Chapter 2

Conceptual framework of sustainable development

In this chapter, a conceptual framework of sustainable development is elaborated by an extensive literature research. Along with this, the first four research gaps are uncovered. Jabareen (2009) defines a “conceptual framework as a network [...] of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena”. Therefore, a conceptual framework is a result of a theorisation, and it is required to understand soft facts and enable interpretations (Jabareen, 2009). Furthermore, it helps to navigate complexity (Pope, Bond, Hugé & Morrison-Saunders, 2017) and thereby supports decision makers during the implementation phase of sustainable development (Chofreh & Goni, 2017).

Among existing sustainable development frameworks (e.g. Baumgartner, 2014; Boron & Murray, 2004; Chofreh & Goni, 2017; Griggs et al., 2014; Maletić et al., 2014), comprehensive approaches are rare, and there is a lack of conflation of various aspects. Hence, a synthesis and integration of multiple sustainable development dimensions is accomplished in this chapter. Established fragments are adopted, and novel elements are added.

Constructing the conceptual framework, this chapter is structured as follows. Section 2.1 discusses distinct definitions of sustainable development and sustainability and adopts one for the remainder of this work. The underlying concepts of the three contentual domains of sustainable development – environmental protection (see Section 2.2.1), social development (see Section 2.2.2), and economic prosperity (see Section 2.2.3) – as well as their linkages (see Section 2.2.4) are presented in Section 2.2. Stakeholders and change agents of sustainable development are introduced in Section 2.3. Multilevel perspectives are present (see Section 2.3.1), and the change agent groups business, policy, and science are debated in Section 2.3.2 to Section 2.3.4. The chapter ends with a summary (see Section 2.4).
2.1 Definition of sustainable development and sustainability

The modern debate on sustainable development is led by the United Nations (UN), who has held world summits for more than 40 years and released the most elaborated concept of sustainable development (Lock & Seele, 2017). The start of their global agenda for a change was the United Nations Conference on the Human Environment (UNCHE), which took place in Stockholm in 1972. In this conference, the foundation of the concept of sustainable development was clarified as the alignment of human development and the planet’s environmental limits (Kates, 2015; UNCHE, 1972). 26 principles on the capacity of the Earth, social as well as economic development for a favourable living, and an action plan with 69 recommendations were worked out (UNCHE, 1972). Further elaborating on the concept of sustainable development, the World Commission on Environment and Development (WCED), also known as the Brundtland Commission, defined sustainable development as a development “that meets the needs of the present without compromising the ability of future generations to meet their needs” (WCED, 1987). To this day, the definition is contemporary and even referred to as an “ethical standard” (Baumgartner, 2014). Centrepiece of this definition is the intergenerational justice (Jerneck et al., 2011) of today’s and tomorrow’s generation regarding two concepts: needs and limits (WCED, 1987). Intergenerational justice spans the first dimension of the sustainable development space: the temporal horizon. The second dimension of sustainable development deals with intragenerational justice of the two concepts. The United Nations Conference on Environment and Development (UNCED) subdivided this second dimension into three contentual domains: environmental protection (given the concept of limits), social development (given the concept of needs), and economic prosperity (UNCED, 1992).¹ These first two dimensions are visualised in Figure 2.1. In spite of the splitting into the three contentual domains, each of them is not a separate crisis, but they are interdependent and mutually reinforcing, requiring a simultaneous and integrated consideration (see Section 2.2.4; WSSD, 2002). Furthermore, sustainable development is a collective responsibility at local, national, regional,² and global levels (WSSD, 2002). This notion constitutes the third sustainable development dimension, the geographical region, depicted in Figure 2.2.

Despite the fact that the UN’s approach to sustainable development and sustainab-

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¹Some authors, e.g. Jesinghaus (2018), interpret the Agenda 21 to subdivide sustainable development into four domains: environment, society, economy, and institutions (UNCED, 1992). As institutions deal with the three contentual domains, a separation at the same level is not systematic, and is thus not adopted in this work. Confirming this view, the SDG 17, “Partnerships for the goals”, does not clearly span its own, institutional domain (see Figure 2.12b).

²The term “regional” may also refer to an area smaller than the national level (e.g. Ramos & Caeiro, 2010). However, the WSSD’s (2002) classification is adopted in this work.
2.1. Definition of sustainable development and sustainability

Figure 2.1 The first two dimensions of the sustainable development space (based on Witjes et al., 2017; with friendly permission of © 2017 The Authors)

Sustainability now represents a global consensus (Costanza, Fioramonti & Kubiszewski, 2016; Vermeulen, 2018), both terms are controversially discussed in the academic literature. On the one hand, scholars such as T. Hahn et al. (2015); Lozano (2008); Sala et al. (2013); Shaker (2015); and Reid (1997) are in line with the UN’s approach, interpreting sustainable development not as a steady state but as a journey or a process of change, adaption, and learning. Contrasting, sustainability is the ideal, dynamic state to achieve. In this case, the pathway of sustainable development ought to be pursued in order to obtain the long-term goal of sustainability (Dragicevic, 2018). On the other hand, authors such as Clark et al. (2016); Holden et al. (2014); and Waas et al. (2014) use both terms interchangeably. Further scholars such as P. James, Magee, Scerri and Steger (2015) argue vice versa: Sustainability is the capacity to persist over time, and therefore, it is a process to achieve the goal sustainable development (Dragicevic, 2018). An overview of different approaches to sustainable development can be found in, e.g. Hopwood, Mellor and O’Brien (2005). Arising from the numerous existing definitions, other works intend to capture the terminology by generating a tag cloud of commonly-used elements in peer-review-published definitions (White, 2013). This approach might be questionable because, for example, in highly subjective areas such as the social domain of sustainable development (see Section 2.2.2), a larger group than the science community should be consulted. However, for merely identifying the main research domains, this reflective method might be legitimate (Kajikawa, Ohno, Takeda, Matsushima & Komiyama, 2007).
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The UN’s approach to sustainable development is adopted for this work because it is most profound and comprehensive (Biermann, Kanie & Kim, 2017; Lock & Seele, 2017) and agreed on by world leaders, awarding it with a high degree of accordance. Sustainable development is interpreted as a process that requires change and transformation (Lock & Seele, 2017; Sala et al., 2013) to a desired development path (T. Hahn et al., 2015) in order to reach the ideal, dynamic state of sustainability (Lozano, 2008; Reid, 1997), which is a long-term goal (Shaker, 2015). If sustainable development and sustainability can be both referred to simultaneously, for brevity, the term sustainable development is preferred in the remainder of this work because sustainability has not yet been reached.

Dealing with sustainable development consists of two modes: first, a descriptive-analytical mode that aims to understand the human-nature interaction in a complex socio-ecological system; and second, a transformational mode that addresses the societal transition required to achieve sustainability (Clark et al., 2016; Hall et al., 2017; McGreavy & Kates, 2012; Schaltegger, Beckmann & Hansen, 2013; Spangenberg, 2011; Wiek, Ness, Schweizer-Ries, Brand & Farioli, 2012). The next section, Section 2.2, sheds light on the first mode and investigates the contentual domains of sustainable development, whereas the other two, already spanned dimensions (temporal horizon and geographical region) do not require further theoretical analysis due to their straightforwardness; they are directly incorporated in the methodological and empirical part (see Chapter 4 et seq.). Subsequently, Section 2.3 addresses the second mode, the stakeholders and change agents of the transition process, expanding the three-dimensional to

Figure 2.2 The first three dimensions of the sustainable development space (based on Witjes et al., 2017; with friendly permission of © 2017 The Authors)
a six-dimensional sustainable development space. The six-dimensional space is the final conceptual framework of sustainable development, required to adequately measure and assess sustainable development. In turn, the adequate assessment is the prerequisite for sustainable development management and its transition (see Chapter 3; e.g. Parris & Kates, 2003).

2.2 The three contentual domains of sustainable development

The UNCED (1992) classified sustainable development into three contentual domains: environmental protection, social development and economic prosperity (see Section 2.1). The following sections, Section 2.2.1 to Section 2.2.3, review and analyse the academic literature of these domains. Other segmentations such as the natural capital approach by Costanza and Daly (1992), the five capital approach by Porritt (2007), or the place-permanence-persons approach by Seghezzo (2009) are not further considered because these attempts “explain the composition of the cake by cutting it into thinner [or different] slices” (Hacking & Guthrie, 2008). The last section, Section 2.2.4 integrates the three domains to a unified dimension of sustainable development.

2.2.1 Environmental protection

In the academic literature of sustainable development, the use of the terms environment and ecology is not precise (e.g. Costanza, Fioramonti and Kubiszewski, 2016; Kates, 2015; and T. Hahn et al., 2015 vs. Hall et al., 2017; and Holden et al., 2014). Ecology is defined as “the branch of biology that deals with the relations of organisms to one another and to their physical surroundings” (Oxford Dictionaries, 2018a). In contrast, the environment is defined as (1) “the surrounding or conditions in which a person, animal, or planet lives or operates”, or as (2) “the natural world, as a whole or in a particular geographical area, especially being affected by human activity” (Oxford Dictionaries, 2018b). Ecology refers to the relationship between an organism and its natural environment, whereas the environment as of definition (1) is something an organism possesses (Mebratu, 1998). In the context of sustainable development, the term ecology is too narrow because only the human-nature interaction would be regarded. The first definition of the term environment is too wide since it would include, in addition to the natural environment, the economic, political, and cultural environment (Mebratu, 1998). These aspects are already assigned to the other two domains – social development (see Section 2.2.2) and economic prosperity (see Section 2.2.3). Finally, the second definition of the environment suits the sustainable development context: The natural environment itself and the human-nature interaction are referred
to simultaneously. It follows that, in this work, *environmental protection* is defined as the path to *environmental sustainability*, a state in which the natural world is not harmed nor degraded by human activity, such that needs of today’s generation are met without compromising needs of tomorrow’s generation.

For highly anthropocentric reasons, the natural world is pointed at: The environmental system of the Earth is intended to remain stable because it provides life-supporting services to humans and is thus a prerequisite for thriving societies (Griggs et al., 2013; Kates, 2015; Steffen et al., 2015). Scientific insights deduced by the natural science community are in the centre of the environmental domain. The main focus is on limits or threshold values as well as interdependences of ecological and Earth system processes (Holden et al., 2017; Patterson et al., 2017; Sala et al., 2015). Especially the research group around Rockström spreads new knowledge in this field. Their concept of planetary boundaries (Rockström et al., 2009a, 2009b; Steffen et al., 2015) perfectly reflects the UN’s concept of limits (see Section 2.1). *Planetary boundaries* are threshold values of life-supporting Earth system processes above which an unacceptable global environmental change might not be possible to be avoided. This zone is the *zone of high risk*. The threshold itself lies in the *zone of uncertainty* that features an increasing risk. Below the boundary, the *zone of safe operating space for humanity* is located. *Core boundaries* are boundaries “each of which has the potential on its own to drive the Earth system into a new state should they be substantially and persistently transgressed” (Steffen et al., 2015). Nine planetary boundaries, thereof two core boundaries (climate change and biosphere integrity), are identified. Figure 2.3 displays the nine planetary boundaries and their current statuses of exploitation. The planetary boundaries stratospheric ozone depletion, ocean acidification, and freshwater use are currently operating in the safe zone. Climate change and land system change are in the zone of uncertainty, while the boundaries biochemical flows and the biosphere integrity’s subboundary genetic diversity are in the zone of high risk. For novel entities, atmospheric aerosol loading, and the subboundary functional diversity, thresholds could not be quantified yet.

Despite the derivation from natural science, the concept of planetary boundaries draws on both objective and subjective matters. Measuring thresholds is objective, but assessing and setting the level of the boundaries is highly subjective because it implies defining the acceptable risk. Therefore, boundary setting is eventually a social decision (Griggs et al., 2014; Leach, Raworth & Rockström, 2013) that requires political decision making (see Section 2.3.3).

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3Detailed descriptions of the planetary boundaries, their functioning, and role in the Earth system are not further outlined but can be found in Rockström et al. (2009b).
2.2.2 Social development

Of the three contentual domains, the social domain of sustainable development is least developed (Missimer, Robert & Broman, 2017a, 2017b). The concept remains open and contested (Boström, 2012), different meanings circulate, and there are difficulties in identifying purely social issues (Murphy, 2012). The literature is fragmented and limited (Ajmal, Khan, Hussain & Helo, 2018; Dempsey, Bramley, Power & Brown, 2011), such that a further development of this domain is required (see Section 6.3).

Murphy (2012) identifies four dimensions in the social domain of sustainable development: equity, awareness, participation, and social cohesion. Cuthill (2010) also points out four key concepts, though, slightly different: social capital, social infrastructure, social justice and equity, and engaged governance. Overviews and more detailed concepts of the social domain can be found in, e.g. Ajmal et al. (2018); Boström (2012); Missimer et al. (2017a); Missimer et al. (2017b); and Murphy (2012). Core concepts include, among others, quality of life, wellbeing, subjective welfare, happiness, life satisfaction, social inclusion, dignity, affection, freedom, and safety (Harangozo, Csutora & Kocsis, 2018; Vavik & Keitsch, 2010). These involve material as well as non-material aspects and their achievement is highly subjective and individually determined (McGregor & Pouw, 2017). Especially the former concepts rather refer to the developed world, where basic needs have been successfully addressed and higher order needs are focused (Vallance, Perkins & Dixon, 2011).\footnote{Vallance et al. (2011) neither specify basic nor higher order needs. The concept of needs adopted in this work follows shortly.} Vallance et al. (2011) subdivide the social domain into three categories: development sustainability, bridge sustainability, and...
maintenance sustainability. Development sustainability addresses basic needs, justice, and equity, whereas bridge sustainability covers the changes in behaviour to achieve environmental sustainability. Maintenance sustainability aims to preserve socio-cultural patterns. In this work, the social domain is understood as development sustainability. Bridge sustainability and the notion of changes in behaviour is the underlying process of sustainable development in general, not only a means of obtaining environmental sustainability. Furthermore, social conditions correlate with environmental protection, but this linkage is not the focal point of the social domain. Maintenance sustainability is disregarded as the preservation of socio-cultural patterns is not necessarily desired. Thus, maintenance is not an overriding principle, but it is actively and explicitly governed. Further authors agree on the notion of development sustainability by Vallance et al. (2011): In view of Ajmal et al. (2018); Holden et al. (2017); Stumpf, Baumgärtner, Becker and Sievers-Glotzbach (2015); and Stumpf, Becker and Baumgärtner (2016), social development is characterised by moral principles and philosophy on needs, equity, and justice. Needs are in-born requirements of humans to be physically, emotionally, and mentally healthy (Missimer et al., 2017a). Equity regards “situations in which the claimant is equally off” (Young, 1995), whereas justice is concerned with the “fair balance of mutual claims and obligations within a community” (Stumpf et al., 2015). Equality also appears frequently in the context of social development and deals with equal considerations as a claim holder or equal shares in distribution (Stumpf et al., 2015). Because equity and equality are principles of justice (Stumpf et al., 2015; Stumpf et al., 2016; Young, 1995), they become obsolete in working out the overarching concepts of the social domain. The guiding principle is justice on its own, supporting the concept of needs. Satisfaction of needs must be fairly balanced across regions (intragenerational justice) and time (intergenerational justice) (Dower, 2004; Stumpf et al., 2015). A definition of social development might therefore read: Social development is the path to social sustainability, a state in which human needs of today’s generation are satisfied in a just manner without compromising the human needs of tomorrow’s generation.

Because the core of the social domain are human needs (see Section 2.1), concepts of human needs ought to be adduced in theorising this domain. The most well-known concept of human needs is the hierarchy of needs by Maslow (1943). He points out that humans are motivated by in-born needs that are ordered hierarchically and can be visualised in a pyramid (see Figure 2.4). At the bottom of the pyramid are needs that humans first seek to satisfy. After their satisfaction, needs from a higher layer are desired to be met, until the top of the pyramid is reached. Physiological needs at the bottom consist of homeostasis and appetite needs. Safety needs include, among others, the need for security, protection, freedom of fear and chaos, as well as structure and law. Belongingness and love needs are the third step on the hierarchy of needs.

\[^5\text{Other works on human needs include, e.g. Max-Neef, Elizalde and Hopenhayn (1991), but are not further examined.}\]
and refer to relations with other people to get and receive affection. Esteem needs can be categorised into two parts: first, self-esteem such as the desire for strength, achievement, competence, and confidence; and second, esteem of others such as desire for reputation, fame, recognition, attention, and dignity. The last stage consists of needs for self-actualisation, which Maslow (1987) described as the “desire to become [...] what one idiosyncratically is”. In other words, humans desire self-fulfilment and seek to become actualised in what they potentially are (Maslow, 1943, 1987). The principle of justice is applicable to every hierarchy level: justice among physiological needs at the bottom and justice among needs to self-actualisation at the top.

The concept of social boundaries is designed in analogy to the concept of planetary boundaries. *Social boundaries* represent thresholds above which basic conditions are met and below which critical human deprivations occur (Raworth, 2012, 2017). These boundaries count water, food, health, education, income and work, peace and justice, political voice, social equity, gender equality, housing, networks, and energy (see Figure 2.5). Water, for example, is measured as the “population without access to improved drinking water [and sanitation]”, or food quantifies the “population undernourished” (Raworth, 2017). The setting of the threshold values and current statuses of achievement as of Raworth (2017) are also displayed in Figure 2.5. Although referencing to the UN’s approach, in particular the SDGs (see Section 2.3.3), Raworth’s social boundaries are mainly applicable to the developing world, which is not in line with the UN suggesting a universally applicable approach. A merger of Maslow’s hierarchy of needs, which includes needs of the developed and the developing world, with Raworth’s concept of social boundaries yields a valuable conceptual framework of the social domain of sustainable development. In this connection, Maslow’s hierarchy is dissolved to a

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6 Maslow (1972) added self-transcendence at the top of the pyramid. However, since he did not include it in his work in 1987, it is also disregarded in this work.

7 Worldwide data set; in the majority of cases one year of calculation between 2008 and 2015.
circle of boundaries. The dissolution is legitimate because the hierarchy might not be significant, but needs might be independent of each other (Tay & Diener, 2011). An illustrative example is an artist not having satisfied all material needs but being rich in terms of self-actualisation.

### 2.2.3 Economic prosperity

Economic growth or profits are often incorporated in the economic domain. However, neither economic growth nor profits are key to sustainable development, nor are they required for a broader conception of it (Jackson, 2009; McGregor & Pouw, 2017; Vermeulen, 2018). Even happiness does not necessarily require economic growth. Empirical evidence suggests diminishing marginal happiness in the course of a rising GDP per capita (p.c.) (Jackson, 2009). The misconception of economic growth or profits being key to sustainable development can be traced back to Elkington (1997) and the triple bottom line of people, planet, profit (Vermeulen, 2018).\(^8\) This misconception is carried forward, and only 8% of reviewed corporate sustainable development literature negatively invoke the term triple bottom line (Isil & Hernke, 2017). Economic prosperity is the third contentual domain of sustainable development, and economic growth is only needed in places where human needs are not met in order to bring people out of poverty (Holden et al., 2014, 2017; McGregor & Pouw, 2017; WCED, 1987). In other words, the production of resources is only required to maintain a reasonable standard of living (Bansal, 2002). Prosperity is defined as the state of being successful in material and financial terms (Oxford Dictionaries, 2018c, 2018d). In contrast, Jackson (2009) does

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\(^8\)Elkington (2018) himself requested to revise his framework of the triple bottom line. It was not designed to be an accounting tool that balances financial, environmental, and social aspects, but it intended to induce reflections about capitalism and its future.
2.2. The three contentual domains of sustainable development

| Literature stream | Assumption, description                                                                 | Example references                                                                 |
|-------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Degrowth economy, negative growth economy | The throughput of an economy can be reduced by political and social transitions while increasing quality of life and wellbeing. | Buch-Hansen, 2018; Harangozo et al., 2018; Kallis et al., 2018; Latouche, 2009; Magee and Devezas, 2017; Schneider, Martinez-Alier and Kallis, 2011 |
| Zero growth economy, steady state economy | The throughput of an economy, capital stocks, and population remain constant at a desired maintenance rate to stay within the planetary [and social] boundaries. Economic growth is not required for increasing wellbeing. | H. E. Daly, 1977, 1991, 1996; Harangozo et al., 2018; Kallis et al., 2018; Kerschner, 2010 |
| A-growth economy | Environmental effectiveness is the central point and an a-growth economy is indifferent about economic growth. | van den Bergh, 2011 |
| Positive growth economy, green growth economy | Economic growth can be decoupled from environmental usage and is based on efficiency as well as environmental-friendly technologies. | Harangozo et al., 2018; Schneider et al., 2011; UNEP, 2011 |
| Green economy | Economic growth is not explicitly addressed, but the improvement of human wellbeing and social equity is focused as well as the reduction of environmental risks and ecological scarcities. | Harangozo et al., 2018; UNEP, 2010, 2011 |

Table 2.1 Overview of (post-)growth literature streams

not define prosperity based on only material success, but prosperity further includes social and psychological aspects. However, as these aspects are already subsumed in the social domain (see Section 2.2.2), economic prosperity in this work follows the Oxford Dictionaries’ definition: *Economic prosperity* is the path to *economic sustainability*, a state in which material and financial success is achieved, such that today’s environmental limits and social (or human) needs are met without compromising future generations’ limits and needs.

The effect of economic growth on sustainable development is ambiguous. On the one hand, economic growth might contribute to sustainable development because first, it might induce technological advancement required to mitigate environmental degradation (Holden et al., 2017; Stern, 2015; van den Bergh, 2011), and second, it might lift people out of poverty, improve social welfare, and satisfy human needs. On the other hand, economic growth might harm sustainable development as it typically entails environmental damages and might reduce social equality (A. B. Atkinson, 2015; Holden et al., 2017; Piketty, 2014) and justice. Because of this ambiguity, various streams of (post-)growth literature have emerged. These are presented in Table 2.1. Degrowth, negative growth, zero growth, steady state, positive growth, and green growth economies
are disregarded by definition since the concept of sustainable development purports that economic growth is merely a means to an end. In contrast, an a-growth economy and a green economy comply with this notion: Economic growth is not a driving force, but human needs and environmental limits are centred.

Economic growth can be understood in terms of GDP, employment, consumption, production and further measures (EC, IMF, OECD, UN & World Bank, 2009). The most widely used economic performance measurement is the GDP, which is defined as the “monetary market value of all final goods and services produced in a country” (Giannetti et al., 2015; van den Bergh, 2009). GDP receives severe criticism for its construction and its use, while its founder, Kuznets (1934a, 1934b), was well aware of its shortcomings – or rather its pointedness. For instance, he was aware of the fact that GDP cannot measure economic welfare because the distribution of income and means of earning the income remain unknown. He even warned not to equalise GDP growth and economic or social wellbeing (Costanza, Hart, Kubiszewski, Posner & Talberth, 2018; Costanza et al., 2014; Kuznets, 1934a, 1934b). Moreover, GDP does not differentiate between desirable and undesirable activities but positively accounts all expenditures. For example, undesired clean-up costs of an oil spill lead to an increase in GDP (Cobb, Halstead & Rowe, 1995; Giannetti et al., 2015; Kubiszewski et al., 2013). GDP gives an incomplete picture by only including priced goods. Social costs such as environmental damages are known as negative externalities and remain unpriced with the result that GDP encourages the depletion of natural resources faster than their renewal rate (Costanza et al., 2018; Costanza et al., 2014; Giannetti et al., 2015; van den Bergh, 2009). Further limitations and examples can be found in, e.g. Cobb et al. (1995); Costanza et al. (2014); Giannetti et al. (2015); Kubiszewski et al. (2013); Stiglitz, Sen and Fitoussi (2009); and van den Bergh (2009). Even the argument that GDP positively correlates with wellbeing indicators such as life expectancy or literacy rate is not enough for GDP being utilised as a measure of wellbeing because a correlation does not attest causality (van den Bergh, 2009). However, GDP is not a wrong measure, but it is wrongly used (Giannetti et al., 2015; Stiglitz et al., 2009). Instead of attempting to measure welfare or progress, ending up with wrong conclusions, GDP’s original purpose should be stuck to: GDP quantifies the size of an economy in monetary terms of final goods and services.

2.2.4 Integration of the three contentual domains

In the previous sections, Section 2.2.1 to Section 2.2.3, it has come to light that a strict separation of the three domains is not feasible, but the three domains are deeply interlinked (WSSD, 2002). To investigate the demanded synchronisation and coordination of the three subsystems nature, society, and economy (Bossel, 1998; Spangenberg, 2011), cross-disciplines such as environmental sociology, economic sociology
2.2. The three contentual domains of sustainable development

(Boström, 2012), or ecological economics (e.g. Costanza & Daly, 1992) have emerged. The interlacing is driven by the socio-economic subsystem’s embeddedness in and dependence on the global biophysical system (Griggs et al., 2014; Patterson et al., 2017; Sala et al., 2015). Changes in environmental circumstances (environmental domain) have resulted in economic gains (economic domain) but not for all people (social domain) (Kates, 2015; Turner II et al., 1990). The principles of limits and needs are combined, and clear cuts between the domains are challenging. Environmental pollution that pushes people back below the social foundation (Raworth, 2012) might be interpreted as an environmental-economic or environmental-social issue. Also, environmental pollution that arises from higher living standards (typically leading to pollution at global level) or environmental pollution that originates in poverty (mostly resulting in pollution at local level (WCED, 1987)) may be classified as environmental-economic or environmental-social problems. This example further evokes thoughts about environmental justice, and it illustrates the ambiguous correlation of income and environmental degradation: Higher living standards but also poverty can lead to environmental degradation. However, it is certain that people only take up with environmental protection if their basic needs are met (Bansal, 2002; Vallance et al., 2011). Similarly, corporations are more likely to engage with sustainable development if they feature a strong financial performance (Campbell, 2007). A more clear-cut example of the linkage of the environmental and the social domains is the discussion whether an environmental tax should be a fixed or progressive tax. Furthermore, the social and economic domains are closely intertwined as income and prosperity brings people out of poverty, ensuring a minimum wellbeing and typically enhancing social cohesiveness (Dragicevic, 2018). Here, ambiguities are also present because economic prosperity at a macro level might reduce social equality, a setback in social development (A. B. Atkinson, 2015; Holden et al., 2017; Piketty, 2014). The relationship of the three domains are illustrated in Figure 2.6. The arrows symbolise the direction of the relationship. Environmental protection and social development are both focal points and mutually dependent, whereas economic prosperity only serves the other two domains and should be adjusted according to their requirements.

On the conceptual side of integrating the three domains, the concepts of planetary and social boundaries are combined, obeying the UN’s core concepts limits and needs. The result is the so-called safe and just space for humanity or doughnut for the Anthropocene (see Figure 2.7a; Raworth, 2012, 2017). The outer boundary represents the environmental ceiling and should not be exceeded. The inner boundary expresses the social foundation and should not be deceeded. Critical natural thresholds are located above the outer boundary, and critical deprivations of human needs occur below the inner boundary. As a result, the safe and just space for humanity is located below the planetary and above the social boundaries, respectively (O’Neill, Fanning, Lamb & Steinberger, 2018; Raworth, 2012, 2017). The current status of the safe and just operating space is
Within the safe and just space, a range of possible pathways that could yield sustainability can be mapped. The preferred trail is highly subjective because it is a function of, among others, cultures, visions, values, costs, risks, and distribution of power (Leach et al., 2013). The existence of a range of possible pathways makes sustainable development a deeply political topic. The role of policy and their current goal setting will be further discussed in Section 2.3.3. Moreover, the range of possible pathways implies that weak sustainability can be applied. The notion of weak sustainability originates from capital theory and assumes substitutability of the different types of capital. Natural and manufactured capital can be reduced individually as long as the overall level of capital passed to future generations remains constant or grows (Cabeza Gutiés, 1996; Figge & Hahn, 2004; Neumayer, 2010; Pearce & Atkinson, 1993; Pope et al., 2017; Sala et al., 2013). This type of sustainability is often represented in a Venn diagram (see Figure 2.8a), the most common graphical representation of sustainability (Dragicevic, 2018; Lozano, 2008; Mebratu, 1998). On the contrary, strong sustainability assumes that the different types of capital are complements and need to be preserved for future generations (Costanza & Daly, 1992; H. E. Daly, 1990; Dragicevic, 2018; Figge & Hahn, 2004; Neumayer, 2010; Sala et al., 2013). Therefore, the capital with the shortest supply is a limiting factor (H. E. Daly, 1990; Dragicevic, 2018). The graphical representation of strong sustainability is often a concentric diagram (see Figure 2.8b; Dragicevic, 2018; Griggs et al., 2013; Lozano, 2008; Mebratu, 1998), with the environmental domain on the outside and the economic domain on the inside because the socio-economic subsystem is embedded in the global biophysical system (see above; Patterson et al., 2017; Sala et al., 2015). Strong sustainability is in line with most

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9 Denotations and statuses of the boundaries slightly differ from Steffen et al. (2015; see Figure 2.3).
10 Lozano (2008) suggests further graphical representations grounded in a critical review of the existing visualisations. Major criticism includes compartmentalisation of the linked domains and the missing representation of dynamics.
2.2. The three contentual domains of sustainable development

(a) The concept of the safe and just operating space for humanity

(b) Current statuses of the nine planetary and 12 social boundaries

**Figure 2.7** The safe and just operating space for humanity (based on/from Leach et al., 2013; Raworth, 2012, 2017; with friendly permissions of © ISSC, UNESCO 2013; © Oxfam International February 2012; © 2017 The Author)

ecological economists (e.g. Costanza & Daly, 1992; H. E. Daly, 2005; Holden et al., 2014; Isil & Hernke, 2017). The reasons behind are twofold. First, the anthropocentric, natural science perspective recognises that human outcomes depend on the functioning of the Earth system (O’Neill et al., 2018) and acknowledges that the limiting factor has become exactly this system (Costanza & Daly, 1992; H. E. Daly, 2005). Second, from an economic perspective, strong sustainability is required as natural and manufactured capital are often complements by their nature (Costanza & Daly, 1992). Synthesising Leach et al.’s (2013) and the ecological economists’ viewpoints, weak sustainability, which is allowed within the safe and just operating space for humanity, should be accompanied by minimised substitutability to respond to both factor limitations and complementarity. However, outside the safe and just space, strong sustainability must be applied because factors of the environmental or the social domain are exhausted and thus become limiting factors. The environmental and the social boundaries must be known to determine whether weak or strong sustainability should be in use.

After dealing with the descriptive-analytical mode of sustainable development by analysing the three contentual domains and their linkages, the next section, Section 2.3, examines stakeholders and change agents of sustainable development. These are prerequisites for the second, transformational mode of sustainable development that aims to put the normative concept of sustainable development into practice (see Section 2.1; Wiek et al., 2012).
Chapter 2. Conceptual framework of sustainable development

2.3 Stakeholders and change agents of sustainable development

At the start of the UN’s debate on sustainable development in the 1970s, the UNCHE (1972) recognised that citizens, communities, enterprises, and institutions at any level should share equitable efforts in the sustainability transition. Groups or individuals that can affect or be affected by actions are stakeholders (Freeman, 1984, 2010; Hörisch, Freeman & Schaltegger, 2014). Change agents are defined as “internal or external actors that play a significant role in initiating, managing, or implementing change” (Caldwell, 2003; van Poeck et al., 2017). Because sustainable development requires change and transformation (see Section 2.1; e.g. Lock & Seele, 2017), it is desired that all stakeholders become change agents who devote actions, behaviour, decision making, and solutions (Hall et al., 2017) towards sustainable development. Thus, the change agent group builds the fourth dimension of the sustainable development framework and can be arranged into four clusters: business, policy, society (Hajer et al., 2015), and science (Lock & Seele, 2017).\footnote{Lock and Seele (2017) divide change agents into several categories: companies, governments, Intergovernmental Organisations (IGOs), private citizens, non-governmental organisations, charitable organisations or non-profit organisations, grassroot organisations, media, future generations (though, being passive stakeholders), and academia. For this work, this granularity is not required but the general structure is adopted.} Each group acts on every sustainable development dimension. To facilitate the visualisation of the sustainable development space, the
2.3. Stakeholders and change agents of sustainable development

Figure 2.9 The first four dimensions of the sustainable development space

previously displayed cube is now disassembled into its six squares; each represents one sustainable development dimension. Figure 2.9 shows the visualisation of the first four dimensions of the sustainable development space: the temporal horizon, contentual domain, geographical region, and the change agent group. The fifth and sixth dimension will follow in Section 2.3.1 and Section 2.3.2.

In the following section, Section 2.3.1, the *multilevel perspective* is discussed. It is a framework that conflates the different change agents into one, unified framework. Hereafter, the main change agent groups business, policy, and science are examined (see Section 2.3.2 to Section 2.3.4). The group society is not further investigated as deeper insights from sociology or further disciplines are beyond the scope of this work. However, society remains an indispensable change agent group in the sustainability transition as, for instance, private citizens can influence corporations by their consumer behaviour (Kucuk & Krishnamurthy, 2007) and politics by their election decision.

2.3.1 The multilevel perspective

In sustainable development, multiple perspectives are present (Lock & Seele, 2017; Seyfang & Haxeltine, 2012) for two reasons. First, various types of stakeholders exist and have myriad demands (Perez-Batres, Miller & Pisani, 2011). Second, sustainable development, which is a society level concept (see Section 2.3.2; e.g. T. Hahn et al., 2015), requires change and transformation (Lock & Seele, 2017) at multiple scales and across all sectors (Griggs et al., 2014) because effects on the planet are the cumulative results of individuals (Dahl, 2012). Both sustainability transition frameworks – the multilevel perspective and transition management – organise these multiple perspectives into three levels: micro, meso, and macro (e.g. Geels, 2002; Kemp, 1994; Köhler
et al., 2019; Loorbach, 2010; Markard, Raven & Truffer, 2012; Rip & Kemp, 1998; Rotmans et al., 2001; Smith, Voß & Grin, 2010). By doing so, the big picture and the broader problem framing can be captured (Smith et al., 2010), which is in turn necessary for a successful transition to sustainability. Only if multiple actors cooperate, their actions can intensify each other, leading to a successful transition (Loorbach, 2007). On the one hand, the multilevel perspective regards technological change for sustainable development and organises the analysis into niches (micro), regimes (meso), and landscapes (macro) (e.g. Geels, 2002; Kemp, 1994; Loorbach, 2007; Rip & Kemp, 1998; Smith et al., 2010). Niche is the level of innovation inside which novelties are created, tested, and diffused. A regime is the “dominant culture, structure and practice embodied by physical and immaterial infrastructures”, whereas a landscape is defined as the overall societal setting (e.g. social values, political cultures, or economic trends), in which a process of technological change occurs (Loorbach, 2007). Given its focus on technological change, this framework is not further regarded in this work. On the other hand, the transition management framework by Rotmans et al. (2001) is of relevance for this work because it is a decision-oriented framework that sorts the aggregational size of stakeholders and change agents of sustainable development into micro, meso, and macro. A micro object comprises individuals and individual actors, a meso object is composed of networks, communities, or organisations, whereas a macro object is a conglomerate of institutions or organisations. Because this framework also addresses micro, meso, and macro levels, it is also referred to as the multilevel perspective. Every stakeholder can be divided to the three aggregational sizes. For example, business may be an individual economic agent (micro), a corporation (meso), or a branch or an overall economy (macro); policy may be a single politician (micro), a single national government (meso), or an IGO (macro); and so on ad nauseam. Figure 2.10 illustrates this novel dimension within the sustainable development space, which is disregarded in existing sustainable development frameworks (see Chapter 2; e.g. Chofreh & Goni, 2017). This perspective gap is closed by the present framework. The sixth and last dimension follows in the next section, Section 2.3.2, which deals with the change agent group business.

2.3.2 Corporate sustainability

Without dedication and leadership by corporations to sustainable development, sustainable development will not be reached (Sachs, 2012). Sustainable production and consumption are the major challenges of sustainable development (Sala et al., 2013; Weitz et al., 2018), and corporations represent the productive sources of the economy, producing and consuming resources (Bansal, 2002; T. Hahn & Figge, 2011).

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12 Further definitions of landscapes, regimes, and niches exist and can be found in, e.g. Geels (2002); and Rip and Kemp (1998).
2.3. Stakeholders and change agents of sustainable development

Analysing corporations with respect to sustainable development, T. Hahn and Figge (2011) developed three conceptual principles: instrumental finality, teleological integration, and practicability. First, *instrumental finality* is concerned with the determinateness of corporate sustainability and can be either organisational or societal (G. D. Atkinson, 2000; T. Hahn & Figge, 2011). *Organisational* sustainable development targets the long-term survival of the firm (G. D. Atkinson, 2000; T. Hahn & Figge, 2011), advancing financial performance by means of environmental and social issues (Dyllick & Hockerts, 2002). In other words, environmental and social issues only enter the equation to the degree of an opportunity for business success (T. Hahn & Figge, 2011). Sustainable development is seen as a source of value creation (Baumgartner, 2014; McWilliams & Siegel, 2011). To this end, *corporate sustainability* is defined as meeting the needs of a firm’s direct and indirect stakeholders, without compromising its ability to meet the needs of future stakeholders as well (Dyllick & Hockerts, 2002). *Societal* sustainable development of the firm postulates corporate contributions to sustainable development at society level. The firm should only exist to the degree it contributes (G. D. Atkinson, 2000; T. Hahn & Figge, 2011). Societal instrumental finality is demanded because sustainable development is a society level concept (T. Hahn, Figge, Pinkse & Preuss, 2010; T. Hahn et al., 2015; Jennings & Zandbergen, 1995). Corporate sustainability must be about transposing the notion of sustainable development to the business level (Dyllick & Hockerts, 2002), such that corporate sustainability is conceptually linked to the Brundtland definition of sustainable development (Montiel & Delgado-Ceballos, 2014). Consequently, businesses themselves cannot become sustainable (T. Hahn et al., 2015; Jennings & Zandbergen, 1995), but their contribution at society level is haunted. The triple bottom line of people, planet, profit by Elkington (1997)
is not only a misconception in the society level concept of sustainable development but also in corporate sustainability. In the society level concept, economic prosperity and not economic growth is key to sustainable development (see Section 2.2.3; e.g. Vermeulen, 2018); for corporate sustainability, also economic prosperity and not profit is key as societal instrumental finality is required (see above). Furthermore, the defensive approach of corporate social responsibility is not enough because it only addresses corporations’ responsibility to society and regards the moral obligation of managers (Bansal & Song, 2017). Only negative impacts of businesses on society are eliminated (Baumgartner, 2014; Carpenter & White, 2004), but contributions to sustainable development must be tackled by a scientific system perspective (Bansal & Song, 2017). This perspective is pursued by corporate sustainability and societal instrumental finality.

Second, teleological integration deals with the integration of environmental, social, and economic aspects (T. Hahn & Figge, 2011). This integration is seen as a major challenge in post-modern society and thus in corporate sustainability (Gladwin, Kennelly & Krause, 1995; T. Hahn & Figge, 2011; Taylor, 1989) as the interlinkages include tensions (T. Hahn et al., 2015). Tensions may arise along each sustainable development dimension visualised in Figure 2.10, forthcoming in Figure 2.11. Four management approaches are identified that cope with tensions. The win-win perspective regards situations in which the three domains are in harmony, such that economic, social, and environmental objectives can be reached simultaneously (T. Hahn et al., 2010). The business case for sustainable development is realised (Dyllick & Hockerts, 2002; T. Hahn et al., 2010) by avoiding tensions through alignment of the three domains. This typically implies an economic bias, which is referred to as bounded instrumentality (T. Hahn & Figge, 2011; T. Hahn et al., 2010; van der Byl & Slawinski, 2015). The triple bottom line leads to bounded instrumentality. By limiting itself to profit maximisation, this perspective is likely to dismiss potential positive corporate contributions to sustainable development (T. Hahn et al., 2010). The trade-off perspective recognises that there are situations in which the three domains cannot be obtained simultaneously. Owing to the multidimensionality of sustainable development, these situations are rather the rule than the exception, and thus, corporate sustainability is required to conceptually be able to deal with trade-offs (T. Hahn & Figge, 2011; T. Hahn et al., 2010). In this management perspective, tensions are avoided by choosing one sustainable development element over the other. Typically, profits are sought to be maximised (van der Byl & Slawinski, 2015). Thinking “beyond the business case” is required (Dyllick & Hockerts,

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13 According to T. Hahn et al. (2015), tensions may only arise along three dimensions: levels, process of change, and context. Levels refer to the aggregational size and can be individuals, organisations, or systems. This view is in line with the multilevel perspective by Rotmans et al. (2001) (see Section 2.3.1). Process of change regards the three contentual domains, and context refers to the temporal and spatial context (i.e. intergenerational and intragenerational aspects, respectively).

14 Opposing, Pradhan et al. (2017) conclude in their empirical study that there are typically more synergies than trade-offs. Nonetheless, conceptual ability to deal with trade-offs remains essential because they have to be managed regardless of their relative frequency.
2.3. Stakeholders and change agents of sustainable development

Figure 2.11 The six-dimensional sustainable development space and the three conceptual principles of its management

2002; T. Hahn & Figge, 2011; T. Hahn et al., 2010, 2018; T. Hahn et al., 2015), and businesses should not have any a priori economic superiority (T. Hahn & Figge, 2011) but simultaneously address the three, interconnected sustainable development domains (T. Hahn et al., 2015). The integrative perspective requests managers to pursue different sustainable development aspects at once even if they are oppositional (T. Hahn et al., 2015). The focus is shifted from economic to environmental and social issues (van der Byl & Slawinski, 2015), and solutions for the entire system of interrelated elements are looked for (Gao & Bansal, 2013). Last, the paradox perspective explicitly acknowledges tensions (T. Hahn et al., 2018) by coexistence of oppositional elements (Clegg, Vieira da Cunha & Pina e Cunha, 2002; T. Hahn et al., 2015; Lewis, 2000). These situations are managed by first accepting the contradictions and second exploring them (van der Byl & Slawinski, 2015), such that managers are able to achieve competing objectives (T. Hahn et al., 2018). T. Hahn et al. (2018); T. Hahn et al. (2015); and van der Byl and Slawinski (2015) agree that in terms of teleological integration, the paradox perspective must be implemented. Notwithstanding, Landrum and Ohsowski (2018) find that the dominating mindset is the business case for sustainable development, which neither acknowledges the paradox theory nor tensions in general.

Third, practicability refers to the need of effectively informing and guiding decision makers (Boron & Murray, 2004; T. Hahn & Figge, 2011). These three conceptual principles do not only apply to their original field of corporate sustainability but can be transferred to the management of sustainable development in general. Therefore, they enter the conceptual framework of sustainable development (see Figure 2.11).

The three conceptual principles – societal instrumental finality, paradox teleological integration, and practicability – are urged to be embedded into all decisional tiers
(Engert, Rauter & Baumgartner, 2016; Galbreath, 2009; R. Hahn, 2013), opening the sixth and last dimension of the sustainable development space. The decisional tier can be divided into three levels: normative, strategic, and operational (Baumgartner, 2014; Ulrich, 2001). The normative tier deals with the management philosophy and basic beliefs as well as values of the corporation that influence behaviours and decisions of management and employees (Baumgartner, 2014; Ulrich, 2001). The strategic tier is responsible for the effectiveness of the sustainability strategy. The process of planning, implementing, and evaluating effects is dealt with in order to achieve the long-term goals (Baumgartner, 2014; David, 2009). The operational tier is concerned with efficiency and implements normative and strategic goals (Baumgartner, 2014; Ulrich, 2001). This model is known as the St. Gallen management model (Ulrich, 2001). Similar to the conceptual principles, the decisional tiers are not only of relevance for corporate sustainability but for sustainable development management in general, entering the conceptual framework. The final version of the framework, with its six dimensions and three conceptual principles, is pictured in Figure 2.11. Despite the need to address all three decisional tiers, many corporations only integrate corporate sustainability at the operational tier (Engert et al., 2016; Galbreath, 2009; R. Hahn, 2013). This operational-to-normative gap is seen as the major reason in the lack of progress towards (corporate) contributions to sustainable development (Baumgartner & Rauter, 2017; Tseng et al., 2018) and is hence taken into consideration in the selection process of the sustainable development measurement method (see Section 3.1 to Section 3.2).

Generally, corporations need an incentive to engage in corporate contributions to sustainable development (T. Hahn & Figge, 2011; Husted & de Jesus Salazar, 2006). Incentives and drivers can be of internal or external nature (Lozano, 2015), and several theories exist to explain engagements in corporate sustainability. An overview on literature streams, their main assumptions, and example references from theory-building, summarising, or empirical studies are given in Table 2.2. The last column of Table 2.2 evaluates the fulfilment of the respective theory with the conceptual principles of societal instrumental finality and paradox teleological integration (see Figure 2.11). Practicability is not meaningful to be evaluated in this context but will be taken up on in Chapter 3. The natural resource-based view focuses on competitive advantage and maximisation of the firm, such that bounded instrumentality is present. The win-win or the trade-off perspective might be the managing view. Institutional, legitimacy, and stakeholder theories are driven by stakeholders and therefore may fit the criteria of instrumental finality and teleological integration if stakeholders desire or enforce these. Stewardship theory and sustaincentrism are the only theories that conceptually include societal instrumental finality and paradox teleological integration at any time. Consequently, corporations are encouraged to take actions to employ stewards and implement sustaincentrism in their organisation. Further studies on drivers of corporate sustainability include Engert et al. (2016); and Lozano (2015). Eccles, Ioannou and
| Literature stream                          | Assumption                                                                 | Example references                                                                 | Societal instrumental finality and paradox teleological integration |
|------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Natural resource-based view, agency theory | Corporations depend on natural and manufactured resources and regard their scarcity to gain competitive advantage. Managers are rational agents and maximise profits. | T. Hahn and Figge, 2011; Hart, 1995; Hart and Dowell, 2011; Jensen and Meckling, 1976; McWilliams and Siegel, 2011; Montiel and Delgado-Ceballos, 2014 | No                                                                   |
| Stakeholder theory                       | Corporations keep the interest of their stakeholders in mind in order to achieve a superior performance. | Freeman, 1984, 2010; R. Hahn and Kühnen, 2013; Laplume, Sonpar and Litz, 2008; Montiel and Delgado-Ceballos, 2014; Perez-Batres et al., 2011; Shevchenko, Lévesque and Pagell, 2016 | Only if stakeholders desire |
| Legitimacy theory                        | Corporations require a *licence to operate*, granted by their stakeholders. | Bansal and Clelland, 2004; Baumgartner, 2014; Deggan, 2002; DiMaggio and Powell, 1983; Dowling and Pfeffer, 1975; R. Hahn and Kühnen, 2013; Perez-Batres et al., 2011; Schaltegger and Hörisch, 2017; Suchman, 1995 | Only if stakeholders desire |
| Institutional theory                     | Institutional culture of the corporation enables and constrains behaviour. | Campbell, 2007; DiMaggio and Powell, 1983; Egels-Zandén and Wahkqvist, 2007; Galbreath, 2010; Limmenluecke and Griffiths, 2010; J. W. Meyer and Rowan, 1977; Montiel and Delgado-Ceballos, 2014 | Only if regulations or stakeholders enforce and institutionalise |
| Stewardship theory                       | Managers receive a higher utility from pro-organisational, collectivistic than self-serving behaviour and actively shape pathways of social and environmental change. | Davis, Schoorman and Donaldson, 1997; Folke, Biggs, Yes Norström, Reyers and Rockström, 2016; Godos-Diez, Fernández-Gago and Martínez-Campillo, 2011; Tseng et al., 2018 | Yes                                                                   |
| Sustaincentrism                          | Managers are guided by an environmental and moral compass.                  | Gladwin et al., 1995; Montiel and Delgado-Ceballos, 2014; Valente, 2012             | Yes                                                                   |

*Table 2.2* Overview of literature streams of corporate sustainability drivers
Serafeim (2014) investigate vice versa and tackle the impact of corporate sustainability on organisational processes and performances.

### 2.3.3 Political goal setting: The United Nations’s (UN) Sustainable Development Goals (SDGs)

Policy making and the involvement of governments are inherent in sustainable development (Meadowcroft, 1997, 2011). The subjective nature of sustainable development means going beyond efficiency and deciding upon one of the multiple pathways (see Section 2.2.4; Leach et al., 2013), requiring negotiations in a democratic system (McGregor & Pouw, 2017). Moreover, governments exercise control by launching laws or regulations and by providing public goods such as infrastructure (Clarkson, 1995; Hood & Margetts, 2007; Lock & Seele, 2017). IGOs frame political interactions (Meadowcroft, 2011), and in this vein, the UN has released the most elaborated concept of sustainable development (see Section 2.1; Lock & Seele, 2017). Further international organisations such as the Organisation for Economic Co-operation and Development (OECD) and International Labour Organization (ILO) spread advices on political landscapes and legal frameworks for sustainable development in documents such as ILO (2013); and OECD (2016).

However, as in previous sections, this work continues to concentrate on the UN’s approach to sustainable development. Section 2.1 has dealt with the normative concept of the UN’s approach, whereas this section regards the strategic level and the release of development goals.

The first development goals were the Millennium Development Goals (MDGs). The MDGs are an integrated framework adopted by 189 countries around the world in the 2000s, aiming at social development and improved living standards of the world’s poor (Glaser, 2012; Griggs et al., 2014; Sachs, 2012; UNGA, 2000). With the MDGs, measurable and timebound objectives were set, promoting global awareness, political accountability, social feedback, and public pressure for sustainable development (Sachs, 2012). In 2015, the MDGs were replaced by the SDGs. The SDGs do not only embrace developing countries but are universally applicable to all countries and geographical regions (Glaser, 2012; Sachs, 2012). Given the third dimension of the sustainable development space (see Figure 2.11), an essential improvement is realised. The SDGs promote social development and economic prosperity in harmony with nature for all nations and are globally accepted as the content and meaning of sustainable development (Dahl, 2018; UNCSD, 2012; UNGA, 2015). There are 17 SDGs with 169 targets and 232 indicators in total. The goals and targets are agreed on by international negotiation, whereas the indicators are worked out and annually refined by an expert group (UN, 2018, 2019a; UNGA, 2015). With the numerous, quantitative indicators, progress can be monitored, policy may be informed, and accountability of all stakeholders can be

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15 The ILO focuses topics of labour and thus only regards the social or economic domain.
ensured (UN, 2019a). The SDGs are, similar to the MDGs, voluntary, time-bounded targets (Glaser, 2012) and can be summarised to poverty elimination, sustainable lifestyles for all, and a stable resilient planetary life-supporting system (Griggs et al., 2014). In detail, the 17 SDGs read (UN, 2018):

- SDG 1: End poverty in all its forms everywhere.
- SDG 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
- SDG 3: Ensure healthy lives and promote wellbeing for all at all ages.
- SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
- SDG 5: Achieve gender equality and empower all women and girls.
- SDG 6: Ensure availability and sustainable management of water and sanitation for all.
- SDG 7: Ensure access to affordable, reliable, sustainable, and modern energy for all.
- SDG 8: Promote sustained, inclusive, and sustainable economic growth; full and productive employment; and decent work for all.
- SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation.
- SDG 10: Reduce inequality within and among countries.
- SDG 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.
- SDG 12: Ensure sustainable consumption and production patterns.
- SDG 13: Take urgent action to combat climate change and its impacts.
- SDG 14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
- SDG 15: Protect, restore, and promote sustainable use of terrestrial ecosystems; sustainably manage forests; combat desertification; halt and reverse land degradation; and halt biodiversity loss.
- SDG 16: Promote peaceful and inclusive societies for sustainable development; provide access to justice for all; and build effective, accountable, and inclusive institutions at all levels.
- SDG 17: Strengthen the means of implementation and revitalise the global partnership for sustainable development.

Figure 2.12a displays the 17 SDGs and Figure 2.12b shows their allocation to the three contentual domains. Four goals are assigned to the environmental domain, eight goals belong to the social domain, another four goals make up the economic domain and
one goal, SDG 17 on partnership for the goals, cannot be assigned to any but affects all contentual domains.

The SDGs are critically discussed in the academic literature. On the positive side, they open the door to a unified framework of sustainable development (Griggs et al., 2014), and the level of ambition and comprehensiveness are the greatest so far in the history of political goal setting for sustainable development (Biermann et al., 2017). Similar to the MDGs, the SDGs place this goal setting at the centre of political agendas and generate worldwide commitments and actions (Glaser, 2012). The novel bottom-up, non-legally-binding approach is a key success factor as, among others, moral and practical commitments feature lower transaction costs as well as fewer delays than the classical top-down approach (Biermann et al., 2017; Hajer et al., 2015; Sachs, 2012). Nonetheless, the SDGs are explicit in the endpoint and may therefore clarify pathways to necessary end outcomes (Vermeulen, 2018). The SDGs are universally applicable (Glaser, 2012; Griggs et al., 2013; Sachs, 2012), and the small number of goals as well as their simplicity are essential for focus and effectivity (Griggs et al., 2014; Sachs, 2012). Yet, the goals and targets are comprehensive (Pradhan et al., 2017). Besides, they are practicable (Sachs, 2012), measurable (Griggs et al., 2013), and science provides guidance on their framing (Glaser, 2012; Griggs et al., 2014), such that the important science-practice interlinkage is realised (see Section 2.3.4). To sum up, advocates claim major requirements of the sustainable development framework are met.

However, opponents of the SDGs do not interpret the bottom-up approach as a success factor but claim that an obligation for target fulfilment should be established. Otherwise, counterproductive drivers are supported, and only easily achievable targets might be chosen with the result that the full potential of the SDGs might be forfeited (Allen et al., 2019; Spangenberg, 2017). Furthermore, the global goals and targets must
be translated into corresponding efforts at the national level (Dahl, 2018). In addition, the SDGs are said to be vague, weak, or meaningless (Holden et al., 2017; Stokstad, 2015). 54% of the targets require further work and need to be strengthened by, for instance, determining endpoints and time frames for an accurate measurement. 17% of the targets are non-essential and can be disregarded (ICSU & ISSC, 2015; Stokstad, 2015). Spaiser et al. (2017) reinforce these qualitative assertions by empirical evidence derived by several multivariate techniques. They conclude that the economic domain is valid, the social domain is well represented, but the environmental domain is poorly defined and incoherent. Scholars generally agree that further research is demanded in the environmental domain, among others, the planetary boundaries must be linked to the SDGs and broken down to national or corporate level (see Section 2.2.1 and Section 6.3; e.g. O’Neill et al., 2018; Whiteman et al., 2013). Further criticism involves that there are repetitions and that the environmental goals 12 to 15 are not quantifiable (Holden et al., 2017). The author of this work does not agree on this criticism as the UN (2018) lists numerous solid, quantitative indicators. Nonetheless, the author agrees on Holden et al.’s (2017) criticism that the SDGs rest on wrong premises by balancing the three dimensions. The UN (2018) includes economic growth as a sustainable development indicator but does not specify a threshold above which economic growth is not required anymore. Further criticism includes having too many goals results in not having a goal at all. Therefore, only relevant indicators should be chosen (see Section 3.1; Háč, Janoušková & Moldan, 2016; Holden et al., 2017; Janoušková, Háč & Moldan, 2018; Reyers, Stafford-Smith, Erb, Scholes & Selomane, 2017). Reyers et al. (2017) offer an approach to monitor the SDGs with only essential variables. Moreover, prioritisation of the SDGs is a prerequisite for effectiveness of actions. The SDGs are individually straightforward but the system as a whole, its dynamics, synergies, and trade-offs have to be understood (Allen et al., 2019; Nilsson et al., 2016; Pradhan et al., 2017; Sachs, 2012; Spaiser et al., 2017; Weitz et al., 2018). This knowledge gap must be solved for maximising progress on the SDGs (Costanza, Fioramonti & Kubiszewski, 2016; ICSU & ISSC, 2015; Spaiser et al., 2017; Weitz et al., 2018), critically determining the selection process of the sustainable development assessment method (see Section 3.1 to Section 3.2). If decision makers ignore the interlinkages and overlaps, important contributions to sustainable development may be missed. However, decision makers require science-based assistance for complexity reduction and prioritisation. First works on SDG prioritisation include, for instance, Allen et al. (2019); Pradhan et al. (2017); and Weitz et al. (2018). New insights on the system dynamics, synergies, and trade-offs will be contributed by the empirical part of this work (see Chapter 5).

To sum up, the SDGs entail both risks and opportunities: The SDGs bear the risk of

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16 Folke et al. (2016); and Rockström and Sukhdev (2014) assign SDG 12 on responsible consumption and production to the economic domain. The author of this work rather agrees with Holden et al. (2017) and the SDG 12 being an environmental goal (see Section 5.3.1).
creating a huge bureaucratic burden with failure of practical results, and they have the potential to transform the globe towards sustainable development. To reduce the risk of failure, the knowledge gap must be closed. This is a task for the science community (including this work), which is characterised in the next section, Section 2.3.4.

2.3.4 Sustainability science

Last, the science community is fundamental in the process of sustainable development because it crafts knowledge, facilitates the transition with the new knowledge, passes the knowledge on to young people in institutions of higher education, and publishes the information for the public (Bachmann, 2016; Barth, 2016; Clark, 2007; Clark et al., 2016; Folke et al., 2016; Lock & Seele, 2017). The discipline sustainability science was initiated by Kates et al. (2001), decades after the start of the intergovernmental debate headed by the UN (see Section 2.1 and Section 2.3.3). Kates (2015); and Kates et al. (2001) raised seven core questions to be answered by the discipline, drawing on both the descriptive-analytical and the transformational mode (see Section 2.1; Wiek et al., 2012). The dual mission of sustainability science (Hall et al., 2017; McGreavy & Kates, 2012) shapes this discipline, always seeking solutions to real world problems and being teleologically directed towards sustainable development (Spangenberg, 2011). Most importantly is the connection of science (knowledge) and practice (societal action and informed decision making) between which sustainability science creates a dynamic bridge (Clark, 2007; Kates, 2015; Sala et al., 2015; Turner II et al., 2003). To manage both the descriptive-analytical and the transformational mode, sustainability science needs to be transdisciplinary (Jahn, Bergmann & Keil, 2012; Lang et al., 2012; Schaltegger et al., 2013; Spangenberg, 2011). Transdisciplinary research is not only characterised by science-practice collaborations that focus on societally relevant problems and seek for real-world solutions, but also by methodological pluralism and collaborations of various disciplines (Lang et al., 2012; Schaltegger et al., 2013; Spangenberg, 2011).17 In sustainability science, pluralism is required to handle the complexity arising from the multidimensionality of the framework. A conceptual agenda for transdisciplinary research can be found in Jahn et al. (2012); and Lang et al. (2012) and is reproduced in Figure 2.13. Societal and scientific practice work hand in glove. During the first phase (Phase A), a societal problem is identified and triggers the scientific research question. Herefrom, the joint problem is framed, and collaborative teams from academia and practice are built, such that mutual learning among researchers and practitioners is enabled. In Phase B, solution-oriented and transferable knowledge is generated and disclosed. Subsequently, this knowledge is reintegrated and applied, leading to useful and relevant results for social and scientific practice in Phase C. This in turn loops

17A detailed differentiation of disciplinary, multidisciplinary, interdisciplinary, and transdisciplinary research can be found in Schaltegger et al. (2013).
Taking into account the research reviewed for this work, the discipline sustainability science has accomplished Phase A to the point of being on hold for further feedback loops. Societal and scientific problems are framed, which, for example, resulted in the SDGs (see Section 2.3.3). The development of a sustainable development indicator set demands scientific knowledge production as well as political norm creation (Rametsteiner, Püzl, Alkan-Olsson & Frederiksen, 2011). The SDGs successfully draw this line from science to practice first by the process itself (see Section 2.3.3) and second by providing results of the goals, targets, and indicators for political decision making as well as scientific analysis. Actor specific and scientific disclosure (Phase B) has been performed. Examples include corporations that disclose sustainability reports in accordance with the standard of the GRI (see Section 3.3.1; GRI, 2016) and the growing number of academic publications (Kates, 2015). Phase C has been entered but it is not finalised yet, such that sustainable development remains a vision of future (White, 2013). Useful and relevant results for society and science have been generated but are not completed. On the scientific side, not all planetary boundaries have been quantified, the concept of social boundaries demands further refinement, and the corresponding economic system has to be designed (see Section 2.2). On the societal side, for instance, practicability and effectiveness of the SDGs have to be tested and concluded on. Future research will be discussed in Section 6.3. In spite of having entered Phase C, there are bottlenecks in
the science-practice linkage (Castellani, Piazzalunga & Sala, 2013; Sala et al., 2015), also called the knowledge-to-action gap (Sala et al., 2013) or the sustainability gap (Agyeman, 2005; Christie & Warburton, 2001; Hall et al., 2017). This work aims to contribute to closing this fourth research gap by easily applicable measurement methods, which will be discussed and selected in Section 3.2 et seq.

2.4 Summary

In this chapter, a six-dimensional framework of sustainable development has been developed, and three central conceptual principles of the management of sustainable development have been identified. The finalised framework includes both the descriptive-analytical and the transformational mode of sustainable development. The dimensions (1) to (3) in Figure 2.11 primarily refer to the descriptive-analytical mode, whereas dimensions (4) to (6) primarily bear upon the transformational mode. The temporal horizon (1) implies that present and forward-looking time series analysis instead of single points in time should be incorporated. The contentual domain (2) consists of several concepts. Environmental protection rests on the concept of limits, represented by the planetary boundaries. Social development is theorised by the concept of needs, captured by the social boundaries, within which the principle of justice should be applied. Combining these concepts, the safe and just operating space for humanity results, for which the green economy should be calibrated. This ideal system should be applied around the whole globe and at every regional scope (3). Sustainable development is a vision of future, which is aimed to become the present as soon as possible. Necessary to this end is change and transition, managed and guided by change agents (4) of every aggregational size (5), who take decisions at normative, strategic, and operational tiers (6). By including the multilevel perspective on the aggregational size of change agents and the St. Gallen management model for the decisional tiers, the perspective and the operational-to-normative gaps are closed, respectively. The conceptual management principles of societal instrumental finality (i), paradox teleological integration (ii), and practicability (iii) ought to be obeyed with regard to every dimension of the framework. Sustainable development requires a transdisciplinary working agenda, whose main characteristic is the connection from science to practice. The SDGs are a successful transdisciplinary result. Nonetheless, a knowledge gap of the individual sustainable development elements and their dynamic interactions as well as a sustainability gap concerning the application of crafted scientific knowledge to political, entrepreneurial, and societal practice is present.

The next chapter, Chapter 3, deals with the measurement and assessment of contributions to sustainable development. Any pursued method should comply with the conceptual framework of sustainable development and is critically determined by the ability to address the knowledge and the sustainability gaps.
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