Sufficiency and transformation−A semi-systematic literature review of notions of social change in different concepts of sufficiency

Jonas Lage*

Norbert Elias Center for Transformation Design and Research, Europa-Universität Flensburg, Flensburg, Germany

Sufficiency is an indispensable strategy for sustainable development that is gaining growing attention in both the scientific and the political sphere. Nevertheless, the question of how sufficiency-oriented social change can be shaped by different actors remains unclear. There are many different concepts of sufficiency and all of them entail certain notions of social change. However, these notions of social change remain mostly implicit. By conducting a semi-systematic literature review on sufficiency and transformation, this article makes explicit notions of social change in various concepts of sufficiency. Additionally, these notions are structured and discussed concerning their possible contribution to a broader socio-ecological transformation to advance the debate about sufficiency-oriented strategies. The literature was sampled by a systematic search in the databases of Web of Science and the ENOUGH-Network, a European network of sufficiency researchers, and complemented by texts known to the author. In total 133 articles, books and book chapters were reviewed. The sufficiency concepts were analyzed regarding two dimensions: the goal of and the approach toward social change. Various ecological and sometimes social goals that different concepts of sufficiency pursue were identified. Some scholars operationalize the social and ecological goals in a sufficiency-specific way as consumption corridors or a pathway toward a post-growth economy. Furthermore, three different approaches to sufficiency-oriented social change were identified: a bottom-up-approach, a policy-making-approach and a social-movement-approach. Specific contributions and limitations of these approaches were identified. The three approaches differ regarding the role of conflicts and the conceptualization of behavior and social practices. By interpreting the results utilizing the Multi-Level-Perspective of Sustainability Transition Research and Erik O. Wright's transformation theory, synergies for sufficiency-oriented social change were identified. The review founds a

theoretical basis for further empirical and theoretical research on shaping sufficiency-oriented social change.

Introduction

In sustainability discourse, the necessity for socio-technical innovations, i.e., the increase of efficiency, the recycling of resources and the switch to renewable energies, can be considered to be undisputed. Nevertheless, evidence is increasing that socio-technical solutions alone will not be sufficient to achieve the climate targets of the Paris Agreement and other sustainability goals. Therefore, sufficiency measures are widely regarded as being necessary (Steinberger and Roberts, 2010; O'Neill et al., 2018; Vita et al., 2019; Wachsmuth and Duscha, 2019; Haberl et al., 2020; Kuhnhenn et al., 2020; Koide et al., 2021; Wiese et al., 2022). Accordingly, sufficiency has been gaining (renewed) attention from scholars in the last decade (Jungell-Michelsson and Heikkurinen, 2022). In 2022, the Intergovernmental Panel on Climate Change (IPCC) mentioned sufficiency as an important strategy to mitigate climate change for the first time in its summary for policy makers (IPCC, 2022, p. 41). To a minor extent, sufficiency has recently been gaining momentum in policy making (Hotta et al., 2021; Zell-Ziegler et al., 2021).

There are many different and sometimes contradictory conceptualizations of the sufficiency strategy, but they share two common dimensions. Firstly, sufficiency is conceptualized as a quantitative limitation of consumption and production on a generalizable level, often referred to as "consumption corridors," which address overconsumption and deprivation at the same time (Di Giulio and Fuchs, 2014; Jaeger-Erben et al., 2020; Fuchs et al., 2021). Secondly, the strategy of sufficiency describes social innovations[1] that are used to change social practices (Lorek and Spangenberg, 2019).

By these two dimensions, sufficiency can be distinguished from the sustainability strategies of efficiency and consistency[2]. Efficiency and consistency strategies are used to reduce the environmental damage per unit of products or services consumed and produced, but, unlike sufficiency, do not describe absolute limits to consumption and production. In addition, efficiency and consistency strategies rely on (socio-)technical innovations. If, for example, the sustainability goal were to reduce CO_2-emissions for space heating in the residential sector, a possible sufficiency measure would not be to install better insulation in buildings (efficiency), or supply renewable energy (consistency), but to reduce living space.

All sustainability strategies encompass certain normative notions of social change since they are used to attain sustainability targets in a certain manner. The implementation of the strategies has effects on different socio-economic structures, such as the modes of production and consumption, norms and values or the distribution of wealth and power. For the cases of socio-technical innovations (efficiency and consistency strategies) significant research has been conducted on how these innovations can be implemented, and how they diffuse into the mainstream and change societal structures (e.g., Geels and Schot, 2007; Grin et al., 2010; Geels, 2019). This cannot be said to the same extent for the sufficiency strategy. The notions of social change mostly remain implicit in the different conceptualizations of sufficiency (Fuchs et al., 2016), and a systematic reflection on the underlying concepts of social change in the sufficiency discourse has rarely taken place. Existing systematic literature reviews on sufficiency provide valuable insights into sufficiency-related rebound effects (Sorrell et al., 2020), sufficiency for businesses (Niessen and Bocken, 2021), specific consumption changes (Sandberg, 2021) or the different theoretical roots of sufficiency concepts and implications of sufficiency on different economic scales (Jungell-Michelsson

---

1   Social innovations are defined by Zapf (1994) as "new ways of achieving goals, especially new forms of organization, new regulations, new lifestyles that change the direction of social change, (that) solve problems better than previous practices, and (that) are therefore worth imitating and institutionalizing" (p. 33). Similarly, but with a focus on social practices Domanski et al. (2020) describe social innovation as "a new combination and/or new configuration of social practices in certain areas of action or social contexts prompted by certain actors or constellations of actors in an intentional targeted manner with the goal of better satisfying or answering needs and problems than is possible on the basis of established practices" (p. 459).

---

2   The term "consistency" stems from the German discourse (German: Konsistenz) and describes "green" technologies that aim on aligning material and energy flows with natural processes in a less harmful way (e.g., switch to renewable energies) (Huber, 2000). It is also used in English literature, often as an analytical perspective together with the sustainability strategies of efficiency and sufficiency (among others: Allievi et al., 2015; Gunarathne and Lee, 2021; Loy et al., 2021; Tröger and Reese, 2021; Jungell-Michelsson and Heikkurinen, 2022).

and Heikkurinen, 2022). However, none of them have analyzed the notions of social change in different conceptualisations of sufficiency. Given the urgency of socio-ecological crisis, the growing recognition of the necessity of the sufficiency strategy and the difficulties to implement it, a reflection on the different notions of how to create and shape social change within the different concepts of sufficiency could help to advance the debate about sufficiency-oriented strategies.

Accordingly, explicating and discussing the notions of social change in sufficiency concepts is relevant for at least four reasons. Firstly, sufficiency, like all sustainability strategies, aims to achieve sustainability goals and therefore seeks to shape social change in a normative way although the goals sought may differ. In contrast to the sustainability strategies of efficiency and consistency, the sufficiency strategy describes social innovations rather than socio-technical innovations to achieve sustainability goals and thus directly addresses social change (Zapf, 1994). Secondly, in contrast to the sustainability strategies of efficiency and consistency, sufficiency strategies are often at odds with current structures of societal organization, such as the orientation of policymaking toward economic growth (Princen, 2005). Thus, sufficiency-oriented social change is confronted with specific difficulties and requires separate consideration. Thirdly, a reflection on the implicit concepts of social change enables the identification of specific potentials and limits of the respective concepts of sufficiency. Fourthly, such a reflection enables the discussion of contradictions and synergies between the different concepts of sufficiency. Such a reflection on the concepts of social change present within concepts of sufficiency provides a basis for an elaborate discussion on the question of how and by whom social change toward sufficiency can be shaped. As a basis for such a debate, the notions of social change that are often implicit in the concepts of sufficiency need to be explicated and structured. Thus, this paper addresses the following research questions:

A Which sustainability goals and notions of social change do concepts of sufficiency imply?
B What are the specific limitations and contributions of the different concepts of sufficiency concerning their notion of social change?
C What are the contradictions and possible synergies among the different concepts of sufficiency?

With research question C, the different sufficiency concepts are discussed in relation to each other in order to identify fruitful combinations of the different concepts of sufficiency and to put them in the context of a broader socio-ecological transformation. To do this, the findings are discussed in relation to the so-called Multi Level Perpective (MLP) of Sustainability Transition Research (Grin et al., 2010; Geels, 2019) as well as Wright's (2010) transformation theory. While the MLP is the dominant paradigm of social change in sustainability research, Wright's transformation theory can be regarded as one of the most elaborate sociological theories of societal transformation in recent years. His work expands on the role of real utopias in the transformation of capitalism. By "real utopias," Wright (2010, p. 6) describes emancipatory institutions and practices that already exist now but encompass elements of a utopian – in Wright's perspective egalitarian and radical democratic – societal organization, beyond current dominant modes of production and consumption[3]. Following this heuristic, sufficiency policies and practices can be regarded a real utopia in a growth oriented economy and society. Thus, Wright's theory seems to be very applicable for reflecting on the different notions of social change in different sufficiency concepts.

Method

A semi-systematic review methodology was used to develop narratives and synthesize a broad inter-disciplinary strand of literature (Wong et al., 2013; Snyder, 2019). As Snyder (2019) points out, a semi-systematic review can be useful for detecting themes and theoretical perspectives and thus aids the development of a theoretical model. Furthermore, Snyder indicates that a semi-systematic approach can combine different methods of sampling (systematic or non-systematic) and analysis and evaluation (qualitative or quantitative).

Sampling

Three different sets of literature were sampled (Figure 1). The first and foundational set stems from a systematic search for literature in the Web of Science database using the keyword "sufficiency" in the categories of "environmental science," "environmental studies" and "environmental engineering," excluding the keywords "self-," "taxonomic" and "marine." The search was performed in December 2021 and provided 382 articles. The use of 'sufficiency' as the only positive search item ensured a very broad and comprehensive sample of sufficiency literature. This search strategy is similar to that used by Jungell-Michelsson and Heikkurinen (2022) since it includes sufficiency on both the consumption and the production side unlike the work of Sandberg (2021), which limited the search to the consumption side. If only literature that included "sufficiency" and "consumption" had been sampled, the results would have been reduced by ∼75 percent. However, in contrast to Jungell-Michelsson and Heikkurinen (2022) and following their own

─────────

3   In his study, Wright (2010, p. 2–5) gives the examples of participatory city budgeting, Wikipedia, the Basque Mondragon cooperatives, and unconditional basic income (UBI). Wright (2010, p. 20–25) argues that the existence (and the analysis) of real utopias do not only enlarge the imaginable but increase the achievable as well, since real utopias render an alternative world possible.

FIGURE 1
Sampling process. Own depiction.
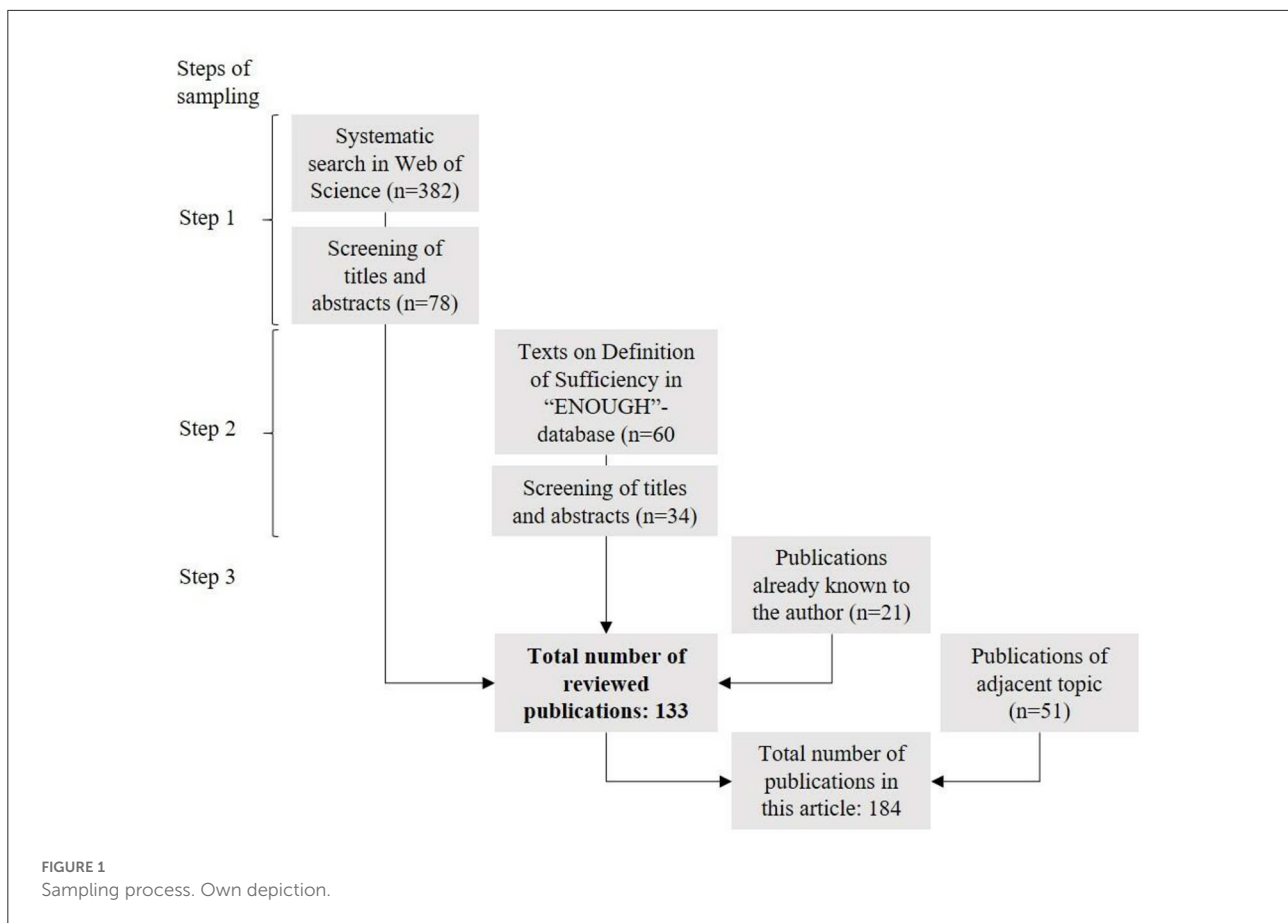
reflections, not only peer-reviewed papers were included but also books and book chapters, which ensures a broader perspective on the sufficiency debate. The abstracts of the selected literature were screened for relevance to the research topic, which left a sample of 78 research articles.

The second set of literature derives from the International Network for Sufficiency Research and Policy (ENOUGH) database. This database is nurtured by dozens of researchers working on sufficiency (see Toulouse et al., 2019). This database is structured by different keywords, so that all texts with the keyword 'definition' were screened ($n = 60$). This screening added 34 articles to the sample. By combining the keyword-based search in Web of Science with a screening of the ENOUGH-Database, it could be ensured that articles, which are relevant to scholars in the field of sufficiency but that are not part of the Web of Science database or do not include the used key-words are still considered in the analysis.

The third set of literature contains publications which were already known to the author ($n = 21$). Whereas, the first two sets encompassed only English literature, this third step added some German publications as well. This sample was supplemented with publications on adjacent topics, increasing the total number of publications in this article to 184.

Data analysis

The data analysis was guided by research question A and aimed at identifying the pursued sustainability goals and a development of a typology of sufficiency concepts concerning their notions of social change. The three sets of literature were analyzed in an iterative process of induction and deduction. First insights obtained from the material were theorized in the form of a typology, which was then tested and further developed by analyzing more literature. During this process, several feedback loops with different groups of sufficiency experts were conducted to strengthen the robustness of the results.

In order to operationalize the main research question and to differentiate notions of social change within the sufficiency concepts, the analysis was guided by three sub-questions. Since sufficiency is a strategy to achieve sustainability goals, an analysis of the goals of the intended social change and their specific operationalisation is one dimension to differentiate sufficiency concepts. Thus, the first question for the analysis asks:

A What are the sustainability goals that the sufficiency concept is aiming to achieve?

This question is answered in the first subsection of the results. In order to analyse the process of implementing sufficiency measures and shaping social change toward sufficiency, two questions focus on the leverage points and the actors of social change:

B What is the object of social change, i.e., what has to be changed?

C Who are the subjects of social change, i.e., who are seen as the central actors of change?

These two questions are answered in the second subsection of the results by developing a typology of different concepts of sufficiency concerning their notions of social change. Based on the results of this analysis the research question B (specific limitations and contributions of the different concepts) is addressed at the end of each identified type of sufficiency concept. The research question C (contradictions and possible synergies among the different concepts) is tackled separately in the discussion section of this paper.

Results

Sustainability goals of sufficiency concepts

Since sufficiency concepts in this review derive from an ecological perspective, it is not surprising that all concepts of sufficiency aim to reduce environmental damage. The sufficiency strategy is used to meet climate targets (Moser et al., 2015, p. 2; Wachsmuth and Duscha, 2019; Kuhnhenn et al., 2020), to reduce the demand for energy and materials (O'Neill et al., 2018), and to reduce land-use change, water use or toxicity (Vita et al., 2019).

Even if in some concepts, social implications of sufficiency measures are excluded from the definition of sufficiency (Fischer and Grießhammer, 2013), other authors highlight that sufficiency may solve ecological *and* social problems (for housing, see Bohnenberger, 2021; for agriculture/food see Brunori and Di Iacovo, 2014). Often described as social or economic co-benefits, sufficiency is associated with an increase in the quality of life (Parks, 2012; Zannakis et al., 2019), with health benefits (Allievi et al., 2015; Creutzig et al., 2021), lower costs (Lenz, 2015, p. 63–64), higher resilience against economic crisis (Alexander and Yacoumis, 2018) and positive effects on social and environmental justice (Hayden, 2019; Kalt and Lage, 2019).

To pursue social and ecological goals is not specific for sufficiency but applies for all sustainability strategies. However, there exist sufficiency-specific operationalisations of these goals: sufficiency as consumption corridors and sufficiency as a way into a post-growth economy.

Sufficiency as consumption corridors

To operationalise the social and ecological goals, sufficiency is interpreted in some concepts in the sense of having the minimum necessary to live well *and* as limits to social practices that cause ecological damage, especially to consumption. From an ecological perspective, these limits are upper ones aiming to reduce overconsumption (Lorek and Fuchs, 2013; Schroeter et al., 2017). Inspired by a discourse in the field of social politics, sufficiency describes minimum limits (of consumption) as well, which is especially, but not exclusively, important when applied to the Global South (Kanschik, 2016; Spengler, 2016; Gladkykh et al., 2021). These minimum limits describe a minimum amount of consumption that is needed for a decent life. This puts sufficiency in the context of debates on social justice (Salleh, 2009, 2010). They usually originate from concepts of basic human needs. Overall, the upper and lower limits define consumption corridors that are socio-ecologically just and sustainable (Di Giulio and Fuchs, 2014; Jaeger-Erben et al., 2020). Most likely it requires more equity in consumption to stay within the corridor (Jaccard et al., 2021, p. 8–9).

For the definition of sufficiency-specific aims, attention needs to be paid to the indicators of these consumption corridors. In some cases, the setting of maximum CO_2 budgets and planetary boundaries (Rockström et al., 2009) or a "safe and just operating space for humanity" (Raworth, 2012, p. 4), which consists of ecological upper and social lower limits, are interpreted as sufficiency-specific limits, because they describe absolute limits (see Darby, 2007, p. 112–113; van Loy et al., 2021, p. 2). However, it is important to note that compliance with social foundations or ecological limits is the goal of any sustainability strategy, such as efficiency or consistency. Sufficiency-specific goals are limits to the consumption and production of services or products, such as limits to the living space per person or the speed limit for cars.

Defining limits to consumption without being paternalistic is a difficult task. In qualitative approaches (e.g., Di Giulio and Fuchs, 2014; Gough, 2015; Fuchs et al., 2021), the conditions of decent human life and wellbeing are defined with regard to the capabilities approach of Nussbaum (1992) and Sen (1993) or the needs and satisfier approach of Max-Neef (1991). In these approaches, needs are more or less generalizable across time and space, whereas satisfiers are flexible and depend on cultural and political contexts. For example, the generalizable *need* of protection in the case of mobility can be *satisfied* by driving a big, powerful car *or* by living in a car-free city. Furthermore, needs are indispensable, irreducible, non-substitutable and limited in number and must be distinguished from endless, untrammeled and subjective desires (Fuchs et al., 2021, p. 13–15). Thus, the distinction between satisfiers and needs in these sufficiency approaches highlights the difference between the means and ends of consumption (Haapanen and Tapio, 2016; Darby and Fawcett, 2018; Gough, 2020).

In contrast to this perspective on human needs as more or less generalizable, other scholars describe necessities as "constituted by routinized and embodied types of thought and action" (Aro, 2017, p. 6) and thus consumption corridors must differ among different political, cultural and social contexts (Cherrier et al., 2012; Lavelle and Fahy, 2021). This approach to define lower limits by investigating what kind and amount of consumption is needed to feel part of society (e.g., minimum income standard), is used in social policy (Davis et al., 2015; Gough, 2020, p. 213). From a perspective of consumption corridors and needs-theory, this approach faces the problem that it merely looks on how people can be part of the current (unsustainable) society and does not approach a bigger societal shift, which would enable a completely different satisfaction of needs. By this, the difference between needs and satisfiers remains unclear. Even though these approaches indicate that a reduction of consumption in high income countries to the minimum income standard would lead to significant reductions in greenhouse gas emissions (Druckman and Jackson, 2010), the remaining consumption would most likely stay above global ecological limits (Gough, 2020, p. 216).

Since the exact definition of such consumption corridors is a political question and needs to be constantly under debate (Darby, 2007; Di Giulio and Fuchs, 2014; Schroeter et al., 2017), quantitative approaches are rare and the results differ widely in terms of methodology and results (for housing sector, see Cohen, 2021; for electricity and natural gas demand see Fournier et al., 2020; for final energy demand see Lallana et al., 2021; for different sectors see Millward-Hopkins et al., 2020).

Sufficiency as a pathway toward a post-growth economy

The consumption corridors defined in the literature above suggest that, at least in most countries of the Global North the current development is way above the limits, which does not necessarily imply that the social foundation is ensured. A study of low-income households in Finland shows that the material basis for a decent life, which was defined by a consumer panel, was not met by most of the households and at the same time, the material footprint was higher than long-term ecological sustainability would require (Lettenmeier et al., 2014). In other words, the results suggest that a decent life within the consumption corridors is hardly possible in Finland today and requires a deep reconstruction of society and the way different needs are satisfied. Similarly, but on a higher scale, O'Neill et al. (2018) showed that out of 150 countries none met basic social needs without exceeding the planetary boundaries conceptualized in the doughnut concept by Raworth (2012)[4].

The authors conclude by describing sufficiency as a strategy that should not only meet social and ecological targets but move beyond GDP growth as measure of progress. Coscieme et al. (2019) describe a "wellbeing economy" as an alternative to guide policy making. Steinberger and Roberts (2010) argue in the same direction and emphasize the importance of growing equity by showing that the energy demand worldwide is sufficient to meet a high standard of living for everyone.

Following such insights, the environmental and social goals are in some sufficiency concepts not only operationalised by limiting consumption to corridors, but by developing an a-growth or degrowth society or a steady-state economy, where societal prosperity is independent of economic growth (Princen, 2005; Salleh, 2009; Lorek and Fuchs, 2013; Hayden, 2014b, 2015; Lorek and Spangenberg, 2014; Alexander and Yacoumis, 2018; Cibulka and Giljum, 2020). These concepts describe sufficiency as a strategy to (re-)embed economy into the ecological sphere. Accordingly, these sufficiency concepts build on sustainability concepts that emphasizes the connection of sustainability and a critique of endless economic growth such as the work on the limits to growth (Meadows et al., 1972) or the doughnut economy (Raworth, 2017). Especially influential early works on sufficiency in German (Sachs, 1993, 1995) and English (Princen, 2003, 2005) builds on work of the ecological economists Daly (1974, 1991, 2015), who views the economy as a subsystem of the ecological sphere and argues for a steady-state economy as a prerequisite for avoiding ecological collapse.

Furthermore, the sufficiency concepts that emphasize a critique of economic growth are linked to concepts of degrowth, which have been deriving from social movements since the early 2000's and have been consolidating into concepts in academic literature since then (Jackson, 2009; Demaria et al., 2013; Schmelzer and Vetter, 2019). The exact conceptual relation of sufficiency concepts to degrowth concepts often remains unclear. Sometimes a cultural change toward sufficiency is described as precondition for a degrowth-society (Alexander, 2013), sometimes a degrowth society is seen as the inevitable result of consequent sufficiency practices and sometimes sufficiency is described as an organizing principle (Spangenberg, 2018) or logic (Princen, 2005) for society, which reveals many direct overlaps with concepts of degrowth. One of these overlaps that is present in many sufficiency concepts is the (re-)politisation of debates among the good live for all beyond economic growth (O'Neill et al., 2018).

Sufficiency as a means or as an end?

Since sufficiency is a strategy used to attain sustainability goals, some authors argue that sufficiency is not an end in

---

4   The doughnut economy conceptualizes sustainability as "a safe and just space for humanity," which lies in between a social foundation and an environmental ceiling (Raworth, 2012). The social foundations ensures

that no one is falling short of life's essentials. The ecological limits ensure that humanity is not exceeding the planetary boundaries (Rockström et al., 2009).

itself, but an indispensable element of effective sustainable development (Spangenberg, 2018). In this interpretation, limits to consumption and the creation of a post-growth economy are strategies to pursue broader sustainability goals and no end in itself.

However, in some concepts the sufficiency-specific (quantitative) limits to consumption (and production) are interpreted not (only) as a means to pursue sustainability goals but as a "direction" (Sachs, 1995, p. 6) or as "goals" (Sorrell et al., 2020, p. 3). These goals could mark a sufficiency-oriented state of consumption (Darby and Fawcett, 2018). Furthermore, Jungell-Michelsson and Heikkurinen (2022) interpret concepts that describe sufficiency as an idea, worldview, vision or a way of life also as descriptions of ends in themselves.

If these limits and visions are interpreted as means or ends depends on the point of view. From a broader perspective, they can be interpreted as means to achieve sustainability goals, from a narrow perspective they can illustrate a desirable state and function as ends to guide individual or political decisions to achieve quantitative reductions in consumption and production.

Despite the question of whether these quantitative limits to consumption and production are described as means or ends, it is important to note that the sufficiency-specific operationalisation of social and ecological goals in the form of quantitative limits is unique, compared to the other sustainability strategies. Because of these quantitative limits, some scholars conceptualize sufficiency as the first or overarching of all sustainability strategies (Schroeter et al., 2017; Lorek and Spangenberg, 2019; Böcker et al., 2021; Gladkykh et al., 2021; Newell et al., 2021). By this, rebound effects of efficiency measures may be reduced and renewable energies need only provide the amount of energy, services and resources that are necessary for a decent, sufficient life.

Notions of social change

Type 1: Bottom-up approach

The following three types of concepts of sufficiency are analytically differentiated due to their (implicit) approaches to social change. The first type describes a bottom-up approach, focusing on changes in individual lifestyles, consumption patterns and cultural change.

Object of transformation

In order to achieve ecological and, in part, social and economic goals, the sufficiency concepts summarized here rely on reductions of individual consumption. The aim of sufficiency strategies is to develop an ecologically responsible lifestyle (Alcott, 2008, p. 771; Heindl and Kanschik, 2016, p. 43; Koide et al., 2021). This lifestyle may be described as low-tech and is thought to encompass a high level of small-scale production and do-it-yourself practices within self-sufficient communities

(Alexander and Yacoumis, 2018; Bauwens et al., 2020). In some conceptions, ecological motivation becomes constitutive for sufficiency practices (Alcott, 2008, p. 771; Heindl and Kanschik, 2016). Thus, this conception of sufficiency is closely linked to approaches of voluntary simplicity (Alexander and Ussher, 2012; Rebouças and Soares, 2021), conscious consumption (Freudenreich and Schaltegger, 2020; Kelleci and Yildiz, 2021) or sometimes even eco-anarchism (Trainer, 2019). Research and suggested measures often focus at individual or household level (Parks, 2012; Sahakian et al., 2021; van Loy et al., 2021).

According to Heindl and Kanschik (2016, p. 43), sufficiency strategies that focus on individual consumption reduction fit well into existing liberal economic and policy frameworks and do not have to go hand in hand with more radical degrowth approaches. However, if individual sufficiency practices are implemented in isolation, there is an increased risk of sufficiency rebound effects (Alcott, 2010; Sorrell et al., 2020). This is because, for example, income is in many cases a more influential parameter for consumption than individual values (Moser and Kleinhückelkotten, 2018; Kleinhueckelkotten and Neitzke, 2019; Korphaibool et al., 2021).

Other scholars describe individual changes in consumption patterns as a way of obtaining deeper structural change (Alexander, 2013; Lenz, 2015; Kleinhueckelkotten and Neitzke, 2019). The diffusion and spread of changes in individual consumption patterns may lead to a broader cultural change. A cultural change that follows a notion of sufficiency as the antidote to "excessive greed" (O'Sullivan and Kraisornsuthasinee, 2020, p. 443) does not only question growth in consumption but may lead to reductions in payed work as well, since less money is required for a good life (O'Sullivan and Kraisornsuthasinee, 2020). Cultural change can modify structures of recognition so that a reduction in consumption leads to positive feedback from the social environment (Heindl and Kanschik, 2016, p. 44–45).

Subjects of transformation—affluent consumers, grassroots initiatives and businesses

Based on an individualistic understanding of consumption, one central target group for consumption reductions are the "most affluent consumers" (Schmidt and Matthies, 2018, p. 3), the "global consumer class" (Spangenberg and Lorek, 2002, p. 128) or the wealthy upper and middle classes (Alcott, 2008, p. 771; Moser et al., 2015; Heindl and Kanschik, 2016, p. 44; O'Sullivan and Kraisornsuthasinee, 2020). This is because, according to common argumentation, the high resource consumption of these groups goes hand in hand with a high responsibility for reducing consumption (Baatz, 2014), on the one hand, and suggests a high effectiveness of reduction on the other hand (Spangenberg and Lorek, 2002, p. 128). Consumption reduction can be described as 'individual', when political, social or economic conditions are seen as external to the consumption decision. Accordingly, sufficiency

is conceptualized as an "intentional and informed decision" (Schmidt and Weigt, 2015, p. 209) and a "voluntary reduction of affluence" (Alcott, 2010) and thus builds on the ecological reflection of one's own consumption behavior.

Different reasons are given for the individualization of reductions in consumption. Firstly, some authors argue for the voluntariness and individualization of sufficiency with freedom of choice (Alcott, 2008, 2010; Heindl and Kanschik, 2016). In order not to restrict individual consumption liberties, each individual should be able to decide whether they want to choose a sufficiency-oriented or non-sufficiency-oriented lifestyle. By emphasizing individual responsibility, the decision between sufficiency-oriented and a non-sufficiency-oriented consumption is left to the individuals. If one assumes that non-sufficiency decisions contribute to environmental degradation to a greater extent and thus limit the life chances of future generations, it can be argued that those individualistic sufficiency conceptions (unintentionally) place individual (consumption) freedom above questions of intergenerational justice.

Secondly, Schmidt and Matthies (2018) emphasize that restrictive individual consumption is a moral imperative due to ecological damage. In this context, the role of religion, especially Buddhism, is sometimes mentioned as a motivation and legitimation of individual sufficiency oriented behavior (Ketprapakorn and Kantabutra, 2019; O'Sullivan and Kraisornsuthasinee, 2020; Song, 2020) or as guiding principle for decision makers (Lamberton, 2005). Although Baatz (2014) follows the polluter pays principle and the idea that the individual share of global emissions should not be exceeded, he recognizes that there are structural obstacles to such individual responsibility. That is why he limits the individual's moral obligation to reducing consumption to a responsible level appropriate to the circumstances and considers lobbying for political measures as the primary task of individuals rather than reducing consumption.

Thirdly, some scholars follow a radical bottom-up approach to transformation by stating that political and economic change will only arise by mainstreaming micro-economic practices of sufficiency (Alexander, 2013; Schanes et al., 2019; Bauwens et al., 2020). This notion of sufficiency was dominant in a survey conducted at the degrowth conference in Leipzig in 2014 (Eversberg and Schmelzer, 2018). The underlying assumption is that individual behavioral changes spread through processes of social diffusion and thus contribute to a broader cultural change from the consumption and growth orientation in society (Alexander, 2013; Lenz, 2015, p. 63; Kleinhueckelkotten and Neitzke, 2019; O'Sullivan and Kraisornsuthasinee, 2020). This approach emphasizes the relevance of grassroots initiatives and niche projects in which practices of voluntary simplicity, do-it-yourself and low-tech-lifestyles can be learned and further developed (Alexander, 2013, 2015; Sahakian and Dobigny, 2019; Bauwens et al., 2020). The role of the state in this conception is

to "facilitate" the changing values and virtues (Soetebeer, 2015, p. 185). This approach to transformation has many similarities to the "parallel-society" type described by Adler (2016), where alternatives are created aside and, more or less, independent of current institutions.

As well as consumers–either as individuals or as part of grassroots initiatives–businesses are key actors in mainstreaming sufficiency-oriented practices, since consumption describes the relation among consumers and businesses. Sufficiency-oriented businesses respond to changing consumer behavior and influence consumers by shifts in promotion and sales strategies and development of business models beyond fast fashion trends and increasing product sales (Bocken and Short, 2016; Tunn et al., 2019; Bocken et al., 2020; Kantabutra and Punnakitikashem, 2020; Ralph, 2021). Instead of mass consumption sufficiency-oriented marketing emphasizes wellbeing (Kelleci and Yildiz, 2021). For some businesses, especially in the premium sector, such new business models may be beneficial (Bocken and Short, 2016; Bocken et al., 2016, p. 43; Yip and Bocken, 2018; Freudenreich and Schaltegger, 2020). However, empirical studies show that an orientation toward sufficiency among businesses is very rare (Freudenreich and Schaltegger, 2020) as it hinders the growth of firms (Bocken et al., 2014), and that the main focus is on a shift to "greener" products and processes instead of reductions in consumption (Gunarathne and Lee, 2021; Niessen and Bocken, 2021). Thus, the individualization of responsibility for sufficiency-oriented behavior is complemented here by the (individual) responsibility of companies to create sufficiency-oriented offers and to influence consumer decisions in a sufficiency-oriented way (Wieser, 2016). Sufficiency concepts for businesses follow as well a radical bottom-up approach, which includes changes in individual consumer behavior, development of alternatives in societal niches and the diffusion of such practices.

Contributions and limitations

In summary, it can be stated that the concepts of sufficiency presented here are aimed at voluntarily reducing the consumption of a (global) upper and middle class with a bottom-up approach, which relies on individual realization of the problem, diffusion of individual behavior and cultural change. A link to social theories of behavior that emphasize the autonomy of individuals and the ability of independent choices and changes (Ajzen, 1985) is evident in this approach and further elaborated by Spangenberg and Lorek (2019). Accordingly, transformation is conceptualized as an incremental change that results primarily from a tendency to voluntarily change consumption practices. This makes transformation seem relatively free of conflicts.

However, it remains unclear whether the necessary reduction of consumption levels and the accompanying de-privileging of members of upper and middle classes can actually

be achieved through individual realization of the problem and voluntary action. Consumer research and sociologists have indicated that consumption practices are always supra-individual and shaped by political, economic and socio-cultural (Bourdieu, 1982; Røpke, 1999; Schor, 1999, 2007; Veblen, 2003 [1899]) as well as infrastructural (Shove et al., 2015; Yang et al., 2021) conditions. This means that individual changes in consumption are limited, because of the constitution of social institutions such as social norms, legal regulations or the organization of wage- and care work. Numerous studies show that environmental consumption depends primarily on income and to a lesser extent on values and attitudes, which makes voluntary consumption reduction by the upper and middle classes less likely (Jappelli and Pistaferri, 2010; Notter et al., 2013; Dauvergne, 2016; Kleinhueckelkotten and Neitzke, 2019; Verfuerth et al., 2019). Moreover, the potential of sufficiency practices of individuals or companies is diminished by free-riding incentives, for example the possibility that lower consumption by some is offset by increased consumption by others, for example due to falling prices (Cornes and Sandler, 2003, p. 157). The contribution to sustainability of sufficiency approaches based on individual decisions therefore remains limited. According to Linz (2013, p. 47), sufficiency research has for a long time underestimated the inertial forces of routine behavior and the scope of the social embedding of social practices, and has overestimated individuals' willingness to change behavior and the chances for a sufficiency-oriented cultural change.

Type 2: Policy-making approach

Taking up the arguments that emphasize the social embeddedness of consumption practices, a second cluster of sufficiency conceptions interprets sufficiency as a political sustainability strategy and emphasizes the need for political frameworks (Lorek and Fuchs, 2013; Pettersen, 2016; Spengler, 2018; Verfuerth et al., 2019). Modes of consumption are thought to be social practices that cannot be directly controlled but can be shaped by framework conditions (Pettersen, 2016; Spangenberg and Lorek, 2019).

Object of transformation

Sufficiency policy aims to "make the good life easier" by changes in framework conditions and on the production side (Schneidewind and Zahrnt, 2014). Accordingly, sufficiency policy aims to create political, economic, social and infrastructural framework conditions that promote, encourage or enable resource-conserving social practices and avoid or prevent resource-intensive social practices (Lorek and Fuchs, 2013; Tröger and Reese, 2021). By changing framework conditions, the social practices and consumption levels of consumers with a high level of consumption in a global context are to be changed in particular (Fischer and Grießhammer, 2013;

Linz, 2013; Lorek and Fuchs, 2013). Changes in framework conditions do not only influence the social practices of consumers but also the decisions of companies, since they are subject to structural constraints in a similar way and are dependent on political framework conditions that enable and foster sufficiency-oriented corporate strategies (Pettersen, 2016; Heikkurinen et al., 2019).

Proposed sufficiency policy measures range from ones with a low level of intervention such as the support of local sufficiency-oriented initiatives (Brunori and Di Iacovo, 2014) to structural measures with a high depth of intervention such as an orientation of policy making toward new wellbeing indicators (Hayden, 2015; Jitsuchon, 2019) or the reconstruction of infrastructures (Schneidewind and Zahrnt, 2014; Burke, 2020, p. 9; Brunner, 2021; Cohen, 2021). The scope of sufficiency measures varies. While sufficiency policy is often related to consumption-intensive sectors such as mobility (Waygood et al., 2019) or housing (Bohnenberger, 2021; Cohen, 2021), some concepts go much further and also relate sufficiency to the entire provision of public services, including education and the health sector, or the transformation of wage labor (Schneidewind and Zahrnt, 2014; Haberl et al., 2020). In some of these concepts it is argued that a sufficient decoupling of economic growth from ecological depletion is unlikely and that growth dependency is enshrined in societal structures (Parrique et al., 2019; Haberl et al., 2020). This implies that a substantial sufficiency policy–which is admitted to be necessary–would require a society that is independent from growth and may lead into a degrowth or steady-state-economy (Parrique et al., 2019; Haberl et al., 2020). The concepts of major restructuring overlap with the third type of sufficiency concepts, outlined below (e.g., Lorek and Spangenberg, 2019). Regardless of the scale of intervention, the orientation toward public policy measures aiming to achieve sufficiency plays a central role in the concepts summarized here.

The political definition and enforcement of upper limits to consumption raises questions on the encroachment on (individual) liberties. A major critique to sufficiency *policy* is that it may tend to paternalism since it aims to influence the individual notions of what a good life is (Muller and Huppenbauer, 2016). In contrast, Linz (2013, p. 47) argues that the space within which freedom can prevail must be politically defined. In the context of consumption corridors Fuchs et al. (2021, p. 68) emphasize that freedom can only be guaranteed by setting and exercising limits. Likewise, Spengler (2018) argues with regard to consumption-oriented sufficiency policies that corresponding encroachments on individual liberties can be justified with the help of the harm principle in liberal democracies. In contrast to scholars, who focus individual sufficiency concepts and emphasize the freedom to choose between sufficiency and non-sufficiency consumption behavior (Heindl and Kanschik, 2016), Spengler emphasizes that such restrictions can also be necessary, because by exceeding ecological limits, i.e., by having non-sufficiency lifestyles, the

freedom of other people can be restricted. An argumentation that can also be found in a landmark ruling by the Federal Constitutional Court of Germany that called for an immediate substantial climate protection policy, as the postponement of climate protection would restrict the freedom rights of the young today as well as future generations (BVerfG, 2021). The debate about a general speed limit on German motorways, among other things, illustrates how contested sufficiency policies can be. Sufficiency policy, as conceived here, thus raises questions of intergenerational justice above or at least to the same level as questions of individual (consumption) liberties, which clearly distinguishes these sufficiency conceptions from conceptions of the first type.

Subject of transformation

The sufficiency concepts of this type are characterized by an orientation toward state institutions and decision-makers to develop sufficiency policy measures and instruments and to examine the process of their implementation (Lorek and Fuchs, 2013; Brunori and Di Iacovo, 2014; Lorek and Spangenberg, 2019; Sandberg, 2021). Accordingly, (sufficiency-oriented) policy makers are central actors of change. Policy recommendations (Thomas et al., 2019; Haberl et al., 2020; Lorek et al., 2021; Zell-Ziegler et al., 2021), best practice examples (Böcker et al., 2021), the development of sufficiency-related scenarios and models (Wachsmuth and Duscha, 2019; Fishman et al., 2021; Poncin, 2021) as well as questions of communication and framing of sufficiency policy (Toulouse et al., 2019) play a role in this context. In the spirit of policy advice, research aims to provide knowledge for decision-makers and thus influence discourses. This relies primarily on the realization of the problem by decision-makers.

Contributions and limitations

In contrast to the first type of sufficiency concepts, those of the second type do not allocate the responsibility for change to individuals or businesses but emphasize the necessity for political change. This perspective builds on insights from social practice theory that emphasizes the embeddedness of social practices in framework conditions such as infrastructures or other institutions. From this point of view, unsustainable infrastructures or institutions are politicized rather than unsustainable behavior.

However, until now far-reaching policies of sufficiency are seldom found in practice. An analysis of national energy and climate plans and the long term strategies of the EU member states shows that there are few regulatory sufficiency measures in place (Zell-Ziegler et al., 2021). Schmitt et al. (2015) studied the climate protection plans of German municipalities and mainly found measures that increase the variety of options for consumers, which put the onus on consumers to decide to act sustainably. Likewise Hayden (2014a) argues that especially those, narrowly defined, sufficiency policy measures with a high

symbolic value (such as a ban on plastic bags) or with a potential to generate economic growth (such as the support of local food production) are likely to be implemented, but not those leading to a broader reduction in consumption. This suggests that in a growth-oriented world it might be easier to add more options to choose from than to limit choices. So, a remaining question is how this political change could come into practice.

Most of the concepts of this second type emphasize the necessity for changes in political framework conditions, but pay comparatively little attention to the question of how this change should come into place. Policy-makers are key actors in the second type of concepts, as they need to decide on the sufficiency policies. This means that a sufficiency-oriented change relies, more or less, on the realization of the necessity of sufficiency policies by policy makers. Similar to the first type, social change is conceptualized quite free of conflicts. This focus on the ability of the state to solve ecological and social problems is criticized as being insufficient to overcome the manifest structures of unsustainability since it tends to underestimate how deep the causes of unsustainability are encoded in the political and economic structures (Brand, 2021). This criticism emphasizes that the necessary downshift of consumption in the Global North will be a very conflictual process and that the political decisions will not happen automatically or easily, but will need pressure, for example, from social movements (Steinberger and Roberts, 2010; Newell et al., 2021). Thus, the big question of how sufficiency policies can be implemented and which role different actors play remains for further research.

Type 3: Social-movement approach

Taking up the argument that it seems to be difficult to reduce consumption in a growth-oriented and capitalist society, the focus of the third type of sufficiency concepts is on the structural constitution of current capitalist consumer societies. In these concepts, sufficiency is conceived as a critique of capitalism and domination and as an emancipatory strategy against a society focused on acceleration, externalization and growth. Many arguments in this type of sufficiency concepts are derived from eco-feminist and postcolonial perspectives.

Object of transformation

The object of transformation of these concepts of sufficiency is not only a reduction of consumption and production–may it be voluntarily or incited by adjusted political framework conditions–but a fundamental shift in the mode of production. Sufficiency describes something that cannot be implemented within the current economic and social system without fundamentally changing it. Thereby, sufficiency becomes a lens to criticize and question the present and is therefore described as a "political sting" (Winterfeld, 2007, p. 54; Winterfeld, 2017) or a "critical category" (Winterfeld, 2011).

One major point of criticism of the current modes of production and consumption is the link between economic growth and ecological depletion, which has already been mentioned above and is sometimes part of sufficiency concepts of the first two types. This is a central point in concepts of the third type (Princen, 2005; Wiedmann et al., 2020). In the third type, sufficiency is seen as less about changing social or consumption practices than the first two types. Instead, sufficiency, when applied to the Global North, aims to achieve a stationary or even shrinking economy in order to obtain ecological goals and thus raises, as Sachs (1993, p. 71) writes, "the big question of our time [...]: how is social security, how is a decent life possible without a growing economy?". Thus, sufficiency describes the principle of a different economy and societal organization, which is orientated toward sufficiency rather than efficiency (Princen, 2005; Newell et al., 2021). This could include the establishment of new time regimes (Princen, 2005; Darby, 2007, p. 116), a restriction of private property, an expansion of the commons (Sachs, 1993; Princen, 2005; Lage and Leuser, 2019) or the foundation of sufficiency as one of the core principles of liberal societies (Muller and Huppenbauer, 2016)[5]. In addition to ecological goals, the restructuring of the mode of production is focused on shaping a fairer, and more equal society.

This leads to a second crucial point of criticism, which is highlighted by these sufficiency concepts, namely the connection between economic growth, externalization, exploitation and discrimination (Salleh, 2009). From this point of view, economic growth and the living standard in the Global North is based on the externalization of cost *via* the exploitation of natural resources and people in other parts of the world. Power and domination relationships, which manifest in patterns of discrimination and a dualistic world-view, create hierarchies between "here" and "elsewhere," "developed" and "developing," "men" and "women" or "humans" and "nature," and thus enable externalization from the first to the second. In this context, sufficiency is thought to establish relationships among people and between humans and nature without exploitation and externalization (Salleh, 2010) and to reduce discrimination (Newell et al., 2021). In the reviewed literature, there is a focus on reducing discrimination along the dimensions of race, class and gender (Salleh, 2010; Winterfeld, 2017; Newell et al., 2021). When understood in this way, sufficiency in relation to the upper limit does not ask "what is enough?" but "what is too much" or, put differently, "at whose expense is the current growth taking place?" (Winterfeld, 2011). Reflecting on the

_____

5 The question whether the implementation of sufficiency as a core principle of society is possible *within* a *liberal* society or is contradictive to it because of its criticism of capitalist consumer society depends on the exact notion of "liberal society." Muller and Huppenbauer (2016) argue that implementing sufficiency as a core principle would "redefine the frame that determines how liberal societies should be conceived" (p. 108).

impacts of sufficiency-oriented interventions on dimensions of discrimination and externalization can be seen as a contribution to decolonizing the sustainable living debate (Newell et al., 2021). For policymaking, this would mean putting practices of care and community at the center of sufficiency measures to meet human needs in a less materialistic way (Newell et al., 2021) and to focus on redistribution instead of growth (Steinberger and Roberts, 2010). Practices, knowledge and experiences from the Global South, and peasant farmers or care-givers are mentioned as being inspirational and helpful to the organization of a society in line with the logic of sufficiency (Salleh, 2010).

Spitzner (2020, 2021) exemplifies the interpretation of sufficiency from a care perspective with the simple case of mobility. She argues that the car system is often more oriented toward the mobility patterns of wageworkers, rather than toward the mobility patterns of still mostly female caregivers and people in need of care, such as children or the elderly. Accordingly, Spitzner (2020, 2021) argues that the dismantling of the car infrastructure and the expansion of a low-cost public transport system oriented toward the routes of caregivers could be part of an emancipative sufficiency policy. Other examples of connecting sufficiency measures directly with aspects of care or redistribution are the reallocation of revenues from frequent flyer levies on flights of wealthier consumers to subsidized forms of public transport (Newell et al., 2021, p. 8), or an unconditional basic income to enable the development of new time regimes (Sachs, 1993, p. 71). However, concepts of the third type of sufficiency are less focused on concrete bundles of measures and instruments as concepts of the second type, but describe a different logic of societal organization (Princen, 2005). In this sense, Muller and Huppenbauer (2016) understand sufficiency as a new, additional core principle of liberal societies that "addresses the frame for policy making rather than the policy making itself" (p. 107).

The emphasis on the growth-critical and domination-critical dimension of sufficiency in combination with a focus on social movements shows numerous overlaps with the work on "imperial mode of living" (Brand and Wissen, 2011, 2021) and concepts of degrowth (Demaria et al., 2013). Brand and Wissen (2021) analyse how the mode of living (in the Global North) on the expanses of others (human and nature) is interrelated with modes of production and based on structural discrimination. Degrowth concepts, similar to these concepts of sufficiency, can be understood both as critiques of the growth model, which are formulated from different perspectives (Schmelzer and Vetter, 2019), and as fundamental political and economic reorganization (Kallis et al., 2018). Part of this restructuring is the overcoming of growth dependency of current social institutions and the creation of just, more egalitarian, democratic and environmentally sustainable institutions (Demaria et al., 2013). Some scholars emphasize the link between degrowth and post-development studies and other perspectives and

TABLE 1 In a nutshell: Different approaches to social change in sufficiency concepts.

	Bottom-up approach	Policy-making approach	Social-movement approach
Object of transformation	Individual consumption and cultural change	Mode of consumption including framework conditions (infrastructures, institutions etc.)	Structures that suggest economic growth, externalization, exploitation and discrimination
Subject of transformation	Individuals, businesses, grassroots movements	Political decision makers	Social movements
Sufficiency definition	Sufficiency describes conscious and intended reductions in individual consumption and a corresponding cultural change.	Sufficiency policy describes changes in framework conditions that enable, facilitate and shape social practices of reduced consumption.	Sufficiency is a critical perspective on the nexus of unsustainability, growth-dependency, externalization, exploitation, and discrimination and describes a logic of societal organizations (in contrast to efficiency) that is oriented toward socio-ecological justice and "enoughness."
Approaches to transformation	The diffusion of changes in individual behavior shapes a cultural change toward sufficiency, which forms the basis for possible further political measures.	Changed framework conditions shape a broad and sometimes unconscious change of social practices and a reduction of consumption levels.	Social movements politicize structures of injustice and unsustainability, and open up windows of opportunity for structural change.

movements from the Global South (Escobar, 2015; Perkins, 2019).

Subject of transformation

Unlike the first two types, the sufficiency concepts of the third type do not rely on individual realization of the problem to reduce consumption levels, will and knowledge, of either individuals and companies or politicians. Instead, the implementation of sufficiency is described as a question of power and interests (Fuchs et al., 2016; Spangenberg, 2018, p. 7). This highlights the role of conflicts as a driver of social change. However, the final implementation of sufficiency policies still depends on political decisions (Lorek and Fuchs, 2013). A sufficiency-oriented transformation, therefore, needs counter-hegemonic movements and conflictual confrontations to shift power structures and increase political pressure (Winterfeld, 2011, p. 63). Thus, social movements (Princen, 2005; Wiedmann et al., 2020; Newell et al., 2021) and NGOs (Lorek and Spangenberg, 2014) become central subjects of transformation in sufficiency concepts of the third type. Since grassroots movements are social movements as well, some sufficiency concepts of the bottom-up approach and the social-movement approach overlap regarding the subject of transformation. Nevertheless, social movements mentioned by concepts of the third type are characterized by a stronger focus on social struggles, influencing discourses, changing power structures and creating windows of opportunities (Wiedmann et al., 2020; Feola et al., 2021). In this context, social movements from the Global South are highlighted as potential allies and a profound source of knowledge and experience in resisting and overcoming

exploitive conditions and reorganization of the Global North toward sufficiency (Salleh, 2010; Kalt and Lage, 2019; Feola et al., 2021).

Contributions and limitations

In contrast to the first two types of sufficiency concepts, concepts of the social-movement approach emphasize the interconnection of ecological and social problems by highlighting mechanisms of exploitation, externalization and discrimination as being fundamental for ecological damage. Thereby, connections to struggles for social justice come much more into focus. This connection may be beneficial for the implementations of sufficiency policies since findings from political ecology highlight that issues of social justice are usually much better starting points for the politicization of non-sustainable conditions than abstract ecological boundaries (Robbins, 2012). Consequently, struggles and conflicts are described as a central driver of social change, and social movements are named as central actors. Since social movements not only resist or demand but sometimes work directly on the development of alternative practices, a link to the grassroots initiatives of type one can be observed. Nevertheless, the role of social movements in processes of implementing sufficiency policies has been seldom examined so far.

One major point of critique of sufficiency concepts of the social-movement approach is that the implementation of sufficiency in this conceptualization seems quite unlikely und unclear. This is because, firstly, sufficiency approaches of any kind are still far away from being a part of mainstream political discourse on sustainability, and the overcoming of

capitalist power and domination relationships and a growth logic seems even further away. Secondly, it is more difficult to translate the sufficiency concepts of the social-movement approach into concrete measures and instruments, which makes direct applicability in the form of concrete political demands and decisions more difficult. This means that the scope of application for policy practice is reduced compared to concepts of the policy-making approach. One major contribution may be to offer a perspective for critical reflection on current patterns of unsustainability and planned measures.

Table 1 summarizes the three different notions of social change within sufficiency concepts in an idealized and simplified way.

Discussion

Nexus between sufficiency goals and different notions of social change

The literature of this study was reviewed concerning two dimensions of social change, namely the goal of and the approach to social change (Figure 2). As part of the goals of sufficiency-oriented social change, some scholars describe sufficiency itself as an end, which was also described by Jungell-Michelsson and Heikkurinen (2022). Furthermore, the sustainability goals and the notions of social change were differentiated by the development of different narratives. Building on this differentiation, the nexus of these two dimensions can be discussed as one part of the relationship of different sufficiency concepts to each other (research question C). The underlying question is whether certain notions of social change are linked in the sufficiency concepts to certain sustainability goals.

One can recognize that all types of notions of social change are conceptualized to attain different sustainability goals. In other words, it is *not* possible to link directly one notion of social change to a special characteristic of sustainability goals, e.g., the sufficiency concepts that emphasize a growth-critique are not allocated to one type of notions of social change.

Nevertheless, some differentiations can be made that highlight some dominant narratives in an idealized way (Table 2). In all types some sufficiency concepts can be found that follow social sustainability goals, but these goals are most dominant in sufficiency concepts of the social-movement approach. Accordingly, in both the first and the second type, concepts exist that describe sufficiency as a strategy to attain ecological goals only. In concepts of the third type, social aspects are crucial, since sufficiency is conceptualized as a strategy to reduce externalization and discrimination. In sufficiency concepts of the bottom-up approach social aspects and a critique of an ever-growing consumption are merely addressed in the

context of individual wellbeing. In concepts of the policy-making approach social limits to consumption are discussed as a (political) question of distribution.

The upper and lower limits to consumption as a sufficiency-specific operationalisation of social and ecological goals are mostly present in the second and the third type. Especially in the second type the goal of sufficiency policies is described as to create framework conditions that enable a descent life within the consumption corridors. In the third type, questions of sufficient consumption are linked with questions of externalization and discrimination. In some concepts of the bottom-up approach, the development of generalizable individual lifestyles is pursued by an orientation of individual lifestyles toward ecological upper limits.

Concerning the question of economic growth, in both the first and the second type some concepts exist that describe no conflict of sufficiency measures with economic growth and some that emphasize the necessity of an independence of societal development from economic growth. Concepts of the third type describe sufficiency as a new logic of societal and economic organization.

Contradictions and synergies between different notions of social change

Focusing on the relationship between the three different approaches to social change, one can recognize that they are not equally present in the sufficiency discourse. Most of the literature focuses on the first two types, such as the reviews on sufficiency by Sorrell et al. (2020) and Sandberg (2021), which distinguish an "individual" and a "political" thread that are more or less linkable with the bottom-up approach and the policy-making approach. Both reviews missed the third type, which is not as prominent in the literature as the first two. The question as to which of the first two types is most dominant remains unclear. Sorrell et al. (2020) describe the bottom-up approach to sufficiency as dominant, whereas Sandberg (2021) sees a focus on policy-making approaches. Creutzig et al. (2021) describe even sector-specific differences. In their review on demand-side mitigation, which has significant overlaps to sufficiency, they found the call for overall governance as being dominant in the literature on the housing sector whereas behavioral change was emphasized in the literature on food and consumption (p. 7–8). The question whether the concepts of the bottom-up approach or the policy-making approach dominate cannot be answered here, but the hypothesis is formulated that the discourse is moving from the first type to the second. The third type might gain attention since global social movements, such as Fridays for Future, put climate justice in the center of their actions and are able to influence the sustainability and sufficiency discourse on the local and the global level.
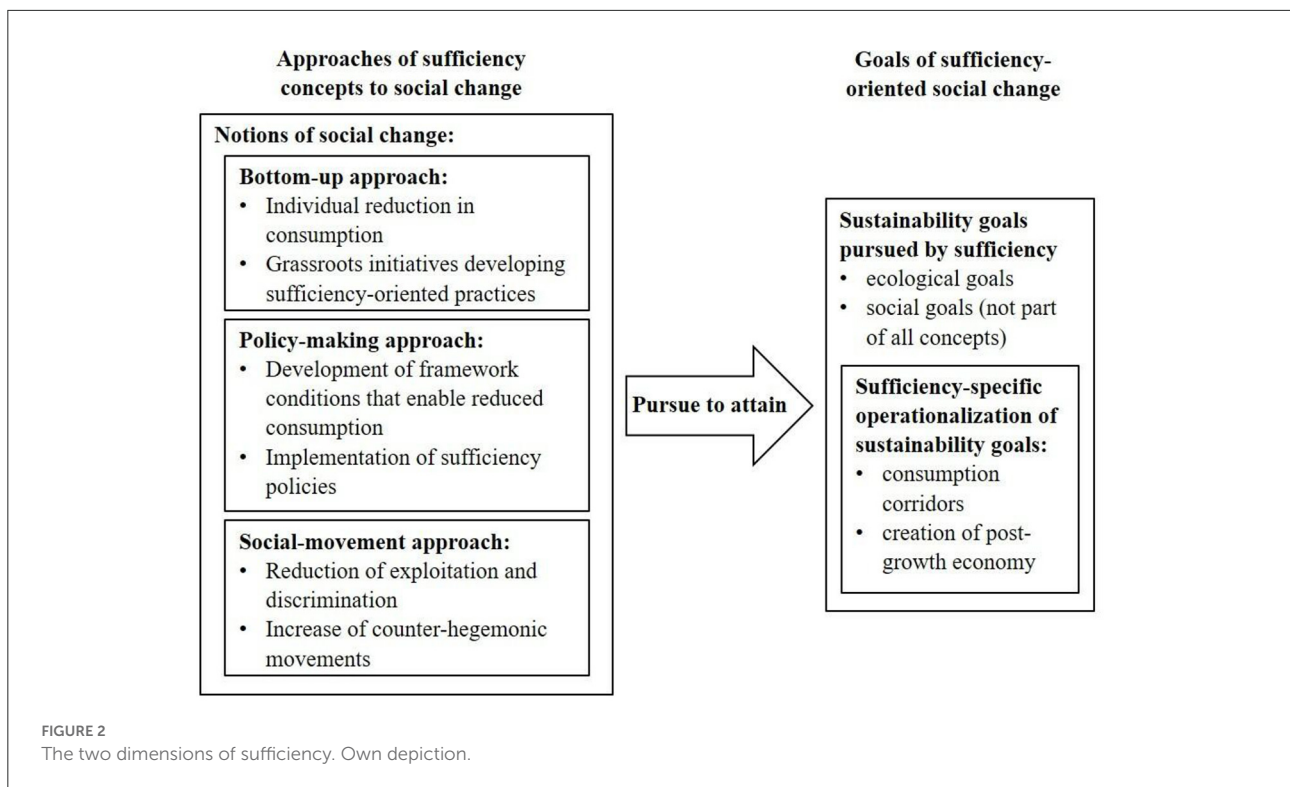
FIGURE 2
The two dimensions of sufficiency. Own depiction.

TABLE 2 Sustainability goals and notions of social change of sufficiency concepts.

		Notions of social change in sufficiency concepts		
		Bottom-up	**Policy-making**	**Social movements**
Sustainability goals	**Ecological goals**	Present	Present	Present
	Social goals	Partly present (mainly in context of individual wellbeing)	Partly present [mainly in context of (re)distribution]	Present (reducing externalization and discrimination)
Sufficiency-specific operationalisation of sustainability goals	**Upper and lower limits to consumption**	Partly present (orientation of lifestyles toward upper ecological limits)	Present (reconfiguration of framework conditions)	Present (linked to externalization and discrimination)
	Create a post-growth economy	Partly present (voluntary simplicity)	Partly present (independence from growth)	Present (sufficiency as a "logic" of societal/economic organization)

Contradictions

The separation into three different types of approaches to social change is an analytical one, which implies that the different types overlap and are to some extent heterogeneous and contradictive in themselves. Nevertheless, this analytical separation enables the identification of contradictions and possible synergies among the different concepts of sufficiency. Two contradictions are highlighted below: (1) different approaches to behavioral change and changes of social practices and (2) the role of conflicts in social change.

First, in sufficiency concepts of the first type social theories of behavior dominate, whereas concepts of the second and the third type are linked to theories of practice. As Shove (2010) points out, these two types of social theories are based on contrasting paradigms. Whereas, theories of behavior, such as the theory of planned behavior (Ajzen, 1985, 1991), describe people as autonomous agents of choice and change, the theory of practice emphasizes the embeddedness of individuals and their decisions in social contexts. In the theory of planned behavior, the focus lies on understanding and influencing attitudes that shape individual behavior. Institutional or infrastructural framework conditions that enable or hinder behavioral change are conceptualized as external to behavior. The aim of policymaking is to adjust these external factors. From

the perspective of practice theory, individuals are carriers of practices and institutions and infrastructures are not external factors but configure and structure the practices. Thus, political interventions are one part of creating new social practices. They are not limited to influencing individual behavior but may question and redesign all institutions and infrastructures. This social practices approach is dominant in the second and the third type of sufficiency concepts, which indicates that they are contradictory to the first type, concerning the approach to social change.

Second, the role of conflicts differs among the different sufficiency concepts. In sufficiency concepts of the first and second type, conflicts play a minor role. When conflicts are mentioned, they are a result of and a barrier to social change that should be avoided (Heindl and Kanschik, 2016, p. 44). Accordingly, higher-level authorities, such as policy makers should "avoid the development of conflicts among local actors" (Bauwens et al., 2020, p. 9). In sufficiency concepts of the third type, conflicts play an important role. Social struggles, as one dimension of conflicts, are described as a driver of social change, since they may politicize injustice and demand for political actions (Salleh, 2009).

The examples of different approaches to changes in behavior/practices and the role of conflicts in social change indicate that the different types of sufficiency concepts are not just different but to some extent contradictive. This implies that the choice of sufficiency concept is highly significant for the analytical perspective on social change and the practical implications for political actions.

Possible synergies

Even though the different types of sufficiency concepts are contradictive in some aspects, it is possible to develop synergies from a broader perspective and draw connections to transformation theory. Sufficiency with bottom up approach can help to develop new, sufficiency-oriented social practices and shift cultural norms, especially if grassroots initiatives and businesses are focused as subjects of transformation. Transformation processes that start in societal niches play a major role in different concepts of socio-ecological change, such as the Multi-Level-Perspective (MLP) (Geels and Schot, 2007), which focuses on socio-technical innovations, or in the sociological transformation theory by Wright (2010). Societal niches are characterized by a quite strong autonomy from dominant power relations and principles of social organizations and thus enable the development of *new* practices. Thus, interstitial strategies–as Wright (2010) calls transformation processes that start in societal niches–may help to envision alternatives and help to "strengthen popular understandings that another world is possible" (p. 365). If approached in such a way, sufficiency concepts of the first type encompass a political dimension and do not merely

individualize the responsibility of social change by focusing on individual lifestyles.

The development of new sufficiency-oriented practices by grassroots initiatives in societal niches could empower policymakers to change institutional frameworks and infrastructures, which is part of the second type of sufficiency concepts. The other way around, such political changes could support niche-practices to thrive and occasionally break through into the mainstream (Ziesemer et al., 2019). In the MLP such a link between developments in societal niches and the development of supportive framework conditions is crucial for the breakthrough of innovations into the mainstream (Grin et al., 2010; Geels, 2019). As pointed out above, sufficiency concepts of the second type address policymakers in a merely collaborative way, which tries to avoid conflicts and confrontation. Wright describes this method of addressing policymakers as a "symbiotic strategy" that aims to change institutions and to develop new ones by using current state institutions. In an idealized way, these strategies aim to solve problems collaboratively and generate win-win solutions (Wright, 2010, p. 361). Wright (2010) suggests that symbiotic strategies are more likely to become deeply institutionalized and durable if they effectively solve social problems and serve the interests of elites and dominant groups. He describes the combination of interstitial (bottom-up) and symbiotic (policy making) transformation as a "sustained metamorphosis" (p. 303).

The third type of sufficiency concepts emphasizes the role of conflicts, confrontation and deep structural change and thus does not fit well with the image of a metamorphosis. Nevertheless, sufficiency strategies of the first two types could render a deep shift toward a logic of sufficiency possible. For example, if sufficiency gained center stage in climate-related policymaking and public discourses, it could benefit deeper structural changes such as politics beyond economic growth. At the same time, the concepts of the first and the second type could benefit from the focus on confrontation and social movements, which is associated with the third type. Sufficiency concepts of the third type emphasize that the process of implementing sufficiency will *not* be a smooth, non-conflictual process, but the result of power struggles and competing interests. In this sense, social movements could become key actors in putting pressure on policymakers and changing and influencing public discourse. The MLP is often criticized for underestimating the role of conflicts and confrontation for driving social change (Geels, 2019). In contrast, Wright (2010, p. 308) describes "ruptural strategies" as a third approach to transformation. He states that ruptural strategies "envision creating new institutions of social empowerment through a sharp break within existing institutions and social structures" (p. 303). Wright frequently emphasizes, that "rupture" does not merely describes a systemic rupture, but a conception of struggles as challenge and confrontation in contrast to

the collaborative problem-solving of the other two strategies (Wright, 2010, p. 370–71).

In conclusion, it is possible to develop synergies among the different concepts of sufficiency and it seems plausible that no notion of social change alone is sufficient; a combination of (elements of) all three notions is necessary for sufficiency-oriented social change. To put it in an idealized and simplified way, a virtuous cycle may emerge, if new sufficiency-oriented social practices are developed in societal niches by grassroots movements, infrastructures and institutions are changed by using state institutions, and social movements fight for shifting public discourse and other power relations and thereby render a deep shift toward sufficiency possible. Nevertheless, to date, a profound theory of how to develop a sufficiency-oriented societal change does not exist.

Reflection, limitations and further research

This article contributes to the field of sufficiency research by providing the first semi-systematic literature review of the sustainability goals and the notions of social change implied in concepts of sufficiency. Until now only a few systematic literature reviews on the conceptualization of sufficiency exist (Niessen and Bocken, 2021; Sandberg, 2021; Jungell-Michelsson and Heikkurinen, 2022). These provide valuable insights, but do not focus on the different approaches to shape sufficiency-oriented social change. By structuring the sufficiency debate concerning the different approaches to social change and discussing them in the context of transformation theory, the review helps to advance the debate about sufficiency-oriented strategies. The search strategy, used for the literature sampling, was comparably broad and not limited to a specific sector (like in Niessen and Bocken, 2021), to consumption (like in Sandberg, 2021) or to peer-reviewed articles (like in Jungell-Michelsson and Heikkurinen, 2022). Among other things, the identification of the third type of notions of social change underlines the importance of such a broad search strategy, since this perspective is mostly, but not exclusively present in books or book chapters.

The use of the semi-systematic literature review method has its limitations. The search strategy limited the selected articles to those in English and some in German. Articles in other languages and those without the word "sufficiency" in their title, abstract or keywords were excluded from the search in the Web of Science Database. By screening the ENOUGH-database, the potential of excluding relevant articles because of missing key words, was minimized. Additionally, a search in other literature databases could have enlarged the reviews sample. Furthermore, research on concepts such as Buen Vivir from South America

or Ecological Sawaraj from India[6], which might have significant overlaps to concepts of sufficiency but do not or only seldom use the term "sufficiency," might contribute valuable insights into this topic. Further research could explicitly focus on links from adjacent concepts to sufficiency–especially those from countries of the Global South–and thereby enrich the sufficiency debate.

Several concepts of sufficiency problematize the role of endless economic growth. The necessary macroeconomic preconditions for and consequences of comprehensive and deep sufficiency policies have been not sufficiently investigated.

As part of this review, different notions of social change within concepts of sufficiency were identified. In the discussion some contradictions and possible synergies were provided. Nevertheless, the question of how to develop a sufficiency-oriented social change could benefit from a further in-depth analysis from the perspectives of transformation and social theories. Thereby, a theory for sufficiency oriented social change could be developed. As well as this theoretical investigation, more empirical studies on the implementation of sufficiency policies and the way in which they enable deeper sufficiency-oriented social change is needed. More attention could be paid to the role of conflicts, since sufficiency is at odds with dominant structures of the economic system (e.g., economic growth) and conflicts have so far played a minor role in many sufficiency concepts.

Conclusion

In this article, sufficiency literature was reviewed concerning notions of social change, which are inherent in concepts of sufficiency. Since sufficiency is a strategy to influence social change toward sustainability, two dimensions were investigated, namely the goal of and the approach toward social change within sufficiency concepts. Sufficiency is thought to pursue ecological and sometimes social goals. Sufficiency as consumption corridors or sufficiency as a way to post growth economy can be described as sufficiency-specific operationalisations of social and ecological goals and are part of some of the concepts.

Furthermore, three different types of approaches to social change were identified: the bottom-up approach, the policy-making approach, and the social-movements approach. In sufficiency concepts of the bottom-up approach a reduction in consumption by changing consumer behavior, new business

---

6   Buen Vivir (Sumak Kawsay in Quechua), is an indigenous concept from South America and is often discussed by post-development scholars. Ecological Sawaraj is a concept that emerged from communities in India. Despite several differences both concepts focus on a non-anthropocentric and harmonious relationship between human beings and nature, social justice and organizing a non-capitalistic economy (Kothari et al., 2014). Acosta and Abarca (2018) mention a link between concepts of Buen Vivir and sufficiency explicitly.

models and grassroots-movements is central. One major limitation to this approach lies in the individualization of responsibility for sufficiency-oriented behavior because infrastructures and institutions do not support or even hinder such behavioral change. In concepts of the policy-making approach, the social embeddedness of social practices is emphasized and reductions in consumption are pursued by changes in political framework conditions. One remaining question in concepts of this approach is how these changes in political framework conditions come into place. It seems that in many concepts the decision for sufficiency policy relies more or less on the realization of the necessity to act by decision makers. This limits the potential of this approach and points to the necessity of further research. In sufficiency concepts of the social-movement approach sufficiency is conceptualized as a critical perspective on the nexus of unsustainability, growth-dependency, externalization, exploitation, and discrimination and is described as a new organizing principle for society. These concepts shed light on structures of power and domination and describe social movements as relevant subjects for transformation, as their role might be to increase counter-hegemonic power. The conceptualization of sufficiency in the social-movement approach is very broad and comparably radical. That is why an operationalization in the form of policies seems to be difficult.

The three approaches differ regarding the role of conflicts and the conceptualization of behavior and social practices. Nevertheless, some possible synergies among these different approaches were identified utilizing the Multi-Level-Perspective of Sustainability Transition Research and Erik O. Wright's transformation theory. In an idealized and simplified way, grassroots movements may develop new sufficiency-oriented social practices, which might be supported, mainstreamed and further developed by political decisions on changing infrastructures and institutions, and social movements may fight for shifting public discourse and other power relations and thereby render a deep shift toward sufficiency possible.

Reflecting on possible synergies indicates how important a fruitful combination of these different approaches might be for shaping sufficiency-oriented social change. By this analysis, the article hopefully contributes to an elaborated debate on how sufficiency-oriented social change can be implemented. Building on the possible synergies identified above, further theoretical and empirical research on the implementation of far-reaching sufficiency policies and the role of different actors is needed. For investigating this question, the analysis of the role of conflicts and the combination with related concepts from the Global South could be explored in further detail. A major obstacle to the implementation of far-reaching sufficiency policies might be that sufficiency is a rather radical concept,

thought to aim for a major restructuring of the modes of production and consumption. However, such a radical approach might be necessary considering the urgency of current socio-ecological crises, and an investigation of transformation paths toward sufficiency is indispensable.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

Acosta, A., and Abarca, M. M. (2018). "Buen vivir: an alternative perspective from the peoples of the global south to the crisis of campitalist modernity," in *The Climate Crisis: South African and Global Democratic Eco-Socialist Alternatives*, ed V. Satgar (Johannesburg: Wits University Press) 131–148.

Adler, F. (2016). *Transformation zur Postwachstumsgesellschaft – ja, aber wie und wer?* Working Paper 3/2016 of the DFG Research Group on Post-Growth Societies. Jena: DFG-Kollegforscherinnengruppe Postwachstumsgesellschaften.

Ajzen, I. (1985). "From intentions to actions: a theory of planned behavior," in *Action Control: from Cognition to Behavior*, eds J. Kuhl, and J. Beckmann (Berlin, Heidelberg: Springer Berlin Heidelberg), 11–39.

Ajzen, I. (1991). The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50, 179–211. doi: 10.1016/0749-5978(91)90020-T

Alcott, B. (2008). The sufficiency strategy: would rich-world frugality lower environmental impact? *Ecol. Econ.* 64, 770–786. doi: 10.1016/j.ecolecon.2007.04.015

Alcott, B. (2010). Impact caps: why population, affluence and technology strategies should be abandoned. *J. Clean. Prod.* 18, 552–560. doi: 10.1016/j.jclepro.2009.08.001

Alexander, S. (2013). Voluntary simplicity and the social reconstruction of law: degrowth from the grassroots up. *Environ. Values* 22, 287–308. doi: 10.3197/096327113X13581561725356

Alexander, S. (2015). *Sufficiency Economy: Enough, for Everyone, Forever*. Melbourne: Simplicity Institute.

Alexander, S., and Ussher, S. (2012). The voluntary simplicity movement: a multi-national survey analysis in theoretical context. *J. Consum. Cult.* 12, 66–86. doi: 10.1177/1469540512444019

Alexander, S., and Yacoumis, P. (2018). Degrowth, energy descent, and low-tech living: potential pathways for increased resilience in times of crisis. *J. Clean. Prod.* 197, 1840–1848. doi: 10.1016/j.jclepro.2016.09.100

Allievi, F., Vinnari, M., and Luukkanen, J. (2015). Meat consumption and production - analysis of efficiency, sufficiency and consistency of global trends. *J. Clean. Prod.* 92, 142–151. doi: 10.1016/j.jclepro.2014.12.075

Aro, R. (2017). A bigger living room required a bigger TV: doing and negotiating necessity in well-to-do households. *J. Consum. Cult.* 20, 498–520. doi: 10.1177/1469540517745706

Baatz, C. (2014). Climate change and individual duties to reduce GHG emissions. *Ethics Policy Environ.* 17, 1–19. doi: 10.1080/21550085.2014.885406

Bauwens, T., Hekkert, M., and Kirchherr, J. (2020). Circular futures: what will they look like? *Ecol. Econ.* 175, 1–14. doi: 10.1016/j.ecolecon.2020.106703

Bocken, N., Morales, L. S., and Lehner, M. (2020). Sufficiency business strategies in the food industry-the case of oatly. *Sustainability* 12, 824. doi: 10.3390/su12030824

Bocken, N. M. P., Pauw, I., de, Bakker, C., and van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *J. Ind. Prod. Eng.* 33, 308–320. doi: 10.1080/21681015.2016.1172124

Bocken, N. M. P., and Short, S. W. (2016). Towards a sufficiency-driven business model: experiences and opportunities. *Environ. Innov. Soc. Transit.* 18, 41–61. doi: 10.1016/j.eist.2015.07.010

Bocken, N. M. P., Short, S. W., Rana, P., and Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *J. Clean. Prod.* 65, 42–56. doi: 10.1016/j.jclepro.2013.11.039

Böcker, M., Brüggemann, H., Christ, M., Knak, A., Lage, J., and Sommer, B. (2021). *Wie wird weniger genug?* Suffizienz als Strategie für eine nachhaltige Stadtentwicklung. München: Oekom Verlag.

Bohnenberger, K. (2021). Can sufficiency reconcile social and environmental goals? AQ-methodological analysis of German housing policy. *J. Hous. Built Environ.* 36, 171–189. doi: 10.1007/s10901-020-09762-4

Bourdieu, P. (1982). *Die feinen Unterschiede: Kritik der gesellschaftlichen Urteilskraft*. Frankfurt am Main: Suhrkamp.

Brand, U. (2021). Wider die Fixierung auf die Politik! Anmerkungen zur aktuellen Transformationsdebatte. *GAIA Ecol. Perspect. Sci. Soc.* 30, 227–230. doi: 10.14512/gaia.30.4.4

Brand, U., and Wissen, M. (2011). "Sozial-ökologische Krise und imperiale Lebensweise: Zu Krise und Kontinuität kapitalistischer Naturverhältnisse," in *VielfachKrise: Im finanzmarktdominierten Kapitalismus*, eds. A. Demirović, J. Dück, F. Becker, and P. Bader (Hamburg: VSA), 78–93.

Brand, U., and Wissen, M. (2021). *The Imperial Mode of Living: Everyday Life and the Ecological Crisis of Campitalism*. New York: Verso Books.

Brunner, K.-M. (2021). "Suffizienz in der Konsumgesellschaft – Über die gesellschaftliche Organisation der Konsumreduktion," in *Transformation und Wachstum*, eds. H. Pechlaner, D. Habicher, and E. Innerhofer (Wiesbaden: Springer Fachmedien Wiesbaden), 161–177.

Brunori, G., and Di Iacovo, F. (2014). Urban food security and landscape change: a demand-side approach. *Landsc. Res.* 39, 141–157. doi: 10.1080/01426397.2014.891725

Burke, M. J. (2020). Energy-sufficiency for a just transition: a systematic review. *Energies* 13, 1–14. doi: 10.3390/en13102444

BVerfG (2021). *Order of the First Senate of 24 March*. Available online at: http://www.bverfg.de/e/rs20210324_1bvr265618en.html (accessed August 15, 2022).

Cherrier, H., Szuba, M., and Özçaglar-Toulouse, N. (2012). Barriers to downward carbon emission: exploring sustainable consumption in the face of the glass floor. *J. Mark. Manag.* 28, 397–419. doi: 10.1080/0267257X.2012.658835

Cibulka, S., and Giljum, S. (2020). Towards a comprehensive framework of the relationships between resource footprints, quality of life, and economic development. *Sustainability* 12, 4734. doi: 10.3390/su12114734

Cohen, M. J. (2021). New conceptions of sufficient home size in high-income countries: are we approaching a sustainable consumption transition? *Hous. Theory Soc.* 38, 173–203. doi: 10.1080/14036096.2020.1722218

Cornes, R., and Sandler, T. (2003). *The Theory of Externalities, Public Goods, and Club Goods*. Cambridge: Cambridge Univ. Press.

Coscieme, L., Sutton, P., Mortensen, L. F., Kubiszewski, I., Costanza, R., Trebeck, K., et al. (2019). Overcoming the myths of mainstream economics to enable a new wellbeing economy. *Sustainability* 11, 4374. doi: 10.3390/su11164374

Creutzig, F., Callaghan, M., Ramakrishnan, A., Javaid, A., Niamir, L., Minx, J., et al. (2021). Reviewing the scope and thematic focus of 100 000 publications on energy consumption, services and social aspects of climate change: a big data approach to demand-side mitigation. *Environ. Res. Lett.* 16, 33001. doi: 10.1088/1748-9326/abd78b

Daly, H. E. (1974). The economics of the steady state. *Am. Econ. Rev.* 64, 15–21.

Daly, H. E. (1991). *Steady-State Economics*. Washington, DC: Island Press.

Daly, H. E. (2015). *Economics for a Full World*. Available online at: https://greattransition.org/publication/economics-for-a-full-world (accessed August 15, 2022).

Darby, S. (2007). "Enough is as good as a feast - sufficiency as policy," in *eceee Summer Study proceedings European Council for an Energy-Efficient Economy* (Stockholm: ECEEE), 111–119.

Darby, S., and Fawcett, T. (2018). *Energy Sufficiency: An Introduction: Concept Paper*. Oxford: ECEEE.

Dauvergne, P. (2016). *Environmentalism of the Rich*. Cambridge, London: The MIT Press.

Davis, A., Hirsch, D., Padley, M., and Marshall, L. (2015). *How Much is Enough? Reaching Social Consensus on Minimum Household Needs*. Loughborough: Loughborough University.

Demaria, F., Schneider, F., Sekulova, F., and Martinez-Alier, J. (2013). What is degrowth? From an activist slogan to a social movement. *Environ. Values* 22, 191–215. doi: 10.3197/096327113X13581561725194

Di Giulio, A., and Fuchs, D. (2014). Sustainable consumption corridors: concept, objections, and responses. *GAIA Ecol. Perspect. Sci. Soc.* 23, 184–192. doi: 10.14512/gaia.23.S1.6

Domanski, D., Howaldt, J., and Kaletka, C. (2020). A comprehensive concept of social innovation and its implications for the local context – on the growing importance of social innovation ecosystems and infrastructures. *Eur. Plan. Stud.* 28, 454–474. doi: 10.1080/09654313.2019.1639397

Druckman, A., and Jackson, T. (2010). The bare necessities: how much household carbon do we really need? *Ecol. Econ.* 69, 1794–1804. doi: 10.1016/j.ecolecon.2010.04.018

Escobar, A. (2015). Degrowth, postdevelopment, and transitions: a preliminary conversation. *Sustain. Sci.* 10, 451–462. doi: 10.1007/s11625-015-0297-5

Eversberg, D., and Schmelzer, M. (2018). The degrowth spectrum: convergence and divergence within a diverse and conflictual alliance. *Environ. Values* 27, 245–267. doi: 10.3197/096327118X15217309300822

Feola, G., Koretskaya, O., and Moore, D. (2021). (Un)making in sustainability transformation beyond capitalism. *Glob. Environ. Change Human Policy Dim.* 69, 102290. doi: 10.1016/j.gloenvcha.2021.102290

Fischer, C., and Grießhammer, R. (2013). *When Less is More: Sufficiency: Terminology, Rationale and Potentials*. Working Paper. Freiburg, Darmstadt, Berlin: Öko-Institut e.V.

Fishman, T., Heeren, N., Pauliuk, S., Berrill, P., Tu, Q., Wolfram, P., et al. (2021). A comprehensive set of global scenarios of housing, mobility, and material efficiency for material cycles and energy systems modeling. *J. Ind. Ecol.* 25, 305–320. doi: 10.1111/jiec.13122

Fournier, E. D., Cudd, R., Federico, F., and Pincetl, S. (2020). On energy sufficiency and the need for new policies to combat growing inequities in the residential energy sector. *Elementa-Sci. Anthropocene.* 8, 1–12. doi: 10.1525/elementa.419

Freudenreich, B., and Schaltegger, S. (2020). Developing sufficiency-oriented offerings for clothing users: business approaches to support consumption reduction. *J. Clean. Prod.* 247, 119589. doi: 10.1016/j.jclepro.2019.119589

Fuchs, D., Di Giulio, A., Glaab, K., Lorek, S., Maniates, M., Princen, T., et al. (2016). Power: the missing element in sustainable consumption and absolute reductions research and action. *J. Clean. Prod.* 132, 298–307. doi: 10.1016/j.jclepro.2015.02.006

Fuchs, D., Sahakian, M., Gumbert, T., Di Giulio, A., Maniates, M., Lorek, S., et al. (2021). *Consumption Corridors: Living a Good Life within Sustainable Limits*, 1st Edn, textbar: Routledge.

Geels, F. W. (2019). Socio-technical transitions to sustainability: a review of criticisms and elaborations of the multi-level perspective. *Curr. Opin. Environ Sustain.* 39, 187–201. doi: 10.1016/j.cosust.2019.06.009

Geels, F. W., and Schot, J. (2007). Typology of sociotechnical transition pathways. *Res. Policy* 36, 399–417. doi: 10.1016/j.respol.2007.01.003

Gladkykh, G., Daviosdottir, B., and Diemer, A. (2021). When justice narratives meet energy system models: Exploring energy sufficiency, sustainability, and universal access in Sub-Saharan Africa. *Energy Res. Soc. Sci.* 79, 102075. doi: 10.1016/j.erss.2021.102075

Gough, I. (2015). Climate change and sustainable welfare: the centrality of human needs. *Cambridge J. Econ.* 39, 1191–1214. doi: 10.1093/cje/bev039

Gough, I. (2020). Defining floors and ceilings: the contribution of human needs theory. *Sustain. Sci. Pract. Policy* 16, 208–219. doi: 10.1080/15487733.2020.1814033

Grin, J., Rotmans, J., and Schot, J. (2010). *Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change*. New York, London: Routledge.

Gunarathne, N., and Lee, K.-H. (2021). The link between corporate energy management and environmental strategy implementation: efficiency, sufficiency and consistency strategy perspectives. *J. Clean. Prod.* 293, 1–15. doi: 10.1016/j.jclepro.2021.126082

Haapanen, L., and Tapio, P. (2016). Economic growth as phenomenon, institution and ideology: a qualitative content analysis of the 21st century growth critique. *J. Clean. Prod.* 112, 3492–3503. doi: 10.1016/j.jclepro.2015.10.024

Haberl, H., Wiedenhofer, D., Virag, D., Kalt, G., Plank, B., Brockway, P., et al. (2020). A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: synthesizing the insights. *Environ. Res. Lett.* 15, 1–42. doi: 10.1088/1748-9326/ab842a

Hayden, A. (2014a). Enough of that already: sufficiency-based challenges to high-carbon consumption in Canada. *Env. Polit.* 23, 97–114. doi: 10.1080/09644016.2013.818301

Hayden, A. (2014b). *When Green Growth is Not Enough: Climate Change, Ecological Modernization, and Sufficiency*. Montreal, Kingston, London, Ithaca: McGill-Queen's University Press.

Hayden, A. (2015). Bhutan: blazing a trail to a postgrowth future? or stepping on the treadmill of production? *J. Environ. Dev.* 24, 161–186. doi: 10.1177/1070496515579199

Hayden, A. (2019). "Sufficiency," In *Sufficiency Chapter in Routledge Handbook of Global Sustainability Governance*, eds A. Kalfagianni, D. Fuchs, and A. Hayden (Other titles: Global sustainability governance Description: New York: Routledge 2020. Routledge), 151–163.

Heikkurinen, P., Young, C. W., and Morgan, E. (2019). Business for sustainable change: extending eco-efficiency and eco-sufficiency strategies to consumers. *J. Clean. Prod.* 218, 656–664. doi: 10.1016/j.jclepro.2019.02.053

Heindl, P., and Kanschik, P. (2016). Ecological sufficiency, individual liberties, and distributive justice: implications for policy making. *Ecol. Econ.* 126, 42–50. doi: 10.1016/j.ecolecon.2016.03.019

Hotta, Y., Tasaki, T., and Koide, R. (2021). Expansion of policy domain of sustainable consumption and production (SCP): challenges and opportunities for policy design. *Sustainability* 13, 6763. doi: 10.3390/su13126763

Huber, J. (2000). *Industrielle Ökologie: Konsistenz, Effizienz und Suffizienz in zyklusanalytischer Betrachtung*. Konferenzbeitrag. Available online at: https://nbn-resolving.org/urn:nbn:de:0168-ssoar-121622 (accessed August 15, 2022).

IPCC (2022). *Climate Change 2022: Mitigation of Climate Change - Summary for Policymaker*. Available online at: https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf (accessed August 15, 2022).

Jaccard, I. S., Pichler, P.-P., Toebben, J., and Weisz, H. (2021). The energy and carbon inequality corridor for a 1.5°C compatible and just Europe. *Environ. Res. Lett.* 16, 1–10. doi: 10.1088/1748-9326/abfb2f

Jackson, T. (2009). *Prosperity Without Growth: Economics for A Finite Planet*. London, Washington, DC: Earthscan.

Jaeger-Erben, M., Blättel-Mink, B., Fuchs, D., Götz, K., Langen, N., and Rau, H. (2020). Grenzen des Konsums im Lebensverlauf: Gelegenheiten, Hürden und Gestaltungsspielräume. *GAIA Ecol. Perspect. Sci. Soc.* 29, 218–223. doi: 10.14512/gaia.29.4.4

Jappelli, T., and Pistaferri, L. (2010). The consumption response to income changes. *Annu. Rev. Econ.* 2, 479–506. doi: 10.1146/annurev.economics.050708.142933

Jitsuchon, S. (2019). Thailand's sufficiency economy philosophy as an alternative path to sustainable development. *Eur. J. Sustain. Develop.* 8, 191–200. doi: 10.14207/ejsd.2019.v8n2p191

Jungell-Michelsson, J., and Heikkurinen, P. (2022). Sufficiency: a systematic literature review. *Ecol. Econ.* 195, 107380. doi: 10.1016/j.ecolecon.2022.107380

Kallis, G., Kostakis, V., Lange, S., Muraca, B., Paulson, S., and Schmelzer, M. (2018). Research On Degrowth. *Annu. Rev. Environ. Resour.* 43, 291–316. doi: 10.1146/annurev-environ-102017-025941

Kalt, T., and Lage, J. (2019). Die Ressourcenfrage (re)politisieren! Suffizienz, Gerechtigkeit und sozial-ökologische Transformation. *GAIA Ecol. Perspect. Sci. Soc.* 28, 256–259. doi: 10.14512/gaia.28.3.4

Kanschik, P. (2016). Eco-sufficiency and distributive sufficientarianism - friends or foes? *Environ. Values* 25, 553–571. doi: 10.3197/096327116X14703858759099

Kantabutra, S., and Punnakitikashem, P. (2020). Exploring the process toward corporate sustainability at a Thai SME. *Sustainability* 12, 9204. doi: 10.3390/su12219204

Kelleci, A., and Yildiz, O. (2021). A guiding framework for levels of sustainability in marketing. *Sustainability* 13, 1644. doi: 10.3390/su13041644

Ketprapakorn, N., and Kantabutra, S. (2019). Culture development for sustainable SMEs: toward a behavioral theory. *Sustainability* 11, 2629. doi: 10.3390/su11092629

Kleinhueckelkotten, S., and Neitzke, H.-P. (2019). Social acceptability of more sustainable alternatives in clothing consumption. *Sustainability* 11, 6194. doi: 10.3390/su11226194

Koide, R., Kojima, S., Nansai, K., Lettenmeier, M., Asakawa, K., Liu, C., et al. (2021). Exploring carbon footprint reduction pathways through urban lifestyle changes: a practical approach applied to Japanese cities. *Environ. Res. Lett.* 16, 1–14. doi: 10.1088/1748-9326/ac0e64

Korphaibool, V., Chatjuthamard, P., and Treepongkaruna, S. (2021). Scoring sufficiency economy philosophy through GRI standards and firm risk: a case study of Thai listed companies. *Sustainability* 13, 2321. doi: 10.3390/su13042321

Kothari, A., Demaria, F., and Acosta, A. (2014). Buen vivir, degrowth and ecological swaraj: alternatives to sustainable development and the green economy. *Development* 57, 362–375. doi: 10.1057/dev.2015.24

Kuhnhenn, K., Costa, L., Mahnke, E., Schneider, L., and Lange, S. (2020). *A Societal Transformation Scenario for Staying Below 1.5°C*. Berlin, Leipzig: Heinrich-Böll-Stiftung; Konzeptwerk Neue Ökonomie.

Lage, J., and Leuser, L. (2019). Fläche unter Druck: Sozial-ökologische Dimensionen der Flächennutzung in deutschen Wachstumsregionen. *GAIA Ecol. Perspect. Sci. Soc.* 28, 365–373. doi: 10.14512/gaia.28.4.8

Lallana, M., Almazan, A., Valero, A., and Lareo, A. (2021). Assessing energy descent scenarios for the ecological transition in Spain 2020-2030. *Sustainability* 13, 11867. doi: 10.3390/su132111867

Lamberton, G. (2005). Sustainable sufficiency - an internally consistent version of sustainability. *Sustain. Develop.* 13, 53–68. doi: 10.1002/sd.245

Lavelle, M. J., and Fahy, F. (2021). Creating context for corridors of consumption: the case of Ireland. *Sustain. Sci. Pract. Policy* 17, 62–76. doi: 10.1080/15487733.2020.1864966

Lenz, C. (2015). *Zur Durchsetzungsfähigkeit von Suffizienzstrategien: Eine Analyse auf der Grundlage von Ansätzen der Neuen Politischen Ökonomie.* Marburg: Metropolis-Verlag.

Lettenmeier, M., Lahteenoja, S., Hirvilammi, T., and Laakso, S. (2014). Resource use of low-income households - approach for defining a decent lifestyle? *Sci. Total Environ.* 481, 681–684. doi: 10.1016/j.scitotenv.2013.11.048

Linz, M. (2013). "Suffizienz–unentbehrlich für Nachhaltigkeit," in *Jahrbuch Ökologie*, eds. H. Leitschuh, and G. Altner (Stuttgart: Hirzel), 44–54.

Lorek, S., and Fuchs, D. (2013). Strong sustainable consumption governance – precondition for a degrowth path? *J. Clean. Prod.* 38, 36–43. doi: 10.1016/j.jclepro.2011.08.008

Lorek, S., Gran, C., Barth, J., Kiss-Dobronyi, B., Tomany, S., and Weber, L. (2021). *1.5 Degree Policy Mix: Demand-Side Solutions to Carbon-Neutrality in the EU: Introducing the Concept of Sufficiency.* Available online at: https://zoe-institut.de/wp-content/uploads/2021/04/ZOE_Policy_Note_1-5-Degree_Final.pdf (accessed August 15, 2022).

Lorek, S., and Spangenberg, J. H. (2014). Sustainable consumption within a sustainable economy – beyond green growth and green economies. *J. Clean. Prod.* 63, 33–44. doi: 10.1016/j.jclepro.2013.08.045

Lorek, S., and Spangenberg, J. H. (2019). Energy sufficiency through social innovation in housing. *Energy Policy* 126, 287–294. doi: 10.1016/j.enpol.2018.11.026

Loy, L. S., Tröger, J., Prior, P., and Reese, G. (2021). Global citizens - global jet setters? the relation between global identity, sufficiency orientation, travelling, and a socio-ecological transformation of the mobility system. *Front. Psychol.* 12, 1–14. doi: 10.3389/fpsyg.2021.622842

Max-Neef, M. A. (1991). *Human Scale Development: Conception, Application and Further Reflections.* New York, NY: Apex Press.

Meadows, D. H., Meadows, D. L., and Randers, J. (1972). *The Limits to Growth; a Report for the Club of Rome's Project on the Predicament of Mankind*, ed Donella H. Meadows. New York, Universe Books [1973].

Millward-Hopkins, J., Steinberger, J. K., Rao, N. D., and Oswald, Y. (2020). Providing decent living with minimum energy: a global scenario. *Glob. Environ. Change* 65, 102168. doi: 10.1016/j.gloenvcha.2020.102168

Moser, C., Rösch, A., and Stauffacher, M. (2015). Exploring societal preferences for energy sufficiency measures in Switzerland. *Front. Energy Res.* 3, 1–15. doi: 10.3389/fenrg.2015.00040

Moser, S., and Kleinhückelkotten, S. (2018). Good intents, but low impacts: diverging importance of motivational and socioeconomic determinants explaining pro-environmental behavior, energy use, and carbon footprint. *Environ. Behav.* 50, 626–656. doi: 10.1177/0013916517710685

Muller, A., and Huppenbauer, M. (2016). Sufficiency, liberal societies and environmental policy in the face of planetary boundaries. *GAIA Ecol. Perspect. Sci. Soc.* 25, 105–109. doi: 10.14512/gaia.25.2.10

Newell, P., Twena, M., and Daley, F. (2021). Scaling behaviour change for a 1.5-degree world: challenges and opportunities. *Glob. Sustain.* 4, 1–13. doi: 10.1017/sus.2021.23

Niessen, L., and Bocken, N. M. P. (2021). How can businesses drive sufficiency? The business for sufficiency framework. *Sustain. Prod. Consum.* 28, 1090–1103. doi: 10.1016/j.spc.2021.07.030

Notter, D. A., Meyer, R., and Althaus, H.-J. (2013). The western lifestyle and its long way to sustainability. *Environ. Sci. Technol.* 7, 4014–4021. doi: 10.1021/es3037548

Nussbaum, M. C. (1992). Human functioning and social justice. *Polit. Theory* 20, 202–246. doi: 10.1177/0090591792020002002

O'Neill, D. W., Fanning, A. L., Lamb, W. F., and Steinberger, J. K. (2018). A good life for all within planetary boundaries. *Nat. Sustain.* 1, 88–95. doi: 10.1038/s41893-018-0021-4

O'Sullivan, P., and Kraisornsuthasinee, S. (2020). YOU EARN as YOU LIVE as YOU VALUE consumption-work dialectic and its implications for sustainability. *Sustain. Account. Manag. Policy J.* 11, 429–450. doi: 10.1108/SAMPJ-12-2018-0362

Parks, S. (2012). Divergent pathways of development: a comparative case study of human well-being in two Thai provinces. *Environ. Planning C-Govern. Policy* 30, 891–909. doi: 10.1068/c1165r

Parrique, T., Barth, J., Briens, F., Kerschner, C., Kraus-Polk, A., Kuokkanen, A., et al. (2019). *Decoupling Debunked: Evidence and Arguments Against Green Growht as a Sole Strategy for Sustainability.* Brussels: European Environmental Bureau.

Perkins, P. E. (2019). Climate justice, commons, and degrowth. *Ecol. Econ.* 160, 183–190. doi: 10.1016/j.ecolecon.2019.02.005

Pettersen, I. N. (2016). Fostering absolute reductions in resource use: the potential role and feasibility of practice-oriented design. *J. Clean. Prod.* 132, 252–265. doi: 10.1016/j.jclepro.2015.02.005

Poncin, S. (2021). Energy policies for eco-friendly households in luxembourg: a study based on the LuxHEI model. *Environ. Model. Assess.* 26, 37–61. doi: 10.1007/s10666-020-09725-7

Princen, T. (2003). Principles for sustainability: from cooperation and efficiency to sufficiency. *Glob. Environ. Polit.* 3, 33–50. doi: 10.1162/152638003763336374

Princen, T. (2005). *The Logic of Sufficiency.* Cambridge, Mass MIT Press.

Ralph, N. (2021). A conceptual merging of circular economy, degrowth and conviviality design approaches applied to renewable energy technology. *J. Clean. Prod.* 4, 1–13. doi: 10.1016/j.jclepro.2021.128549

Raworth, K. (2012). *A Safe and Just Space for Humanity: Can We Live Within the Doughnut.* Oxford: Oxfam.

Raworth, K. (2017). *Dougnout Economics: Seven Ways to Think Like a 21st-Century Economist.* White River Junction: Chelsea Green Publishing.

Rebouças, R., and Soares, A. M. (2021). Voluntary simplicity: a literature review and research agenda. *Int. J. Consum. Stud.* 45, 303–319. doi: 10.1111/ijcs.12621

Robbins, P. (2012). *Political Ecology: A Critical Introduction.* Malden, MA: Wiley-Blackwell.

Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin, F. S. III., Lambin, E. F., et al. (2009). A safe operating space for humanity. *Nature* 461, 472–475. doi: 10.1038/461472a

Røpke, I. (1999). The dynamics of willingness to consume. *Ecol. Econ.* 28, 399–420. doi: 10.1016/S0921-8009(98)00107-4

Sachs, W. (1993). Die vier E's: Merkposten für einen maßvollen Wirtschaftsstil. *politische ökologie* 11, 69–72.

Sachs, W. (1995). From efficiency to sufficiency. *Resurgence.* 171, 6–10.

Sahakian, M., and Dobigny, L. (2019). From governing behaviour to transformative change: a typology of household energy initiatives in Switzerland. *Energy Policy* 129, 1261–1270. doi: 10.1016/j.enpol.2019.03.027

Sahakian, M., Rau, H., Grealis, E., Godin, L., Wallenborn, G., Backhaus, J., et al. (2021). Challenging social norms to recraft practices: a living lab approach to reducing household energy use in eight European countries. *Energy Res. Soc. Sci.* 72, 101881. doi: 10.1016/j.erss.2020.101881

Salleh, A. (2009). *Eco-Sufficiency and Global Justice: Women Write Political Ecology.* London: Pluto Press.

Salleh, A. (2010). From metabolic rift to metabolic value: reflections on environmental sociology and the alternative globalization movement. *Organ. Environ.* 23, 205–219. doi: 10.1177/1086026610372134

Sandberg, M. (2021). Sufficiency transitions: a review of consumption changes for environmental sustainability. *J. Clean. Prod.* 293, 126097. doi: 10.1016/j.jclepro.2021.126097

Schanes, K., Jaeger, J., and Drummond, P. (2019). Three scenario narratives for a resource-efficient and low-carbon Europe in 2050. *Ecol. Econ.* 155, 70–79. doi: 10.1016/j.ecolecon.2018.02.009

Schmelzer, M., and Vetter, A. (2019). *Degrowth/Postwachstum zur Einführung.* Hamburg: Junius.

Schmidt, K., and Matthies, E. (2018). Where to start fighting the food waste problem? Identifying most promising entry points for intervention programs to reduce household food waste and overconsumption of food. *Resour. Conserv. Recycl.* 139, 1–14. doi: 10.1016/j.resconrec.2018.07.023

Schmidt, S., and Weigt, H. (2015). Interdisciplinary energy research and energy consumption: what, why, and how? *Energy Res. Soc. Sci.* 10, 206–219. doi: 10.1016/j.erss.2015.08.001

Schmitt, C., Leuser, L., Brischke, L.-A., Duscha, M., and Jacobsen, S. (2015). *Suffizienz-Maßnahmen und -Politiken in kommunalen Klimaschutzkonzepten und Masterplänen - ein Überblick: Arbeitspapier im Rahmen des Projektes "Strategien und Instrumente für eine technische, systematische und kulturelle Transformation zur nachhaltigen Begrenzung des Energiebedarfs im Konsumfeld Bauen / Wohnen".* Heidelberg; Berlin: IFEU.

Schneidewind, U., and Zahrnt, A. (2014). *Politics of Sufficiency: Making it Easier to Live the Good Life.* München: Oekom Verlag.

Schor, J. B. (1999). "What's wrong with consumer society? competetive spending and the "new consumerism"," in *Consuming desires: Consumption, Culture, and the Pursuit of Happiness*, ed. R. Rosenblatt (Washington, DC: Island Press), 37–50.

Schor, J. B. (2007). In defense of consumer critique: revisiting the consumption debates of the twentieth century. *Ann. Am. Acad. Pol. Soc. Sci.* 611, 16–30. doi: 10.1177/0002716206299145

Schroeter, M., Stumpf, K. H., Loos, J., van Oudenhoven, A. P. E., Boehnke-Henrichs, A., and Abson, D. J. (2017). Refocusing ecosystem services towards sustainability. *Ecosyst. Serv.* 25, 35–43. doi: 10.1016/j.ecoser.2017.03.019

Sen, A. (1993). "Capability and well-being," in *The Quality of Life*, eds. Nussbaum, and Sen (Oxford: Clarendon Press).

Shove, E. (2010). Beyond the ABC: climate change policy and theories of social change. *Environ. Plan. A* 42, 1273–1285. doi: 10.1068/a42282

Shove, E., Watson, M., and Spurling, N. (2015). Conceptualizing connections. *Eur. J. Soc. Theory* 18, 274–287. doi: 10.1177/1368431015579964

Snyder, H. (2019). Literature review as a research methodology: an overview and guidelines. *J. Bus. Res.* 104, 333–339. doi: 10.1016/j.jbusres.2019.07.039

Soetebeer, I. (2015). Well-being and prosperity beyond growth discursive struggles in the german enquete commission on growth, prosperity and quality of life. *GAIA-Ecol. Perspect. Sci. Soc.* 24, 179–187. doi: 10.14512/gaia.24.3.10

Song, H.-C. (2020). Sufficiency economy philosophy: buddhism-based sustainability framework in Thailand. *Bus. Strategy Environ.* 9, 1–11. doi: 10.1002/bse.2553

Sorrell, S., Gatersleben, B., and Druckman, A. (2020). The limits of energy sufficiency: a review of the evidence for rebound effects and negative spillovers from behavioural change. *Energy Res. Soc. Sci.* 64, 101439. doi: 10.1016/j.erss.2020.101439

Spangenberg, J. H. (2018). "Sufficiency: a pragmatic, radical visionary approach," In *Sufficiency: Moving Beyond the Gospel of Eco-Efficiency*, ed. Friends of the Earth Europe (Brüssel: Friends of the Earth Europe), 5–8.

Spangenberg, J. H., and Lorek, S. (2002). Environmentally sustainable household consumption: from aggregate environmental pressures to priority fields of action. *Ecol. Econ.* 43, 127–140. doi: 10.1016/S0921-8009(02)00212-4

Spangenberg, J. H., and Lorek, S. (2019). Sufficiency and consumer behaviour: from theory to policy. *Energy Policy* 129, 1070–1079. doi: 10.1016/j.enpol.2019.03.013

Spengler, L. (2016). Two types of 'enough': sufficiency as minimum and maximum. *Env. Polit.* 25, 921–940. doi: 10.1080/09644016.2016.1164355

Spengler, L. (2018). *Sufficiency as Policy: Necessity, Possibilities and Limitations*. Baden-Baden: Nomos Verlagsgesellschaft.

Spitzner, M. (2020). Transformative Klimapolitik - Genderwirkungsprüfung und emanzipative Suffizienz-Rechte. *Forum Wissenschaft* 37, 17–21.

Spitzner, M. (2021). Für emanzipative Suffizienz-Perspektiven: Green New Deal statt nachhaltiger Bewältigung der Versorgungsökonomie-Krise und Verkehrsvermeidung? *Prokla* 51, 95–114. doi: 10.32387/prokla.v51i202.1934

Steinberger, J. K., and Roberts, J. T. (2010). From constraint to sufficiency the decoupling of energy and carbon from human needs, 1975-2005. *Ecol. Econ.* 70, 425–433. doi: 10.1016/j.ecolecon.2010.09.014

Thomas, S., Thema, J., Brischke, L.-A., Leuser, L., Kopatz, M., and Spitzner, M. (2019). Energy sufficiency policy for residential electricity use and per-capita dwelling size. *Energy Effic.* 12, 1123–1149. doi: 10.1007/s12053-018-9727-4

Toulouse, E., Sahakian, M., Lorek, S., Bohnenberger, K., Bierwirth, A., and Leuser, L. (2019). "Energy sufficiency: how can research better help and inform policy-making?" In *ECEEE 2019 Summer Study Proceedings - Is Efficient Sufficient?*, ed. ECEEE Summer Study (Stockholm, Sweden: ECEEE Secretariat).

Trainer, T. (2019). "Eco-Anarchism," in *Pluriverse: A Post-Development Dictionary*, eds. A. Kothari, A. Salleh, A. Escobar, F. Demaria, and A. Acosta (New Delhi: Tulika Books), 160–163.

Tröger, J., and Reese, G. (2021). Talkin' bout a revolution: an expert interview study exploring barriers and keys to engender change towards societal sufficiency orientation. *Sustain. Sci.* 16, 827–840. doi: 10.1007/s11625-020-00871-1

Tunn, V. S. C., Bocken, N. M. P., van den Hende, E. A., and Schoormans, J. P. L. (2019). Business models for sustainable consumption in the circular economy: an expert study. *J. Clean. Prod.* 212, 324–333. doi: 10.1016/j.jclepro.2018.11.290

van Loy, N., Verbeeck, G., and Knapen, E. (2021). Personal heating in dwellings as an innovative, energy-sufficient heating practice: a case study research. *Sustainability* 13, 7257. doi: 10.3390/su13137257

Veblen, T. (2003 [1899]). *The Theory of the Leisure Class*. Available online at: https://discoversocialsciences.com/wp-content/uploads/2018/02/veblen_theory-leisure-class1.pdf (accessed May 18, 2020).

Verfuerth, C., Henn, L., and Becker, S. (2019). Is it up to them? Individual leverages for sufficiency. *GAIA Ecol. Perspect. Sci. Soc.* 28, 374–380. doi: 10.14512/gaia.28.4.9

Vita, G., Lundstrom, J. R., Hertwich, E. G., Quist, J., Ivanova, D., Stadler, K., et al. (2019). The environmental impact of green consumption and sufficiency lifestyles scenarios in europe: connecting local sustainability visions to global consequences. *Ecol. Econ.* 164, 106322. doi: 10.1016/j.ecolecon.2019.05.002

Wachsmuth, J., and Duscha, V. (2019). Achievability of the Paris targets in the EUthe role of demand-side-driven mitigation in different types of scenarios. *Energy Effic.* 12, 403–421. doi: 10.1007/s12053-018-9670-4

Waygood, E. O. D., Sun, Y., and Schmöcker, J.-D. (2019). Transport sufficiency: introduction and case study. *Travel Behav. Soc.* 15, 54–62. doi: 10.1016/j.tbs.2018.12.002

Wiedmann, T., Lenzen, M., Keyßer, L. T., and Steinberger, J. K. (2020). Scientists' warning on affluence. *Nat. Commun.* 11, 1–10. doi: 10.1038/s41467-020-16941-y

Wiese, F., Thema, J., and Cordroch, L. (2022). Strategies for climate neutrality. Lessons from a meta-analysis of German energy scenarios. *Renew. Sust. Energ. Transit.* 2, 100015. doi: 10.1016/j.rset.2021.100015

Wieser, H. (2016). Beyond planned obsolescence product lifespans and the challenges to a circular economy. *GAIA Ecol. Perspect. Sci. Soc.* 25, 156–160. doi: 10.14512/gaia.25.3.5

Winterfeld, U. (2007). "Keine Nachhaltigkeit ohne Suffizienz: Fünf Thesen und Folgerungen," in *Vorgänge*, ed Humanistische Union e.V. (Berlin: Berliner Wissenschaftsverlag (BWV)), 46–54.

Winterfeld, U. V. (2011). "Vom Recht auf Suffizienz," in *Ausgewachsen! Ökologische Gerechtigkeit, soziale Rechte, gutes Leben*, ed. W. Rätz (Hamburg: VSA-Verl.), 57–65.

Winterfeld, U. V. (2017). "Politische Stachel der Suffizienz," in *Postwachstumspolitiken: Wege zur wachstumsunabhängigen Gesellschaft*, eds. F. Adler, and U. Schachtschneider (München: oekom), 65–76.

Wong, G., Greenhalgh, T., Westhorp, G., Buckingham, J., and Pawson, R. (2013). RAMESES publication standards: meta-narrative reviews. *BMC Med.* 11, 20. doi: 10.1186/1741-7015-11-20

Wright, E. O. (2010). *Envisioning Real Utopias*. London: Verso.

Yang, Q., Cai, J., Feng, T., Liu, Z., and Timmermans, H. (2021). Bikeway provision and bicycle commuting: city-level empirical findings from the US. *Sustainability* 13, 3113. doi: 10.3390/su13063113

Yip, A. W. H., and Bocken, N. M. P. (2018). Sustainable business model archetypes for the banking industry. *J. Clean. Prod.* 174, 150–169. doi: 10.1016/j.jclepro.2017.10.190

Zannakis, M., Molander, S., and Johansson, L.-O. (2019). On the relationship between pro-environmental behavior, experienced monetary costs, and psychological gains. *Sustainability* 11, 5467. doi: 10.3390/su11195467

Zapf, W. (1994). *Modernisierung, Wohlfahrtsentwicklung und Transformation: Soziologische Aufsätze 1987 bis 1994*. Berlin: Edition Sigma.

Zell-Ziegler, C., Thema, J., Best, B., Wiese, F., Lage, J., Schmidt, A., et al. (2021). Enough? The role of sufficiency in European energy and climate plans. *Energy Policy* 157, 112483. doi: 10.1016/j.enpol.2021.112483

Ziesemer, F., Huettel, A., and Balderjahn, I. (2019). Pioneers' insights into governing social innovation for sustainable anti-consumption. *Sustainability* 11, 6663. doi: 10.3390/su11236663