer in a typical corporate office with life cycles closer to 3–5 years. While there certainly are computer systems that have been running for decades, they constitute a tiny minority considering all ICT-powered hardware in use worldwide.

- Non-ICT-powered machinery mostly consist of several types of materials that must be separated and recycled separately at the end of the machine's life cycle. However, compared to the amount and types of materials used in ICT, most of those recycling processes are simple and cost-efficient. Due to the number and types of materials used in ICT hardware and the fact that it is miniaturized whenever possible, recycling turns into a cost-intensive process. This is the main reason why year after year millions of tons of ICT hardware scrap are shipped to countries with weak or developing industries for recycling, sometimes illegally. Away from tight regulation and oversight, ICT hardware is often simply burned to get access to some of the materials it contains, with catastrophic consequences:
  - For the health of the workers having to perform these jobs, often without any equipment or protection
  - For the workers' families who are often forced to live on-site due to lacking alternatives
  - For the dumping and burning sites that are increasingly saturated with poisonous residues from years of burning and melting materials and have meanwhile become an ecological hazard themselves, poisoning groundwater reservoirs and surrounding ecosystems.
- ICT hardware relies on materials that are energy-intensive in their production, destructive to human health and ecosystems, short in supply on a global scale. Examples include silicon dioxide, quartz, hafnium, tantalum, palladium, boron, cobalt, tungsten, chrome, nickel, beryllium, platinum-group metals, indium, the list is almost endless. In addition to these rather electronics-specific materials, ICT products contain the usual mix of plastics and synthetics, making recycling even more complicated and cost-intensive.
- ICT hardware depends on software to operate them, which gives this kind of products an additional lever when it comes to improving sustainability. Instead of redesigning or even swapping out the entire product, ICT products can be updated or even upgraded by changing the software part of the product. Upgraded software can lead to results such as better energy efficiency, lower hardware requirements, lower material fatigue, etc.

In summary, ICT products are harder to recycle than the average household consumer product due to their composition and their relatively short life cycle. Therefore, new approaches promoting more sustainability of ICT products are needed. These are for example, use software upgrades to make existing products more sustainable in their operation to prolong their life cycle, employ clean design of ICT products to enable reuse, and ease the recycling and reuse of the materials used in the products.

8.3 Sustainability Through ICT

The influence of **ICT products** on the sustainability of systems goes beyond their operational footprint and can be observed in different aspects:

- Introducing ICT into almost all steps of production and delivery of products or services mostly happens with the goal to improve efficiency, e.g. less fuel usage through more precise injection of fuel, less time loss through flexible route planning, less waste material through better tailored cutting. Whenever efficiency is improved and, consequently, less resources like material or hardware operating time is needed or the life cycle of a product is prolonged, sustainability is increased.[1]
- Apart from increasing efficiency in already existing systems, ICT products have the potential to create new systems that would have been impossible before the introduction of ICT. The opportunities of, for example, digital distance learning, the possibilities of a modern office workplace or platforms enabling sharing of goods or services all can have a large impact on sustainability. In the same vein, a well-streamed collection of eGovernment services can save tons of papers, make on-site visits unnecessary, enable the easier collection and sharing of data, etc. By separating services from the physical movement and manipulation of material, ICT has a large potential to influence the sustainability of a system.

The variety of ICT products is growing and new applications are being rolled out in virtually every aspect of our economy and society. On the one hand, the increased use of ICT tools solves many a problem of the pre-ICT era. On the other hand, however, consequential problems arise, such as the increased consumption of energy and resources, the sometimes unrealistically growing expectations of the problem-solving capacity of ICT, or the fact that access to ICT resources is still very unevenly distributed globally. Unfortunately, one could not expect corporations to deliver a report on these topics with total openness and honesty. That is why the listed dimensions are rather meant to give users of digital artifacts an approach and nudge to think about the characteristics of the digital artifacts they are using or plan to use. After all, the decision which digital artifacts to use could not only have societal impacts in the future but very much shapes the choices a corporation makes from when developing strategies and ways of doing business.

8.4 Sustainability of Digital Artifacts

Our journey towards a digital society means that more information is being transformed from analog to digital format. Consequently, an increasing part of our lives depends on information saved in files and decisions made by software, which

[1] Unfortunately, this is sometimes offset by the rebound effect, which for simplicity is not considered here.

itself comes in the form of code saved in files. Both kinds of digital data—information (e.g., text, pictures, videos, audio recordings) and software (source code or any sort of compiled code)—can therefore be classified as **digital artifacts**, independent of their concrete function.

Digital artifacts differ from their physical data storage artifacts in a number of ways:

- Digital artifacts are not self-contained since they cannot be accessed without the help of a technical device and another digital artifact. To access the digital version of a report, book, or any form of text we not only need the digital artifact itself, but additionally a device capable of running an operating system, the operating system itself, and some sort of application, able to read and interpret the information stored in the digital file. This means that the digital file itself loses its usefulness unless it is surrounded by an entire ecosystem of other artifacts, tangible (the device), virtual (the operating system, all applications) and even social (people creating all these artifacts following the same rules and standards). While traditional artifacts often need to be embedded in a societal ecosystem, too (e.g., adhering to the same rules of language, writing, figures of speech, or pictorial depictions), the preconditions for successfully accessing and interpreting a digital artifact are considerably higher.
- While traditional artifacts can clearly be assigned to the category of material objects, this is both correct and incorrect for digital artifacts. None of them would exist without their physical manifestation (the information carrier) and their existence is limited by the limitation of their physical representation, e.g. the size limitations or the lifetime of the data carrier. At the same time, the material representation of a digital artifact has no practical value by itself. The latter is only revealed when combined with other digital artifacts and their potential to translate the characteristics of a physical object to, for example, an emulation of a printout shown on a screen.
- Due to their existence in the material and at the same time virtual world, digital artifacts cannot not only be reproduced at very lost cost and with no quality loss, but this reproduction can also take place over large distances using a virtually endless variety of other carriers over radio connections, fiber optic cables, satellite links, etc., without any loss in quality.
- Digital data carriers have quite limited lifespans (from a few years to a few decades), compared with the long periods of time knowledge needs to be preserved. Naturally, the lifespan of a data carriers depends on many factors, e.g. the quality of the material, frequency of usage or storing conditions, and therefore can vary in individual cases.
- In addition to the data carriers themselves, data carrier formats have changed many times since computers were first used to store data: cardboard punch cards, paper tape, magnetic tape, magnetic disk, optical disks, flash-drives, etc. However, even if you had an operational data carrier from 40 years ago and a still functional floppy drive to successfully read out the data, you still could not access the stored information without much ado. The software needed to operate the

floppy drive has never been written for today's operating systems, as there is no need for it. Writing new software could prove to be very costly or even impossible as the source code and documentation for old digital artifacts, if not published openly, is often lost when the corporation that wrote it goes out of business or merges with another corporation.

- Documentation—for data formats or any other topics—is not written in a vacuum but embedded in a social environment with implicit social rules, assumptions, and tacit knowledge even the authors of the documentation might not be consciously aware of. Since this tacit knowledge is not explicit, it must be shared within a community to be evolved and to survive the ravages of time . Such a community can be a worldwide association or a small team of programmers. However, the smaller and the less open a group, the higher are the probabilities that at a certain point in time knowledge is not shared anymore and disappears, rendering an unknown number of digital artifacts useless. E.g., a documentation for a magnet audio tape player from the 1950s or 60s might instruct you to "insert the tape in the player," because at that time it was perfectly clear how this is done, but you might struggle today not having this knowledge.
- Final characteristic relates to the fact that digital artifacts can be perfectly reproduced at a low cost. However, such reproductions are not necessarily perfect and can also be subject to random changes, thus underscoring the highly transmutable nature of digital artifacts.

Protecting digital artifacts against these various threats does not only demand an awareness of potential threats but constant, considerable efforts to keep the stored information accessible by copying it to fresh data carriers or converting it to more current data formats. Furthermore, it needs to be kept accessible to a broad community thereby keeping the vital tacit knowledge alive. Considering the enormous amounts of information created in the past and the staggering volume of information being created nowadays, this can quickly become a quite costly process that only larger organizations or corporations are able to afford (Fig. 8.1).

The ten criteria sustainable for digital artifacts (Stürmer et al., 2017) describe the basic conditions for sustainable digital artifacts and their contribution to sustainable development in a digitized society by keeping access to knowledge and tools as open as possible. They are separated in three groups addressing different aspects of the topic. The first group describes the digital artifact itself, followed by a description of the ecosystem the digital artifact exists in and finally a last criterion linking it to global sustainability.

8.5 Indirect Impacts of Digital Artifacts

Although digital artifacts are merely sequences of bits with the values 0 and 1, they can hold economic value same as other commodities. Their value stems from the fact that digital artifacts can serve as means to satisfy a need or desire, can therefore have practical value meaning their application can have very real consequences in the

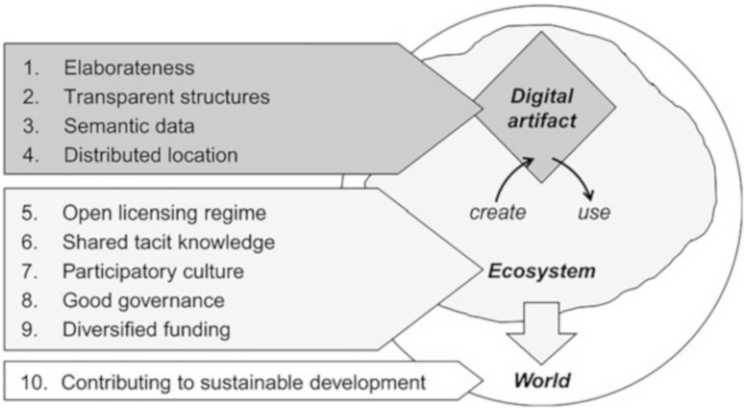

Fig. 8.1 Criteria of sustainable digital artifacts (Stürmer et al., 2017)

analog reality. In contrast to many other commodities, however, digital artifacts are not subject to wear and tear and are inherently non-rival. Moreover, since they can be replicated at very low cost, their availability is practically endless. Therefore, the use of a digital artifact by other people does not impair my own use of the same artifact. Individuals cannot be excluded from making use of a certain digital artifact and the use by one individual does not exclude another person from using them, which makes digital artifacts de facto a common-pool resource. This leaves the question, why somebody should be willing to pay a price for a resource that can be replicated and distributed at almost zero cost.

While the replication and distribution of digital artifacts is almost free of cost, their development is not. This begs the question, why anybody should invest effort in the development of a product that can subsequently be endlessly replicated by anyone at almost no cost. There are two fundamentally different approaches to answer this question:

1. The private model of developing innovative digital artifacts is motivated by the incentive of intellectual property rights granted to the authors or their employer. In return for the effort of developing an innovative digital artifact, the authors or their employer can protect access to their newly developed digital artifact using copyrights and patents. Thereby having an effective tool to lock individuals out from using their digital artifact, they can now dictate licensing or selling prices for their product. The benefit of this model is that there is a strong incentive for innovation. The downside is the lost potential with regard to societal knowledge and under certain circumstances—interestingly enough—loss of innovation. The lock-in strategy has become a widespread strategy in the domain of IT corporations. Following this strategy, the IT corporation not only locks out individuals from using their product without a license, but also strives to lock in the individuals using it with a license. Usually this is done by reducing compatibility and connectivity to an absolute minimum. Taking a common situation in

education, if students have written all their essays and other documents with my software and I have made sure that these digital artifacts may not be edited with any other software or converted to other data formats, I can force these individuals to keep using my software, without having to invest in innovation. The fear of losing access to their own data makes sure that they keep using and paying for my product. The same principle applies when users have all their pictures, videos, social contacts, etc., in one social network with no compatibility or connectivity to others. Even if other, new social networks were better and more innovative, the cost of losing everything and having to start anew is mostly too high for users to make the change. From a technical point of view, there is no reason why you cannot use a Zoom client to enter a Teams call. It is a design decision that separates those two worlds, not for the benefit of its users, but rather with the goal to minimize competition and thereby the need to innovate.

2. In the collective action model, innovation is provided as a public good. The benefit of this model is that society does not experience any loss of knowledge, neither absolutely nor relatively. The downside is that there are less extrinsic incentives for people or corporations to innovate. This might lead to a situation, where no collective action takes place, because those with extrinsic motivations are unwilling to shoulder the effort of developing and maintaining public good and the number of individuals with intrinsic motivation is too low to have an impact. However, research shows that there may be sufficiently high number of individuals with intrinsic motivation, willing to put the effort it, which relieves this model from the collective action problem. In addition, there are business models that do not focus on selling digital artifacts but services around these artifacts, e.g. most Linux distributions or software like OpenOffice or LibreOffice, as will be briefly discussed below.

Digital artifacts have existed for a bit more than half a century, which is less than half a percent of the timespan since humankind started agriculture. Nevertheless, these artifacts already permeate almost every aspect of our lives. It is digital artifacts that enable us to communicate, to perform our work, to get entertained. There are very few parts of our society that are not dependent on digital artifacts and would remain functional without them. This role gives the creator of digital artifacts enormous power over millions of people that are helplessly at their mercy. Nowadays, increasingly, digital artifacts answer questions like: Will the landing gear of an airplane extend or not? Does this person get a loan or not? Is this corporation trustworthy or not? Will this person get the job, the apartment, or the insurance contract? Digital artifacts also increasingly determine what we can or cannot do and how what we do is perceived by others within society. Microsoft's decision to include or exclude a feature in MS Word or MS Excel determines for millions of office workers worldwide, what they can or cannot do.

The Chinese Social Credit System is a perfect example of how data can been collected and then automatically assessed by digital artifacts without or with minimal human interaction. This system is currently unique, but it demonstrates perfectly the power digital artifacts—or rather their creators and controllers—in the form of

algorithms or artificial intelligence can have over an entire society. Whoever controls these digital artifacts, de facto controls Chinese society, because if a digital artifact determines that a certain person is to be hired, avoided, promoted, celebrated, or arrested, the person will be hired, avoided, promoted, celebrated, or arrested, no questions asked.

Of course, most countries are not today's China, but all countries are on their way into a digitized society full of digital artifacts and there is no roadmap giving directions. All we can say is that our perception of the world and our decisions are heavily influenced by digital artifacts and control of these digital artifacts gives a selected group of people disproportionate power over large groups of individuals. It is for this exact reason that open access to digital artifacts and knowledge about them are the main focus of sustainability in a digital environment.

Literature

Adedoyin, F. F., Bekun, F. V., Driha, O. M., & Balsalobre-Lorente, D. (2020). The effects of air transportation, energy, ICT and FDI on economic growth in the industry 4.0 era: Evidence from the United States. *Technological Forecasting and Social Change, 160*, 120297.

Ashton, T. S. (1948). *The industrial revolution (1760–1830)*. Oxford University Press.

Benkler, Y. (2013). Commons and growth: The essential role of open commons in market economies. *The University of Chicago Law Review, 80*(3), 1499–1555.

Cabinet Office (Council for Science, Technology and Innovation). (2016). The 5th Science and Technology Basic Plan (released on January 22, 2016). Retrieved from https://www8.cao.go.jp/cstp/english/basic/5thbasicplan.pdf.

Cadwalladr, C. (2018) The Cambridge Analytica Files. *The Guardian*. Retrieved from https://www.theguardian.com/news/series/cambridge-analytica-files.

Crafts, N. F. (1986). *British economic growth during the industrial revolution*. Oxford University Press.

Hilty, L., & Aebischer, B. (2015). *ICT innovations for sustainability.* Advances in intelligent systems and computing. Springer.

Hilty, L. M., Lohmann, W., & Huang, E. M. (2011). Sustainability and ICT—An overview of the field. *Notizie di Politeia, XXVII,* 13–28.

Kallinikos, J., Aaltonen, A., & Marton, A. (2013). The ambivalent ontology of digital artifacts. *MIS Quarterly: Management Information Systems, 37*(2), 357–370.

Kern, E., Hilty, L. M., Guldner, A., Maksimov, Y. V., Filler, A., Gröger, J., & Naumann, S. (2018). Sustainable software products—Towards assessment criteria for resource and energy efficiency. *Future Generation Computer Systems, 86*, 199–210.

Sorescu, A. (2017). Data-driven business model innovation. *Journal of Product Innovation Management, 34*(5), 691–696.

Stürmer, M., Abu-Tayeh, G., & Myrach, T. (2017). Digital sustainability: Basic conditions for sustainable digital artifacts and their ecosystems. *Sustainability Science, 12*(2), 247–262.

UN. (2014). *A world that counts. Mobilising the data revolution for sustainable development*. Retrieved from https://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf

von Leitner, F. (2019). *Das nützlich-unbedenklich Spektrum*. Retrieved September 9, 2020, from https://media.ccc.de/v/36c3-10608-das_nutzlich-unbedenklich_spektrum

Wenger, E. (2004). Knowledge management as a doughnut: Shaping your knowledge strategy through communities of practice knowledge. *Ivey Business Journal,* 1–8.

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

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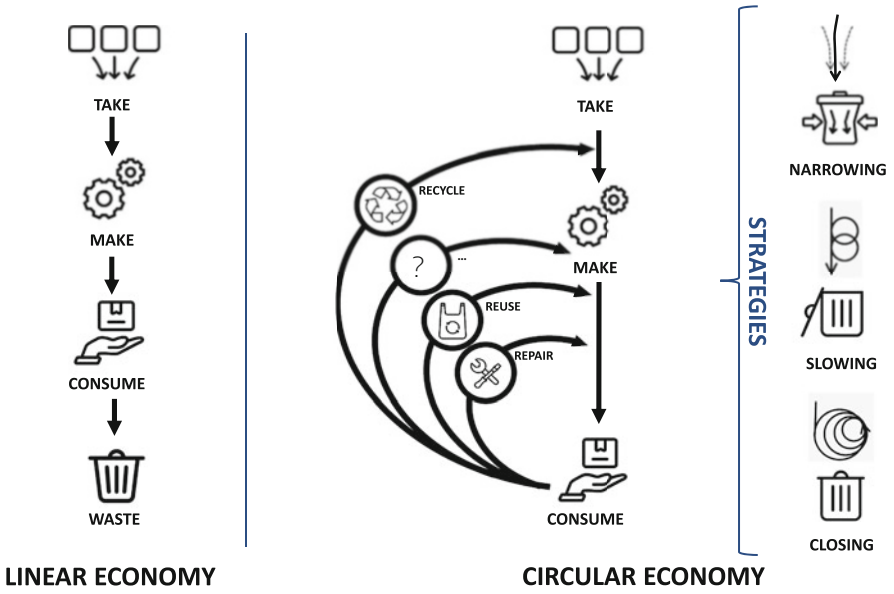

Fig. 9.1 Linear vs. circular economy (source: own representation)

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

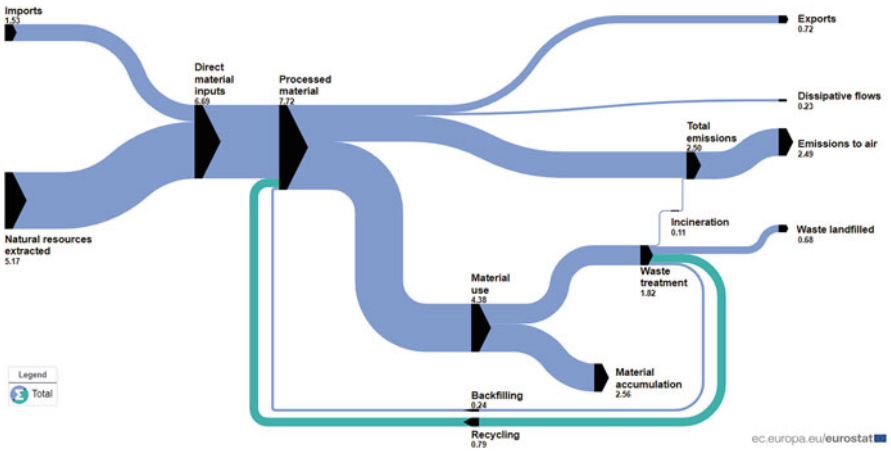

Fig. 9.2 Material flow diagrams for European Union (27 countries) in Gigatons, 2020 (source: Eurostat. (n.d.). Retrieved October 19, 2022 from https://ec.europa.eu/eurostat/web/circular-economy/material-flow-diagram)

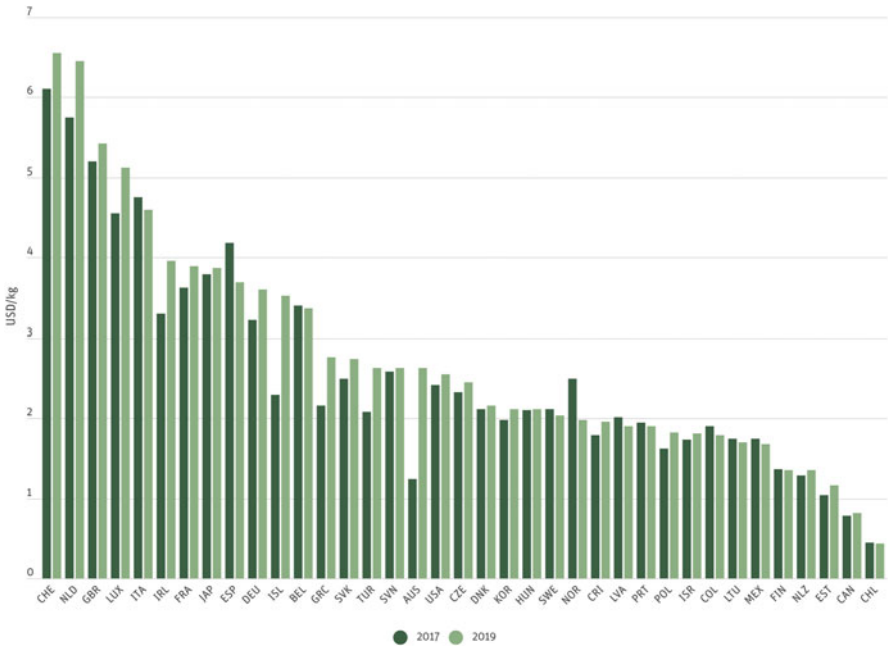

Fig. 9.3 Material productivity measured as economic value (GDP) per kg of materials used for OECD countries (source: own representation based on OECD (2022). https://data.oecd.org/materials/material-productivity.htm#indicator-chart)

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

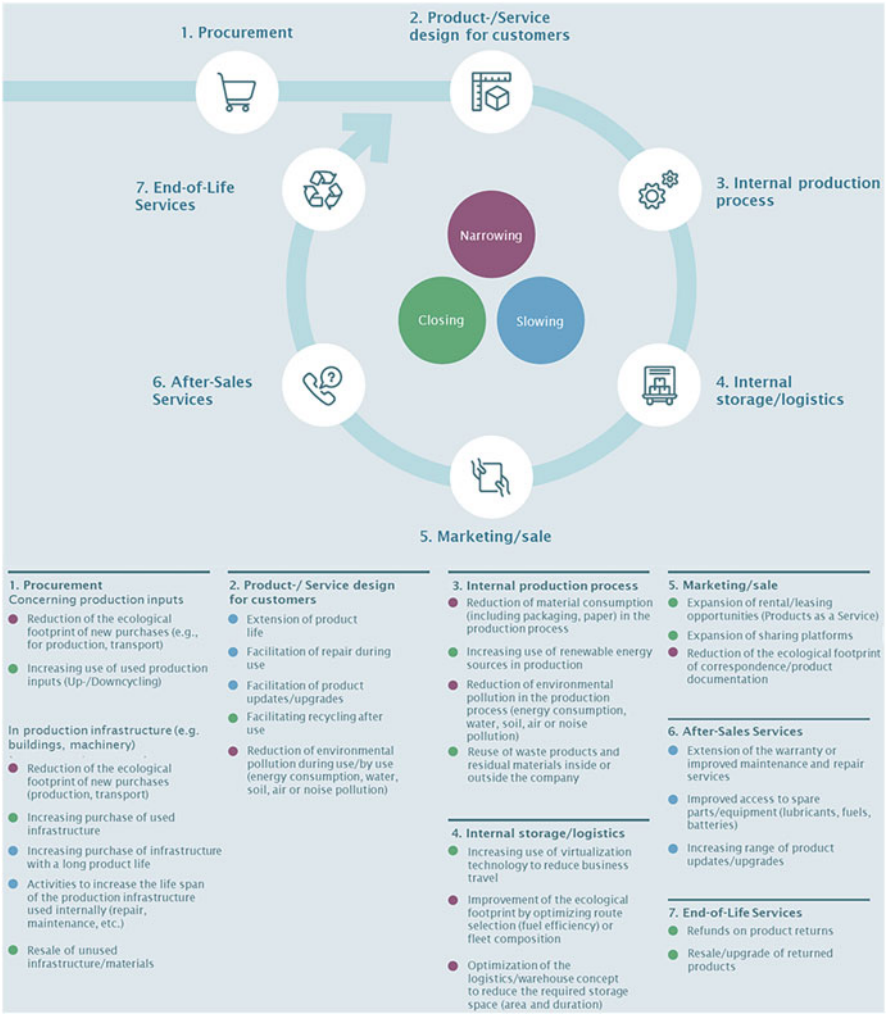

Fig. 9.4 Options for circular economy activities along the value chain of a company (source: Stucki & Wörter, 2021)

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.

Literature

Esposito, M., Terence, T., & Khaled, S. (2017). Is the circular economy a new fast-expanding market? *Thunderbird International Business Review, 59*(1), 630–631.

Wijkman, A., & Skånberg, K. (2017). *The circular economy and benefits for society: Jobs and climate clear winners in an economy based on renewable energy and resource efficiency. A study pertaining to Finland, France, the Netherlands, Spain and Sweden*. The Club of Rome.

YouTube. (2020). *Circular economy: Definition & examples.* (video). Retrieved September 09, 2020, from https://www.youtube.com/watch?v=X6HDcubgxRk

Further Reading

Achterberg, E., Hinfelaar, J., & Bocken, N. M. P. (2016). *Master circular business with the value hill*. Circle Economy.

Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering, 33*(5), 308–320.

Burger, M., Stavropoulos, S., Ramkumar, S., Dufourmont, J., & van Oort, F. (2019). The heterogeneous skill-base of circular economy employment. *Research Policy, 48*(1), 248–261.

De Man, R., & Friege, H. (2016). Circular economy: European policy on shaky ground. *Waste Management and Research, 34*(2), 93–95.

Ellen MacArthur Foundation and the McKinsey Center for Business and Environment. (2015). *Growth within: A circular economy vision for a competitive Europe*. Foundation for Environmental Economics and Sustainability.

EU. (2020). *Circular economy action plan—For a cleaner and more competitive Europe*. Retrieved September 09, 2020, from https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

Horbach, J., Rennings, K., & Sommerfeld, K. (2015). *Circular economy and employment*. SUN Institute Environment & Economics.

Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular economy: The concept and its limitations. *Ecological Economics, 143*, 37–46.

Lieder, M., & Rashid, A. (2016). Towards circular economy implementation: A comprehensive review in context of manufacturing industry. *Journal of Cleaner Production, 115*, 36–51.

Meyer, I., & Sommer, M. W. (2014). Employment effects of renewable energy supply—A meta analysis. *Policy Paper,* 12.

OECD. (2019). *Global material resources outlook to 2060: Economic drivers and environmental consequences*. OECD.

Rizos, V., Rizos, V., Tuokko, K., Tuokko, K., Behrens, A., & Behrens, A. (2017, April). *The Circular Economy: A review of definitions, processes and impacts.* CEPS Research Report No 2017/8.

Schoenmakere, M. D., Hoogeveen, Y., Gillabel, J., Manshoven, S., & Dils, E. (2019). *Paving the way for a circular economy: insights on status and potentials*. European Environment Agency (EEA).

Spörri, A., Stucki, T., Zweidler, R., & von Felten, N. (2022). Die Hürden gegen Ressourceneffizienz und Kreislaufwirtschaft abbauen. Studie zum gleichnamigen Postulat 18.3509 von Ständerat Ruedi Noser. Schlussbericht im Auftrag des Bundesamts für Umwelt. EBP Schweiz AG, Berner Fachhochschule.

Stucki, T., & Wörter, M. (2021). Statusbericht der Schweizer Kreislaufwirtschaft—Erste repräsentative Studie zur Umsetzung der Kreislaufwirtschaft auf Unternehmensebene. Schlussbericht im Auftrag des Bundesamts für Umwelt und Circular Economy Switzerland. Berner Fachhochschule Wirtschaft, ETH Zürich, KOF Konjunkturforschungsstelle.

The Economist. (2022). *The latest IPCC report argues that stabilising the climate will require fast action*. Retrieved April 20, 2022, from https://www.economist.com/science-and-technology/2022/04/09/the-latest-ipcc-report-argues-that-stabilising-the-climate-will-require-fast-action

Van Oort, F. G., Ramkumar, S., Stavropoulos, S., Burger, M. J., Dufourmont, J., & Thissen, M., (2018). *Putting the circular economy to work: Measuring gross employment effects in the Netherlands, 1996-2015* (Working Paper). Erasmus University Rotterdam.

Outlook

The challenges are manifold and require holistic approaches—such as moving to a circular economy—that should have been implemented yesterday than today. But if Western countries, like us in Switzerland, cannot do it, who else will? With our capabilities to produce innovations and purchasing power, we are best placed to take a pioneering role in this transformation and benefit economically from the acquired knowledge and practical expertise. Switzerland's intensive export activities would also lead to a scaling of the effects abroad, thus creating a contribution to global sustainability. So far, Switzerland has not yet taken a pioneering role in the sustainability transition (see Sect. 4.3.2). Patent applications are a reliable indicator for predicting the development of new technologies. Globally collected figures for newly filed patents show that although Switzerland files a relatively large number of green patents, the share of green patents in relation to overall innovation power is below average compared to other OECD countries (OECD, 2022).

Therefore, a long-term rethinking of all involved actors is required: politicians, entrepreneurs, consumers, the financial system, and civil society must work together on the transformation process. Because one thing is clear: if we want to achieve our globally set sustainability goals, we will have to massively adapt the way we do business in the coming years. If we as Switzerland want to maintain our competitiveness in and after this phase, we had better start with a certain knowledge advantage—or at least keep the currently existing gap within limits. Sustainable and circular business is the order of the day and will shape our future all the more.

It is also clear that education in particular has a central role to play in this transformation process. Students will have a significant impact on the transformation for decades to come as consumers, employees, business owners, and politicians. From a scientific perspective, we already have a lot of evidence on what steps should be taken to start the transformation. The goal of future-oriented education must be to

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adequately provide the students with this knowledge. With this reader, we want to contribute to this knowledge transfer from science to practice. We do this in the hope that the challenges of the twenty-first century will finally be tackled in a targeted and effective manner.

Literature

OECD. (2022). *OECD Green Growth Indicators* (database).