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1 The case for strong sustainability

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1 The Earth, increasingly hot and full

This book is written after three decades of global policy and discourse on sustainable development (SD). Regrettably, these decades did not meet the iconic Brundtland report's call to display 'environmental strategies for achieving sustainable development by the year 2000 and beyond' (WCED, 1987: Chairman's foreword). Instead, humanity's combined efforts have made an already strained Earth even hotter and fuller.

Not only has the atmospheric level of the most important greenhouse gas, carbon dioxide, risen sharply due to human activities, but even its growth rate has been increasing (NOAA, 2018). The level is now the highest in at least 800,000 years (Scripps, 2018; Tripati, Roberts, and Eagle, 2009), and it is approximately 50% above the pre-industrial average of the Holocene (Steffen *et al.,* 2011). As a response to these anthropogenic emissions, the Paris agreement recognized 'that climate change represents an urgent and potentially irreversible threat to human societies and the planet' (UNFCCC 2015, p. 1), using 'urgent' or 'urgency' five times in its first section. Even this relatively successful attempt to approach climate change is, however, very inadequate. It was built on voluntary commitments, so called nationally determined contributions. These not yet proven promises were admitted to stay far below the real

reductions needed in order to keep estimated increases of global average temperature at a level where planetary changes and risks, by much less certain estimates, were expected to be manageable (less than 2°C above pre-industrial levels). Leading climate researchers therefore point at 'political short-termism'; they declare that 'alarming inconsistencies remain between science-based targets and national commitments', and they propose rapid scaling up of CO_2 removal by technical means, so called carbon capture and storage (CCS) (Rockström, Gaffney, Rogelj, Meinshausen, Nakicenovic, and Schellnhuber, 2017, p. 1269).

Concerning the second term in the book sub-title's description of the state the Earth is in, we follow Daly's (2005) use of 'full' to signify the global expansion and dominance of humans and human activities, which on a steady rise clearly crowd out other species and make spaces unaffected by human activities rare (Gallagher and Carpenter, 1997). From an anthropocentric perspective, this is often addressed as a problem of biodiversity loss, which has undesired consequences on human societies, e.g. in terms of lost pollination, decreased possibilities to produce medicine, and loss of recreational values (Cardinale et al., 2012). Caused by humans via habitat loss and climate change, another description is one of the emerging sixth mass extinction of species (Barnosky et al., 2011; Wake and Vredenburg, 2008; WWF, 2016). Human domination on Earth can also be understood through comparing the biomass of different species. Even if we would imagine sustainable lifestyles, this impacts on the use of land, energy and other planetary resources. By the year of 2000, the total biomass of humans and our domesticated animals – mainly animals that we subordinate into our food production systems – was estimated to be more than thirty times greater than the total biomass of all wild terrestrial mammals (Smil, 2011, p. 618).

While lifestyles of the latter, wild animals, would come as close as we can get in order to describe 'sustainable' ones, i.e. the lives in approximate balance with surrounding biophysical circumstances, the imprint of the human species is clearly on a very different level, far beyond what would be needed only for biological reasons (Krausmann et al., 2013; Schramski, Gattie, and Brown, 2015; Steffen, Grinewald, Crutzen, and McNeill, 2011; Steffen, Broadgate, Deutsch, Gaffney, and Ludwig, 2015a; Vitousek, Mooney, Lubchenco, and Melillo, 1997). Through the commonly used measure ecological footprint, we can say that an average human uses almost three hectares of the planet's biocapacity, which is problematic due to the availability of much less than two (WWF, 2016). The numbers, of course, get even more dramatic when data from the rich Northern hemisphere and the global consuming class is analysed. This imbalance between the human use of resources and their availability has increased over time, and space and resources accessible for other species than our own, and for future humans, has become smaller (Schramski et al., 2015).

Addressing the massive human imprint on the globe, McKibben (1989) declared 'the end of nature' already at the infancy of the sustainable development discourse. Two years earlier, the Brundtland report had recognized that 'sustainable development can only be pursued if population size and growth are in harmony with the changing productive potential of the ecosystem' (WCED, 1987: Overview, §29). Human population, however, increased by 50% over the following thirty years (UN, 2015b), and the annual nominal increase, mentioned as problematic in the report, remains approximately the same when this book is written: 80 million people (WCED, 1987: Chapter 4, §1; UN, 2015b).

Any optimistic observer focusing on the falling relative growth rates, and a flattening of the curve at its top (see Figure 1.1), still has to accept the significant rise in real numbers (80 million per year means more than 200,000 per day; 9,000 per hour), and the massive aggregate impact that a population would have already at levels much lower than today's. In 1970, around the time when humanity's total ecological footprint was turning into overshoot (passing the Planet's regenerative capacity, and in that sense moving the human collective into a definite and deteriorating unsustainable state), the global population was close to 3.7 billion (Meadows, Meadows, Randers, and Behrens, 1972; Meadows, Meadows, and Randers 2002). This number had doubled in 2015, the year of both the Paris agreement and the 2030 agenda (GFN, 2018; UN, 2015a; 2015b). Maybe as a coincidence, just at the beginning of the overshoot, Nicholas Georgescu-Roegen, a pioneering sense-maker in economics, proposed that the question regarding how many people the Planet could host was not the interesting one. What we should ask is for how long the Planet could support any given global population (Georgescu-Roegen, 1971/1993, p. 83).

The basis for his analysis was one that still is key in the discussion on 'weak' vs. 'strong' sustainability. According to the latter, which holds the main empirical support until today, a higher level of economic development translates to a higher rate of transformation of nature's resources; a depletion or qualitative degeneration of the so called 'natural capital'. And '[t]he upshot is clear. Every time we produce a Cadillac, we irrevocably destroy an amount of low entropy that could otherwise be used for producing a plow or a spade. In other words, every time we produce a Cadillac, we do it at the cost of decreasing the number of human lives in the future.' (Georgescu-Roegen, 1971/1993, p. 85).

The aggregate over-consumption of human societies is not only a matter of transgressing a point where ecological footprint is estimated to equal available biophysical capacity. It should be noticed that the journey towards that point, as well as towards situations where also other environmental indicators turn red, is possible only a relatively limited time. Industrialisation, which combined the science, technology and fossil energy sources, has made it possible, and as the term reveals, over-consumption took off during 'the great acceleration'; a period which also defines the beginning of the Anthropocene (Steffen et al., 2015a). This new epoch of human dominance is certainly radical in impact but very marginal in time, soon becoming a short chapter in the geological history of Earth. As one of the major factors determining human consumption of planetary resources, population growth is illustrated in Figure 1.1.

[PLEASE INSERT FIGURE 1.1 HERE]

Figure 1.1 Global human population, year 0-2100 (UN 1999; 2015b; medium fertility variant projections). It is estimated that the first billion was reached in 1804, no 2 in 1927, no 3 in 1960, no 4 in 1974, no 5 in 1987, no 6 in 1999 and no 7 in 2011. The projection for 2030 is 8.5 billion.

Shaking and shifting the so favourable Holocene period for earthbound life, recent and present human societies are consuming to the detriment of other systems, species and individuals. The excessive wealth of parts of the human population during this marginal period of Earth's history is in the most explicit way made possible by the use of Earth's stocks, not least the fossil sources of energy, but also other 'non-renewable' sources needed to produce human wealth (see Salminen and Vadén, 2015). Further, wealth is dependent on the unsustainable and ethically careless use of 'renewable resources'; the exploitation and domestication of other species, and by overharvesting of other systems,

such as the soils, the forests and the seas. In sharp contrast to the very late and modest reactions of policy makers and business leaders, or wealthy societies at large, a delay in the detrimental effect of our consumption can be expected, such as regarding the carbon sink functions of the oceans, land and atmosphere. Here, as the largest share of the human footprint can be attributed to ecosystem capacity that must deal with the extreme production of greenhouse gases, we also see the link between how human societies heat and fill the Earth.

Causes and responsibilities are, however, far from evenly distributed over the global human population. Rather, they mirror the distribution of wealth. Lifestyles are closely related to income, and so is the use of resources and environmental impact (Ulvila and Wilén, 2017). In high-income countries, the average per capita ecological footprint is roughly six times higher than that in low-income countries (WWF, 2016). Differences within countries and between sociodemographic segments are even greater, which has been recognized by research, e.g. illuminating climate justice (Chancel and Piketty, 2015). As climate change is mainly a result of cumulative build-up of atmospheric greenhouse gases over time, it is also worth considering the historical blame and responsibility. While developing countries are catching up in this respect (which illustrates the deeply problematic term 'development'), China's and India's cumulative shares 1850-2002 were only half of their annual share of global emissions at the end of the same period (Baumert Herzog, and Pershing, 2005, p. 31). The cumulative shares of these two present population giants only summed up to 10% of total emissions, in contrast to the 55% of USA and EU combined (Baumert et al., 2005). Much of the sustainability problems that we have today can thus be framed as problems of over-consumption, of lifestyles, and even of high incomes.

2 Moving from wealth to wellbeing

While problems of poverty are central for the sustainable development discourse as regards the present human population, the problems of wealth are not. Rather, the 'development' part of the conceptual SD pair remains firmly attached to growing wealth and to the expansion of any society's economic activities, irrespective of their present level. The absurdity of the idea of infinite expansion in a 'sustainable way' does not hinder serious advocates of sustainable development to, repeatedly, present such claims. These preposterous claims manifest, for example, in the explicit and persistent growth goals, which can be found in the leading international policy documents, from the Brundtland report to the 2030 agenda (WCED, 1987; UN, 1992; 2015a).

Some of the attraction of this oxymoronic agenda of 'sustainable growth' can be explained by the careless use of terminology, obscuring, not least, important differences between wealth, welfare, and wellbeing (Sanne, 2007). Without having basic clarity and preciseness in communication, attempts for SD could lead anywhere, but as the mainstream SD discourse is constructed, it consolidates key dimensions within present unsustainable societies. While we delve into this later, we will see problems with other related and often employed concepts, and a need for SD terminology that recognizes values also from non-anthropocentric perspectives. For this purpose, 'wellbeing in coexistence' is proposed as a new key term for strongly sustainable societies. In Table 1.1, this concept is contrasted to the three related concepts mentioned above, with examples given.

[PLEASE INSERT TABLE 1.1 HERE]

Table 1.1 Basic terminology for sustainable development (a)

Making these distinctions, we can see that SD must aim further than wealth, to which the qualitatively blind measure of growth mainly relate. Actually, any real attempt to address SD would need to recognize the irrelevance of aggregate quantitative growth as a goal for human societies, as well as its impossibility over time. While the promotion of wellbeing would be the relevant aim from an anthropocentric point of view, such attempts cannot be sustainable in an ecological sense if we do not at least adjust today's completely dominant instrumental view of the non-human world. Defining nature and everything in it through its potential and utility to the humankind signifies that nature becomes objectified and subordinated into human systems of production and consumption. This human-centred instrumentalism locks us into a situation in which our practices increase technology-based manipulation of Earth and hence ecological imbalances, and therefore also the basis of human survival (Heikkurinen, 2016; Heikkurinen, Rinkinen, Järvensivu, Wilén, and Ruuska, 2016). Resilient societies must thus be societies where humans accept to peacefully coexist with the other passengers on spaceship earth (cf. Boulding, 1965; Heikkurinen, 2017).

Nonetheless, the human responsibility for the increasing stress on the planet, and our inclination to manage and control our surroundings, brings with them a special responsibility as captains on the ship. However, as seen in the discussion on wealth, not only states should have 'common but differentiated responsibilities' (principle 7 of the Rio declaration; UN, 1992). Per definition, present wealth has mainly been accumulated

under unsustainable conditions: the average euro or dollar earned, technology developed, infrastructure built, or private and national welfare advanced has a shadow, a hidden cost that is shared by all earthbound beings. In the same time, wealth itself brings with it power and responsibility; power to steer economic activities and responsibility to correct earlier mistakes. As we should expect conflicting interests, that actors with power have vested interests in present structures and priorities (on which their power largely depend), sustainable development must have institutional transformation as a key character.

In such transformational processes, one of the options is to adjust the power base itself. If factual decision-making (which is largely dependent on resources) is made more democratic between humans, global production of wealth is likely to be more justly attuned to global human needs. In principle, this can be reached either by (i) giving money and market exchange a smaller role in human interaction, (ii) adjusting economic reward systems such as profits and income to sustainability criteria (through, e.g., taxation or legislation on corporations), or (iii) directly redistributing resources (Bonnedahl, 2017). The latter is the conventional option and therefore it may be the easiest route to advance. On the other hand, it is a defensive move, as it does not fundamentally change the present institutional structures but rather only taxes them more heavily.

3 Sustainable (conventional) development: The inappropriate compromise

The mainstream sustainable development discourse, established by the publication of the iconic Brundtland report in 1987 and the subsequent UN led meetings and declarations (UN, 1992; 2002; 2015a; WCED, 1987), has been central for the diffusion of valuable knowledge; regarding the rift between 'the most developed' regions and the global poor, and regarding relations between expanding human societies and the Planet they colonize. Several international agreements, as well as policy measures on different levels, have also been important outcomes of the mainstream sustainable development discourse. However, in its standard use, both in policy and business, 'sustainable development' adds suitable, consumer and corporate-friendly, most often low-cost and low-commitment, layers of global responsibility and environmental concern to the conventional development paradigm. Examples are the voluntary commitments of various type (e.g. company codes of conduct), 'green' or 'fair' alternatives to consumers, multistakeholder initiatives (e.g. Marine and Forest Stewardship Councils), long term transition periods for industry, et cetera. Hence, sustainable development's lack of success, particularly any attempt to navigate towards a position within planetary boundaries (Rockström et al., 2009; Steffen et al., 2015b), is given by our disinclination to abandon or even question the prevailing deep order of things. This includes the broadly accepted values, preferences, and privileges of the modern human life. Humanity has been much more inclined to sustain conventional development than it has been willing to promote sustainable development.

Among the key features of conventional development (that majority interpretations of sustainable development in the liberal market economies do not question, but emphasize) is that the development is led by technology and demand. This is very problematic as both technology and demand are mainly fuelled and determined

not by principles of justice or by common causes but by private interest and economic power; the power to invest and the power to purchase. Clearly, most states, however, intervene in some way or another in these processes, for instance by internalizing parts of environmental costs, by giving direction to certain investment through subsidies or other measures, and by providing public services. Nevertheless, in most countries around the globe, the bulk of activities expected to drive development – whether they are labelled sustainable or not – are market-based and marked-driven. Further, threats to the functioning of financial markets, international trade, or the economy in general, are typically dealt with by policy-makers more forcefully and hastily than problems of poverty or environmental degradation.

As regards technology, it refers to an almost infinite number and variation of instruments and aids that could be good, bad, or neutral, depending on the observer and perspective. Technology has, however, together with science and fossil energy enabled a massive transformation of nature into resources and artefacts that determine material wealth, and it has made human liberation from the boundaries of its own nature possible (Bonnedahl, 2017). Apart from ecological dilemmas following from the way economic wealth has been, and still is, produced, the human 'addiction to exosomatic instruments' (Georgescu-Roegen, 1975, p. 369) distances humans from nature, or its remains. This brings with it a tendency to assume that humans can solve problems through further control, domestication, and addition of human-made capital. This is vividly illustrated with the rising desire and call to use geoengineering like CCS technology instead of adjusting human behaviours and reorienting cultures to combat climate change. In the quest for sustainable societies, the type and role of technologies must now change from

mainly being operational in the subordination of nature into human production systems. This task, to separate instruments from instrumentalism, is delicate but necessary.

While it can be claimed that technology as such is neutral, the same cannot be said about demand. Still, its use as a major signal for what is needed and what should be provided for in a society is due to its perceived objectivity and efficiency. However, like in the case of wealth and wellbeing, we have a careless use of terminology, which obscures important differences between, in particular, demand and needs. In terms of how it guides economic practice and policy, demand is assumed to refer to what actors as individuals prefer, or even need. The mainstream assumption is that the aggregate manifestation of such individual demand translates to the best outcome possible. Similar to public elections, market actors are expected to show their preferences by 'voting with their wallets', and consequently signal demand for society's production of goods and services. This includes the degree to which production should meet aspects of sustainability.

Accepted as a foundation for policies on sustainable development this means that societal transformation is dependent on individual and private decision making. Only a voluntary element of responsibility over time and space beyond the immediate desires of the consumer and preferences of the manager are added to Adam Smith's classic description of the butcher, the brewer, and the baker. In this model, 'Nobody but a beggar chooses to depend chiefly upon the benevolence of his fellow-citizens' (Smith, 1961/1776, p. 18), but now, the beggar should be seen as the global poor, as future generations, and as the exploited non-humans. Certainly, many potential alternatives of social organisation would provide worse outcomes than what this liberal market economy does. However, the order of things is inaccurate if we take sustainable

development seriously. It is also inaccurate if we accept any real facts, such as starvation, lack of housing and the existence or extension of a species, i.e. not succumbing into positions claiming that everything is a social construction. First of all, demand is unrelated to essential needs, which was a key term of the Brundtland report. Demand is a function of preferences and purchasing power, which means that society's production under the direction of demand is heavily biased towards the preferences of the already wealthy. Secondly, the individual starting point, which refer to egoism, or 'self-love' (Smith, 1961/1776, p. 18), stands in sharp contrast to the common problems mainly discussed under the umbrella of sustainability. Hence, demand as mechanism, geared towards current satisfaction of individual preferences, would be relevant when the aim is private wealth; less so if we broaden the focus to private welfare (including 'social' dimensions within sustainability policy and the essential needs). But when we aim broader than so, and want to solve common dilemmas, often with complex relations to its sources, and with distance between stakeholders in time and space, individual and private decision making is often not only inappropriate but in dire conflict with the goals of sustainability. Demand is inapt for the achievement of common causes such as the mitigation of climate change (cf. Hardin, 1968), as well as for the inclusion of future values and 'preferences' (Gardiner, 2011). Demand drives consumption, but solving issues of justice and stewardship need other mechanisms and institutional arrangements (cf. Dietz, Ostrom, and Stern, 2003; Ostrom, Burger, Field, Norgaard, and Policansky, 1999; Stern, 2011). Table 1.2 sorts out some of the differences between demand and related concepts, which are necessary in promoting and achieving sustainable development.

[PLEASE INSERT TABLE 1.2 HERE]

Table 1.2 Basic terminology for sustainable development (b)

What is also important to note is that, in parallel to its relation to wealth, demand can be expected to correlate with the degree of investment in and preferences from prevailing, unsustainable, social and economic systems (i.e. what sustainable development must be supposed to alter). Still, the aggregate rise in demand is conventionally kept as indicator of development when 'sustainable' is added. Not even the tendency to use existing adjusted measures of gross domestic product (GDP) is strong, and the 2030 agenda, the global community's policy flagship for sustainable development, argues for plain economic growth (UN, 2015a). This obsession with the quantitative expansion of the monetary expression of demand and supply in society builds on the non-existing link to needs. It also builds on utopian hopes for decoupling, or on other unclear ways to explain how the rise in economic quantities will no longer have any negative impact on the Planet. Until this day, however, this key feature of conventional development has built on an industrial exploitation of the Earth and its non-human species, and resulted in an uneven distribution of the resulting economic wealth between its human inhabitants (Oxfam, 2017).

4 Transformation, capital, and strong sustainability

While we above focused on sustainable development as policy and as process, we now turn to some of the seminal research dealing with its fellow concept sustainability. Employing 'sustainability' to describe and prescribe an ideal state of affairs on Earth,

we introduce major sustainability perspectives and their expected process outcomes. The link here between sustainability and sustainable development is the discussion on development, wealth, demand, and growth, which all depend on transformation of entities, resources or capital in nature. We will also discuss the role of technology further, as it plays a key role in the process of transformation.

Some would question the existence of any duality between humans and nature and ask: 'transformation of what?' – claiming, e.g., that 'sustainability after the end of nature and after climate change should be rather understood as a process of reflexive re-organisation of the socio-natural relation without pre-arranged shape' (Arias-Maldonado, 2013, p. 429). Nature is, as we know, not fixed, and in the Anthropocene, pristine ecosystems and habitat basically no longer exist. Nevertheless, human society and nature are still different phenomena and also necessary as concepts to enable the communication of any non-dualistic claims, such as the quotation above. Nature can be seen as the earthbound whole, in which human societies are embedded and evolve. To make sense of sustainability for these societies, their relations to the biophysical world with its systems, processes, and non-humans, must be recognized and understood. Consequently, concepts that recognize differences between humans and their environment are required to provide normative sense of research and communication on sustainable development; to enable a discussion on responsibilities for action.

Returning to the concepts which we relate to transformation (without denoting these as the only components of such processes), (i) wealth is produced through transformation of nature, (ii) demand drives this transformation, and (iii) growth is a measure of how transformation has developed – basically being the difference in a measure of wealth (like GDP) between two points in time. The mainstream

understanding of development in general overlaps this description of development, in which economic activity and capital is in focus. Some of it makes good sense, as something or someone has to pay the schools, hospitals, and the police. However, as explained by Herman Daly (2005, p. 100): 'When the economy's expansion encroaches too much on its surrounding ecosystem, we will begin to sacrifice natural capital (such as fish, minerals and fossil fuels) that is worth more than the man-made capital (such as roads, factories and appliances) added by the growth. We will then have what I call uneconomic growth, producing "bads" faster than goods—making us poorer, not richer.'

It would of course be splendid if Daly's claim would just be part of common sense, but it is not even generally accepted within the sustainability discourse, and the quotation can, in fact, be used to illustrate a common divide within the field. It introduces the capital concept, which is at the centre of the debate between the so-called 'weak' and the 'strong' positions of sustainability research. The key question in the debate is to what extent different types of capital are substitutable with one each other, or, in practice, to what extent can we transform natural capital into human-made capital without coming to the conclusion that the outcome is unsustainable.

To start with the capital term as such, Ekins, Simon, Deutsch, Folke and De Groot (2003, p. 166) define it as 'a stock that possesses the capacity of giving rise to flows of goods and/or services.' Sustainability is commonly defined as a situation in which the capital stock does not decline, and the utilisation of 'capital' means that economic thinking and valuation is the basis of an analysis. The term human-made capital refers to 'the common definition of capital in economics textbooks' (Berkes and Folke, 1992, p. 2), hence generated through ordinary economic activity. Natural capital

can be defined as consisting of non-renewable resources such as oil, renewable resources such as fish, and regulating ecosystem services such as nutrient recycling (Berkes and Folke, 1992). It 'comprises the sum of natural resources that are employed by humans for human ends' (Arias-Maldonado, 2013, p. 431), and applying the term in sustainability research and policy means that the socioeconomic usage of nature is brought into the forefront. This does not need to be entirely bad, both as such (over-) usage is the essence of humanity's ecological problems, and as the term can bring environmental issues into economics and economic policy. Hence, 'capital' shares problems and benefits with a term like 'ecosystem services'.

Apart from these two main types of capital, namely human-made and natural, (sometimes with different labels), other forms of capital are also relevant in making sense of the transformation process. 'Cultivated capital' links the two types, as it comprises, e.g., of cultivated plants, domesticated animals, and associated landscapes (Holland, 1994). Due to human influences upon natural beings and processes, this category perhaps captures the current state of socio-natural relations best (Arias-Maldonado, 2013). Nonetheless, for analytical and normative ambitions, a still better term may be 'cultural capital', proposed by Berkes and Folke (1992, p. 2), as 'factors that provide human societies with the means and adaptations to deal with the natural environment and to actively modify it', which includes worldviews, ethics, religion, and institutions. The way Berkes and Folke (1992) approached it was useful as it refers to all factors important in the human societal evolution, capturing a systems perspective and including both the way organisms adapt to their environment and the way they modify it. They were also clear with the hierarchy between the different types of capital, where natural capital is the precondition for cultural capital, while an interaction

between these two types generates human-made capital. Thus, what they label cultural capital determines the sustainability or the unsustainability of a human ecology, and how natural capital is transformed into human-made capital. As regards technologies, this means that they 'are not simply tools we can put to good or bad use – they reflect our cultural values' (Berkes and Folke, 1992, p. 6). Consequently, humanity must approach change in ethics and institutions, if it wants to succeed in sustainable development.

While a strong approach to sustainability would follow from this logic, the distinction between strong and weak positions normally also contains statements on substitutability and critical natural capital. In this debate, a key question is whether certain natural capital 'contribute to welfare in a unique way that cannot be replicated by another capital component' (Ekins et al., 2003, p. 167), or whether it would be enough to maintain the total capital stock, allowing substitution between sub-types – basically implying that we are fine if the (economic) value of human-made capital exceeds the estimated value of natural resources lost. Data on climate change, biodiversity loss and increasing overshoot can be used to affirm the strong sustainability alternative, which clearly entails radical change in society, while the steadily increasing production of capital in socioeconomic systems, together with claims about innovation, eco-efficiency and trickle-down effects, are used in defence of the case for weak sustainability.

In practice, serious proponents of weak sustainability would not claim that all natural capital could be replaced. This awareness has not least been spread through the science on climate change, reaching many conventional economists and policy-makers through the Stern report, which described 'the greatest example of market failure we

have ever seen' (Stern, 2006, p. 1). Nevertheless, weak positions on sustainability do not focus on new means or change in any of a society's old ends (Bonnedahl and Eriksson, 2007). Rather, the means of societies, which created major ecological problems and a very unequal distribution of wealth in the first place, will be adjusted to also cater for the new sustainability goals. Here, technology and markets are given key roles. Somehow, in the near future, it is assumed that the relative improvements in environmental efficiency (more units of economic value – more human-made capital – produced per unit of energy, materials, et cetera) that indeed has been achieved via technological innovation will turn into absolute reductions of the environmental impact (to save whatever critical natural capital there is). If this works, an infinite increase in the (eco-efficient) production of wealth will eventually reach every human being and thereby also solve the social or poverty related dimensions of sustainable development. In relation to the latter, one vital assumption that fits well within weak sustainability is that total wealth is more important than social equality – a position that is not surprising as it is mainly represented by the already wealthy, i.e. society's powerful and privileged.

Although the international community's discourse on SD is heterogeneous and ambivalent, the market orientation and radical techno-optimism, and the perspective of weak sustainability, is undoubtedly represented by the Brundtland report (WCED, 1987). It explicit declared that technology and social organization can be improved to make way for a new era of economic growth, implying the rather utopian idea of decoupling or a value-laden belief in high substitutability, i.e. that the growth in human-made capital compensates for losses in natural capital. In consistence with the ecological modernization perspective (Brand, 2010; Mol and Spaargaren, 2000), fundamental reorganisation of society's core institutions is not needed. This can also be

seen in other influential documents, such as the Rio declaration and its trust in international trade and market measures (UN, 1992), and in the 2030 agenda, which includes the goal to promote per capita economic growth (UN, 2015a).

As declared already in the title 'Strongly Sustainable Societies', this book adopts and develops the perspective of strong sustainability. First, this implies that we take a very cautious view on what is seen as nature's stocks, knowing that overshoot is serious and rising, and that risks should be minimized. This means, as a minimum, to acknowledge and protect critical natural functions; the regulation of ecological processes, such as water purification, the production of, e.g., raw materials, habitat functions for plants and animals, and the provision of possibilities for recreation and aesthetic enjoyment, et cetera (Arias-Maldonado, 2013). Further, we mean that the question of how much natural stock humanity must protect to keep those functions intact for the future – in order to know what 'sustainable' is – is misleading in a situation which calls for a radical reduction of society's environmental impact. It is also illusory to ask for exact knowledge and levels, trying to incorporate natural systems into human systems of management and planning (instead of just starting the change processes we typically ask about the most cost-efficient means, or how much anthropogenic greenhouse gases must be reduced in order to have a 66% probability of keeping temperature increases below 2 degrees over the pre-industrial average).

In contrast, we suggest, influenced by, e.g. Holland (1994), to go beyond functionality, the discussion on substitutability – and the instrumental view on nature – and recognise intrinsic values. Referring to ecosystem integrity, Holland writes that maintaining equivalence of function, flow of services, or ecosystem health is not enough, but that we also need the historically particular forms of association and

components. Recognizing ‘that nature, and all its various component events and processes, is a particular historical phenomenon and to be valued as such’ (Holland, 1994, p. 179) would also solve some of the problems raised by those who claim that no nature exists, and that we, consequently, should abandon the use of the concept (see e.g. Vogel, 1996). As Holland (1994, p. 181) explains: ‘[…] there are possible (natural) worlds which one might judge to be bad. There are also possible (natural) worlds which one might judge to be better than the actual natural world. Both of these possibilities are compatible with, and should not inhibit, the simple affirmation that the actual natural world as we know it is good.’

5 In need of a strong agenda for 2030

When we write this book, the global community’s focal document for sustainable development, the 2030 agenda, is quite recent. Given the challenges it is supposed to meet, the target year when problems should be solved is also near. With just one very practical example, cars bought when this book is written will still determine much of the emissions in 2030 – if no radical political change or systemic collapse happen earlier, making that transformation of minerals and other natural capital into cars and related infrastructure quite useless (i.e. no value in that human-made capital beyond what can be recycled). If the example is used further to illustrate where mainstream society may be in its transition, less than 7% of passenger cars sold in the European Union during the last quarter of 2017 were alternatively-powered, and less than 2% were electrically chargeable (ACEA, 2018). Moreover, this only focuses on the environmental impact of

driving an individual car; not the impact which follows from their quantity or production.

The 2030 agenda's target year happen to be 100 years after the publication of an essay by the famous economist John Maynard Keynes (1972/1930). His 'Economic Possibilities for our Grandchildren', reason around the question of what he and his fellows at that time could expect the level of economic life to be a hundred years later. In this quest, Keynes wrote about the future in a way that was more conscious about development, more radical concerning contemporary society, and much more optimistic regarding the role of human life than the 2030 agenda is. Still, we should be aware of that he wrote under the world depression, between two world wars, in a situation when British wealth, measured as real GDP per capita (2011 benchmark) was only 23% of that in 2015 (data on UK from Maddison, 2018). On this latter point Keynes was accurate, predicting that the living standard would increase four to eight times in the coming hundred years.

Interestingly for our sustainability context is that, when dealing with this issue of wealth, he discussed it through the term *the* economic problem. To him, economics or the economy was not the universal cure that it unfortunately later became to be assumed. The economic problem concerns 'the struggle for subsistence', and it is related to one of two classes of human needs: the absolute ones (corresponding to the essential and basic needs of the Brundtland report). When this class of needs is satisfied, Keynes wrote, we should prefer to devote our energies to non-economic purposes, live wisely and cultivate the art of life itself: 'We shall once more value ends above means and prefer the good to the useful' (Keynes 1972/1930, p. 331, see also von Wright, 1963, 1986). Subsequently, productivity increases would be used to reduce the time

spent with pressing economic cares in formal work, and he imagined fifteen-hour work weeks.

Keynes was also very explicit on values and morals – whereas the concern of today's mainstream sustainability discourse is mainly technology and efficiency. This economist – highly influential from his other works – compared the love of money as a possession with a mental disease and declared that future humans would be free to discard distasteful and unjust social customs and economic practices after solving the economic problem. However, time has not yet come, and with what we can read as reference to us in our time, Keynes foresaw that we for at least another hundred years would 'pretend to ourselves and to every one that fair is foul and foul is fair; for foul is useful and fair is not. Avarice and usury and precaution must be our gods for a little longer still' (Keynes 1972/1930, p. 331).

Among the reasons to why humanity still cling to the foul is its usefulness for what Keynes defined as the second class of needs, those which are relative in the sense that their satisfaction makes us feel superior to our fellows (see also Hirsch, 1978). Here, no level will ever be enough, which makes this class a fantastic engine for economic growth and a devastating force for the Earth. The relative determination of value and satisfaction (social comparison and hedonic adaptation) can also be used to explain the happiness – income paradox (Easterlin, Angelescu McVey, Switek, Sawangfa, and Smith Zweig, 2010). We should now learn that more is not always better, definitely not for the Earth as a whole, but not even for individual humans.

Aiming at 2030, the absence of this essential understanding in mainstream policy and discourse on sustainable development is clearly problematic. While many sustainability challenges are well known, scientifically realistic and ethically inclusive

problem descriptions still need to reach the mainstream, and where to go and how to get there should be quite open questions. Based on strong sustainability, and adopting non-instrumentalist perspectives, we must, as Keynes also wrote, encourage and experiment in the arts of life as well as in the activities of purpose. In the following chapters, this is what will happen.

Due to the scope of the challenges, the scope of the book is also broad. Much of its role is to promote perspectives, which allow meaningful change to take place. When we acknowledge the failures of the past and present, alternative descriptions of the problems are needed, as well as alternative stories of how our lives could be lived and societies built. This contrasts to shallow and unidirectional solutions proposed within the mainstream discourse, where technology and market measures most often are advocated to save us not only from ecological disasters, but also from any effort to change our values, priorities, or perspectives, or to challenge the interests that feed on business-as-usual. Nonetheless, the texts that follow are normative and contain clear implications. They are chosen to open up minds and emotions, to allow new values, goals and activities, and to promote a *sustainable* development.

The book continues with two chapters delving into *Roots of unsustainability*. In chapter 2, Tarja Ketola, Tuomas Räsänen and Taina Syrjämaa let us go behind the conventional anthropocentrism through a historical review of inter-species relations. A message is that the conception of human primacy and blind trust in the ability to control the natural world have led to the unsustainable exploitation of nature. Based on data from the world's fairs, game hunting, and methods of catching fish, the chapter shows how practices originating from weak sustainability, with its maximum 'sustainable' use of non-humans, fail to maintain biodiversity and healthy life communities. In chapter 3,

Teppo Eskelinen and Kristoffer Wilén take us to reconsider the dominant economic ontology, which penetrates environmental debates and public policy, and disables alternatives. An alternative economic ontology of strong sustainability should, they argue, emphasize given material conditions as opposed to given preferences, and recognise limits rather than lean on the notion of scarcity. As implication, the Earth's limited resources should meet real needs, and use-value should be in focus rather than exchange value.

Part II develops the first part by exploring *Ethical foundations* for a development towards strongly sustainable societies. Pella Larsdotter Thiel and Henrik Hallgren commence, in chapter 4, by identifying the anthropocentric view of the non-human nature as property as a key problem. In contrast, they discuss the non-human nature as consisting of rights-bearing subjects, and a multicentric understanding of ethics. The chapter contains examples of rights of nature in legal and political frameworks, and these cases show how a non-anthropocentric ethic and a respectful relationship to nature can be supported. In chapter 5, Giovanni Frigo proposes a move from the traditional paradigm's instrumental approach and reliance on expertise to overcome energy challenges. Frigo argues for sustainable energy transitions through an ecocentric turn in the human-energy-nature relationship. Based on interdisciplinary evidence this 'ecocentric energy ethic', outlines principles and values to evaluate the morality of energy policies, practices, and technologies. This can provide guidance to energy practitioners and hence contribute to achievement of strongly sustainable societies.

The themes of part III are *Public policy and urbanization.* In chapter 6, Mohammad Al-Saidi and Renata Buriti connects to earlier chapters by discussing the

evolution of management paradigms and new policy instruments, applied in the Brazilian water and land sectors. The chapter contributes with a community level perspective on ecosystem services. It gives examples suggested to qualify as best practices of multistakeholder projects aiming at ecosystem management and discusses implementation challenges related to the knowledge, empowerment, market-based solutions, and stringent regulations. Stakeholders and ecosystems are also in focus of chapter 7, where Anna Heikkinen, Hannele Mäkelä, Johanna Kujala, Jere Nieminen, Ari Jokinen and Hanna Rekola investigate the role of urban ecosystem services. The authors suggest a sustainable capability approach, containing situational stakeholder engagement and notions of radical democracy. This approach posits that strong sustainability, in the case of urban ecosystem services, can be enhanced through active relationships between human and non-human stakeholders. Finally in this part, Jennifer Rivers Cole and Suzanne K. McCoskey take on the issue of human consumption of animals as an environmental problem, and the issues of large externalities and global growth in this meat market. From the case of China, production, consumption and policy are discussed, including the relation between ethics and dietary preferences.

Part IV, *Business management and investment*, takes the reader to the business sector. In chapter 9, Herman Stål investigates entrepreneurship needed to maintain economic activities within biophysical limits. Reviewing literature on sustainable business models, he concludes that a model for strongly sustainable entrepreneurship must be influenced by natural sciences and be supported by new legal forms. Moreover, value should be conceived as both created and captured in a stakeholder network. Chapter 10 takes on the issue of biodiversity, its complexity and the lack of research that connects company action with effect on biodiversity. Here, Anne Quarshie, Asta

Salmi, Joanna Scott-Kennel and Anni-Kaisa Kähkönen brings together research in sustainable supply chain management with empirical evidence of companies moving toward more sustainable business and supply chain practices. Cases from Finland and New Zealand show how activities and practices can address biodiversity loss. Turning to the role of investment in chapter 10, Tommi Lehtonen delves into what it would entail in the quest for degrowth, followed by balance, in which the economy neither grows nor shrinks. Three investment strategies presented concern the elimination of the worst businesses, the augmentation of good growth, and the transformation of businesses into sustainable practices.

The individual level of analysis is in focus in various ways in part V, *Identity, needs and wellbeing*. In chapter 12, Kristoffer Wilén and Tiina Taipale discuss the role of identity for (un-)sustainable consumption. Their analysis makes a difference between identity and image or style, and recognises how structures influence everyday practices. Based on an empirical study, the authors suggest that consumerism is a form of governmentality that influences people, and disempower them as citizens, thereby hindering the creation of the political space needed for strongly sustainable consumption policies. In chapter 13, Tuula Helne explains why the economistic interpretation of wellbeing jeopardises sustainability and argues for a more holistic conceptualisation. Her framework of sustainable wellbeing stresses the ecological embeddedness and a balanced view of its dimensions. The chapter's focus is on a neglected dimension of wellbeing, being, and how living in harmony with one's deepest needs can be reconciled with planetary boundaries and the wellbeing of other living beings and nature.

The book's final part, VI, *Reconnect to Earth* starts with Maxim Vlasov and Zsuzsanna Vincze, who, inspired by permaculture, in chapter 14 discuss the role of knowledge in strongly sustainable innovation. The authors argue for place-based and alternative knowledge found, for example, in indigenous cultures. They also promote the reinvention of methods and technologies used before oil, and social innovation that enables transition to less resource-intensive and technological-dependent practices. In chapter 15, Todd LeVasseur and Lee Warren also present place-based alternatives, here through solutions offered by ecovillages, a form of residential community where inhabitants are motivated by eco- and social-centric values to grow place-based human ecosystems. A case study illustrates how such experimental alternatives can contribute to regeneration and adaptation of biodiversity, democratic decision-making, inclusive social practices and innovate forms of economic exchange.

In the final chapter, 16, we outline a framework for sustainable change. Based on the chapters of this book, we conclude that sustainable change results from multi-level initiatives (e.g. individual, organisational, national, and global action) that increase sufficiency in terms of affluence, effectiveness in meeting the needs, efficiency in production and consumption, as well as stimulate decline in human population. The potential for sustainable change resides in all sectors of a society, and is argued to be most effective when public, private, and third sector actors are all engaged in creating and supporting initiatives to tackle the pressing problems of our age.

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