frontiers | Frontiers in Sustainability

ORIGINAL RESEARCH
published: 03 May 2022
doi: 10.3389/frsus.2022.899289

The Sufficiency-Based Circular Economy—An Analysis of 150 Companies

Nancy M. P. Bocken[1,2]*, *Laura Niessen*[1] and *Samuel W. Short*[1,3]

[1] Maastricht Sustainability Institute, School of Business and Economics, Maastricht University, Maastricht, Netherlands, [2] The International Institute for Industrial Environmental Economics (IIIEE), Lund University, Lund, Sweden, [3] Institute for Manufacturing (IfM), Department of Engineering, University of Cambridge, Cambridge, United Kingdom

The circular economy has become a popular paradigm in the business and policy spheres. It can support sustainable development by aiming to safeguard the resources to mitigate negative impacts on the climate and the environment and to sustain our current and future generations. Yet, despite progress with circular economy initiatives, there is a risk of focusing on incremental innovations with little real impact, and possibly even creating serious negative rebound effects. This study suggests that the concept of "sufficiency" is inadequately represented in the current circular economy discourse and innovations, and this may be undermining real progress. In this paper, the Sufficiency-based Circular Economy paradigm is introduced. We investigate the following questions: What is the role of business in the sufficiency-based circular economy? What are the institutional limitations to the role of business as a driver for the transition and how might these be overcome? We conduct a "practice research" by analyzing company cases of sufficiency practices in a business context. We analyse 150 business cases to identify how their organizational strategies support sufficiency and what type of innovations they exemplify within this transition. We investigate seven core business elements for economic transformation (purpose, ownership, governance, finance, networks, scale-up and impact) of these businesses to understand how they drive the value propositions and their impact on the wider transition. This is followed by a discussion on a broader business and policy perspective of the Sufficiency-based Circular Economy.

Keywords: circular economy, sufficiency economy, societal transition, industrial system transformation, sustainable consumption and production, flourishing, enough, sustainability

OPEN ACCESS

Edited by:
Dalia D'Amato,
University of Helsinki, Finland

Reviewed by:
Tom Waas,
Thomas More University of Applied Sciences, Belgium
Petteri Repo,
University of Helsinki, Finland

***Correspondence:**
Nancy M. P. Bocken
nancy.bocken@maastrichtuniversity.nl

Specialty section:
This article was submitted to Circular Economy, a section of the journal Frontiers in Sustainability

Received: *18 March 2022*
Accepted: *14 April 2022*
Published: *03 May 2022*

Citation:
Bocken NMP, Niessen L and Short SW (2022) The Sufficiency-Based Circular Economy—An Analysis of 150 Companies. Front. Sustain. 3:899289. doi: 10.3389/frsus.2022.899289

INTRODUCTION

Circular Economy is widely viewed as a pathway to sustainability, presenting a counterforce to the conventional take-make-dispose linear model seen in much of the modern economy (Ellen MacArthur Foundation, 2022). The Circular Economy could be one pathway to achieve sustainable development: "Development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends" (Griggs et al., 2013, p. 306). In short, without a safe and thriving natural environment, there can be no thriving society or economy (Griggs et al., 2013).

The Circular Economy (CE) concept is based on the recycling of materials, slowing material resource loops through reuse and repair, optimizing the shared use of assets, and natural ecosystem regeneration, with the objective of reducing demand for virgin materials, resource exploitation, environmental pollution, and wasteful landfill (Bocken et al., 2016; Konietzko et al., 2020). The concept has gathered considerable momentum over the past decade and now dominates much of the sustainability agenda (Geissdoerfer et al., 2017). Governments and industry are engaging with the concept and many seemingly promising initiatives are emerging (Ghisellini et al., 2016). Circular economy potentially offers a way to decouple environmental impacts from economic growth; in other words, to generate more profit while reducing environmental impact (Kjaer et al., 2019; Velenturf et al., 2021). In this regard it fits well with the prevailing economic growth narrative, and this may explain its broad acceptance and momentum. Yet, because of this fit with "business as usual," there is a risk that the Circular Economy when interpreted narrowly perpetuates the current state of resource use and climate impact, or even worsens it.

Many industries such as fashion and packaging have focused on using sustainable materials and recycling but have failed to deliver the needed significant reductions in resource use. In fact, despite the sustainability rhetoric, and improvement in recycling and reuse initiatives (13% of the total material input is now recycled after clothing use), clothing production has doubled in the past 15 years, while clothing utilization (the average time an item is worn) has decreased by 36% over the same time-period (Ellen MacArthur Foundation., 2017). It is estimated that globally, "one garbage truck of textiles is sent to landfill or incinerated every second" (Ellen MacArthur Foundation., 2017, p. 37). Furthermore, 300 million tons of plastic (increasing by about 4% annually) are produced each year worldwide, half of which is for single-use items such as packaging [NRDC (Natural Resources Defense Council), 2021], and much of which cannot be recycled and ends up incinerated or in landfill.

Problematically, the focus on recirculating resources ignores the fact that such approaches have limitations. Firstly, for many products it is not currently economically viable to circulate resources. Secondly, circularity initiatives are simply not able to offset the ever-growing demand for the consumption of products and materials driven by population growth and increasingly resource-intensive affluent lifestyles (Allwood, 2014). Thirdly, there are various potential circular rebound effects whereby unintended consequences undermine sustainability initiatives (Zink and Geyer, 2017). For example, remanufacturing and refurbishment use energy and material inputs for the "recirculation process," and there is an added logistics footprint related to product take-back for reprocessing. Moreover, for a business built on circularity such as recycling, reusing, sharing, or refurbishing, an obvious business strategy for growth is to intensify use or accelerate the resource loops, such as encouraging consumers to use car share or e-scooter for a journey they would previously have walked, or maybe not taken at all. An adverse "circular" scenario is quite likely: consumers might buy and use more of a product if they know that these will have a viable refurbishment or recycling route. This could in fact lead to increasing primary and secondary production (e.g., refurbishment and remanufacturing), and energy consumption (Zink and Geyer, 2017). Moreover, secondary production might not reduce or displace primary production if consumers do not see refurbished or remanufactured products as a desirable substitute (Zink and Geyer, 2017). Finally, if "circular products" are cheaper, consumers might buy more of them, or spend their saved money on unsustainable products or environmentally damaging practices such as air travel, thereby increasing their total environmental footprint.

The successful implementation of a sustainable circular economy thus comes with various challenges, and while initiatives may be addressing sustainable production to a certain extent, they fail to address the topics of sustainable consumption, or "consuming less" which has the least fit with business as usual (Bocken and Short, 2016). The CE paradigm does not exclude this, but by not emphasizing this topic more prominently, practitioners of the CE paradigm currently run the risk of continuing to focus on incremental resource strategies that fail to mitigate the issues of the predominant industrial system. To support meaningful transition, quantitative evidence on environmental impact reduction and the potential negative environmental rebound effects associated with each of the circular strategies are needed (Blomsma and Brennan, 2017; Zink and Geyer, 2017; Das et al., 2021). Overconsumption is gradually becoming a real citizen concern. A majority of respondents to a GlobeScan. (2021) survey agreed with the statement "We need to consume less to preserve the environment for future generations." Furthermore, the rise of anti-consumption advertising on Black Friday—following the "Don't buy this jacket" advert in the New York Times by Patagonia in 2011—suggests that the timing is right to reposition the CE toward sufficiency (Gossen and Heinrich, 2021). Circular economy may well be at an important crossroad: it can continue to propose incremental changes to resource flows, leaving the wider, unsustainable, economic system unchanged, or it can join a transformative movement toward a sustainable circular society (Velenturf et al., 2021).

In this paper, we fully support the concept of circular economy, but we suggest a pathway forward with a stronger focus on concepts such as "sufficiency" and "making do with less" (Alexander, 2012). The CE concept is currently being embedded in policy and business practices across Europe and globally, but needs critical examination to achieve its goal of significant resource conservation and climate impact reductions. Building on the concept of CE, we propose a complementary perspective: the Sufficiency-based Circular Economy (Bocken and Short, 2020).

Sufficiency and its counterpart overconsumption are often presented as a consumer issue with the impetus placed on the individual to change their behavior. However, placing the onus on the consumer ignores the dominate role that industry plays in product/service design, and stimulating consumer demand. In this study, we therefore focus on the role of business as a potential lever toward the economic transition to a "sufficiency-based economy." In their interaction with consumers, businesses can leverage their resources and market influence to drive changes in consumption. To that end, we investigate the following research questions: What is the role of business in the sufficiency-based

circular economy? What are the institutional limitations to the role of business as a driver for the transition and how might these be overcome? In order to investigate the role of business and the institutional limitations, we use the lens of seven core elements for a sufficiency-based economy (purpose, ownership, finance, governance, networks, scale and impact), borrowing the first five Kelly's (2012) work on regenerative economy and DEAL's (Doughnut Economics Action Lab). (2021) work on business traits for the Doughnut economy.

The remainder of this paper is structured as follows. First, we discuss the concept of a Sufficiency-based Circular Economy and present the seven possible core elements for a new economy, as well as the research gap. Second, we present our method including a multiple-case study of 150 companies, the sufficiency practices they promote, and innovations they exemplify within this transition. This results in a state of practice of business in sufficiency. Based on this, we provide a future outlook from a business and policy perspective and identify potential policy-level levers for change to enable and facilitate sufficiency-based business initiatives. We conclude with suggestions for future work on the potential transformation toward a more sufficiency-focused circular economy.

BACKGROUND

Sufficiency

Sufficiency has been defined as having enough to live well without excess, satisfying essential needs necessary to live and function comfortably, while prioritizing quality of life in work, education, and leisure, but not needlessly striving to satisfy infinite human material wants (Niessen and Bocken, 2021). Alexander (2012, p. 8) terms a sufficiency economy as having "Enough, for Everyone, Forever," and Spangenberg and Lorek (2019) clarify that in a sufficiency economy, the aim is to meet social well-being while resource consumption is actively restricted to stay within planetary boundaries. What constitutes a sufficient level of consumption is complicated and subjective, but recent research for sufficient consumption tries to understand basic needs in the form of consumption corridors, which indicate the minimum level of social provisioning required while staying within planetary boundaries (Fuchs et al., 2021).

Sufficiency is associated with minimizing wasteful consumption, which is often in stark contrast to the currently dominant "throwaway" consumer society (Cooper, 2005). It can be positioned within the waste hierarchy ranking of waste management options as targeting the higher levels of refuse, reduce, and rethink strategies that deliver greater environmental benefit, as illustrated in **Figure 1**. These categories were chosen as they were in line with the business for sufficiency strategies in Niessen and Bocken (2021). Although the waste hierarchy focuses on environmental benefit, rethink, reduce, and refuse strategies can also contribute meaningful social benefits at the individual consumer level and for the broader society (e.g., a rethink, reduce or refuse approach to food might address diet related non communicable diseases such as obesity).

Thus, we define the sufficiency-based circular economy as follows:

In the sufficiency-based circular economy, the refuse, reduce, and rethink strategies are prioritized over recycling strategies. A sufficiency-based circular economy encourages citizens to make conscious consumption choices for sustainability, by making do with less, avoiding unnecessary purchases, repairing, and maintaining existing products, and buying second hand, refurbished or remanufactured where possible, to the effect of reducing overall resource use. Businesses strategies and policies support this hierarchy of choices by making "refuse, reduce, and rethink" the most feasible, desirable, and viable options for citizens. Policies should enable such a new economy.

For consumers, this means that one should not only consider what type of products and services to consume, but also how much of it, or in other words:

- Absolute quantity vs. basic needs.
- Quality of goods and environmental impact of consumption.

Whether or not sufficiency should be encouraged or discouraged depends on both. A certain absolute level of consumption is necessary for many consumer goods, energy, transport, etc, while excess can harm the environment, public health, or the individual. Consumption also depends on the quality (e.g., durability, functionality, timeless design, beauty) and environmental impact (e.g., resource efficiency, design for circularity, minimal environmental impact, longevity, use of renewable resources) of the goods and services. For example, driving a small electric car is less impactful than a large SUV. Therefore, certain categories that go far beyond "bare necessities" should be treated as a higher priority for reduction to achieve sufficiency than others.

Sufficiency, at its core, means persuading consumers not to buy and consume as much, or where consumption is essential, making products less resource-intensive, and assisting consumers to use goods for longer, which ultimately means selling less (Potocnik et al., 2018; Godelnik, 2021; Niessen and Bocken, 2021). This may seem at odds with economically viable business practice, although recent studies have investigated its business potential and demonstrated successes (Bocken and Short, 2016; Freudenreich and Schaltegger, 2020; Gossen and Heinrich, 2021; Niessen and Bocken, 2021). The underlying economic logic for a sufficiency-based business model is to incentivise consumers to use less, often by introducing substitute products or services that shift the value proposition, making sufficiency the preferred option for the consumer. Sufficiency is not just about product longevity and selling less, but also about reducing energy and materials throughout the use phase—all of which can be of significant value to the end-user. Such businesses can still pursue aggressive growth and profit, taking market share away from incumbents, but ultimately, they deliver sufficiency by shrinking the overall size (and material and energy demands) of the market.

Sufficiency models are not new; they have been commonplace throughout history when resources have been tightly constrained, and remain an economic necessity for many today. Quotas on fishing to protect marine resources, or zoning restrictions on construction to protect the environment represent examples of widely-accepted sufficiency practices. Excessive consumption

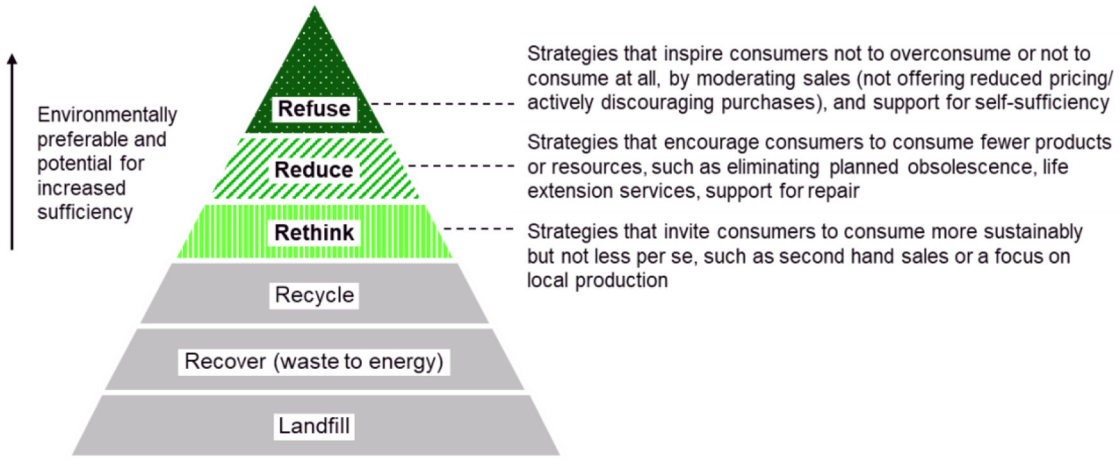

FIGURE 1 | Circular hierarchy depicting sufficiency strategies. *Source*: Based on Bocken and Short (2016) and Niessen and Bocken (2021).

today will impose serious impacts and restrictions on future generations, such as irreversible climate change, biodiversity collapse and reaching hard limits on resources. This makes sufficiency an important issue of inter-generational ethics and presents a challenge for a modern consumer society built on the unequal distribution of wealth and a growth-based market system that encourage excessive consumption (Wilkinson and Pickett, 2009).

Sufficiency in the Wider Circular Economy Transition

The Circular Economy has been presented as a future paradigm effectively combining resource savings and economic growth. However, critics have argued that meeting human needs while minimizing environmental impact would be a better goal than achieving material circularity (Allwood, 2014; Zink and Geyer, 2017). In response to this critique, recent work by Bocken and Short (2021) introduced a framework to position the circular economy in relation to broader perspectives on a sustainable society (**Figure 2**).

Early sustainability efforts by business have been focused on quick wins of efficiency and productivity improvements that reduce costs and resource use (Hart and Ahuja, 1996), and substituting renewables and clean production technologies in place of fossil fuels and other polluting processes or use of non-renewable resources (Jeswani et al., 2008; Weinhofer and Hoffmann, 2010). The net-zero movement rapidly gaining momentum is an extension of these earlier approaches, with a specific focus on carbon reduction. While continuous resource (and cost) efficiency improvements are important from a business and environmental perspective, they have proven to lead to growth rather than reducing resource use (as lower costs stimulate higher demand). Moreover, they do little to encourage the circulation (reuse) of materials. The circular economy paradigm seeks to address this latter problem, and holds potential for a more significant impact on resource use and climate change mitigation as it enables companies to reuse materials and products. Yet, it requires more radical value chain and business model innovations and reconfigurations, and a shift in consumer behavior to allow for this (Lüdeke-Freund et al., 2019).

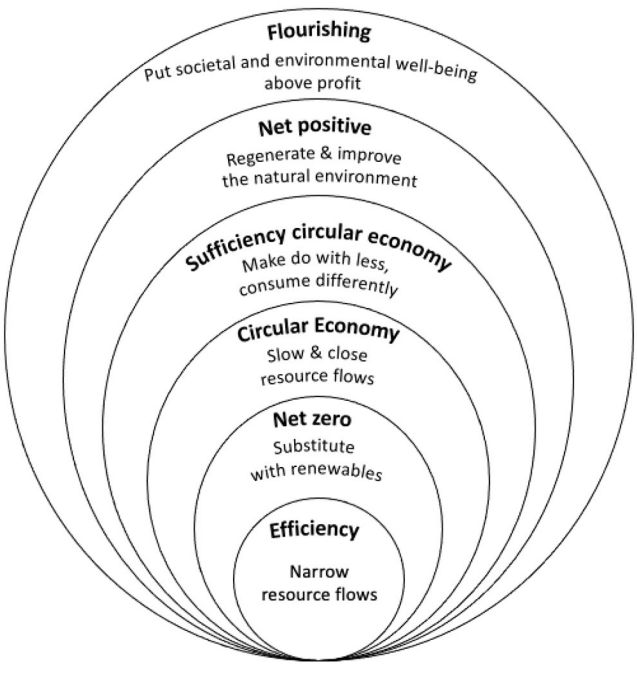

FIGURE 2 | Toward a new sustainable society. *Source*: Bocken and Short (2021).

The sufficiency-based circular economy (Bocken and Short, 2020; Godelnik, 2021) goes a step further than the cycling of products and materials: it proposes that society as a whole needs to "make do with less" while operating within a circular economy.

A sufficiency example from a citizen-perspective is "flygscham," an anti-flying social movement which started in 2018 and literally translates as "flight shame," promoting less flying on account of the sector's high greenhouse gas emissions. This citizen action for sufficiency translated into business reaction when, in 2019, Dutch airline KLM's CEO Pieter Elbers wrote in a letter that "we invite all air travelers to make responsible decisions about flying" (Preston, 2019). While still a minority, there is a growing community of businesses that support sufficiency and actively promote the concept to their customers (Niessen and Bocken, 2021). Examples of such Business for Sufficiency include companies that promote the use of fewer, sustainably-produced items for extended lifetime, such as clothing retailers Asket and Eileen Fisher, smartphone manufacturer Fairphone, outdoor clothing company Patagonia, and furniture manufacturer Vitsœ (see Niessen and Bocken, 2021). These companies have actively sought to redesign their products for longevity, eliminate built-in obsolescence, and encourage and support their customers in keeping the product in use through repair, refurbishment, and upgrade services, while discouraging customers from making unnecessary extra purchases. Timeless designs are often a feature of such business, removing the temptation for consumers to replace items simply to have the latest more fashionable model. Other business strategies include rental or lease offers, for instance with Gerrard Street headphones or Feather furniture, that enable customers to use a product for the duration they need it, without being forced to buy and dispose; or offering a choice that is less resource-intensive, for instance by enabling a switch to plant-based diets or a modal shift away from private car use.

As shown in **Figure 2**, a Sufficiency-based Circular Economy is also not the last step in business transformation toward real sustainability. For a sustainable future, business practices will need to be regenerative and contribute positively to society and the environment, leaving the environment (and society) in a better state than before, to undo the environmental degradation of the past century (Hahn and Tampe, 2021). Net positive businesses would contribute more positive impact to the environment and society than they would detract. Going further, flourishing, a concept introduced by Ehrenfeld (2019), suggests that we should be agnostic about economic wealth and growth, and rather strive for a thriving society and the environment, an argument also popularized in the work of Kate Raworth on doughnut economics (Raworth, 2017). The aim is to build a thriving society and environment regardless of economic growth (Raworth, 2017; Ehrenfeld and Hoffman, 2020). Flourishing has also been discussed in the business model context (Upward and Jones, 2016) and linked to the concept of strong sustainability, which is about the importance of maintaining and repairing stocks of natural capital to sustain basic life support functions, rather than sustainability efforts being a mere extension of our current economic system (Neumayer, 2013). In practice, this means introducing policy and regulation that shift economic growth and wealth accumulation objectives toward delivering a thriving environment and society, and redefine the parameters under which business operates, rather than simply leaving it to deregulated "market forces" to deliver the needed change. While the circular economy has put us on a different pathway to innovation beyond efficiencies and cost-savings, and will be a core part of any future sustainable system, this perspective is inadequate on its own to have a radical impact on environmental issues, when interpreted in a narrow way.

Core Elements of a Sufficiency-Based Circular Economy

We argue that sufficiency is an important logical, albeit radical next step (at least in a highly consumerism-focused society), toward a new paradigm that supports the transition toward a truly sustainable society. But how can we understand the role of business in supporting the transformation toward a new societal paradigm? While there is no unifying framework for a (sufficiency-based) circular economy, we draw on work by Meadows (1997), Rockström et al. (2009), and more recent work by Kelly (2012), Raworth (2017), and Bocken and Short (2016) to derive core design elements for a sufficiency-orientated business.

The seminal work on complex systems and systems dynamics by Meadows (1997) addressed key leverage points, which are the places within a complex system (a company, city, or whole economy) where a small shift could bring about major change. The mindset, goal, and focus on the new paradigm are essential (Meadows, 1997). The work by Rockström et al. (2009) introduced the concept of planetary boundaries (e.g., climate change, ocean acidification, ozone depletion, biodiversity loss), to estimate a safe operating space for humanity. At the time of writing, several planetary boundaries have already been surpassed (climate change, biodiversity loss, interference with the nitrogen cycle). Later work on doughnut economics (Raworth, 2017) popularizes these ideas by advocating a just and safe space for humanity [DEAL (Doughnut Economics Action Lab)., 2021]. The doughnut model illustrates that humanity, and the services humanity needs (e.g., food, health, education, housing), are dependent on the natural environment. This echoes earlier work by Buckminster Fuller (1963) and Boulding (1966) on "Spaceship Earth," and Meadows et al. (1972) on Limits to Growth. The doughnut economy principles of practice are as follows: change the goal, see the big picture (the economy is a sub-set of society, which itself is dependent on the natural environment), nurture human nature, think in systems (experiment, adapt, and learn), be distributive and share the value created, create to regenerate (be a sharer, repairer, steward) and aim to thrive rather than narrowly focusing on GDP and economic growth.

The Doughnut Economics Action Lab [DEAL (Doughnut Economics Action Lab)., 2021] was established to put the radical idea of a new (Doughnut) economy into practice. It builds on the work of Kelly (2012), by proposing that for a transition to a new economy, the next generation of organizations should rethink their: (1) purpose, (2) networks, (3) governance, (4) ownership, and (5) finance [DEAL (Doughnut Economics Action Lab)., 2021]. Kelly (2012) originally suggested a Living Purpose, Rooted Membership, Mission-Controlled Governance, Stakeholder Finance, and Ethical Networks as a framework for companies that can create a generative economy, which enables flourishing. These five components are viewed as useful core elements for a sufficiency-based circular economy. In addition,

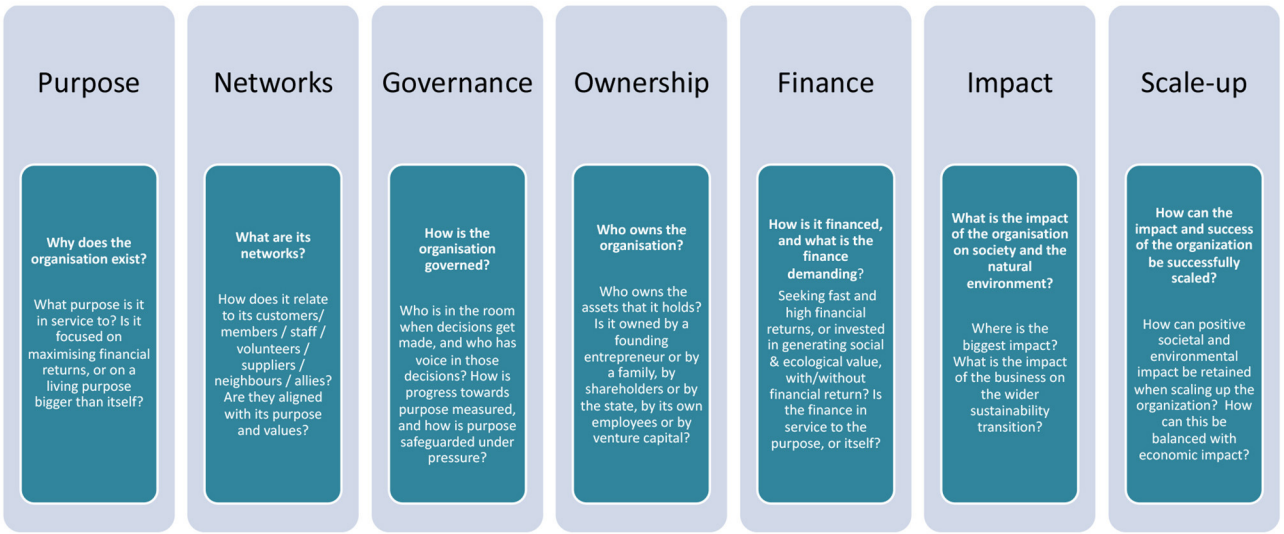

FIGURE 3 | Framework with seven core elements of a sufficiency-based circular economy used for case analysis [Building upon Kelly (2012), DEAL (Doughnut Economics Action Lab). (2021)].

we added the factors impact (6), and scaling up (7), to understand the current state of practice and potential to scale up, as the impact of sufficiency has not been widely investigated and many examples in practice have remained rather niche (Bocken and Short, 2016; Freudenreich and Schaltegger, 2020). **Figure 3** summarizes these seven core elements into a guiding framework, which was used for case analysis in this study. Building on common themes in the sustainable business model literature, the figure indicates key questions to be considered under each element, for example, focusing on changing the purpose and scaling up positive impact of the business on nature and society (Stubbs and Cocklin, 2008; Upward and Jones, 2016; Porter and Kramer, 2019).

Research Gap

Previous work has conceptualized sufficiency in business (Bocken and Short, 2016) and empirically investigated solutions, e.g., in relation to food (Bocken et al., 2020), clothing (Tunn et al., 2019; Freudenreich and Schaltegger, 2020), washing machine use (Bocken et al., 2018) and multiple high-impact sectors (Niessen and Bocken, 2021). However, while recent conceptual studies have raised the importance of sufficiency transitions (Sandberg, 2021), making these more prominent in the circular economy discourse (Bocken and Short, 2020; Godelnik, 2021), empirical studies at the transitions level are lacking. Moreover, although research has included business cases (Bocken and Short, 2016; Gossen et al., 2019; Freudenreich and Schaltegger, 2020; Niessen and Bocken, 2021), it has lacked a comprehensive approach linking business practice to the wider economic and societal transition.

Here, we investigate the potential role and limitations of business as a driver of the sufficiency-based circular economy in order to address these gaps in the literature and bridge the circular economy and societal transitions literature streams. We build on the work on doughnut economics (Raworth, 2017), which developed guidelines for businesses to transition toward a new, more sustainable economy, where environmental and societal prosperity dominate [DEAL (Doughnut Economics Action Lab)., 2021]. In line with the doughnut economics core elements to guide business in their transitions, we investigate the purpose, networks, governance, ownership, and finance of businesses practicing sufficiency (Kelly, 2012; DEAL (Doughnut Economics Action Lab)., 2021). Two more gaps in CE research relate to the lack of environmental impact assessment (Das et al., 2021) and scaling up of initiatives (Chembessi et al., 2021). Hence, we also investigate "impact" and "scale" in the cases.

METHODS

To understand the role of business in the transition toward a sufficiency-based circular economy, we conduct an analysis of company cases of sufficiency practices. Practice review and analysis can be insightful when business practice is advancing quickly ahead of academia. Through practice review, emerging examples can be observed to build new knowledge (Bocken et al., 2014).

The dataset of cases for this study builds on a previous dataset developed by Niessen and Bocken (2021). In their study, 105 company examples of sufficiency were identified based on key academic articles in the field, a structured web search for sufficiency examples and practitioner interviews. For this new study, additional company cases of interest were added, and a total of 150 company cases were identified and analyzed. The criteria for inclusion were based on the companies' own communications regarding potential sufficiency initiatives. Reports, websites, the platform LinkedIn, and other company communications were scanned to determine whether

the business recognizes a need for changes in consumer practices for sustainability reasons, and whether their product/service offerings were aligned in some way with sufficiency objectives of reducing material throughput and energy use in production and consumption/use phase. The companies also had to actively communicate to consumers about the need to change their consumption patterns, for instance using language around enabling longer or more intense product usage, recognizing resource constraints and overconsumption, or suggesting slow consumption or consuming less (Niessen and Bocken, 2021).

The complete dataset of 150 companies was reviewed to better understand and present the business position in terms of sufficiency (Refuse, Reduce, Rethink) and the sufficiency-economy core elements (purpose, ownership, governance, finance, networks, impact and scale-up) where data was available. Rather than reviewing specific products, the analysis was focused at the company level, and their activities. Using a combination of deductive and inductive coding, company documents were coded in Atlas.ti. Deductive codes applied included the seven core elements and the 16 Business for Sufficiency strategies identified in Niessen and Bocken (2021). Data were then compiled in a database format, and inductive coding was applied to identify recurring patterns and emerging topics of interest across the data—for instance in terms of different purposes or governance systems. Case companies were contacted with the possibility to review their listing. A total of 41 companies came back with feedback on their entry in the database. The full dataset is publicly available at the Circular X website: www.circularx.eu.

In Section Sufficiency Strategies, we map the sufficiency strategies adopted per company. Following Niessen and Bocken (2021), strategies are categorized by the radicalism of the strategy along the three options of Refuse, Reduce and Rethink (**Figure 1**). The most radical strategy from a business perspective is "Refuse" which includes strategies that inspire consumers not to overconsume or not to consume at all (Niessen and Bocken, 2021). Refusing consumption is also the most environmentally impactful strategy as research into consuming sustainable alternatives vs. not consuming indicates (Kropfeld et al., 2018). "Reduce" consumption strategies encourage consumers to consume fewer products or resources. Less radical but still impactful is the "Rethink" strategy, which invites consumers to consume more sustainably but do not instigate reduced consumption *per se*.

In Section Sufficiency Economy Core Elements, we analyse each of the companies according to the seven core elements of a sufficiency-based circular economy (**Figure 3**) to better understand how sufficiency-enabling businesses are structured and where the largest shortcomings and barriers might lie in transitioning further toward a flourishing economy.

FINDINGS

Sufficiency Strategies

This section describes the key sufficiency strategies identified. As shown in **Figure 4**, in this review, most businesses opted for less radical strategies, with "Green alternative" by far the most commonly applied strategy, used by 134 of the 150 businesses. Green alternatives are more eco-friendly products and services, but do not question the general pattern and level of consumption. These fall within the category of *Rethink* strategies that dominate the cases to-date. *Rethink* strategies can be conceived as sufficiency initiatives as they reduce resource use, but they are the least radical form as they do not question consumption levels. *Reduce* consumption strategies, such as Life extension service and Support for repair were also quite commonly implemented. Strategies from the *Refuse* category were much less frequently applied: Questioning consumption (publicly questioning the need to consume) was only applied by 22 firms; Moderating sales (not offering reduced pricing or actively discouraging purchases) by only 8 firms; and Support for self-sufficiency (supporting consumers to produce themselves) by only 4 companies. Context-dependent strategies can promote *Rethink*, *Reduce* or *Refuse*, depending on how they are applied. Awareness-raising can be used to encourage customers to choose greener options, or it could educate customers about the need to reduce overall consumption. Similarly, Exchange platforms can be used for several purposes, such as the resale of used items (i.e., reuse in the *Rethink* category) or sharing advice on repair (i.e., *Reduce* through longer lifetimes).

Sufficiency Economy Core Elements

Purpose

Mission and vision statements were reviewed for the company's stated purpose, to understand why the business operates and what drives its purpose [DEAL (Doughnut Economics Action Lab)., 2021]. As Kelly (2012) states: "Living Purpose—being of service to the community as a way to feed the self—is the sine qua non of all generative ownership design. It is the single irreducibly necessary core of every generative [i.e., sustainable] enterprise" (p. 153). From the 150 cases, the majority of companies had clear purpose statements, and, from those, six broader types of purpose were identified: (1) Not sustainability-related purpose, (2) Social purpose, (3) Social and environmental purpose, (4) Environmental purpose, (5) Circular design purpose and (6) Sufficiency purpose. These are described below, and examples are shown in **Table 1**.

Not Sustainability-Related Purpose

Even though they talk about sufficiency in their communication and follow sufficiency strategies, one group of companies does not link their purpose to environmental or social sustainability. These firms' mission statements often focus on producing high quality, reliable and desirable products, increasing comfort or improving experiences, or saving costs. Interestingly, one of the 28 companies that implements a radical *Refuse* strategy falls into this category with their purpose not directly linked to sustainability.

Social Purpose

Some of the businesses focus their purpose on social impact. They aim to promote health or a better quality of life or specifically aim to improve labor standards and transparency in production. Others also mention empowering people with their products or enhancing cultural value.

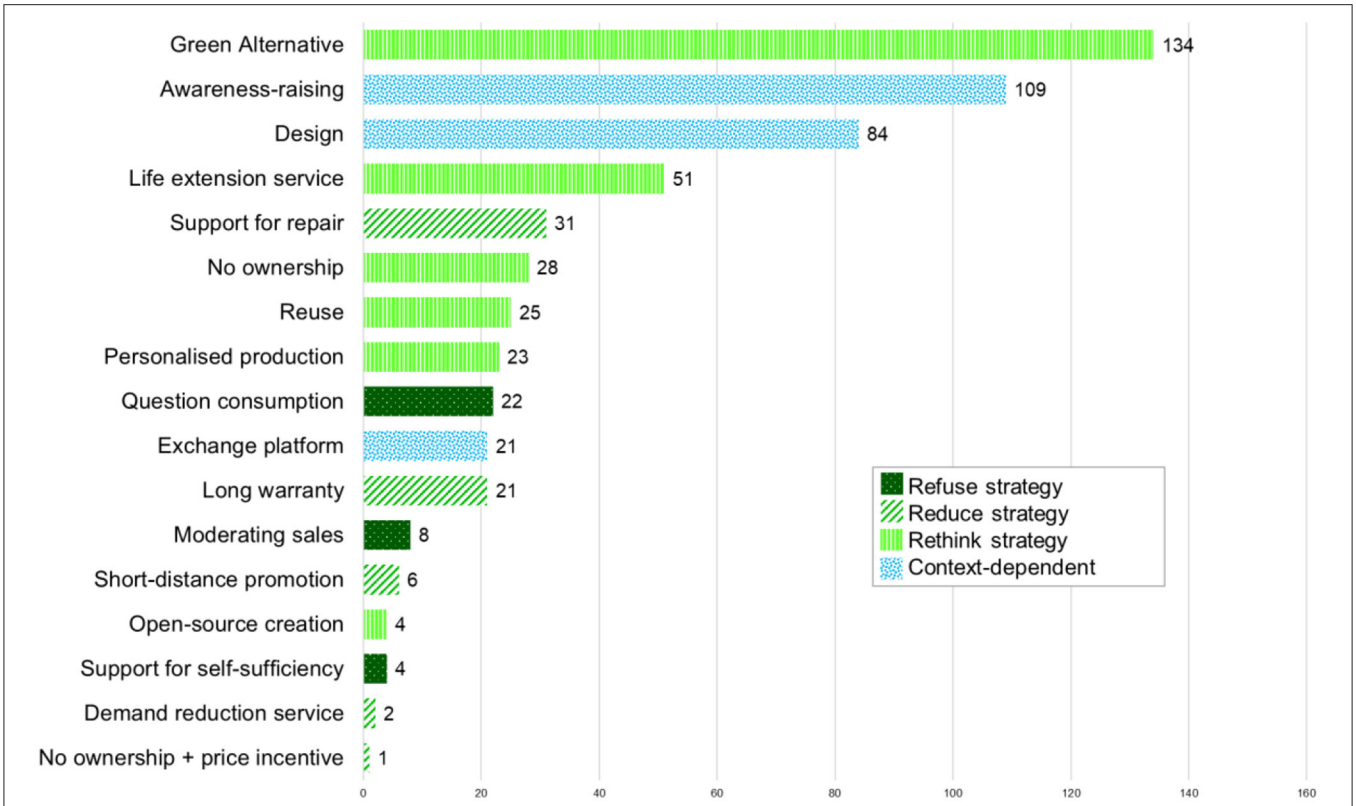

FIGURE 4 | Frequency of sufficiency strategies applied by radicalness [Building on Niessen and Bocken (2021)].

TABLE 1 | Business purpose types identified in this study.

Business purpose type	Examples from database
Not sustainability-related	*Fernish*: "Fernish is a premium furniture and decor rental service on a mission to make it effortless to create your home." *SANVT*: "Our mission is to develop a collection of high-quality essentials."
Social	*Alpro*: "Bring health through food to as many people as possible" *Fairphone*: "We're making a positive impact across the value chain in mining, design, manufacturing and life cycle, while expanding the market for products that put ethical values first."
Social and environmental	*Darn Tough Socks*: "We aim to improve the well-being of our community by locally designing and manufacturing the most comfortable, durable, best fitting socks while continuously reducing our environmental impacts." *KOTN*: "[O]ur mission [is] to change the way the things we love are created and consumed: better for the people, and better for the planet."
Environmental	*Colorful Standard*: "Our mission has always been to identify all the ways we can produce garments while remaining climate positive." *Nudie Jeans*: "Nudie Jeans is striving to be a leader within the textile industry by systematically working in areas where we have the highest environmental impact and focus our sustainability efforts where they are most needed."
Circular design	*Lapuan Kankurit*: "We want to pass on a lasting textile legacy for generations to come." *Revendo*: "The aim of Revendo is enabling the sustainable use and extension of lifespan of unused devices through upgrading, repairs and holistic customer care across Europe."
Sufficiency	*Artknit Studios*: "Our motto is Buy Less, Buy Better." *Vitsœ*: "[T]o allow more people to live better with less that lasts longer."

Social and Environmental Purpose

A third group of businesses combines environmental and social goals in their purpose. These are commonly portrayed in the form of promoting environmental sustainability plus a social goal. Social goals paired with environmental sustainability include creating employment opportunities and supporting craftspeople, promoting ethical labor practices, or empowering and strengthening communities. Some also promote health or the general betterment of both people and planet.

Environmental Purpose

Businesses that focus their purpose on environmental sustainability typically refer to green alternatives, such as sustainable, ethical, or conscious products or services. They often refer to working toward a healthy planet or saving the planet and making the world a better place. Other purposes state the aim to become carbon negative, climate positive or reduce environmental impact/ increase positive impact.

Circular Design Purpose

A subset of the environmental purpose, some companies specifically focus their purpose on long product lifetimes and circularity. They refer to products that are made or designed to last and of superior quality. Purposes here refer to products lasting for generations, for the long-term future or for life. Others refer to circularity through reuse, repair, recycling or keeping products in use.

Sufficiency Purpose

A smaller subset of companies specifically promote sufficiency in their purpose statements. These are worded around the premise of buying less and not buying more. Often, these statements are paired with buying better, doing more with less or living better with less. Although this is a smaller group of 13 of the 150 companies, it is of note to see these businesses openly articulate sufficiency and reduced consumption in their mission statements. Eight of these 13 businesses also implemented one or more Refuse strategy, highlighting a link between more radical action and communication about sufficiency.

While a majority of the 150 case businesses have a sustainability-related purpose, sufficiency strategies are also implemented by companies with a focus on social sustainability or a purpose that is not related to sustainability. Yet, explicit reference to sufficiency in the company purpose is only found in a small subset of the companies.

Ownership

To determine company ownership, business websites were analyzed along with LinkedIn company profiles and national business registries. The majority of the case businesses were listed as privately held companies but there were also several companies trading on the public stock market and a select few with alternative ownership models, for instance employee or customer ownership.

A considerable share of the privately held companies were co-owned or majority-owned by their founders, directors, or family members. For 46 of the 150 businesses, more in-depth information confirmed that the founders or directors held company shares or sole proprietorship. Another 9 companies identified as family businesses. Some of these privately held businesses also offered ownership options to employees, for instance Blackhorse Lane Ateliers, Klean Kanteen and the Library of Things, or were working toward employee ownership (e.g., Vitsœ). Other companies offered their customers the option to become co-owners, such as Ecologyst who currently have 525 customer co-owners (FrontFundr., 2022) or LOOM who offered their customers the option to become shareholders starting at €100 in 2019 (LOOM., 2019).

Some companies were publicly traded businesses, such as Oatly or Rent the Runway who both joined the stock market in 2021. Both some privately held, and some publicly traded companies had been acquired by larger corporations and been working under their ownership structures. Examples include Alpro who were acquired by Danone in 2017, or Eastpak and JanSport which are both part of larger company VF Outdoor. It is interesting to note that of the 28 companies applying more radical *Refuse* strategies, two are publicly traded businesses and the vast majority (24 firms) is in private hands, often family- or founder-/director-owned.

Governance

In terms of governance, three trends were observed. First, while some of the companies were incorporated under a specific form to promote environmental or social sustainability, the majority of businesses were conventional limited companies governed by a board of directors. Some of these companies running under a conventional governance set-up actively tried to incorporate bottom-up proposals, communal decision-making or enable customer input into product creation.

Second, several of the companies adopted slightly altered governance practices such as working as a social enterprise or social impact business. Six companies referred to themselves as social enterprise/impact business, and while not all of them held specific legal forms, such as community interest company, they all intended to create value beyond financial profit. Social enterprise Library of Things, for instance, has set up a "Guardian share" in its governance which is held by non-profit company "Things Trust" whose members are representatives of community and environmental needs (Library of Things., 2020). In another alternative governance practice, companies were certified as Benefit Corporations (B Corp). From the sample of 150 businesses, 17 were already B Corp certified and another company was working toward the certification. The B Corp certification is meant to show that the business benefits not only the company's shareholders but also society and the environment (Hiller, 2013). Of the 17 companies with B-Corp certification, only four implemented the more radical *Refuse* strategies.

Third, four companies were working under or toward alternative governance arrangements. Co2online, a web-based firm that provides advice, consultancy, and research on reducing resource use, is run as a non-profit limited company. GEA Waldviertler, a furniture and shoe manufacturer, is working toward rebuilding as a cooperative. Riversimple who work on a hydrogen-based, shared mobility system, have set up a "Future Guardian Governance" where six custodians represent the environment, customers, community, staff, investors, and commercial partners, effectively making all those stakeholders also shareholders, except for the equity rights. Vitsœ who offer furniture products and complementary services state that they are not primarily run for profit, and the company is reviewing ownership structures and governance to include employee ownership.

Finance

While financial data was only available for a part of the business cases sample, a few different financing structures could be observed.

First, it should be noted that conventional financial investment dominated and led to successful outcomes. Conventional financial investment through, e.g., (pre-)seed rounds, series A/B/+ rounds, or venture rounds, was obtained by several of the organizations. Some, namely Back Market, Oatly, Rent the Runway and TIER, were particularly successful

in finding investment and have been branded (exited) unicorns. While a lot of the finance granted stemmed from conventional investors, some businesses also particularly received money from sustainability-interested investors, such as investment into sustainable electronics producer Fairphone by DOEN Participaties, or from impact and angel investors, as in the case of food-saving grocery chain Sirplus. (2022). At least 20 of the reviewed businesses also accessed financial streams through crowdfunding, typically through equity crowdfunding rounds. Some companies also used reward-based crowdfunding where investment is paid back with an actual product. In the case of Australian cookware producer Solditeknics, products are only made once a sufficient amount is pre-ordered through the Kickstarter crowdfunding platform. Since 2014, Solidteknics. (2022) has launched and funded over 35 projects through this process.

Second, several other financial streams were identified, but these were less common. Three of the businesses stated they were privately financed, which, in the case of Kodasema, meant that there was no need for quick returns and the brand could develop its products slowly (own communication). Others took out loans from impact-oriented organizations, such as the German Umweltbank or the Prince's Trust in the UK. Some companies also received funding through grants, from non-governmental organizations (e.g., foundations or innovation accelerators) or governments (e.g., EU funding), or through project funding (e.g., public procurement). Some interesting alternative financing structures enabled funding by customers, such as in the case of Vitsœ who issued bonds to their customers to finance a new factory and office building. A handful of companies intentionally did not seek investment and were happy with a small-scale business (Elephant Box, own communication) or intentionally refrained from conventional investment to protect their mission (e.g., Klean Kanteen).

Networks

In terms of networks, Kelly (2012) suggests building ethical networks with suppliers, businesses, customers, and other actors to fulfill and spread the business purpose. The reviewed businesses were highly active in a range of networks, connecting to other businesses, as well as their customers, suppliers, governmental and non-governmental organizations. The different modes of collaboration are examined below.

Business Networks

In terms of sustainability networks, several of the firms are part of industry-specific associations that promote environmental issues, such as the Outdoor Industry Association's Sustainability Working Group/Climate Action Corps, the Sustainable Apparel Coalition, FairWear Foundation, or the German forum for alternative travel. Several companies also joined general sustainability networks, such as the UN Global Compact, the Science-Based Targets initiative, the Benefit Corporation (B Corp) network or the Economy for the Common Good.

Business Collaborations

Companies also cooperate with other brands. A common collaboration is the retail of similarly minded brands through their own outlets. Brothers We Stand and BuyMeOnce, for instance, sell products from other producers that they deem to pass certain sustainability and quality standards. Another common business collaboration was cooperating to offer circular services: these include working with other platforms to offer rental (e.g., Boob Design through Hyber), resale (e.g., Cuyana through ThredUp), or repair (e.g., Nudie Jeans setting up repair stations in retail partner shops). A third common type of business collaboration saw companies teaming up to raise customer awareness. Here, we find examples such as the Black Fridye brand coalition initiated by Citizen Wolf (to dye old garments and extend lifespans). In a fourth type, House of Baukjen and VAUDE both set up mentoring offers to help other businesses change their business models. Finally, some companies collaborated with others to increase their scale and impact, such as Fairphone working with Vodafone to change the electronics industry.

Customer Relations

Network collaboration also extends to the connection with customers. Several businesses offered community forums and blogs to discuss the products and receive help, for instance in repair or to enable the resale of the brand's products. Some companies offered sustainability education material, such as a sustainable fashion course by MUD Jeans, or offered hands-on training courses to customers. Other companies also created campaigns to involve their customers and change behaviors. Examples include the Still in its Prime Day campaign by BackMarket with iFixit, Revendo organizing a Secondhand Day campaign, or the No New Things Pledge that Goodfair customers can sign up to.

Supplier Relations

Another important network for the reviewed businesses was the connection to their suppliers. Companies selected their suppliers based on specific standards, for instance being women-owned factories. A common selection criterion was the geographical distance to the office, with European-based companies only producing in Europe, Canada-based Encircled producing within 60 km from their office, and Artknit Studios working in direct collaboration with suppliers in their native Italy. Companies also supported their suppliers in transforming toward more sustainable practices, such as KOTN supporting local farmers in becoming organic or Riversimple working with their suppliers to implement circular principles.

Research Collaborations

Companies also formed research collaborations with universities or non-profit organizations. Several of the research collaborations were intended to calculate environmental and social impact (e.g., Houdini creating a Planetary Boundaries assessment with Albaeco and Mistra Future Fashion). Other research was intended to trial new business models: Kuyichi, Asket and Nudie Jeans all joined the Switching Gear project by Circle Economy to launch new circular business models. Specific sufficiency-related research was also undertaken by two companies: HOMIE assessed the impact of their pay-per-use business offering on the users' consumption levels (Bocken et al., 2018) and werk.um architects are partnering

with others in the OptiWohn project to research sufficiency options in the construction sector by using existing buildings and increasing occupation.

NGO Collaborations

Another network connection was businesses collaborating with or financially supporting non-governmental organizations and charities. Several of the businesses had joined the "1% for the Planet movement" initiated by Patagonia where 1% of profits are donated to environmental organizations. Other companies donated specific amounts of their overall profit to charitable purposes, such as The R Collective donating 25% of profits to environmental NGO Redress. Some companies also dedicated specific profits to charity, such as income from resale items (e.g., 50% of Baukjen Pre-loved earnings go to Oxfam) or donating profits to charities on Black Friday instead of offering sales (e.g., Lanius donating Blue Friday proceeds to Healthy Seas). Companies also collaborated with NGOs on research (e.g., Organic Basics teaming up with WWF on regenerative agriculture), on creating repair guides (e.g., Vaude and Patagonia partnering with iFixit) or on promoting circularity (e.g., IKEA partnering with the Ellen MacArthur Foundation).

Government Collaborations

A handful of the case companies also work with public organizations, mainly at the municipal level. These include DB Connect who work with municipalities to offer sustainable mobility solutions, Riversimple who have signed agreements with local councils in the UK to test their vehicles or goFLUX who cooperate with transport associations in Germany to offer their services in the area.

Scale and Impact

Scaling sufficiency businesses and strategies might create positive impacts on both an environmental and social level. Most companies that reported their impacts focused on environmental impact. Those businesses used a variety of tools to assess this impact. The most applied tool was Life Cycle (Impact) Assessment with results sometimes displayed in a carbon or climate footprint. Alpro and Houdini also used planetary boundaries assessments, with Alpro assessing the boundaries for water, land, nutrients, and biodiversity throughout their almond and soya supply chains. Some companies reported their environmental impact in greenhouse gas emissions, for instance in Scope 1–3 emissions reporting (Klean Kanteen). Some companies bolstered their data with customer research. For instance, ASKET studied the number of minimum wears of an ASKET t-shirt, HOMIE researched how their service affects laundry behavior, and Rent the Runway's customer survey indicated the rate of replacement of new clothes because of rental. Environmental impact metrics were also often combined with social impact metrics. The Baukjen Sustainability Index combines social and environmental data and is reported on quarterly. Outdoor clothing producers such as Arc'teryx use the Higg Index which is based on life cycle assessment data but includes labor metrics in the supply chain. Goldfinger report their impact by estimating tons of rescued materials and hours of training and meaningful work created. Additionally, the B Corp-certified business cases also report on their performance along the B Corp pillars of governance, workers, community, environment, and customers; however, only a fraction of those reports are publicly available.

In terms of scaling the impact, it is interesting to note that 50 companies were identified as clearly working on growth and scaling. Outdoor retailers Patagonia and Vaude explicitly reviewed continued business growth in a critical light, and a few businesses stated that they aim to grow naturally or sustainably (e.g., LOOM). In terms of business size, the number of employees was used as a proxy for scale. For 10 companies, the company size could not be identified, but for the other 140, an interesting mix of various sizes was found. The majority of 91 businesses are rather small with up to 50 employees; yet 25 of the reviewed businesses are of a medium size with 51-250 employees, another 6 businesses are large with 251-500 employees, and 18 case companies are large with more than 500 employees. Only a handful of companies focused their offer on a regional market (e.g., ODDBOX who currently deliver only to the South of England), with most companies selling their products and services at a national or international level.

DISCUSSION

Few companies included in this study explicitly attempt to moderate consumption by not offering sales or discouraging purchases. A total of 22 firms publicly question the need to consume, 8 firms purposely avoid discounting or discourage selling, and 4 companies support consumers to produce themselves. Out of this study's highly curated list of 150 "sufficiency-orientated businesses" this limited representation for higher level sufficiency is disappointing and suggests that few companies are able to identify profitable mechanisms to engage with more radical Refuse sufficiency strategies. This suggests that entrepreneurs and investors fail to grasp the potential opportunities that sufficiency can present, and that policy interventions may be needed to fill the inevitable gaps toward "strong sufficiency" business models to achieve significant reductions in consumption. Next, the seven core elements that act as levers for change toward a new sufficiency-based circular economy are discussed based on the insights gained from the cases. Following those, the discussion touches upon the role business and policy can have in driving a sufficiency-based circular economy. Finally, opportunities for experimentation for a new economy are reviewed and the limitations of this paper are considered.

Discussion on the Seven Core Elements

Purpose

There was a clear tendency of sufficiency-aligned businesses to orientate their work with a social and/or environmental purpose, yet only a small group of companies openly talk about sufficiency in their purpose. This could be explained with a range of reasons. For instance, sufficiency can be considered a contested concept and may have negative connotations associated with

frugality, reduced quality of life or enjoyment, and companies might not identify with the word or be wary of openly talking about it since it might alienate customers or shareholders. While companies seem able to promote sufficiency through their strategies without explicitly incorporating it into their purpose, Kelly (2012) and Stubbs and Cocklin (2008) suggest that the purpose is instrumental in guiding the company's activities, hence the current lack of explicit recognition of sufficiency in business purpose may be a severely limiting factor. Supporting policy could focus on redefining the business purpose as described in the statutes of conventional business forms, so that business can more easily satisfy societal and environmental needs, similar to B-Corp Benefit corporations or social enterprises.

Ownership and Governance

The analysis showed a large number of family- or entrepreneur-owned businesses in the dataset. This is in line with the existing literature on the contribution of family-owned business toward sustainability (Clauß et al., 2022; Cox et al., 2022) which generally have more autonomy and flexibility to pursue environmental and social goals than their publicly-traded peers. This was explicitly acknowledged by some businesses, such as Klean Kanteen (2022) who stated, "Turning down investor dollars isn't always easy, but the freedom to stay true to our principles is worth it." The review of governance structures also highlighted several cases of B Corp certified businesses and social enterprises. This could be because these governance structures better enable sufficiency approaches to be followed, or perhaps due to sufficiency-driving companies being more reflective of their governance and ownership structures. Kelly (2012) suggests rooted ownership (e.g., employee- or family-owned) and mission-controlled governance with member input to support a generative business. Related to the previous point, it might be worth considering policies that strengthen aspects of social enterprise, B Corps and similar structures to better promote sufficiency in businesses.

Finance

The analysis supported Kelly's (2012) recommendation for stakeholder finance and highlighted the role of purpose-orientated capital for sufficiency businesses. While conventional financial investments were accessed by a lot of the businesses, it is worth noting that alternative financial models were also prevalent and that some businesses openly preferred crowd financing or impact investments. In conventional investment, fast and continuous growth which creates wealth for shareholders is a basic requirement, running counter to the logic of natural growth and selling/consuming only what is needed. This indicates that mainstream financial markets are not best suited to allocate capital to sufficiency-orientated businesses. As mentioned in the introduction, sufficiency can be a competitive and profitable business strategy. However, rapid growth is perhaps less likely to be a driving imperative of entrepreneurs interested in implementing sufficiency, and moreover, negative perceptions of sufficiency may act as a barrier to access to capital. To support sufficiency businesses, a shift in capital allocation and expectations of growth and return of investments may be needed. Examples of such shifts could include corporate tax rate increases based on the amount of raw material and other resources used to incentivize frugality. Government could support sufficiency businesses by establishing funds with the specific purpose of funding sufficiency initiatives and a mandate allowing lower returns or longer pay-back periods. Alternatively, government could intervene in institutional investing to incentivize long-term funds such as pension funds to invest in social value creation, with pay back terms that suit the sufficiency direction of the business. Firms and shareholders could be held more accountable for the negative externalities of their business, e.g., with a tax on waste to landfill or a tax paid by the manufacturer or retailer on disposal of the products at end-of-life.

Networks

Building new approaches to business, such as circular business models, and sufficiency-orientated business models requires new sets of actors to come together, and new ways of interacting and engaging with consumers. Building these new networks can be a significant challenge, but also can be key to successful implementation and scale-up. The analysis indicates a high level of collaboration and supportive business eco-systems in the cases investigated. Rather than relying on organic or serendipitous formation of network relationships, policy could support development through publicly funded innovation hubs, provision of databases to match businesses, and government services to assist in mentoring and connecting entrepreneurs and businesses. The common link to non-governmental organizations seen in the cases also indicates that sufficiency businesses are more aware of their environmental and social impacts and working to offset these and bring expertise and credibility to their initiatives through these collaborations. This could inspire policy to ensure that the environment and society are adequately represented and considered in governance of businesses; for instance, by mandating a position on the board of companies with a high negative impact, or proactively supporting industry-NGO collaborations to establish certification and oversight bodies that develop industry best practice. Government can also support sufficiency businesses through strengthening their own collaboration with them, for instance by using their public procurement processes to support and encourage sufficiency business practices.

Scale and Impact

There seems to be a need for clear, unified metrics to measure the impact of sufficiency businesses. While there is research conducted on the development of metrics for circularity in businesses (e.g., the Ellen MacArthur Foundation's Circulytics programme), there is a need to measure and reward business behavior that reduces resource consumption of their customers. The starting point for this is establishing appropriate target levels for the definition of sufficient consumption—as mentioned in the background section of this article, sufficiency depends on several factors so levels will need to be developed by specific product

categories. Once a basic definition of sufficiency is developed, metrics can then be used to monitor performance and identify hotspots or targets for intervention. Such sufficiency metrics could take the form of, e.g., measuring the average lifespan of product/material to failure/disposal, consumer usage rates (e.g., hours/year), repair rates, quantifying built-in obsolescence, the number or volume of garments owned per person, etc. Most of the reviewed companies operated at a smaller scale but were actively trying to grow. The scaling of sufficiency companies might increase their positive impact and could be supported through appropriate financing structures and policies that incentivise sufficiency behavior. Yet, any scaling should also be reviewed critically as larger operations can create a larger negative impact and it might be more appropriate to replicate the business with consideration of local contexts.

Sufficiency Strategies: The Role of Business and Policy

Business for Sufficiency

At the business level, in line with Bocken and Short (2016), Freudenreich and Schaltegger (2020) and Gossen and Heinrich (2021), sufficiency is necessarily closely linked to the product and service offering, sales strategy, and marketing and customer engagement. First, at the level of product-service offering (i.e., value proposition) products needs to include design for longevity, and long product life and quality should be supported (e.g., maintainability, repairability), along with sufficiency in the use phase (energy and consumables use, etc). Second, at the sales level the strategy should be about avoiding unnecessary consumption—for example, bulk purchase discount incentives (e.g., buy-two-get-one free offers) should be abolished to avoid unnecessary purchases (Bocken and Allwood, 2012) that may also lead to purchase regrets and waste (Skelton and Allwood, 2017). Third, restrictions on marketing might help curb unnecessary consumption—these are already in place for some product types such as tobacco in many countries, and the UK for example, is introducing a ban in 2023 on TV advertising of foods high in sugar, salt, and fat (junk foods), before 9 pm to tackle the UK's growing childhood obesity crisis. Building on the cases explored in this research, **Figure 5** presents these three components of the customer value proposition, and some guiding questions for each on the integration of sufficiency into the business model.

Policy for Sufficiency

There is also a need to better define appropriate thresholds (what is a sustainable level of consumption?) while recognizing that we cannot have a blanket approach to sufficiency. Research on sufficiency has started investigating the minimum and maximum thresholds of consumption needed for a good life, for instance in the concept of consumption corridors (Fuchs et al., 2021). Once those levels are defined, it is possible to start considering policies for a sustainable consumption space, such as higher eco-taxes, tax, and subsidies to shift consumption patterns, production and consumption quotas or caps, or outright bans to constrain consumption (e.g., the UK soft drinks industry levy (SDIL), introduced in April 2018 to motivate manufacturers to reduce sugar in their products). For policy makers, there are several levers for change: at the product, business model, and (more controversially) individual consumption level.

At the product level, policies might incentivize or mandate the provision of modular, repairable products that enable easy DIY repair, incentive the provision of repair services (for instance through reduced VAT on low value consumer goods repairs) or provide higher taxes on disposal of unrepairable items (see e.g., Dalhammar et al., 2021). EU legislation already mandates extended producer responsibilities for end-of-life disposal and recycling, which has encouraged significant recycling in sectors such as the car industry. Proposed legislation and higher levies on waste to landfill are also anticipated to shift attitudes away from single use packaging (e.g., The UK will introduce a plastic packaging tax from April 2022 on packaging manufacturers to mitigate the costs of disposal and encourage industry change; Gov.uk., 2022). The EU Eco-design and Energy Labeling Directive (2009/125/EC and Regulation (EU) 2017/1369) already includes extensive guidance on design for repair, reuse, remanufacturing and recycling/recycled content; however, these guidelines are still advisory– mandating performance could greatly improve on this. Emerging European policy on avoiding planned obsolescence which started in France, and right-to-repair initiatives (e.g., mandating manufacturers to provide spare parts) could also discourage premature product replacements, which are part of institutionalized unsustainable business models focused on volume over value (Bocken and Short, 2021; Dalhammar et al., 2021).

A more controversial (although probably needed) approach would be to put quotas on resource use, sales, and consumption. This could include quotas on air travel per year, quotas on car mileage, or a tapered tariff—e.g., electricity, fuel or flights get more expensive the more you use per year. A study by Wynes and Nicholas (2017) already highlighted the importance of individual choices—e.g., having fewer children, living car free, avoiding transatlantic flights, and switching toward a plant-based diet—on climate change. However, policies still seem far away from intervening in such personal life choices. Practically, such a radical transition may start by first taxing "unsustainable industries" (aviation, livestock) which would increase prices and using part of these taxes to develop new technologies to clean up industries. Furthermore, policies could penalize marketing that leads to addictive or over-consumption (Bocken and Short, 2021). While perhaps difficult to police, these policies might be needed to curb corporate malpractices and institutionalized unsustainable business models. Finally, information provision on the impact of life choices on the climate may also provide an important starting point. The UK's Sustainable Consumption Roundtable. (2006) report already highlighted important choices around shifts in how we live, eat, get around and travel for holidays, while the 2021 Rapid Transition Alliance report (Newell et al., 2021) emphasizes the need to accelerate the shift to more sustainable behavior. The EU is currently in a consultation phase over new legislation on food labeling to include carbon footprint and other sustainability metrics to raise consumer awareness of the impact of their consumption decisions and to try to nudge behaviors toward more healthy and sustainable alternatives (EDJNet., 2022).

FIGURE 5 | Guiding questions for sufficiency in business strategy.

Transitioning and Experimenting Toward the Future of the Economy

In the transition toward a sufficiency-based circular economy, the biggest institutionalized problem is that the current consumer-based economy depends on consumption for its continued success—any abrupt slowdown is catastrophic (e.g., Fullerton, 2015; Bocken and Short, 2016; Raworth, 2017; Potocnik et al., 2018). A fundamental shift in economic thinking is required, based on a sufficiency mind-set. Significant experimentation is needed to challenge this economic paradigm. Leading thinkers have proposed a new economy or even a society where the economy as we know it does not exist anymore (Jackson, 2009; Fullerton, 2015; Raworth, 2017; Ehrenfeld, 2019). The reason is that more income created through more production and consumption leads to higher resource impacts (e.g., Sorrell et al., 2020) and does not necessarily make humans happier (Druckman and Jackson, 2010). Concepts such as Doughnut Economics instead focus on creating a system in which social wellbeing is met while staying within planetary capacities, thereby ensuring environmental wellbeing. In such a system, society will need to focus on increasing societal and environmental wellbeing rather than economic indicators such as the Gross Domestic Product (GDP). While we still seem far away from such a new economy, experiments are under way to create a more equitable and sustainable society, increasing human wellbeing while reducing environmental impact.

First, at an individual level, citizens have started experimenting with minimalist and voluntary simplicity lifestyles (Elgin, 1993; Osikominu and Bocken, 2020, choosing to live with less income and adopt a non-materialist lifestyle that fits within the sufficiency paradigm. While important, such groups of citizens are still rather niche. Interestingly, those adopting voluntary simplicity and reducing working hours reported increased levels of happiness by freeing up time to do more engaging activities (Osikominu and Bocken, 2020). Other research suggests that there are many low-carbon leisure activities (e.g., sports, socializing with friends) that contribute to wellbeing (Druckman and Gatersleben, 2019), while higher incomes and consumption beyond a certain threshold do not make one happier (Abdallah et al., 2006).

Second, at a city level, the work by Raworth (2017) on Doughnut Economics is being applied to experiment with urban activity to live within environmental boundaries while promoting societal wellbeing (Raworth, 2017) The city of Amsterdam is one such experimenting "Doughnut city" with ambitions aligned with sufficiency such as reducing overall urban consumption, using what the city has more sparingly, and making the most of discarded products (Amsterdam., 2022). Similar to the Doughnut city trend, there are related concept such as Sharing Cities Sweden (2021), Circular Cities (Prendeville et al., 2018) and the older concept of Transition Towns with the aim to create sustainable communities for a future with a changing climate and resource constraints (Richardson et al., 2012). For each, ample local experimentation examples have emerged.

Finally, experiments with alternative income and work models are taking place on a national and regional level. These are

relevant as they might show the way to increased and more equal wellbeing coupled with lower environmental impact. Higher income is one of the drivers for climate impact. Over the last 25 years, 1% of the global population have produced two times as many carbon emissions as the poorest 50%, while the poor are hit hardest by climate change (Berkhout et al., 2021). Unsustainable behavior of the richest population may be curbed, for instance through personal carbon budgets or personal carbon trading schemes, but alternative systems such as a universal basic income might help decrease inequality. To date, Finland is the only country with a nationwide randomized control trial of a universal basic-income program (Allas et al., 2020). The findings suggest that this trial led to a small increase in employment, while significantly boosting recipients' well-being (Allas et al., 2020).

Shorter work weeks have also been discussed in the context of increasing well-being and sustainability. These can take different shapes, such as four-day weeks or reducing the work week from 40 to 36 hours (Luffkin and Mudditt, 2021). Researchers found that when government workers went from 40-hour weeks to 35 or 36-hour weeks with the same pay, they maintained productivity while improving their wellbeing (Haraldsson and Kellam, 2021). Such experiments propose a different view on society that is focused on wellbeing and sustainability rather than economic indicators. Importantly, a shorter workweek could also hold benefits for the climate, e.g., by reducing carbon-intensive commuting and electricity use (Mompelat, 2021). Enabling such new work conditions in businesses like those we studied requires policy intervention and guidance. For instance, to ensure the benefits of a shorter work week, boundary conditions need to be in place such as higher minimum wages, a Universal Basic Income or Universal Basic Services, to allow every citizen to partake in the initiative. Moreover, low carbon behavior can be supported by providing green spaces, promoting cultural conditions for free low-carbon activities and events as well as limiting ecologically harmful advertising (Mompelat, 2021).

These are just some examples of experiments on different levels that de-emphasize economic indicators and refocus attention on environmental and societal wellbeing. More work is needed to accelerate this transition. Future research questions may include:

- Sufficiency is typically portrayed as an issue of over-consumption and excessive affluence—too much income and wealth. While it is certainly the case in some areas, lack of wealth is also a contributor to unsustainability evident in developed and emerging countries (e.g., buying the same cheap low-quality item repeatedly rather than being able to afford one long-life product). Sufficiency therefore requires greater income equality—bringing up the bottom part and capping the top. Universal income and minimum wages are part of that. Hence: what sufficiency responses are possible at a business and policy level to address socio-economic as well as environmental issues simultaneously?
- Excessive marketing and promotion are core to a consumer society, and until addressed, sufficiency is likely impossible as advertising is built into every facet of our lives. At the same time, the pricing of goods and services is fundamentally misaligned with environmental and social performance needs (e.g., cheap products that fail prematurely, and low-quality foods are affordable, while durable goods and healthy food are unaffordable for many). What policies (taxes, subsidies, caps, and redistribution) are needed to redress this imbalance, combined with regulation to eliminate the worst offenders? What are potential ethical business responses in this regard?
- The main environmental issue in a Circular Economy is that it might lead to more consumption and therefore negative rebound effects. While efficiency efforts in a business context are important, they might encourage sales by lowering costs of products. Hence, sufficiency policies should focus on eradicating negative rebound effects and cap resource usage (Potocnik et al., 2018). Future research questions may focus on the following: What type of policies will support sufficient consumption? Which policies can curb rebound effects in the pursuit of a sufficiency-based circular economy? What viable circular business strategies can be developed that avoid negative rebound effects?

Limitations

The work represents one of the first major multi-case studies of sufficiency in business, but it must be acknowledged that not all information (e.g., financing, ownership, and governance) could be retrieved for all businesses. Hence, while we sought to make our database as complete as possible and reached out to companies to verify their entry in the database, there are inevitably some gaps in the data and some conclusions had to be drawn on partial data. Moreover, a "limitation" is the fact that a sufficiency-based circular economy is a developed country concept. While Thailand has pursued sufficiency as part of its development agenda (see Bocken and Short, 2016), further work could be conducted to investigate sufficiency as an emerging country concept, or perhaps even to re-learn how to live sufficiently from examples in emerging economies. However, we see the guidance on the different policy levels and inspiration for business as a pathway forward for many country contexts.

CONCLUSIONS

In this article, we position sufficiency as the missing link in the Circular Economy transition and discourse. The increasing pressure of human activity on the climate and biodiversity, and the limited potential for circular economy to address the endless growth in demand for materials and energy, require a refocus on a *sufficiency-based circular economy*, where consumption avoidance is prioritized over strategies such as recycling. Citizens are encouraged to make conscious consumption choices for sustainability, by making do with less, avoiding unnecessary purchases, repairing, and maintaining existing products, and buying second hand, refurbished or remanufactured where possible, to the effect of reducing overall resource use.

We studied the role of business in the transition toward such a sufficiency-based circular economy and observed profitable business models that also successfully play an important and proactive role in driving societal sufficiency by helping to

moderate consumer demand. We observe several key attributes for success:

- The business purpose as stated by exemplar companies often specifically aligns with environmental and social objectives, in some cases adopting B-Corp Benefit corporations or social enterprise structures.
- The analysis showed a large number of family- or entrepreneur-owned businesses, which generally have more autonomy and flexibility to pursue environmental and social goals than their publicly traded peers.
- Alternative financial models and access to slow finance were common-place and some businesses openly preferred crowd financing or impact investments, to avoid the pressure for rapid growth that often accompanies conventional financing.
- New approaches to business, such as circular business models, and sufficiency-orientated business models require new sets of actors to come together, and new ways of interacting and engaging with consumers. A common feature of the studied cases was collaboration with advocacy and not-for-profit organizations to bring expertise and credibility to environmental and social initiatives.
- A starting point is establishing appropriate target levels for the definition of sufficient consumption. Once a basic definition of sufficiency is developed, metrics can be used to establish performance targets and appropriate reward systems, monitor performance and identify hotspots or targets for intervention.
- These business models assist in moderating consumption through their value propositions to their customers, including product and service offerings, sales strategies, and marketing and customer engagement. Their strategies are aligned with sufficiency objectives of designing products and materials to be kept in use for as long as possible and selling and using less.

The 150 company cases we analyzed show that the number of companies pursuing "strong sufficiency"—i.e., companies vouching for consumption refusal—is still relatively low. This suggests that policy interventions are needed to make a more profound change, including interventions at the product, business model, individual consumption, societal and economic transformation level. While experimentation already occurs at each level (e.g., voluntary simplicity, circular cities, and business for sufficiency strategies analyzed in this paper) more urgent and profound work is needed to tackle ingrained unsustainable consumption and behavioral patterns. While policy packages such as the Circular Economy Package as part of the European Green Deal are a start, bringing a focus on sufficiency may provide a clearer pathway to address unsustainable consumption patterns. Policy could play a role in shifting businesses toward sufficiency by mandating organizational governance and ownership structures, and providing financing solutions that better facilitate sufficiency as discussed above. Less popular measures such as consumption corridors, and quotas on industry and consumption behavior are also necessary and should be experimented with more in practice. Moreover, a deep rethink and urgent action are needed toward a world where nature and future generations are protected rather than focusing on short-term economic priorities.

We recommend future research to explore the important concept of a sufficiency-based circular economy to provide novel pathways for business, policymakers, and citizens to inspire and further develop the current circular economy.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: www.circularx.eu.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

FUNDING

This study has received funding from the European Union's Horizon 2020's European research Council (ERC) funding scheme under Grant Agreement No. 850159. More details on the funded project, Circular X, can be found here: www.circularx.eu.

ACKNOWLEDGMENTS

We want to thank Jan Konietzko for his suggestions for redesigning **Figure 2**.

REFERENCES

Abdallah, S., Marks, N., Simms, A., and Thompson, S. (2006). *The (un) Happy Planet Index: An Index of Human Well-Being and Environmental Impact*. London: New Economics Foundation (nef).

Alexander, S. (2012). *The Sufficiency Economy*. Available online at: http://simplicityinstitute.org/wp-content/uploads/2011/04/TheSufficiencyEconomy3.pdf (accessed March 17, 2022).

Allas, T., Maksimainen, J., Manyika, J., and Singh, N. (2020). *An Experiment to Inform Universal Basic Income. McKinsey and company*. Available online at: https://www.mckinsey.com/industries/public-and-social-sector/our-insights/an-experiment-to-inform-universal-basic-income (accessed November 9, 2021).

Allwood, J. M. (2014). "Squaring the circular economy: the role of recycling within a hierarchy of material management strategies," in *Handbook of Recycling* (London: Elsevier), pp. 445–477. doi: 10.1016/B978-0-12-396459-5.00030-1

Amsterdam. (2022). *Policy: Circular Economy*. Available online at: https://www.amsterdam.nl/en/policy/sustainability/circular-economy/ (accessed 9 March 2022).

Berkhout, E., Galasso, N., Lawson, M., Rivero Morales, P., Taneja, A., Alejo, D., et al. (2021). The Inequality Virus. Bringing together a world torn apart by coronavirus through a fair, just and sustainable economy. OXFAM BRIEFING PAPER—JANUARY 2021. Available online at: https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621149/bp-the-inequality-virus-summ-250121-en.pdf (accessed 17 March 2022). doi: 10.21201/2021.6409

Blomsma, F., and Brennan, G. (2017). The emergence of circular economy: a new framing around prolonging resource productivity. *J. Industr. Ecol.* 21, 603–614. doi: 10.1111/jiec.12603

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., and Allwood, J. M. (2012). Strategies to reduce the carbon footprint of consumer goods by influencing stakeholders. *J. Clean. Product.* 35, 118–129. doi: 10.1016/j.jclepro.2012.05.031

Bocken, N. M., De Pauw, I., Bakker, C., and Van Der Grinten, B. (2016). Product design and business model strategies for a circular economy. *J. Industr. Product. Eng.* 33, 308–320. doi: 10.1080/21681015.2016.1172124

Bocken, N. M., Mugge, R., Bom, C. A., and Lemstra, H. J. (2018). Pay-per-use business models as a driver for sustainable consumption: evidence from the case of HOMIE. *J. Clean. Product.* 198, 498–510. doi: 10.1016/j.jclepro.2018.07.043

Bocken, N. M., 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., and Short, S. W. (2020). "Transforming business models: towards a sufficiency-based circular economy," in *Handbook of the Circular Economy*, (London: Edward Elgar Publishing). doi: 10.4337/9781788972727.00028

Bocken, N. M., and Short, S. W. (2021). Unsustainable business models–Recognising and resolving institutionalised social and environmental harm. *J. Clean. Product.* 12, 7828. doi: 10.1016/j.jclepro.2021.127828

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

Boulding, K. E. (1966). *The Economics of the Coming Spaceship Earth*. New York.

Buckminster Fuller, R. (1963). *Operating Manual for Spaceship Earth*. New York, NY: E.P. Dutton and Co.

Chembessi, C., Beaurain, C., and Cloutier, G. (2021). Understanding the scaling-up of a Circular Economy (CE) through a strategic niche management (SNM) theory: a socio-political perspective from Quebec. *Environ. Challen.* 100, 362. doi: 10.1016/j.envc.2021.100362

Clauß, T., Kraus, S., and Jones, P. (2022). Sustainability in family business: Mechanisms, technologies and business models for achieving economic prosperity, environmental quality and social equity. *Technol. Forecast. Soc. Change* 176, 121450. doi: 10.1016/j.techfore.2021.121450

Cooper, T. (2005). Slower consumption: reflections on product life spans and the "throwaway society. *J. Industr. Ecol.* 9, 51-67. doi: 10.1162/10881980540 84671

Cox, K. C., Lortie, J., Marshall, D. R., and Kidwell, R. E. (2022). Beyond the balance Sheet: The effects of family influence on social performance. *J. Bus. Res.* 143, 318–330. doi: 10.1016/j.jbusres.2022.01.013

Dalhammar, C., Milios, L., and Richter, J. (2021). *Increasing the lifespan of Products Policies and Consumer Perspectives*. The Swedish Energy Agency January 2021.

Das, A., Konietzko, J., and Bocken, N. (2021). How do companies measure and forecast the environmental impacts when experimenting with circular business models? *Sustain. Product. Consumpt.* 29, 273–285. doi: 10.1016/j.spc.2021.10.009

DEAL (Doughnut Economics Action Lab). (2021). *About Doughnut Economics*. Available online at: https://doughnuteconomics.org/about-doughnut-economics (accessed March 17, 2022).

Druckman, A., and Gatersleben, B. (2019). A time-use approach: high subjective wellbeing, low carbon leisure. *J. Public Mental Health*. 18, 85–93. doi: 10.1108/JPMH-04-2018-0024

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

EDJNet. (2022). *Sustainability Labels and the Carbon Footprint of Foods*. Available online at: https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview (accessed March 17, 2022).

Ehrenfeld, J. R. (2019). *The Right Way to Flourish: Reconnecting to the Real World*. London: Routledge. doi: 10.4324/9780429282331

Ehrenfeld, J. R., and Hoffman, A. J. (2020). *Flourishing*. Stanford: Stanford University Press. doi: 10.1515/9780804786676

Elgin, D. (1993). Voluntary Simplicity: Toward a Way of Life That is Outwardly Simple, Inwardly Rich; Second Rev. New York, NY: Harper Collins Publishers.

Ellen MacArthur Foundation (2022). *Circular Economy Introduction*. Available online at: https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview (accessed March 17 2022).

Ellen MacArthur Foundation. (2017). *A New Textiles Economy: Redesigning Fashion's Future*. Available online at: https://www.ellenmacarthurfoundation.org/publications/a-new-textiles-economy-redesigning-fashions-future (accessed March 17, 2022).

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

FrontFundr. (2022). *Ecologist—We're on a Mission at Ecologyst—to End Fast Fashion*. Available online at: https://www.frontfundr.com/ecologyst (accessed March 10, 2022).

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 (1 ed.)*. New York: Routledge. doi: 10.4324/9780367748746

Fullerton, J. (2015). *Regenerative Capitalism*. Greenwich, CT: Capital Institute.

Geissdoerfer, M., Savaget, P., Bocken, N. M., and Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm?. *J. Clean. Product.* 143, 757–768. doi: 10.1016/j.jclepro.2016.12.048

Ghisellini, P., Cialani, C., and Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *J. Clean. Product.* 114, 11–32. doi: 10.1016/j.jclepro.2015.09.007

GlobeScan. (2021). *Healthy and Sustainable Living Study 2021*. Available online at: https://globescan.com/wp-content/uploads/2021/11/GlobeScan-Insight-of-the-Week-Consumer-Less-Nov2021.png (accessed March 17, 2022).

Godelnik, R. (2021). "The Rise of the (Mc)circular economy," in *Rethinking Corporate Sustainability in the Era of Climate Crisis* (Cham: Palgrave Macmillan), pp. 67–80. doi: 10.1007/978-3-030-77318-2_4

Gossen, M., and Heinrich, A. (2021). Encouraging consumption reduction: findings of a qualitative study with clothing companies on sufficiency-promoting communication. *Clean. Responsib. Consumpt.* 21, 100028. doi: 10.1016/j.clrc.2021.100028

Gossen, M., Ziesemer, F., and Schrader, U. (2019). Why and how commercial marketing should promote sufficient consumption: A systematic literature review. *J Macromarketing* 39, 252–269. doi: 10.1177/0276146719866238

Gov.uk. (2022). *Policy paper. Introduction of Plastic Packaging Tax from April 2022*. Available online at: https://www.gov.uk/government/publications/introduction-of-plastic-packaging-tax-from-april-2022/introduction-of-plastic-packaging-tax-2021 (accessed March 17, 2022).

Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M. C., Shyamsundar, P., et al. (2013). Sustainable development goals for people and planet. *Nature* 495, 305–307. doi: 10.1038/495305a

Hahn, T., and Tampe, M. (2021). Strategies for regenerative business. *Strategic Organizat.* 19, 456–477. doi: 10.1177/1476127020979228

Haraldsson, G., and Kellam, J. (2021). *Going Public: Iceland's journey to a shorter working week. Alda and Autonomy*. Available online at: https://en.alda.is/wp-content/uploads/2021/07/ICELAND_4DW.pdf (accessed March 17, 2022).

Hart, S. L., and Ahuja, G. (1996). *Does* it pay to be green? an empirical examination of the relationship between emission reduction and firm performance. *Bus. Strateg. Environ.* 5, 30–37.3.0.CO;2-Q" target="_blank"> https://doi.org/10.1002/(SICI)1099-0836(199603)5:1<30::AID-BSE38>3.0.CO;2-Q

Hiller, J. S. (2013). The benefit corporation and corporate social responsibility. *J. Bus. Ethics* 118, 287–301. doi: 10.1007/s10551-012-1580-3

Jackson, T. (2009). *Prosperity without growth: Economics for a finite planet*. London: Routledge. doi: 10.4324/9781849774338

Jeswani, H. K., Wehrmeyer, W., and Mulugetta, Y. (2008). How warm is the corporate response to climate change? evidence from Pakistan and the UK. *Bus. Strateg. Environ.* 17, 46–60. doi: 10.1002/bse.569

Kelly, M. (2012). *Owning Our Future : The Emerging Ownership Revolution*. London: Berrett-Koehler Publishers.

Kjaer, L. L., Pigosso, D. C., Niero, M., Bech, N. M., and McAloone, T. C. (2019). Product/service-systems for a circular economy: the route to decoupling economic growth from resource consumption?. *J. Industr. Ecol.* 23, 22–35. doi: 10.1111/jiec.12747

Klean Kanteen (2022). Our Story Starts in Chico, CA but Wraps Around the World. Available online at: https://www.kleankanteen.com/pages/about (accessed March 10, 2022).

Konietzko, J., Bocken, N., and Hultink, E. J. (2020). A tool to analyze, ideate and develop circular innovation ecosystems. *Sustainability* 12, 417. doi: 10.3390/su12010417

Kropfeld, M. I., Nepomuceno, M. V., and Dantas, D. C. (2018). The ecological impact of anticonsumption lifestyles and environmental concern. *J. Public Policy Market.* 37, 245–259. doi: 10.1177/0743915618810448

Library of Things. (2020). *So, are you a business or a charity*? Available online at: https://www.libraryofthings.co.uk/blog/purposebeforeprofit (accessed March 10, 2022).

LOOM. (2019). *Pourquoi nous ne serons jamais une startup*. Available online at: https://la-mode-a-l-envers.loom.fr/pourquoi-nous-ne-serons-jamais-une-startup/ (accessed March 10, 2022).

Lüdeke-Freund, F., Gold, S., and Bocken, N. M. (2019). A review and typology of circular economy business model patterns. *J. Industr. Ecol.* 23, 36–61. doi: 10.1111/jiec.12763

Luffkin, B., and Mudditt, J. (2021). *The Case for a Shorter Workweek*. Available online at: https://www.bbc.com/worklife/article/20210819-the-case-for-a-shorter-workweek (accessed March 17, 2022).

Meadows, D. (1997). Places to intervene in a system. *Whole Earth* 91, 78–84.

Meadows, D. H., Randers, J., and Meadows, D. L. (1972). *The Limits to Growth: A Report for the Club of Rome's project on the predicament of mankind*. New York, NY: Universe Books. doi: 10.1349/ddlp.1

Mompelat, L. (2021). *Stop The Clock. The Environmental Benefits of a Shorter Working Week. 4 Day Week campaign from Platform London*. Available online at: https://6a142ff6-85bd-4a7b-bb3b-476b07b8f08d.usrfiles.com/ugd/6a142f_5061c06b240e4776bf31dfac2543746b.pdf (accessed March 17, 2022)

Neumayer, E. (2013). *Weak Versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms (4th ed.)*. Cheltenham, England: Edward Elgar. doi: 10.4337/9781781007082

Newell, P., Daley, F., and Twena, M. (2021). *Changing our ways*? *Behaviour change and the climate crisis.* Available online at: https://www.rapidtransition.org/resources/cambridge-sustainability-commission/ (accessed March 17, 2022). doi: 10.1017/9781009104401

Niessen, L., and Bocken, N. M. (2021). How can businesses drive sufficiency? the business for sufficiency framework. *Sustain. Product. Consumpt.* 28, 1090-1103. doi: 10.1016/j.spc.2021.07.030

NRDC (Natural Resources Defense Council) (2021). *Single-Use Plastics 101*. Available online at: https://www.nrdc.org/stories/single-use-plastics-101 (accessed March 17, 2022).

Osikominu, J., and Bocken, N. (2020). A voluntary simplicity lifestyle: Values, adoption, practices and effects. *Sustainability* 12, 1903. doi: 10.3390/su12051903

Porter, M. E., and Kramer, M. R. (2019). "Creating shared value," in *Managing Sustainable Business* (Dordrecht: Springer), pp. 323–346. doi: 10.1007/978-94-024-1144-7_16

Potocnik, J., Spangenberg, J., Alcott, B., Kiss, V., Coote, A., Reichel, A., et al. (2018). *Sufficiency. Moving beyond the Gospel of Eco-Efficiency. Brussels, Belgium: Friends of the Earth Europe.*

Prendeville, S., Cherim, E., and Bocken, N. (2018). Circular cities: mapping six cities in transition. *Environ. Innov. Soc. Transit.* 26, 171–194. doi: 10.1016/j.eist.2017.03.002

Preston, A. (2019). *Editor's Comment: Flygsham Fever*. Available online at: https://www.inflight-online.com/editors-comment-flygsham-fever/ (accessed March 17, 2022).

Raworth, K. (2017). *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*. London: Random House Business Books.

Richardson, J., Nichols, A., and Henry, T. (2012). Do transition towns have the potential to promote health and well-being? a health impact assessment of a transition town initiative. *Public Health* 126, 982–989. doi: 10.1016/j.puhe.2012.07.009

Rockström, J., Steffen, K., Noone, Å., Persson, F. S., Chapin, E., Lambin, T. M., et al. (2009). Planetary boundaries: exploring the safe operating space for humanity. *Ecol. Soc.* 14, 32. doi: 10.5751/ES-03180-140232

Sandberg, M. (2021). Sufficiency transitions: a review of consumption changes for environmental sustainability. *Journal of Cleaner Production* 126097. doi: 10.1016/j.jclepro.2021.126097

Sharing Cities Sweden (2021). *Slutrapport fr?n testb?dden. Sharing City Ume?, 2017–2021*. Available online at: https://static1.squarespace.com/static/59e86b55aeb625e2140eec1a/t/61642c03df7f7b42ac2a546d/1633954823695/Slutrapport$+$Umeå.pdf (accessed March 17, 2022).

Sirplus. (2022). *Sirplus Gewinnt Impact Investoren*. Available online at: https://sirplus.de/blogs/news/warum-sirplus-mit-impact-investoren-noch-mehr-lebensmittel-retten-wird (accessed March 17, 2022).

Skelton, A. C., and Allwood, J. M. (2017). Questioning demand: a study of regretted purchases in Great Britain. *Ecol. Econ.* 131, 499–509. doi: 10.1016/j.ecolecon.2016.06.028

Solidteknics. (2022). *Kickstarter's FAQ's*. Available online at: https://www.solidteknics.com/kickstarter (accessed March 17, 2022).

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., 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

Stubbs, W., and Cocklin, C. (2008). Conceptualizing a "sustainability business model". *Organizat. Environ.* 21, 103–127. doi: 10.1177/1086026608318042

Sustainable Consumption Roundtable. (2006). *I will if you will Towards sustainable consumption*. Available online at: http://www.sd-commission.org.uk/data/files/publications/I_Will_If_You_Will.pdf (accessed March 17, 2022).

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. Product.* 212, 324–333. doi: 10.1016/j.jclepro.2018.11.290

Upward, A., and Jones, P. (2016). An ontology for strongly sustainable business models: Defining an enterprise framework compatible with natural and social science. *Organization Environ.* 29, 97–123. doi: 10.1177/1086026615592933

Velenturf, A., Schröder, P., Mair, S., and D'Amato, D. (2021). Rethinking economic theory and practice for a sustainable circular economy. *Front. Sustain.* 1, 24–37. Available online at: https://www.frontiersin.org/research-topics/24931/rethinking-economic-theory-and-practice-for-a-sustainable-circular-economy

Weinhofer, G., and Hoffmann, V. H. (2010). Mitigating climate change–how do corporate strategies differ?. *Bus. Strategy Environ.* 19, 77–89. doi: 10.1002/bse.618

Wilkinson, R., and Pickett, K. (2009). *The spirit level: Why equality is better for everyone*. Penguin UK.

Wynes, S., and Nicholas, K. A. (2017). The climate mitigation gap: education and government recommendations miss the most effective individual actions. *Environ. Res. Lett.* 12, 074024. doi: 10.1088/1748-9326/aa7541

Zink, T., and Geyer, R. (2017). Circular economy rebound. *J. Industr. Ecol.* 21, 593–602. doi: 10.1111/jiec.12545

Conflict of Interest: The authors declare 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.

Copyright © 2022 Bocken, Niessen and Short. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.