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Barriers and enablers of 1.5° lifestyles: Shallow and deep structural factors shaping the potential for sustainable consumption

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Introduction: Transforming consumption and lifestyles toward sustainability cannot be achieved by individual behavior change alone but requires changes in the structures in which this behavior is embedded. However, "structure" is a blurry concept and scholars use it in a multitude of ways. What often remains implicit in studies on structural phenomena are different types of structures, how they may or may not restrict the agency of individuals in particular ways, and how these restrictions support sustainable consumption patterns at the societal level. To move beyond the current state of research, this article systematizes political, economic, technological, and societal structural factors the literature identifies as impactful regarding the sustainability of consumption and lifestyles compatible with the targets of the Paris Agreement.

Methods: We draw on a systematic review of existing research and use empirical observations to develop conceptual terms that revisit the structure-agency dilemma and offer ways going forward about (un)sustainable consumption.

Results: We do so based on the material or ideational, as well as shallow or deep nature of these factors. Thereby, the article throws light on the deep and opaque material and ideational structural factors lying underneath and shaping the sustainability impact of the more visible, shallow structural factors typically considered in public debates about sustainability governance.

Discussion: The article, thus, highlights the need to consider and address these deep structural factors for any effective pursuit of transformation.

KEYWORDS

sustainable consumption, lifestyles, structures, climate change, mobility, food, housing, leisure

1. Introduction

Despite 50 years of scientific knowledge about the effects of continued growth in production and consumption on the environment (Meadows et al., 1972; Wilcox, 1975), societies have failed to take necessary action and are facing multiple interrelated and mutually reinforcing global sustainability crises (IPBES, 2016; Newell et al., 2021; IPCC, 2022). Many scholars have argued that this failure to achieve progress is tightly linked to the individual, behavioral focus, dominant in much of sustainability governance, especially sustainable consumption governance, which ignores the embeddedness of (over)consumption in economic, political, technological, and societal structures and the

limits to agency of individuals (Schnaiberg, 1980; Maniates, 2001, 2020; Fuchs and Lorek, 2005; Stoddard et al., 2021). Accordingly, a substantial share of research on sustainable development and consumption has started to focus on the structures in which consumption behavior is embedded, and we now have a large and further burgeoning literature on structural conditions and effects.[1]

There can be no doubt that structures play a vital role in sustainability transformations. Effectively addressing the climate crisis requires societal, economic, political, and technological change at the structural level. More specifically, current unsustainable lifestyles and consumption practices are influenced and enabled by a range of structural categories such as societal foundations, economic superstructures, policies and regulations, infrastructures, and the (non-)availability of appliances and technologies (Fuchs et al., 2021a). Essentially, the societal and economical order, the wider system that makes humans function as a social entity, must be transformed toward different, maintainable ways of con*struct*ing and con*stru*ing our lives. Indeed, the necessary deep transformation stipulated also in the most recent IPCC (2022) report requires structural changes in all spheres of life, changes that simultaneously allow the pursuit of social justice, avoid societal conflict, and foster long-term individual and societal wellbeing within planetary boundaries. As the crisis aggravates, the decisive role of wider structural relations—including power relations—can no longer be ignored. Structure is a rather blurry concept used in a myriad of ways in the literature.[2] While social structures are commonly defined in opposition with agency and accordingly as constraints on action and on social change, this strict opposition has been challenged (e.g., Guy, 2022). The focus of this paper, thus, is not on—possibly unresolvable—theoretical debates on structure vs. agency but on reducing the blurriness of the concept by systematizing structural factors that may hinder or enable change to make them more tangible for climate governance and transformations toward 1.5° lifestyles, compatible with the targets of the Paris Agreement. While some scholars may use terms such as "structures" or "configuration" to refer to the—in our conception: rather "shallow"—contexts of specific policies or policy regimes, such as subsidies for electric vehicles, others may employ it to capture the—rather "deep"—impact of capitalism. This situation amounts to comparing very different phenomena and concepts when speaking of "structures." The consequence is that research on the structural impacts on the sustainability of consumption and lifestyles is extremely difficult to systematize and synthesize, and yet such a systematization and synthesis is urgently needed for moving forward in scholarly understanding, political advice, and, last but not least, governance.

In this article, we first ask which structural factors are—directly or indirectly—identified as impactful by the literature concerned with sustainability. We then seek to bring more clarity into the blurry picture of structural factors impacting the sustainability of consumption and lifestyles. Specifically, we aim to systematize the state of the art on these structural factors using a conceptual differentiation between material and ideational, and shallow and deep factors to identify impactful structural enablers of and barriers to a sustainability transformation. We pursue this objective *via* a content analysis of a large body of current scientific literature.

The article is structured as follows. The next section briefly reviews structural theory and lays out our understanding of "structures" as well as our conceptual approach to differentiating between structural factors. Section 3 delineates the methodology used for building and analyzing the text corpus. Section 4, then, presents our results by systematizing structural factors from political, economic, technological and societal contexts by distinguishing barriers and enablers as well as shallow and deep factors. Section 5 summarizes the findings and discusses implications for research and governance, followed by a conclusion in section 6.

2. Conceptualizing structures

In order to systematize existing insights on structural enablers of and barriers to the sustainability transformation, it is vital to clarify what we mean by structural factors, how we can evaluate their influence, and distinguish them for analytic purposes.

2.1. Structure(s) and agency

Researchers as well as practitioners tend to use the term "structure" in a broad variety of ways. Common language often conceives of structures as "order" and thus the opposite of "chaos," whereas, in academic definitions, a structure is often associated with and opposed to agency or agential action (e.g., Hayward and Lukes, 2008; Powell, 2013; Guy, 2022). This resonates with the common language term insofar as structures work in powerful ways to limit agency and *order* behavior. Giddens (1984, p. 25) defines a structure as a sum of "rules and resources, or sets of transformation relations, organized as properties of social systems." Importantly, Giddens' structuration approach goes beyond the rather static understanding of structures determining behavior through constraints. He suggested the term structuration to emphasize that social life is both dynamic and ordered: "The structural components of society, embedded in an enduring way in institutions, are [...] both enabling and constraining" (Giddens, 1983, p. 78). Therefore, we look at structural components of society, or, more specifically, at structural factors asserted in the literature that hinder or enable a shift toward 1.5° lifestyles. By contrast, non-structural factors would be personal constraints and opportunities directly pertaining to the behavior and choices of individuals at the household level. For example, in a non-structural perspective an individual may be conjured to make "good" choices to live sustainably, without the web of social relations and conditions in which choices are made being addressed. Of course, the two

1 Relevant literatures include social practice theory (Warde, 2005; Sahakian, 2019), consumption corridors (Di Giulio and Fuchs, 2014; Fuchs et al., 2021a), the externalization society (Lessenich, 2019); imperial modes of living (Brand and Wissen, 2021); sustainable/1.5° lifestyles (Lettenmeier, 2018; IGES et al., 2019), and sociotechnical transition pathways (Geels, 2002; Geels and Schot, 2007).

2 Etymologically, the term comes from Latin *structura* and can either refer to any built structure in the material sense or to the order of any social institution or process in a more abstract sense.

levels are connected. However, both science and policy can and frequently have put the spotlight on one or the other level, over the last decades.

Other scholars reject the idea of structures and explain the dynamics of change and stability through networked relations of human and non-human actants (Callon, 1986; Latour, 2005). To bridge Actor Network Theory with structural theory, Greenhalgh and Stones (2010) account for both the knowledgeability of actors and the influence of external and internal structures[3]. Instead of talking about structures, some prefer to focus on configurations. Technologies, for example, can be characterized as "configurations that work" (Rip and Kemp, 1998, p. 330). Created and shaped by social, economic and political forces, technologies cannot be reduced to tools but also include skills and, underpinned by a systems view, merge into a background of wider societal systems, regimes, or sociotechnical landscapes (Rip and Kemp, 1998).

In the context of the climate crisis and (un)sustainable lifestyles, it is a problem how easy it is to attribute responsibility to individual households and overlook the influence of structures. Indeed, most contemporary approaches focusing on structural power highlight that the relevant power relations often remain obscure due to their embeddedness in systems of knowledge and communication and their shaping of behavioral routines.[4] This obscurity makes identifying, evaluating, and challenging structural power difficult. In turn, a "dilemma" that comes with thinking-in-structures is that, in light of the vastness of structures, specific actors can be interpreted as having their hands tied. Therefore, it is important to overrate neither the influence of structures nor agency. It is helpful to conceptualize them as opposed but equivalent: treat all structures as generated through agency; treat all agential action as produced through the operation of structures (Powell, 2013).

In face of these debates we acknowledge, firstly, the attempts at bridging structure and agency, secondly, the enabling and constraining qualities of structures, and, thirdly, that the concept of structure is not only blurry but also contested and can be replaced by the term configuration. This paper, however, is not an attempt at contributing to those theoretical and conceptual debates, but rather at identifying and systematizing structural factors asserted in the literature on climate governance and sustainability. In various ways these factors hinder or enable a shift toward lifestyles compatible with climate targets. It is in the nature of a structural perspective to assume that producers and consumers are trapped in certain ways of thinking and doing, and so is climate governance. However, it is vital to note that we do not understand the structural factors we showcase as determining behavior in absolute terms. Indeed, powerful actors' agency also influences structures which, though representing relative stability, are mutable—an understanding without which it would be difficult to address structures politically.

To systematize and evaluate structural impacts, however, further considerations are necessary. Specifically, analyses need to pay attention to the diversity of structural factors addressed in the literature. The blurry nature of the concept of "structure" entails that analyses employ it to describe hugely different phenomena. In a first step, therefore, we have to try to impose some form of order on structural factors themselves. Generally, they can be differentiated according to their dominant context. Economic structural factors tend to relate to markets and trade, political ones to politics and policy regimes, technological ones to infrastructure and socio-technical relations, and societal ones to norms and institutions ordering how individuals interact and relate to each other as well as with the material world in everyday life. There is considerable overlap, of course. Capitalism, for instance, may well be interpreted in a political or an economic context. Thus, these distinctions are made for analytic purposes, yet always to be seen as part of the interdependencies that are intrinsic to the world and the various entangled structural components it is made of.

2.2. Ideational and material factors

A promising starting point for further differentiation is to distinguish between ideational and material structures (Fuchs et al., 2019). This implies paying attention to norms, values and narratives that attribute meaning to actors, actions, and their contexts, on the ideational side, and to the more concrete technological, financial, or procedural phenomena structuring our lifeworld, on the material side. Understandings of what are "normal" production and consumption systems and behaviors, or of what denotes wellbeing and prosperity, are examples of ideational structures influencing the sustainability of consumption and lifestyles. Similarly, narratives can work as structural barriers to transformation when they question the existence of a problem, e.g., climate change, but also when they directly or indirectly delay acting on it (Lamb et al., 2020). The material side involves prices and competition. Households' financial resources tend to have a strong influence on their ecological footprint, for example, and corporate control over markets or technologies similarly shapes the sustainability characteristics of production and consumption.

Of course, most if not all structural factors have an ideational and a material dimension and are linked in various ways (e.g., as part of business models). The distinction between the two is made here for analytical purposes, and allows us to categorize each structural factor according to its more dominant dimension.

2.3. Shallow and deep factors

We suggest a second fruitful differentiation between deep and shallow factors. This distinction reflects our observation that structural factors are ingrained into the societal fabric in very different ways. Some can be rather specific, for example, policy regimes that determine certain subsidies. Others are very broad and fundamental such as capitalism. The depth or shallowness of

3 While external structures are the conditions of action, internal structures consist of both general dispositions (such as discourses, moral and practical principles, attitudes, skills, and values) and conjuncturally-specific knowledge of the strategic terrain, i.e., how to act within external structures (Stones, 2005).

4 Numerous approaches to the concept of structural power exist. Scholars draw on historical materialist and dialectical perspectives (Harvey, 1982; Seo and Creed, 2002), post-structuralist (Foucault, 1980, 2008; Butler, 1990), practice-oriented (Reckwitz, 2002; Warde, 2005), or new materialist (Barad, 2003; Bennett, 2010) theoretical foundations, to name just a few.

structural factors are likely to have an influence on the potential for and sustainability impact of change in these contexts and on our ability to attribute the responsibility for such change to specific actors. Shallow factors, according to our definition then, are more specific and visible, have a narrower focus, and it is easier to identify specific responsible actors able to change them within the current power relations. By contrast, deep factors are broader, less discernible, and more difficult to change, and they potentially cannot be dismantled without changes in existing power relations.

Importantly, shallow is not meant in a derogative way or supposed to suggest that the factors do not exert influence. We use the term mainly as a contrast to the deep factors, the role of which we want to highlight due to the need to reconfigure structural constellations at a systemic level if climate targets are to be met. Moreover, and as with the ideational/material dimension, the distinction between deep and shallow is an analytical device. In reality, it does not exist in this binary form, but rather forms a continuum. The distinction should neither incite all too quick assumptions that deep factors cannot be changed (and therefore a transformation not achieved) nor that the impact of changes in shallow factors will always be small and not worth pursuing.

3. Systematic literature review

In pursuit of our objectives, we combine a systematic literature review on structural barriers and enablers relevant to mainstreaming sustainable consumption and lifestyles with a peer consulting process within the consortium of the EU 1.5° Lifestyles project.[5]

With this literature review, we provide an overview on relevant knowledge in the research field of climate change mitigation and, more generally, sustainability. A first step in a literature review is to reflect on inclusion criteria (Hart, 1998; Xiao and Watson, 2019). We included studies from a variety of social and environmental scientific disciplines, ranging from ecological economics, political economics, environmental politics, sociology of consumption, urban planning, agri-food studies, innovation studies, social and environmental psychology, and business ethics, to sustainable development and transitions studies. All studies involved empirical research relating either to climate change or sustainability in general. We did not include studies (e.g., on climate modeling or descriptive literature on the Paris Agreement) that provide insights on climate change or climate policy without explicitly and empirically addressing wider implications for society. We only included studies written in English or, if they had an international outlook, German.

Relevant articles were identified using different search strings which combined key words linked to the field of sustainability such as "sustainable lifestyles" with "barriers," "enablers" or "structures" and key words from more specific fields (e.g., "technology," "education"). Those search strings were applied to the databases Web of Science and Scopus and, applied in the various possible combinations, yielded a total of 18,188 hits. We reduced the number of hits through screening (only reading the first 200 hits) or using filtering criteria such as excluding studies on "sustainable livelihood" which focus more on farmer livelihoods in the Global South than on sustainable living. Thereby, the number of articles was reduced to ∼1,500 hits and, after removing duplicates, yielded a total of 477 articles. Through abstract screening, the 120 most relevant articles were then selected while categorizing their (apparent) topical focus by structural factors and consumption areas. Of the coded articles, 60 articles were chosen by structural factors (political: 16, economical: 15, technological: 12, societal: 17) and 60 studies by consumption areas (mobility: 16, housing: 14, nutrition: 19, leisure: 11).

The coding process was conducted with the qualitative data analysis software MAXQDA. While reading the articles, researchers used a set of deductive codes to mark text passages that either addressed "structur*" directly or hadan implicit, contextual relevance. The articles were coded for references to the following aspects: political/economic/societal/technological structure, barriers/enablers, ideational/material power, and responsible actors. Next to marking passages with MAXQDA within the studies, all results were entered into a joint Excel sheet. To enhance intercoder reliability, the codes were discussed in the consortium and further described in the coding guidelines. Using the Excel sheet with the summarized articles as a starting point, then, a qualitative analysis of the coded articles was conducted. During the qualitative analysis, the results regarding enablers and barriers were synthesized according to different categories in order to identify meta-structural factors. Narrowing down the findings to a meta-level was useful for getting a good overview on the most relevant enablers and barriers.

In the course of the qualitative analysis, the need for an additional differentiation between types of structural factors became apparent. Thus, we introduced the distinction between deep and shallow factors, which had not been part of the coding process. Yet this distinction allowed us to further order the results from the coding and systematize the diverse angles and scales with which structural factors show up in the literature.

To enable a peer consulting process within the consortium, the main barriers and enablers identified through the coding process were summarized in tables. To distill these tables down to the most important structural enablers and barriers, we applied a ranking survey method (similar to a Delphi process; e.g., Schmidt et al., 2001) drawing on the broad expertise within the consortium. The resulting structural factors are summarized in section 4 and Tables 1, 2.

The method we applied to review the literature and identify impactful structural factors has its limitations. The qualitative interpretation of (particularly indirect) structural contexts by different coders comes with inherent ambiguities, uncertainty about interpretation, and different readings as a result. As pointed out above, intensive discussions within the consortium and detailed guidance on coding was used to reduce this weakness. Similarly, the inclusion of "barriers" and "enablers" as proxy for structural contexts was important to our perspective but also resulted in a large number of search results in combination with the other search terms, which then had to be narrowed down *via* screening and filtering criteria[6]. In addition, our method does not allow

5 onepointfivelifestyles.eu

6 Future re-runs of similar searches may thus result in slightly different samples.

TABLE 1 Key barriers of 1.5° lifestyles: deep structural factors lower and printed in fat, intermediate factors with both deep and shallow characteristics in italics.

Depth	Key Barriers							
	Economic		Political		Technological		Societal	
	Ideational	Material	Ideational	Material	Ideational	Material	Ideational	Material
Shallow		High prices of sustainable commodities, partly due to subsidies for unsustainable commodities and raw materials (e.g., fossil fuels, nuclear power)		Weak policies (ineffective, insufficient) and failure to mitigate and upscale measures	Belief in the future potential of negative-emissions technologies and their use to justify present emissions	(Infra)structural lock-in effects (including centralization of infrastructure systems) impede swift shift from development to implementation of sustainable innovations	Lack of information, knowledge, and skills to adopt sustainable lifestyles	
				Insufficient financial control	Concerns over "geoengineering" lead to neglect of carbon capture options with less adverse side effects (e.g., soil build-up, afforestation)	High and rising energy demand may overburden systems relying on intermittent renewables	Concern about costs of sustainable practices, material insecurity, and lack of convenience	Lack of investment in sustainable social innovations
	Green growth ideology		***Populism and related challenges to democratic governance***	Fragmented political landscape (institutions; mitigation schemes; geopolitics)	Fears of high and rising energy demand overburdening systems relying on intermittent renewables (partly justified, partly resulting from a lack of knowledge)	***Negative effects of digitalization (energy intensity and resource use, drivers of increased consumption, etc.)***	***Narratives of/beliefs in individual self-optimization and competition***	
	Power of marketing (deep and shallow aspects)	**Production precedes consumption; lack of private and public investment in sustainable products etc. due to risk perceptions and expectations on return**	**Ideological lock-in (false optimism; weak analysis of the problem, fear of breaking established political paths/breaking alliances/uncertainty how a new political course will be accepted by electorate)**	**Systematic influence of vested interests: defense of assets, power, and capital accumulation (fossil-fuel incumbency; national geopolitical interests)—instrumental/lobbying, material-structural (and discursive) power**	**Techno-fix attitude and efficiency focus; lack of LCA of technologies (incl. renewables), and false optimism toward techn. progress; neglect of social change/sufficiency-oriented (also to technology) low-tech approaches as mitigation pathways**	**Trade-offs between societal and economic functions if demand for "food, fodder and fuel" is met simultaneously**	***Marginalization of disadvantaged groups and unconventional lifestyles leading to a lack of knowledge about them***	**Efficiency gains outweighed by consumption increase on aggregate (Jevons paradox/rebound effects at multiple levels)**
Deep	**Economic business models relying on fossil fuel industry (backed by powerful political actors)**	**Competition and profitability pressurizing businesses into unsustainable practices**	**Belief in neoliberal governance**		**Focus on satisfying "high and rising" energy demand instead of planning for sufficient levels of energy use**	**The long shadow of previous infrastructure development reveals itself in social practices, institutions, and vested interests limiting policy impact and techn. advances**	**Behavioral focus on lifestyle change (underestimates the nature of change necessary to meet 1.5°C)**	**Social behavior embedded in and dependent on technology and infrastructure**
	Economic growth paradigm institutionalized in social relations, political priorities and valuations	**Globalized markets, enabled by unequal trade relations, which obscure consumption impacts in Global South**				**Material constraints impeding the "greening" of specific sectors (e.g., steel, concrete, synthetic fertilizers)**	**Social conventions and status grounded upon consumption of energy-intensive goods and services, and is reinforced by current political-economic system, and slow to change**	**Work-spend cycle; Praising work and overconsumption related, work justifies high consumption and vice versa**
		Income stability and material welfare depend on growth in production and consumption (in current system)					**Lack of understanding of the severity of the environmental crises, their interaction, and their social dimension (lack of systemic thinking)**	
		Inequality in access to and use of resources as well as in current carbon footprints within and across countries					**Lack of societal vision of a low-carbon society/post-materialist society**	

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TABLE 2 Key enablers of 1.5° lifestyles: deep structural factors lower and printed in fat, intermediate structures with both deep and shallow characteristics in italics.

Depth	Key Enablers							
	Economic		Political		Technological		Societal	
	Ideational	Material	Ideational	Material	Ideational	Material	Ideational	Material
Shallow	Consumer values (leading to demand for sustainable goods as lever of company portfolios)	Economic incentives for production and consumption of sustainable commodities through internalizing costs and subsidies and eco-social taxation (lower tax on labor, higher tax on Carbon emissions and energy use)	Narratives emphasizing benefits of mitigation for societal wellbeing at individual level	Legislation for stable financial incentives fostering predictability and planning safety of investments	Technological advances leading to improvements in energy efficiency	Substitution of resource-intensive practices through digitalisation (e.g., virtual meetings)	Education for sustainability	Niche practices and eco-communities as experimental petri dish for social innovation
		Local and sharing economies		Regulation of public procurement, energy supply and relevant technologies/innovation	Communication on low-tech, easy to implement solutions	"Smart" technologies and analysis tools through digitalisation (caution for rebound effects and overreliance on tech solutions)	Inclusive, participative approach to mobilize knowledge and strengthen acceptance of policy measures	Sustainable practices/infrastructure at community level (e.g., repair cafes)
		Sustainable investment funds and reliable criteria for the sustainability of investment (difficulty: still driving growth)		***Banning of unsustainable products and processes***		Energy storage and flexible use technologies	Alternative narratives linking sustainability practices and individual wellbeing (as part of grassroot initiatives and beyond)	Initiatives mobilizing households to change their everyday habits and practices
Deep	**New measurement of economic success in a post-capitalist societal order focused on a "good life"**	**UBS/public access to minimum levels of essential goods and services (i.e., demonetized access) enabled by societal dialogue on needs and satisfiers (as opposed to UBI)**	**Political will, honesty regarding the crisis, and corresponding "hands-on" style of politics**	**Strong regulation and litigation of supply and demand, physical architecture and infrastructure, corporate practices and subsidies (smart mix of policies needed to avoid shifting burden between dimensions)**	**Systems perspective on technological advances and transformation (incl. changes in societal, economic, and political foundations if necessary)**	**Existence of low-carbon technologies**	**Change in societal values toward collective wellbeing and a "good life," alternative paradigms to work ideology and the morality of work, which underpins consumption as the "good life"**	***Shifts in work-life balance (reduction in working time)— sustainability impact needs to be enabled in general by policy mix (both in terms of overall production and consumption)***
	Economic crises as disruptive factors to the trend of neoliberalism and in favor of counternarratives to overconsumption	**Weakening work-spend cycle (less income, less consumption, but more time for care work, socializing, and leisure)**	**Sufficiency (in combination with justice-) focused narratives as basis for acceptance of strict environmental policies, fostering societal debate**	**Active, more interventionist control over financial system**				
				Strong institutionalization and consensual, concerted efforts from the global to the local level of governance, involving strong participation of citizens and communities				

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to measure the impact of structural factors, it rather gives an indication of their importance by observing that they are (often) asserted in the literature. Both, the application of the Delphi method within our consortium and the expert interviews served to strengthen the reliability of results on the relevance of specific structural factors and to allow the identification of potential gaps resulting from the coding exercise.

4. Shallow and deep structural barriers and enablers

To approach structures, a multiplicity of variables can be distinguished. Here, we present structural factors that recur in the literature and are thus impactful regarding shifts toward sustainable lifestyles. However, the ways in which their impact manifests diverge. Thus, we first present barriers and then enablers. While we are well-aware that they are two sides of the same coin as overcoming a barrier can be seen as an enabler, it still matters whether the perspective taken is inclined toward problems or solutions. Within the following subsections, we also separate between structural factors at the shallow (4.1 and 4.3) and deep (4.2 and 4.4) level. The additional distinction between material and ideational also appears without constituting its own subsection. An overview of all variables is provided in Tables 1, 2, showing key barriers and enablers, respectively.

4.1. Shallow barriers

Barriers that could be changed by a manageable number of actors without significantly overturning power relations can be seen as "shallow." Policies are a political structural factor referenced most frequently in the literature, with scholars emphasizing that weak policies form a major barrier to transformation (Larsen et al., 2011; Antal and van den Bergh, 2014; Grosjean et al., 2016; Mercure et al., 2016; Spash, 2016; Beck and Mahony, 2018; Gunderson et al., 2018; Henders et al., 2018; Jackson and Smith, 2018; Mathy et al., 2018; Gossen et al., 2019; Anderson et al., 2020; Chan et al., 2020; Somerville, 2020; Streck, 2020; Brand, 2021). Practical examples of policy weakness include loopholes that allow jurisdictions to externalize footprints and meet (their individual) targets by importing rather than producing resource-intensive commodities. Celebrated initiatives such as the Nordic Energy Transition ignore emissions from aviation and shipping (Anderson et al., 2020; Chan et al., 2020; Somerville, 2020). Similarly, researchers regard the Paris Agreement, with its voluntary nationally determined contributions, as insufficient in its promises of climate security (Spash, 2016).

For shallow economic structural factors, the most recurrent material barrier in the literature is about pricing. Scholars frequently highlight that the prices for products and services are unbalanced, with sustainable alternatives generally being more expensive. This is the case for the mobility sector (high prices for alternatives to conventional fuels) (Bakker et al., 2014; Cavoli, 2021), renewable energies (Kuokkanen et al., 2016) or the food sector (Rossi et al., 2019). In some cases, this problem arises from continued subsidies for unsustainable commodities and raw materials (Kirchherr et al., 2018). We categorize product prices as something that could be addressed through existing measures at the shallow level, e.g., specific tax policies. Generally, however, low prices are a function of the externalization of environmental and social costs of production. Cheap labor and exploitation, environmental sinks and degradation are costs not paid by consumers in the Global North but elsewhere as part of unequal exchange between North and South (Dorninger et al., 2021). The resulting prices discourage individuals, companies and (local) governments from making more sustainable choices (Birch, 2016). Those North-South inequalities are *deeply* embedded into the fabric of society (see Table 1).

Shallow technological barriers comprise beliefs in and reliance on the future potential of certain negative-emissions technologies, including so-called "geoengineering." However, academics have warned that rejecting all negative-emissions technologies out of justified concerns over geoengineering bears the risk of neglecting carbon capture options with less adverse side effects such as soil build-up and afforestation (Cox et al., 2020). Another barrier entails that a high and rising energy demand may overburden systems relying on intermittent renewables (Ilieva and Bremdal, 2020) which is at the same time a material barrier and an ideational one since concerns over this are partly justified in the face of the material status quo of renewable infrastructure, partly resulting from a lack of knowledge over alternatives. Infrastructural lock-in effects (including centralization of infrastructure systems) impede a swift shift from development to implementation of sustainable innovations (Bakker et al., 2014; Birch, 2016; Ruhrort, 2020).

Finally, shallow material and ideational factors in the societal realm also constrain the sustainability of consumption and lifestyles. Individuals may lack clear information on how to implement sustainable behaviors into their daily practices or an understanding of (the urgency of action on) climate change and reducing one's footprint (Abrahamse and de Groot, 2013). This is not least a question of insufficient education, as climate change still enjoys too little coverage in the education system (Otto et al., 2020).

A handful of structural factors can be categorized at the intermediate level between shallow and deep (in Tables 1, 2 they are printed in italics). These are barriers that could and should be addressed by specific measures but are rooted in deeper structures that are not easy to change. The predominance of a green growth ideology, the continuous power of marketing over consumption, populism and related challenges to democratic governance, the often unquestioned negative effects of digitalization, narratives of individual self-optimization and competition, and the marginalization of disadvantaged groups and unconventional lifestyles leading to a lack of knowledge about them. While specific measures and responsible actors may be identified for these aspects, these structural factors also highlight that some of them are more difficult to grasp as they have causes at the deep structural level which is detailed in the following subsection.

4.2. Deep barriers

Barriers that are deeply ingrained into the fabric of society are less discernible, more difficult to change, and not without changing power relations.

While policies, in the end, form material factors, they are, of course, closely associated with norms and ideas, especially specific conceptions of problems, solutions, or relevant actors. This is where the powerful role of deeper material and ideational factors behind the specific policies becomes visible. These deeper factors determine what policies are even considered and whether they have the chance to be effective rather than weak.

At this deeper level, the literature identifies power asymmetries between political actors as a crucial material barrier to change. Such asymmetries exist between well-organized, resource rich, profit-oriented economic actors or political elites, on the one side, and citizens, on the other, but also between large and small businesses, between resource rich and poorer segments of the global population, and between current and future generations (Grosjean et al., 2016; Czirfusz et al., 2019; Somerville, 2020; Brand and Wissen, 2021). Scholars highlight the institutionalized influence of vested economic interests in the political process (Birch, 2016; Echeverri, 2018; Schaffartzik and Fischer-Kowalski, 2018; Ruhrort, 2020; Somerville, 2020; Newell and Simms, 2021). More fundamentally, they underline the general role of money in politics, both in its "legal" form of lobbying, sponsorship, and campaign finance, but also in the form of corruption as crucial material barriers (Antal and van den Bergh, 2014; Streck, 2020). On the ideational side, the literature raises alarm over a lack of knowledge of relevant dynamics, pointing also to pervasive misinformation on climate change (Antal and van den Bergh, 2014; Streck, 2020). As a result of such barriers, the literature suggest, climate governance has turned into "a lop-sided, elite-biased liberal proceduralism doomed to failure in the face of changes of a scale and scope hitherto unimaginable" (Somerville, 2020, p. 356 citing Wainwright and Mann, 2013, p. 9).

Furthermore, the hegemony of the growth paradigm remains a dominant ideational barrier to politicians' willingness to pursue changes to the economic and social order (Spangenberg, 2013; Antal and van den Bergh, 2014; Bakker et al., 2014; Spash, 2016; Gunderson et al., 2018; Fletcher et al., 2019; Gossen et al., 2019; Anderson et al., 2020; Brand et al., 2020; Brand, 2021; Pichler et al., 2021). This includes the presumption that growth is progress, its absence leads to instability and recession, and that growth is necessary to preserve jobs and the welfare state (Antal and van den Bergh, 2014). Incompatible with an absolute reduction of resource use (Spash, 2016; Pichler et al., 2021), this logic puts environmental goals second, thereby stabilizing unsustainable living standards while ignoring the risks of resource extraction, the opportunities in controlled degrowth, as well as alternative ways to create jobs or configure welfare (Brand, 2021).

A substantial share of the literature emphasizes that enacting transformative change in the context of sustainable consumption and lifestyles will require an openness to actively regulate the demand for products and services (Henders et al., 2018; Jackson and Smith, 2018; Mathy et al., 2018; Ruhrort and Allert, 2021; Stankuniene, 2021). In the past, such "regulation" was confined to specific, rather passive (i.e., shallow) policies and approaches, typically focused on informing consumers, raising awareness among them, and encouraging them to take individual responsibility (Fuchs and Lorek, 2005). Moreover, it has aimed at the greening of consumption and its growth rather than absolute reductions. Recognizing the shortcomings of individualist approaches, many contributions in the literature emphasize the importance of *collective* mitigation schemes and associated changes in social practices. Energy communities contribute to a decentralized energy system, relevant public procurement and city-level schemes, more public spaces, and a better mobility infrastructure (Larsen et al., 2011; Mosannenzadeh et al., 2017; Schaffartzik and Fischer-Kowalski, 2018; Wamsler and Raggers, 2018; Gossen et al., 2019; Sareen and Grandin, 2020; Cunha et al., 2021; Ruhrort and Allert, 2021). The broad failure of weak sustainable consumption governance asserted in the literature suggests that active political demand-side regulation will necessitate addressing broader political and social norms as well as material factors at the deeper level. Such a deep structural focus would, for instance, allow if not force politicians and societies to question the role of the advertising sector, structural factors and processes that foster status competition, work-spend cycles, and multiple-scale inequities in provision and appropriation of value. A depth-based approach would rethink the value of growth and restrict the influence of vested interests benefiting from growth, but also create new avenues for equitable and inclusive sustainability governance (Daly, 2013; Büchs and Koch, 2019; Brand and Wissen, 2021; Keil and Kreinin, 2022).

Again, deep material and ideational factors shaping the sustainability of consumption and lifestyles shine through the structural barriers at the surface of economic conditions (e.g., prices of sustainable commodities; see 4.1). It is important to note that as well as switching to more sustainable alternatives, consumption needs to be reduced overall in line with ideas of sufficiency (see 4.4; Schaffartzik and Fischer-Kowalski, 2018; Somerville, 2020). However, the capitalist logic means that companies seeking profit and unsustainable demand from households are institutionalized *via* private ownership or capital accumulation in current politico-economic and social relations (Spangenberg, 2013; Gunderson et al., 2018). They are supported by a monetary system highly efficient in fostering this capital accumulation and pursuit of economic growth, as well as by the deep inequalities inherited from the colonialera.

In this context, the literature identifies the continued reliance on fossil fuels as a further material barrier to the transition to sustainable energy use (Messner, 2015; Otto et al., 2020; Brand, 2021; Schaffartzik et al., 2021). Current economic business models and even research, education and innovation policies still attribute an important role to fossil fuels (Messner, 2015), along with continued investment in fossil-fuel assets in financial markets (Otto et al., 2020). Even today, the fossil energy system remains attractive for financial institutions, because it offers safe long-term assets and is not exposed to strong competition, authors argue (Schaffartzik et al., 2021).

Unsustainable levels of consumer demand create an additional deep material barrier to transformation (Spangenberg, 2013; Ertekin and Atik, 2015; Gossen et al., 2019; Jensen and Friis, 2019; De Rosa et al., 2021; Ruhrort and Allert, 2021). Research links this barrier to the capitalist logics mentioned above, insofar that overconsumption is production-driven, with products and services, and specifically advertising artificially creating perceived wants and needs (Gossen et al., 2019). However, some scholars argue that

consumers also rather willingly pursue maximum consumption levels and frequently refuse to pay more for higher quality or circular products (De Rosa et al., 2021). A prominent example for this is the fashion industry with its high demand for cheap clothing and fast fashion (Ertekin and Atik, 2015). This unsustainable consumer culture is also related to capitalist economic logics, however. Individuals are encouraged to pursue "self-optimization" through high-level consumption and *via* societal factors enhancing time pressures and status competition, including long work-hours (Ruhrort and Allert, 2021; Keil and Kreinin, 2022).

When it comes to technology, it is important to differentiate between the role of individual technologies and the deeper material and ideational factors behind technology use and development. The long shadow of previous infrastructure development reveals itself in social practices and institutions, thereby structurally limiting the immediate policy impact—and thus transformational potential—of technological advances (Bakker et al., 2014; Birch, 2016; Kuokkanen et al., 2016), which may also be impeded by the power of businesses preserving the status quo (Spash, 2016). The literature also highlights the risk that improvements in the energy efficiency of products and processes are associated with rebound effects, i.e., the "Jevons paradox" or the risk that efficiency gains will not translate into absolute reductions in carbon emissions, but be leveraged to increase output (Gunderson et al., 2018).[7]

Moreover, technologies themselves imply material constraints and thereby influence transformation trajectories. Some existing industrial processes and products (e.g., steel, concrete, synthetic fertilizer) cannot currently be "greened" through the use of renewable electricity sources, due to the fundamentally different energy properties of fossil vs. renewable energy sources (Malm, 2013; Hoffmann and Spash, 2021).[8] Thus, an "easy" switch in energy sources is not possible, and a transformation would involve decisions about the reduction or phase out of certain processes, ideally in conjunction with broader degrowth and sufficiency strategies (Somerville, 2020; Pichler et al., 2021). Changing the physical infrastructure and productive capacity of society and the economy is anyway necessary to comply with the physicality behind the global carbon budget (Anderson et al., 2020). Similarly, the utilization of renewable resources such as biomass is potentially limited by constraints on production if demand for "food, fodder and fuel" must be met simultaneously, as well as due to concerns about biodiversity loss (Potrc et al., 2021).

At the same time, deep ideational factors also play a crucial role in the context of technology. For example, the hope placed in innovationis a fundamental part of the problem and distraction from environmental (and social) policy progress. "Techno-optimist" perspectives usually highlight the efficiency potential of new, "clean" or "smart" technologies. The critical perspective, in contrast, underlines that technology itself often requires vast amounts of materials and energy, with many "green technologies" having high life-cycle emissions (Ayres and Warr, 2009; Keen et al., 2019). Moreover, ideas about the future practical deployment of many of these technologies are of speculative nature (Anderson et al., 2020; Cox et al., 2020; Somerville, 2020). More fundamentally, techno-optimism impedes societal and political change (Beck and Mahony, 2018) by narrowing policy makers' focus and conditioning societal norms and expectations against effective action toward sustainable consumption and lifestyles (Fletcher et al., 2019). Technological innovation legitimizes a restricted focus on environmental protection by being framed as an economic opportunity, creating the promise of green growth, and enabling the rejection of alternative social futures as well as sufficiency-based policies toward them (Loorbach et al., 2016; Gunderson et al., 2018; Streck, 2020).[9]

How ideational and material factors interact can be seen most easily in governmental and industry decisions on what research to fund (Mathy et al., 2018). But the interaction is even more intricate and nuanced, as the potential attributed to renewable energy sources shows. On the material side, substituting fossil energy with wind and solar energy, for instance, can be seen as a challenge in the context of the inherent intermittency of these renewables due to weather conditions. In this context, the literature highlights concerns that the power grid may be overburdened if energy production exclusively relies on renewables, in the face of persistently high and rising energy demand (Ilieva and Bremdal, 2020). However, such concerns are also influenced by ideational frames. Superficially, insofar as possibilities to overcome the challenges of intermittency may well exist (see 4.1). More fundamentally, the assumption of a rising energy demand need not be made. After all, demand could be curbed, simultaneously, *via* degrowth and sufficiency approaches.

A deep structural perspective on societal change questions the effectiveness of providing individuals with information on sustainable consumption alone. Even well-informed citizens often perform unsustainable consumption (Abrahamse and de Groot, 2013). Lowfinancial resources of households may make high-priced ecological products unattainable (Gossen et al., 2020; Raven et al., 2021). High financial resources tends to result in excessive overall consumption rates. Consumption is associated with households' concrete living and working conditions, including aspects such as family size, space, and time. Moreover, scholars underline that individuals and households are deeply embedded into specific understandings of social value and habitualized conventions of consumption. Conventions and practices underpin a persistent demand for energy-intensive goods and services, including the growing frequency of carbon-intensive consumption such as travel (Fletcher et al., 2019; Jensen and Friis, 2019). Unsustainable

7 According to some scholars, this concern can be attenuated to some extent with the implementation of regulatory policies to incentivize private enterprises to innovate within specific guardrails (Martek et al., 2018; Chan et al., 2020).

8 Many current industrial processes are reliant on fossil fuels as inputs, for example, due to the heat properties of highly energy dense fossil fuels.

9 The increased reliance negative emissions technologies (NET) in climate models and mitigation strategies illustrates this optimistic perspective well, insofar their actual potential is highly speculative and associated risk assessments raise considerable alarm (Anderson et al., 2020; Somerville, 2020). The potential for carbon removal in the future suggested by NETs distracts from the immediate concern to prevent emissions in the first place and enables governments and companies to promise successful long-term mitigation while planning with continued fossil fuel emissions in the medium term (Cox et al., 2020).

consumption is also an important component of social demarcation or status competition. Individuals pursue status stabilization and distinction through consumption, e.g., *via* car ownership or fashion products (Ertekin and Atik, 2015; Cavoli, 2021). As part of the neoliberal social and economic order, individuals are constantly subjected to inter-individual competition and self-optimization, for which they typically require high consumption rates (Gunderson et al., 2018; Brand, 2021).

4.3. Shallow enablers

Faced with the broad variety of barriers, it is even more important to elucidate how the literature depicts solutions. Enablers range from beneficial structural factors that already exist to potentially beneficial ones.

Going back to the shallow structural level in an economic context, it is important to reduce prices of and increase willingness to purchase sustainable commodities. There is a need for legislation for stable financial incentives fostering predictability and planning safety of investments (Echeverri, 2018; Palea, 2021; Sovacool et al., 2021). Furthermore, there are levers that already exist and are relatively easy to trigger for regulating public procurement, energy supply and relevant technologies or innovations (Rootzén et al., 2020; Balázs et al., 2021). And to create acceptance of mitigation measures, political narratives often emphasize collateral benefits for societal wellbeing at individual or collective level (Druckman and Gatersleben, 2019; Creutzig et al., 2022).

Going beyond the question of pricing in the economic context, scholars argue that strong consumer demand for sustainable goods and services would be an important enabler of change. Importantly, they perceive this demand to be growing (Arslan et al., 2021; Saari et al., 2021), such as in the case of plant-based products (Tziva et al., 2020). Though rising, one has to acknowledge that, currently, the demand for sustainable products and services is still far from overpowering the demand for unsustainable ones. What is needed to improve provision are sustainable investment funds and reliable criteria for the sustainability of investment. Another argument is that alternative economic narratives are strengthened through the disruptive effects of crises during which neoliberal norms, for example, are at least temporarily questioned (Hicks and Kuhndt, 2013; Loorbach et al., 2016; Pichler et al., 2021).

Shallow material technological factors include technologies and infrastructure on the demand and supply sides. On the demand side, advances in the energy efficiency of household appliances enable reductions in the carbon footprint of everyday life, while the availability and affordability of technologies such as heat pumps can improve the energy efficiency of housing as such (Hards, 2013). On the supply side, improvements in power grids, energy storage and the introduction of flexible local markets (Ilieva and Bremdal, 2020) to accommodate discontinuous cycles of energy generation from renewable sources can foster improvements in the energy efficiency of production (Mathy et al., 2018).

In recent years, digital technologies receive particular attention in the literature, both in terms of their potential to reduce energy use, but also in terms of their own ecological and social costs. Digitalization can allow employees to work remotely from home, alleviating the need for commuting and (air) travel (Bakker et al., 2014; Kanda and Kivimaa, 2020). Digital devices and "smart" technologies can also help individuals and businesses tracking the carbon impact of consumption practices, including work-related travel (Pargman et al., 2020) or minimizing energy waste of refrigerators and other appliances (Jensen and Friis, 2019). At the same time, digitalization itself is associated with significant energy use, for instance, for searching, streaming, and storage (Chen et al., 2020).

In the societal context, scholars frequently identify education as an enabler for lifestyle changes (Abrahamse and de Groot, 2013; Hicks and Kuhndt, 2013; Longo et al., 2017; Perkins et al., 2018; Gossen et al., 2019; Manca and Fornara, 2019; Jacobson et al., 2020; Otto et al., 2020; Balázs et al., 2021; Brand, 2021; Eker et al., 2021; Schaffartzik et al., 2021). They suggest that educating citizens on sustainability—at school, through professional training, or awareness campaigns organized by governments or civil society[10]—can lead to individual value and behavior change. In this logic, awareness campaigns play an important role in educating adults, e.g., on topics such as meat consumption (Hicks and Kuhndt, 2013; Balázs et al., 2021) or (international) environmental and climate policies (Brand, 2021; Schaffartzik et al., 2021). Similarly, organizing challenges or providing feedback on consumption, e.g., through monitors or meters, can be incentives to change everyday habits, in the view of some authors (Stankuniene, 2021). For education and awareness campaigns to be successful, however, the research suggests that information should be inclusive, tailored to specific audiences (Manca and Fornara, 2019), focus on daily challenges and routines (Longo et al., 2017), and consider the beliefs and practices of the targeted audience (Perkins et al., 2018). Some alternative narratives, for example as part of grassroots initiatives, link sustainability practices and individual wellbeing.

Some shallow structural enablers in a societal context are rather material. Niche practices and eco-communities can be seen as an experimental petri dish for social innovation (Manzini, 2013; Mont et al., 2014). Founded amidst wider public debates on sustainability, specific initiatives mobilize households to change their everyday habits and practices. This comprises "endangered" sustainable practices and infrastructure at community level such as repair cafes (Ehgartner and Hirth, 2019). However, these practices and initiatives can be considered as shallow because they often implicitly seek to optimize behavior of individuals only and lack momentum and support to be upscaled toward collective mass adoption.

Other structural factors are intermediate in that they could be addressed by specific policies or other measures but there may be deeper factors impeding change. Banning of unsustainable products and processes, for example, would be possible with various measures but in the wider political climate regulating and limiting individual behavior is avoided. Similarly, shifts in work-life balance could be enabled but face constraints through deep economic structural factors.

10 The literature suggests benefits of increased collaboration between educational institutions, such as schools and universities, with communities, in this context, specifically as a to provide education for sustainability to a wider public (Perkins et al., 2018).

4.4. Deep enablers

Enablers at the deep structural level shatter the societal norms and underlying power relations. To address the latter, scholars point toward strong political will as a (potential) enabler and "hands-on" policies that involve active regulation (Spangenberg, 2013; Henders et al., 2018; Jackson and Smith, 2018; Roberts et al., 2018), flexible and less fragmented policies (Mathy et al., 2018; Wamsler and Raggers, 2018), policies aiming at sufficiency and justice (Schaffartzik and Fischer-Kowalski, 2018; Wamsler and Raggers, 2018; Somerville, 2020; Stankuniene, 2021), and, in general, a stronger institutionalization of sustainability and climate governance (Larsen et al., 2011; Roberts et al., 2018; Chan et al., 2020; Pastukhova and Westphal, 2020; Brand, 2021). More fundamentally, they argue that more stringent legislation is needed to enforce moratoria or bans of certain behaviors or sectors, e.g., advertising (Otto et al., 2020; Somerville, 2020), or pursue a socially just phase-out or phase-down of resource intensive technologies, behaviors, and sectors (Prinz and Pegels, 2018; Somerville, 2020; Pichler et al., 2021). Effective litigation of unsustainable practices and ecocide (Chan et al., 2020; Otto et al., 2020) and more attention to financial responsibility for governance and its intended outcomes (Pastukhova and Westphal, 2020) would also be enablers of change. Financial tools such as tax (dis)incentives directed at households and businesses, and the shifting of subsidies away from fossil fuels and toward renewables, are also part of the toolset discussed (Kirchherr et al., 2018; Chan et al., 2020; Otto et al., 2020; Rootzén et al., 2020; Somerville, 2020).

Deep change also involves shifting control as well as societal dialogue about broader political and social norms. In this context, scholars argue that stronger participation in climate governance through a wide range of actors, including grassroots initiatives, unions, and energy communities and citizens more broadly can facilitate necessary social innovation (Manzini, 2013; Mont et al., 2014; Prinz and Pegels, 2018; Cunha et al., 2021). Such involvement may be provided for stronger individual (Ruhrort and Allert, 2021) or public participation (Sareen and Grandin, 2020), e.g., in the context of urban governance and energy cities (Mosannenzadeh et al., 2017). Importantly, however, such approaches will only make a difference if they really focus on overcoming power asymmetries (Brand and Wissen, 2021), implement a real shift in control, including the empowerment to shift lifestyles (Jackson and Smith, 2018), rather than shallow performances of participatory sustainability governance. This may require the creation of spaces not only for participation but also deliberation (Larsen et al., 2011), as well as of practical avenues for integrating the outcomes of such processes with the institutions and processes of representative democracy (e.g., democratization through energy communities; Cunha et al., 2021).

When it comes to enablers on the deep, ideational side, the research points to the necessity of a broader vision and frame for possible action that includes attractive and convincing concepts and narratives (Spangenberg, 2013). Specifically, scholars suggest highlighting the positive impact of climate governance on social stability and wellbeing (Gunderson et al., 2018), jobs and security (Roberts et al., 2018), food security (Zurek et al., 2018), reductions in energy poverty (Cunha et al., 2021), and public health (Roberts et al., 2018), for instance due to healthy diets (Hicks and Kuhndt, 2013), or healthier mobility patterns (Jensen et al., 2017).

In the economic context, deep ideational factors also play an important role. Shifts in social and cultural norms and values toward a post-capitalist order are suggested (Spangenberg, 2013; Bakker et al., 2014; Messner, 2015; Gunderson et al., 2018). Along with those changes, what is needed are alternatives to material wealth as a definition of prosperity and to economic growth as an indicator for the success of a country and its economic system and government. Scholars argue that social development, happiness, deeper considerations of what makes a good life, and the imperative to acknowledge ecological limits need to become fundamental economic and societal norms, instead (Bakker et al., 2014), and they see ongoing and future financial and ecological crises as a potential source of mobilization in that direction (Otto et al., 2020; Brand, 2021). They point out that the financial crisis in 2007 and 2008 led to more policy intervention in the economic system, thereby partly disrupting the trend of neoliberalism at the deep structural level (Pichler et al., 2021) as well as facilitating the dissemination of counternarratives to hyper-consumption such as the values of frugality and community (Hicks and Kuhndt, 2013; Loorbach et al., 2016).[11]

On the material side, initiatives that establish a local economy or a collaborative and sharing economy can be qualified as deep enablers. While small initiatives of this kind individually will hardly challenge capitalist logics in global markets, they can grow in size and number. Local economies can cover several sectors, e.g., the food sector through alternative food networks and community-supported agriculture (Bui et al., 2019; Koretskaya and Feola, 2020), the fashion industry (Ertekin and Atik, 2015), but also the energy sector by implementing flexible markets in local energy communities (Ilieva and Bremdal, 2020). While those initiatives take many forms, e.g., food sharing, carpooling, upcycling, and repair cafés, they often share a focus on use and access rather than ownership (Hicks and Kuhndt, 2013; Pirgmaier and Steinberger, 2019; Ruhrort, 2020). This may also strengthen the power and resilience of communities and foster collective wellbeing (Schulz et al., 2019; Kanda and Kivimaa, 2020).

Dissociating provision from markets is a second approach to sheltering economic interaction and societal wellbeing against capitalist pressures. Public access to a greater number of goods and services would decouple the standard of living from monetary income (Spangenberg, 2013). Amongst other things, this involves weakening the work-spend cycle. The work-spend cycle refers to the historic pattern of using labor productivity gains to increase (over)consumption rather than leisure time. Long working hours, destructive in themselves due to environmental impacts of work, both justify, and are justified by, increasing levels of (over)consumption (Schor, 1991; Keil and Kreinin, 2022; Kreinin and Aigner, 2022). Moreover, the provision of universal basic services would allow a focus on needs satisfaction and sufficient, rather than growing, production and consumption (Gough, 2017; Fuchs et al., 2021b). Public financing does not mean that

11 Other scholars, however, have argued that the financial crisis strengthened capital concentration and led to a stabilization of the system (Scherrer, 2011).

addressing the question of pricing within markets, i.e., ensuring the internalization of environmental and social costs, would not be necessary and beneficial. They show, however, possible avenues for also targeting the deeper economic factors shaping the sustainability of consumption and lifestyles.

To change behavior deeply ingrained in society, it is important to mobilize households to change their everyday habits, rather than simply inform them about how to reduce their energy consumption (Longo et al., 2017). This involves challenging certain social standards and expectations, e.g., about home-heating or laundry (frequency, etc.) (Jensen and Friis, 2019). At a more fundamental level, strengthening the sense of place and human-nature connectedness also fosters pro-environmental behavior (Grenni et al., 2019; Riechers et al., 2021). In consequence, a substantial share of the literature suggests changes in broader societal norms and values, such as ideas about a successful and happy life, visions of collective wellbeing, and questioning the current focus on growth and materialistic values (Støa and Aune, 2012; Abrahamse and de Groot, 2013; Manzini, 2013; Bakker et al., 2014; Mont et al., 2014; Shirani et al., 2015; Andersson and Rahe, 2017; Mock et al., 2019; Otto et al., 2020; Morrow, 2021; Tröger and Reese, 2021). To this end, authors promote a focus on cognitive support (Abrahamse and de Groot, 2013), community building and self-sufficiency (Mont et al., 2014), grassroots initiatives providing a supportive normative context and counter-narratives (Gossen et al., 2019; Vita et al., 2020), or consumers becoming an active part in the shaping of supply chains as prosumers (Campos et al., 2020). Community structures and projects foster relationships based on reciprocity, redistribution and participation, e.g., sharing circles or urban gardening initiatives (Hicks and Kuhndt, 2013; Tröger and Reese, 2021), and allow individuals to experiment with non-mainstream lifestyles (Shirani et al., 2015). Grassroots initiatives and community building can also lead to a higher life satisfaction due to a gain in social capital, a sense of empowerment, and agency, which can diminish the need for consumption or building economic capital (Broadbent and Cara, 2018; Gossen et al., 2019; Vita et al., 2020). The hope is that *via* these means change could be provoked and pressure to the existing "regimes" applied (Mock et al., 2019). Eventually, currently dominant narratives could change into degrowth-oriented ones, built on the idea of a good life without a focus on artifact-based material prosperity (Manzini, 2013; Tröger and Reese, 2021; Keil and Kreinin, 2022).

5. Discussion

Distinguishing structural barriers and enablers that are material or ideational, deep or shallow brings some clarity into the way we look at structures. Specifically, it allows us to systematize structural factors that are impactful regarding the potential for sustainable consumption. Our results can show both differences in terms of how deep relevant structural factors permeate the fabric of society and the challenge (and at the same time relevance) of changing them.

Lifestyle changes toward sustainability are hindered or facilitated through structures at the *shallow* structural level. This includes material barriers such as unbalanced prices of commodities and lack of investment in sustainable alternatives; weak policies and control as well as institutional fragmentation; and lock-in effects regarding infrastructure and energy systems. Ideational aspects include fears over shortcomings of renewable energy systems (while not considering the possibility of reducing energy demand) as well as speculative reliance on specific negative-emissions technologies (while neglecting less adverse carbon capture options based on natural solutions). By contrast, material enablers are economic (dis)incentives; reliable criteria, funds, and legislation for investment; incentives for local and sharing economies; regulating public procurement; digitalization and "smart" technologies; energy storage and flexible use technologies; and sustainable niche practices, communities, and initiatives mobilizing individual lifestyle changes. These are complemented by ideational enablers focused on consumer values; narratives linking sustainable practices to collateral benefits and wellbeing of individuals; hope in either technological advances or easy to implement low-tech solutions; information and education; and acceptability as premise for mitigation measures.

We categorized those barriers as "shallow" because they could be addressed by specific policies that would be in reach of (or are even pursued by) influential actors without significantly challenging the current power relations. By tendency, "shallow" enablers are economistic (growth inducing solutions), technocratic, and appeals to individual action and responsibility rather than collective, systemic change. This does not mean they are not worth pursuing or ineffective—they may well be effective in aggregated form. However, they tend to be the most common form of considered mitigation measures while (1) it seems unlikely that climate targets can be reached with shallow enablers alone and (2) their implementation may distract from deeper systemic changes.

Importantly, therefore, our analysis also unearthed barriers *deeply* ingrained in the fabric of society. These are material such as the focus on globalized markets and financial return, obscuring impacts of consumption in the Global South; general inequality in access to and use of resources; systematic influence of vested interests; infrastructure and sectors locked-in through individual vested interests but also material constraints to "greening"; and trade-offs between societal and economic functions (food, fodder, fuel). Other deep barriers are ideational such as the subordination of any activity (incl. mitigation) under the pursuit of economic growth driven by ideas of progress; the power of marketing; business models' continued cognitive reliance on fossil fuels; ideological lock-in that leads to weak understanding of the crisis, its depth and severity, further constrained through presumptions about acceptability and belief in neoliberal governance; predispositions to meet high demand through techno-fixes rather than lowering it to sufficient levels; behavioral focus on lifestyle change; and unquestioned conventions that ground social status in (over)consumption, illustrating the lack of a societal vision for a low-carbon society.

The relevance of *deep* structural factors, in particular, and underlying power relations is already—and at least implicitly—part of debates on the failure of climate governance in the past decades (e.g., Stoddard et al., 2021 for a comprehensive overview). Our review has made the differences in the nature of shallow and deep, as well as material and ideational, factors more visible and explicit. This is in line with the frustration about the status quo of food systems exhibited by a majority of consumers, which

results not only in considerable rates of openness and efforts toward behavior change but, for some, also in a strong desire for structural changes beyond their own control and established power relations (Hirth et al., 2022). That desire, however, is largely ignored by economic and political elites focused, at best, on shallow measures. Differentiating between shallow and deep factors elucidates the divergence between prevalent discussions about the comparatively shallow factors associated with specific policies and the neglect (in governance) of deeper structural forces that determine whether and what policy options are even considered. While the focus on the shallow level dominates much of political and public debate, deep structural factors such as the power of vested interests, the role of money in politics in general, and the reasons for fragmented and weak policy responses remain obscure. Thereby, the set of political choices becomes severely constrained and excludes a broad range of alternative, likely more effective, interventions in pursuit of sustainability transformation.

The neglected status of deep structural factors may bring to mind Anderson et al.'s (2020) insistence that the current crises require policies at least at the scale of the "Marshall Plan" or beyond, including broad changes to the organization of the productive capacity of society and the economy and its physical infrastructure. However, even changes to productive capacity and physical infrastructure are far from enough if this does not explicitly address deep material factors such as the obstructive control of the social and economic order by financial and political elites; as well as ideational factors such as the norms and values based on growth, extractivism, and cost externalization which are in the way of narratives and approaches based on degrowth, sufficiency, and a "good" life.

There are some limitations to our perspective, of course. First, the distinctions made, both between material and ideational and between deep and shallow, are analytical distinctions. As pointed out above, most structural factors have ideational and material dimensions, with one of them tending to be more dominant. Similarly, the binary nature of the deep-shallow distinction is an analytical simplification, as many factors lie somewhere on the continuum between deep and shallow.

Secondly and perhaps more fundamentally, our systematization of ideational and material, deep and shallow factors in the economic, political, societal, and technological realms should not be understood to negate the fact that, ultimately, all structural factors are related. Further research could elaborate on the ways in which specific structural factors interact, and thus on how to compose feedback loops resulting in changes at the deep structural level. Yet, we hope that the above systematization will help to convey what a "concerted effort" would require, and that overcoming established power relations, normalized practices, unequal and excessive resource access, stifled "debates," tokenized "action," and toothless political institutions would be part of that effort.

Thirdly, assessing the influence of structures is a challenge. Relating structures to concrete impacts on consumption behaviors or outcomes is difficult. The influence of structures tends to be broad and subtle, and this is even more the case for deeper structural factors. Their influence is rarely deterministic and interacts with the influence of other factors. Still, politicians, in particular, will always want to know the likely impact of a suggested structural change. However, the complexity and deep uncertainty make the quantification of structural impacts difficult, while conversely, being able to model the effects of changes on the sustainability of structures offers new pathways for transforming societies and understanding interrelations between different structures. Social scientists have been right to criticize and caution against simplistic and positivist pushes for quantification, so-called "simple empiricism" (and especially financialization including cost-benefit-analyses), which have swept the social science and policy making (Spash, 2014). Though only offering one snapshot of possible realities, quantification can nevertheless provide useful signposts to estimate the effects of certain structural factors on (un)sustainable outcomes.

Importantly, some structural factors and their impacts on the sustainability of consumption are easier to quantify, or have already been quantified, such as changes to the energy mix or existence of low-carbon technologies. Other factors and impacts are extremely difficult to quantify. Inequity in resources, resource use and power is—despite of available data on wealth and income inequality—hard to measure since structural power cannot be equated with capital alone. Similarly, (the impacts of) barriers such as the economic growth paradigm, global competition, and unequal North-South trade relations as well as enablers such as strong institutionalization and justice and limits-focused narratives and norms all provide a huge challenge to quantification attempts. Clearly, more research is needed to help overcome these challenges.

6. Conclusion

There is already a rich base of knowledge on the importance of structural change for the sustainability transition in general and the sustainability of consumption and the mainstreaming of 1.5° lifestyles, more specifically. Yet, the breadth and diversity of types of structures discussed in the literature make a systematic understanding of structural barriers and enablers difficult. Therefore, this article identified impactful structural factors that recur in the scientific literature and systematized them by their material and ideational, shallow and deep nature. Shallow factors can be addressed by specific policies that would be in reach of (or are even pursued by) influential actors without significantly challenging the current power relations. They are compatible with current power relations because they tend to support the pursuit of (green) growth, focus on technological efficiency and innovation to avoid unpopular practice changes, and they appeal to individual action and responsibility rather than broader political intervention in pursuit of structural change. Pursuing those shallow mitigation measures receives higher public acceptability. Though still worth pursuing, they will not be effective enough to reach climate targets alone. Individual lifestyle changes toward less carbon-intensive ways of living are largely restricted to the consumption of goods and services, and without changes in material and ideational, shallow and deep factors, households cannot necessarily be expected to make (or even have) sustainable choices and contribute to sustainability on the macro level.

By contrast, reconfiguring the relevant deep structural factors in the interest of sustainable consumption would

challenge taken-for-granted pillars of the current political and economic system, societal institutions and technological and innovation infrastructures. It would put the spotlight on inequities and exploitative relations within societies, in particular between the Global North and the Global South, and turn the focus from the creation of profits to provisioning for needs satisfaction for all within planetary, but also societal (Brand et al., 2021), boundaries. Today's climate governance, as we know it, does not sufficiently consider such deep structural change, however, and therefore is likely to fail the targets of the Paris Agreement. A radical shift in perspective and action will be required for a successful transition toward sustainability.

Data availability statement

Datasets are available on request: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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Conceptualization, methodology, and writing—original draft: SH, HK, and DF. Writing—review and editing: SH and DF. Formal analysis and investigation: SH, NB, PM, IR, and JP. Supervision, project administration, and funding acquisition: DF. Validation of data: all authors and the named partners of the EU1.5° Lifestyles consortium. All authors contributed to the article and all seven main authors approved the submitted version.

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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.

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References

Abrahamse, W., and de Groot, J. (2013). "The psychology of behaviour change: an overview of theoretical and practical contributions," in *The Global Challenge of Encouraging Sustainable Living: Opportunities, Barriers, Policy and Practice*, eds. S. Fudge, M. Peters, S. M. Hoffman, and W. Wehrmeyer (Edward Elgar Publishing), 3–17. doi: 10.4337/9781781003756.00009

Anderson, K., Broderick, J. F., and Stoddard, I. (2020). A factor of two: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways. *Clim. Policy* 20, 1290–1304. doi: 10.1080/14693062.2020.1728209

Andersson, S., and Rahe, U. (2017). Accelerate innovation towards sustainable living: exploring the potential of living labs in a recently completed case. *J. Des. Res.* 15, 234–257. doi: 10.1504/JDR.2017.089914

Antal, M., and van den Bergh, J. C. J. M. (2014). Macroeconomics, financial crisis and the environment: strategies for a sustainability transition. *Environ. Innov. Soc. Transit.* 6, 47–66. doi: 10.1016/j.eist.2013.01.002

Arslan, A., Haapanen, L., Hurmelinna-Laukkanen, P., Tarba, S. Y., and Alon, I. (2021). Climate change, consumer lifestyles and legitimation strategies of sustainability-oriented firms. *Eur. Manag. J.* 39, 720–730. doi: 10.1016/j.emj.2021.03.005

Ayres, R. U., and Warr, B. (2009). *The Economic Growth Engine: How Energy and Work Drive Material Prosperity*. Cheltenham: Edward Elgar. doi: 10.4337/9781848445956

Bakker, S., Zuidgeest, M., De Coninck, H., and Huizenga, C. (2014). Transport, development and climate change mitigation: towards an integrated approach. *Transp. Rev.* 34, 335–355. doi: 10.1080/01441647.2014.903531

Balázs, B., Kelemen, E., Centofanti, T., Vasconcelos, M. W., and Iannetta, P. P. M. (2021). Integrated policy analysis to identify transformation paths to more sustainable legume-based food and feed value-chains in Europe. *Agroecol. Sustain. Food Syst.* 45, 931–953. doi: 10.1080/21683565.2021.1884165

Barad, K. (2003). Posthumanist performativity: toward an understanding of how matter comes to matter. *Signs J. Women Cult. Soc.* 28, 801–831. doi: 10.1086/345321

Beck, S., and Mahony, M. (2018). The politics of anticipation: the IPCC and the negative emissions technologies experience. *Glob. Sustain.* 1, E8. doi: 10.1017/sus.2018.7

Bennett, J. (2010). "Thing-power," in *Political Matter - Technoscience, Democracy, and Public Life*, eds B. Braun, and S. Whatmore (Minneapolis: University of Minnesota Press), 35–62.

Birch, K. (2016). Materiality and sustainability transitions: integrating climate change in transport infrastructure in Ontario, Canada. *Prometheus* 34, 191–206. doi: 10.1080/08109028.2017.1331612

Brand, K.-W. (2021). The black hole of unsustainability. A critical discussion of Ingolfur Blühdorn's approach. *Berl. J. Soziol.* 31, 279–307. doi: 10.1007/s11609-021-00438-6

Brand, U., Görg, C., and Wissen, M. (2020). Overcoming neoliberal globalisation: social-ecological transformation from a Polanyian perspective and beyond. *Globalizations* 17, 161–176. doi: 10.1080/14747731.2019.1644708

Brand, U., Muraca, B., Pineault, É., Sahakian, M., Schaffartzik, A., Novy, A., et al. (2021). From planetary to societal boundaries: an argument for collectively defined self-limitation. *Sustain. Sci. Pract. Policy* 17, 264–291. doi: 10.1080/15487733.2021.1940754

Brand, U., and Wissen, M. (2021). *The Imperial Mode of Living. Everyday Life and the Ecological Crisis of Capitalism*. London: Verso.

Broadbent, S., and Cara, F. (2018). Seeking control in a precarious environment: sustainable practices as an adaptive strategy to living under uncertainty. *Sustainability* 10, 51320. doi: 10.3390/su10051320

Büchs, M., and Koch, M. (2019). Challenges for the degrowth transition: the debate about wellbeing. *Futures* 105, 155–165. doi: 10.1016/j.futures.2018.09.002

Bui, S., Da Costa, I., De Schutter, O., Dedeurwaerdere, T., Hudon, M., and Feyereisen, M. (2019). Systemic ethics and inclusive governance: two key prerequisites for sustainability transitions of agri-food systems. *Agric. Human Values* 36, 277–288. doi: 10.1007/s10460-019-09917-2

Butler, J. (1990). *Gender Trouble*. Feminism and the Subversion of Identity. New York, NY: Routledge.

Callon, M. (1986). "The sociology of an actor-network: the case of the electric vehicle," in *Mapping the Dynamics of Science and Technology: Sociology of Science in the Real World*, eds M. Callon, J. Law, and A. Rip (London: Palgrave Macmillan UK), 19–34. doi: 10.1007/978-1-349-07408-2_2

Campos, I., Pontes, L. G., Marín-Gonzalez, E., Gährs, S., Hall, S., and Holstenkamp, L. (2020). Regulatory challenges and opportunities for collective renewable energy prosumers in the EU. *Energy Policy* 138, 111212. doi: 10.1016/j.enpol.2019.111212

Cavoli, C. (2021). Accelerating sustainable mobility and land-use transitions in rapidly growing cities: identifying common patterns and enabling factors. *J. Transp. Geogr.* 94, 103093. doi: 10.1016/j.jtrangeo.2021.103093

Chan, K. M. A., Boyd, D. R., Gould, R. K., Jetzkowitz, J., Liu, J.; Muraca, B. et al. (2020). Levers and leverage points for pathways to sustainability. *People Nat.* 2, 693–717. doi: 10.1002/pan3.10124

Chen, X., Despeisse, M., and Johansson, B. (2020). Environmental sustainability of digitalization in manufacturing: a review. *Sustainability* 12, 10298. doi: 10.3390/su122410298

Cox, E., Honegger, M., and Gadikota, G. (2020). Barriers to negative-emissions technologies. i*Earth* 3, 137–139. doi: 10.1016/j.oneear.2020.07.017

Creutzig, F., Niamir, L., Bai, X., Callaghan, M., Cullen, J., Díaz-José, J., et al. (2022). Demand-side solutions to climate change mitigation consistent with high levels of well-being. *Nat. Clim. Chang.* 12, 36–46. doi: 10.1038/s41558-021-01219-y

Cunha, F. B. F., Carani, C., Nucci, C. A., Castro, C., Silva, M. S., and Torres, E. A. (2021). Transitioning to a low carbon society through energy communities: lessons learned from Brazil and Italy. *Energy Res. Soc. Sci.* 75, 101994. doi: 10.1016/j.erss.2021.101994

Czirfusz, M., Pósfai, Z., Tóth, K.; Feldmár, N., and Kovács, V. (2019). *Annual Report on Housing Poverty in Hungary—Executive Summary. Habitat for Humanity, Hungary*. Available online at: https://habitat.hu/sites/lakhatasi-jelentes/wpcontent/uploads/sites/5/2020/01/HFH2019EN_V2.pdf (accessed June 20, 2020).

Daly, H. (2013). A further critique of growth economics. *Ecol. Econ.* 88, 20–24. doi: 10.1016/j.ecolecon.2013.01.007

De Rosa, M., Di Pasquale, J., and Adinolfi, F. (2021). The root towards more circularized animal production systems: from animal to territorial metabolism. *Animals* 11, 1540. doi: 10.3390/ani11061540

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

Dorninger, C., Hornborg, A., Abson, D. J., von Wehrden, H., Schaffartzik, A., Giljum, S., et al. (2021). Global patterns of ecologically unequal exchange: implications for sustainability in the 21st century. *Ecol. Econ.* 179, 106824. doi: 10.1016/j.ecolecon.2020.106824

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

Echeverri, L. G. (2018). Investing for rapid decarbonization in cities. *Curr. Opin. Environ. Sustain.* 30, 42–51. doi: 10.1016/j.cosust.2018.02.010

Ehgartner, U., and Hirth, S. (2019). The right to repair and endangered practices. *Discover Society* 75. Available online at: https://archive.discoversociety.org/2019/12/04/the-right-to-repair-and-endangered-practices (accessed February 27, 2023).

Eker, S., Garcia, D., Valin, H., and van Ruijven, B. (2021). Using social media audience data to analyse the drivers of low-carbon diets. *Environ. Res. Lett.* 16, 074001. doi: 10.1088/1748-9326/abf770

Ertekin, Z. O., and Atik, D. (2015). Sustainable markets: motivating factors, barriers, and remedies for mobilization of slow fashion. *J. Macromarketing* 35, 53–69. doi: 10.1177/0276146714535932

Fletcher, J., Longnecker, N., and Higham, J. (2019). Envisioning future travel: moving from high to low carbon systems. *Futures* 109, 63–72. doi: 10.1016/j.futures.2019.04.004

Foucault, M. (1980). *Power/Knowledge: Selected Interviews and Other Writings, 1972-1977*. New York, NY: Pantheon Books.

Foucault, M. (2008). *The Birth of Biopolitics: Lectures at the Collège de France, 1978-1979*. New York, NY: Palgrave Macmillan.

Fuchs, D., and Lorek, S. (2005). Sustainable consumption governance. A history of promises and failures. *J. Consum. Policy* 28, 261–288. doi: 10.1007/s10603-005-8490-z

Fuchs, D., Lorek, S., Di Giulio, A., and Defila, R. (2019). "Sources of power for sustainable consumption: where to look," in *Power and Politics in Sustainable Consumption Research and Practice,* eds M. Martiskainen, L. Middlemiss, and C. Isenhour (New York, NY: Routledge), 62–83. doi: 10.4324/9781315165509-3

Fuchs, D., Sahakian, M., Gumbert, T., Di Giulio, A., Maniates, M., Lorek, S., et al. (2021a). *Consumption Corridors : Living a Good Life within Sustainable Limits*. New York, NY: Routledge doi: 10.4324/9780367748746

Fuchs, D., Steinberger, J., Pirgmaier, E., Lamb, W., Brand-Correa, L., Mattioli, G., et al. (2021b). A corridors and power-oriented perspective on energy-service demand and needs satisfaction. *Sustain Sci. Pract. Policy* 17, 163–173. doi: 10.1080/15487733.2021.1912907

Geels, F. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Res. Policy* 31, 1257–1274. doi: 10.1016/S0048-7333(02)00062-8

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

Giddens, A. (1983). Comments on the theory of structuration. *J. Theory Soc. Behav.* 13, 75–80. doi: 10.1111/j.1468-5914.1983.tb00463.x

Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. Cambridge: Polity Press.

Gossen, M., Holzhauer, B., and Müller, R. (2020). Konsum junger menschen: zwischen nachhaltigkeit und materialistischen wünschen. *Ökologisches Wirtschaften* 33, 18–21. doi: 10.14512/OEW350218

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

Gough, I. (2017). *Heat, Greed and Human Need: Climate Change, Capitalism and Sustainable Wellbeing*. Cheltenham: Edward Elgar. doi: 10.4337/9781785365119

Greenhalgh, T., and Stones, R. (2010). Theorising big IT programmes in healthcare: strong structuration theory meets actor-network theory. *Soc. Sci. Med.* 70, 1285–1294. doi: 10.1016/j.socscimed.2009.12.034

Grenni, S., Soini, K., and Horlings, L. G. (2019). The inner dimension of sustainability transformation: how sense of place and values can support sustainable place-shaping. *Sustain. Sci.* 15, 411–422. doi: 10.1007/s11625-019-00743-3

Grosjean, G., Fuss, S., Koch, N., Bodirsky, B. L., De Cara, S., and Acworth, W. (2016). Options to overcome the barriers to pricing European agricultural emissions. *Clim. Policy* 18, 151–169. doi: 10.1080/14693062.2016.1258630

Gunderson, R., Stuart, D., and Petersen, B. (2018). Ideological obstacles to effective climate policy: the greening of markets, technology, and growth. *Cap. Cl.* 42, 133–160. doi: 10.1177/0309816817692127

Guy, J.-S. (2022). Social structures, social change and the metric/nonmetric distinction. *Can. J. Adm. Sci.* 1–11. doi: 10.1002/cjas.1688

Hards, S. K. (2013). Status, stigma and energy practices in the home. *Local Environ.* 18, 438–454. doi: 10.1080/13549839.2012.748731

Hart, C. (1998). *Doing a Literature Review: Releasing the Social Science Research Imagination*. London: Sage Publications.

Harvey, D. (1982). *The Limits to Capital*. Oxford: Basil Blackwell.

Hayward, C., and Lukes, S. (2008). Nobody to shoot? Power, structure, and agency: a dialogue. *J. Power* 1, 5–20. doi: 10.1080/17540290801943364

Henders, S., Ostwald, M., Verendel, V., and Ibisch, P. (2018). Do national strategies under the UN biodiversity and climate conventions address agricultural commodity consumption as deforestation driver? *Land Use Policy* 70, 580–590. doi: 10.1016/j.landusepol.2017.10.043

Hicks, C., and Kuhndt, M. (2013). "Emergent futures? Signposts to sustainable living in Europe and pathways to scale," in *The Global Challenge of Encouraging Sustainable Living: Opportunities, Barriers, Policy and Practice*, eds S. Fudge, M. Peters, S. M. Hoffmann, and W. Wehrmeyer (Cheltenham, Northampton: Elgar Publishing), 85–105. doi: 10.4337/9781781003756.00014

Hirth, S., Bürstmayr, T., and Strüver, A. (2022). Discourses of sustainability and imperial modes of food provision: agri-food-businesses and consumers in Germany. *Agric. Hum. Values.* 39, 573–588. doi: 10.1007/s10460-021-10269-z

Hoffmann, M., and Spash, C. L. (2021). *The Impacts of Climate Change Mitigation on Work for the Austrian Economy.* SRE - Discussion Papers, 10/2021, Institute for Multilevel Governance and Development, Department of Socioeconomics, Vienna University of Economics and Business, Vienna.

IGES, Aalto-University, D-mat, SITRA, and KR Foundation (2019). *1.5-Degree Lifestyles. Targets and Options for Reducing Lifestyle Carbon Footprints*. Hayama: IGES.

Ilieva, I., and Bremdal, B. (2020). "Implementing local flexibility markets and the uptake of electric vehicles - the case for Norway," in *2020 6th IEEE International Energy Conference (ENERGYCon)* (Gammarth), 1047–1052. doi: 10.1109/ENERGYCon48941.2020.9236611

IPBES (2016). "The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production," in *Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, eds S. G. Potts, V. L. Imperatriz-Fonseca, and H. T. Ngo (Bonn: IPBES).

IPCC (2022). "Climate change 2022: mitigation of climate change," in *Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge; New York, NY: Cambridge University Press).

Jackson, T., and Smith, C. (2018). "Towards sustainable lifestyles: understanding the policy challenge," in *The Cambridge Handbook of Psychology and Economic Behaviour,* 2nd ed., ed A. Lewis (Cambridge: Cambridge University Press), 481–515. doi: 10.1017/9781316676349.017

Jacobson, L., Åkerman, J., Giusti, M., and Bhowmik, A. K. (2020). Tipping to staying on the ground: internalized knowledge of climate change crucial for transformed air travel behaviour. *Sustainability* 12, 51994. doi: 10.3390/su12051994

Jensen, C. L., and Friis, F. (2019). *Experimenting with Resource-intensive Practices and Related Energy Consumption Levels*. Eceee Summer Study Proceedings 2019-June. Available online at: https://vbn.aau.dk/en/publications/experimenting-with-resource-intensive-practices-and-related-energ (accessed February 27, 2023).

Jensen, J. S., Cashmore, M., and Elle, M. (2017). Reinventing the bicycle: how calculative practices shape urban environmental governance. *Env. Polit.* 26, 459–479. doi: 10.1080/09644016.2017.1311089

Kanda, W., and Kivimaa, P. (2020). What opportunities could the COVID-19 outbreak offer for sustainability transitions research on electricity and mobility? *Energy Res. Soc. Sci.* 68, 101666. doi: 10.1016/j.erss.2020.101666

Keen, S., Ayres, R. U., and Standish, R. (2019). A note on the role of energy in production. *Ecol. Econ.* 157, 40–46. doi: 10.1016/j.ecolecon.2018.11.002

Keil, K., and Kreinin, H. (2022). Slowing the treadmill for a good life for All? German trade union narratives and social-ecological transformation. *J. Ind. Rel.* 64, 564–584. doi: 10.1177/00221856221087413

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., et al. (2018). Barriers to the circular economy: evidence from the European union (EU). *Ecol. Econ.* 150, 264–272. doi: 10.1016/j.ecolecon.2018.04.028

Koretskaya, O., and Feola, G. (2020). A framework for recognizing diversity beyond capitalism in agri-food systems. *J. Rural Stud.* 80, 302–313. doi: 10.1016/j.jrurstud.2020.10.002

Kreinin, H., and Aigner, E. (2022). From "Decent work and economic growth" to "Sustainable work and economic degrowth": a new framework for SDG 8. *Empirica* 49, 281–311. doi: 10.1007/s10663-021-09526-5

Kuokkanen, A., Mikkila, M., Kuisma, M., Kahiluoto, H., and Linnanen, L. (2016). The need for policy to address the food system lock-in: a case study of the Finnish context. *J. Clean. Prod.* 140, 933–944. doi: 10.1016/j.jclepro.2016.06.171

Lamb, W. F., Mattioli, G., Levi, S., Roberts, J. T., Capstick, S., Creutzig, F., et al. (2020). Discourses of climate delay. *Glob. Sustain.* 3, e17. doi: 10.1017/sus.2020.13

Larsen, K., Gunnarsson-Östling, U., and Westholm, E. (2011). Environmental scenarios and local-global level of community engagement: environmental justice, jams, institutions and innovation. *Futures* 43, 413–423. doi: 10.1016/j.futures.2011.01.007

Latour, B. (2005). *Reassembling the Social - An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.

Lessenich, S. (2019). *Living Well at Others' Expense: The Hidden Costs of Western Prosperity*. Cambridge: Polity Press.

Lettenmeier, M. (2018). *A Sustainable Level of Material Footprint: Benchmark for Designing Ecologically Sustainable Lifestyles* [Doctoral Dissertation]. Aalto University, Helsinki.

Longo, Y., Coyne, I., and Joseph, S. (2017). The scales of general well-being (SGWB), *Pers. Individ. Differ.* 109, 148–159. doi: 10.1016/j.paid.2017.01.005

Loorbach, D., Avelino, F., Haxeltine, A., Wittmayer, J. M., O'Riordan, T., Weaver, P., et al. (2016). The economic crisis as a game changer? Exploring the role of social construction in sustainability transitions. *Ecol. Soc.* 21, 15. doi: 10.5751/ES-08761-210415

Malm, A. (2013). The origins of fossil capital: from water to steam in the british cotton industry*. *Hist. Mater.* 21, 15–68. doi: 10.1163/1569206X-12341279

Manca, S., and Fornara, F. (2019). Attitude toward sustainable transport as a function of source and argument reliability and anticipated emotions. *Sustainability* 11, 23288. doi: 10.3390/su11123288

Maniates, M. (2020). "Beyond magical thinking," in *Routledge Handbook of Global Sustainability Governance*, eds A. Kalfagianni, D. Fuchs, and A. Hayden (London: Routledge), 267–281. doi: 10.4324/9781315170237-22

Maniates, M. F. (2001). Individualization: plant a tree, buy a bike, save the world? *Glob. Environ. Polit.* 1, 31–52. doi: 10.1162/152638001316881395

Manzini, E. (2013). "Collaborative (and sustainable) behaviours: grassroots innovation, social change and enabling strategies," in *The Global Challenge of Encouraging Sustainable Living: Opportunities, Barriers, Policy and Practice*, eds S. Fudge, M. Peters, S. M. Hoffmann, and W. Wehrmeyer (Cheltenham, Northampton: Elgar Publishing), 131–142. doi: 10.4337/9781781003756.00016

Martek, I., Hosseini, M. R., Shrestha, A., Zavadskas, E. K., and Seaton, S. (2018). The sustainability narrative in contemporary architecture: falling short of building a sustainable future. *Sustainability* 10, 40981. doi: 10.3390/su10040981

Mathy, S., Menanteau, P., and Criqui, P. (2018). After the Paris agreement: measuring the global decarbonization wedges from national energy scenarios. *Ecol. Econ.* 150, 273–289. doi: 10.1016/j.ecolecon.2018.04.012

Meadows, D. H., Meadows, D. L., Randers, J., and Behrens III, W. W. (1972). *The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind*. New York, NY. doi: 10.1349/ddlp.1

Mercure, J.-F., Pollitt, H., Bassi, A. M., Viñuales, J. E., and Edwards, N. R. (2016). Modelling complex systems of heterogeneous agents to better design sustainability transitions policy. *Glob. Environ. Change* 37, 102–115. doi: 10.1016/j.gloenvcha.2016.02.003

Messner, D. (2015). A social contract for low carbon and sustainable development. Reflections on non-linear dynamics of social realignments and technological innovations in transformation processes. *Technol. Forecast. Soc. Change* 98, 260–270. doi: 10.1016/j.techfore.2015.05.013

Mock, M., Omann, I., Polzin, C., Spekkink, W., Schuler, J., Pandur, V., et al. (2019). "Something inside me has been set in motion": exploring the psychological wellbeing of people engaged in sustainability initiatives. *Ecol. Econ.* 160, 1–11. doi: 10.1016/j.ecolecon.2019.02.002

Mont, O., Neuvonen, A., and Lahteenoja, S. (2014). Sustainable lifestyles 2050: stakeholder visions, emerging practices and future research. *J. Clean. Prod.* 63, 24–32. doi: 10.1016/j.jclepro.2013.09.007

Morrow, K. (2021). Tackling climate change and gender justice - integral; not optional. *ONATI Socio-Leg. Ser.* 11, 207–230. doi: 10.35295/OSLS.IISL/0000-0000-0000-1166

Mosannenzadeh, F., Di Nucci, M. R., and Vettorato, D. (2017). Identifying and prioritizing barriers to implementation of smart energy city projects in Europe: an empirical approach. *Energy Policy* 105, 191–201. doi: 10.1016/j.enpol.2017.02.007

Newell, P., and Simms, A. (2021). How did we do that? Histories and political economies of rapid and just transitions. *New Polit. Econom.* 26, 907–922. doi: 10.1080/13563467.2020.1810216

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

Otto, I. M., Donges, J. F., Cremades, R., Bhowmik, A., Hewitt, R. J., Lucht, W., et al. (2020). Social tipping dynamics for stabilizing Earth's climate by 2050. *Proc. Natl. Acad. Sci. USA.* 117, 2354–2365. doi: 10.1073/pnas.1900577117

Palea, V. (2021). Accounting for sustainable finance: does fair value measurement fit for longterm equity investments? *Meditari Account. Res.* 30, 22–38. doi: 10.1108/MEDAR-07-2020-0965

Pargman, D., Biørn-Hansen, A., Eriksson, E., Laaksolahti, J., and Robèrt, M. (2020). "From Moore's Law to the carbon law," in *ACM International Conference Proceeding Series. ICT4S2020: Proceedings of the 7th International Conference on ICT for Sustainability*, 285–293. doi: 10.1145/3401335.3401825

Pastukhova, M., and Westphal, K. (2020). Governing the global energy transformation. *Lect. Notes Energy* 73, 341–364. doi: 10.1007/978-3-030-39066-2_15

Perkins, K. M., Munguia, N., Moure-Eraso, R., Delakowitz, B., Giannetti, B. F., Liu, G., et al. (2018). International perspectives on the pedagogy of climate change. *J. Clean. Prod.* 200, 1043–1052. doi: 10.1016/j.jclepro.2018.07.296

Pichler, M., Krenmayr, N., Schneider, E., and Brand, U. (2021). EU industrial policy: between modernization and transformation of the automotive industry. *Environ. Innov. Soc. Transit.* 38, 140–152. doi: 10.1016/j.eist.2020.12.002

Pirgmaier, E., and Steinberger, J. K. (2019). Roots, riots, and radical change-A road less travelled for ecological economics. *Sustainability* 11, 72001. doi: 10.3390/su11072001

Potrc, S., Cucek, L., Martin, M., and Kravanja, Z. (2021). Sustainable renewable energy supply networks optimization-The gradual transition to a renewable energy system within the European Union by 2050. *Renew. Sustain. Energy Rev.* 146, 111186. doi: 10.1016/j.rser.2021.111186

Powell, C. (2013). "Radical relationism: a proposal," in *Conceptualizing Relational Sociology - Ontological and Theoretical Issues*, eds C. Powell, and F. Dépelteau (New York, NY: Palgrave Macmillan), 187–208.

Prinz, L., and Pegels, A. (2018). The role of labour power in sustainability transitions: insights from comparative political economy on Germany's electricity transition. *Energy Res. Soc. Sci.* 41, 210–219. doi: 10.1016/j.erss.2018.04.010

Raven, R., Reynolds, D., Lane, R., Lindsay, J., Kronsell, A., and Arunachalam, D. (2021). Households in sustainability transitions: a systematic review and new research avenues. *Environ. Innov. Soc. Transit.* 40, 87–107. doi: 10.1016/j.eist.2021.06.005

Reckwitz, A. (2002). Toward a theory of social practices: a development in culturalist theorizing. *Eur. J. Soc. Theory* 5, 243–263. doi: 10.1177/13684310222225432

Riechers, M., Patru-Duse, I. A., and Balazsi, A. (2021). Leverage points to foster human-nature connectedness in cultural landscapes. *Ambio* 50, 1670–1680. doi: 10.1007/s13280-021-01504-2

Rip, A., and Kemp, R. (1998). "Technological change," in *Human Choice and Climate Change, Vol. 2*, eds S. Rayner and E. L., Malone (Columbus, OH: Battelle Press), 327–399.

Roberts, C., Geels, F. W., Lockwood, M., Newell, P., Schmitz, H., Turnheim, B., et al. (2018). The politics of accelerating low-carbon transitions: towards a new research agenda. *Energy Res. Soc. Sci.* 44, 304–311. doi: 10.1016/j.erss.2018.06.001

Rootzén, J., Karlsson, I., Johnsson, F., Kadefors, A., and Uppenberg, S. (2020). Supply-chain collective action towards zero CO2 emissions in infrastructure construction: mapping barriers and opportunities. *IOP Conf. Ser.: Earth Environ. Sci.* 588, 042064. doi: 10.1088/1755-1315/588/4/042064

Rossi, A., Bui, S., and Marsden, T. (2019). Redefining power relations in agrifood systems. *J. Rural Stud.* 68, 147–158. doi: 10.1016/j.jrurstud.2019.01.002

Ruhrort, L. (2020). Reassessing the role of shared mobility services in a transport transition: can they contribute the rise of an alternative socio-technical regime of mobility? *Sustainability* 12, 8253. doi: 10.3390/su12198253

Ruhrort, L., and Allert, V. (2021). Conceptualizing the role of individual agency in mobility transitions: avenues for the integration of sociological and psychological perspectives. *Front. Psychol.* 12, 623652. doi: 10.3389/fpsyg.2021.623652

Saari, U. A., Herstatt, C., Tiwari, R., Dedehayir, O., and Mäkinen, S. J. (2021). The vegan trend and the microfoundations of institutional change: a commentary on food producers' sustainable innovation journeys in Europe. *Trends Food Sci. Technol.* 107, 161–167. doi: 10.1016/j.tifs.2020.10.003

Sahakian, M. (2019). 'More, bigger, better' household appliances: contesting normativity in practices through emotions. *J. Consum. Cult.* 22, 21–39. doi: 10.1177/1469540519889983

Sareen, S., and Grandin, J. (2020). European green capitals: branding, spatial dislocation or catalysts for change? *Geogr. Ann. Ser. B. Huma. Geogr.* 102, 101–117. doi: 10.1080/04353684.2019.1667258

Schaffartzik, A., and Fischer-Kowalski, M. (2018). Latecomers to the fossil energy transition, frontrunners for change? the relevance of the energy 'underdogs' for sustainability transformations. *Sustainability* 10, 82650. doi: 10.3390/su10082650

Schaffartzik, A., Pichler, M., Pineault, E., Wiedenhofer, D., Gross, R., and Haberl, H. (2021). The transformation of provisioning systems from an integrated perspective of social metabolism and political economy: a conceptual framework. *Sustain. Sci.* 16, 1405–1421. doi: 10.1007/s11625-021-00952-9

Scherrer, C. (2011). Reproducing hegemony: US finance capital and the 2008 crisis. *Crit. Policy Stud.* 5, 219–246. doi: 10.1080/19460171.2011.606297

Schmidt, R., Lyytinen, K. M., Keil, M., and Cule, P. (2001). Identifying software project risks: an international delphi study. *J. Manag. Inf. Syst.* 17, 5–36. doi: 10.1080/07421222.2001.11045662

Schnaiberg, A. (1980). *The Environment, from Surplus to Scarcity*. New York: Oxford University Press.

Schor, J. B. (1991). *The Overworked American: The Unexpected Decline of Leisure*. New York, NY: Basic Books.

Schulz, C., Hjaltadóttir, R. E., and Hild, P. (2019). Practising circles: studying institutional change and circular economy practices. *J. Clean. Prod.* 237, 117749. doi: 10.1016/j.jclepro.2019.117749

Seo, M.-G., and Creed, W. E. D. (2002). Institutional contradictions, praxis, and institutional change: a dialectical perspective. *Acad. Manag. Rev.* 27, 222–247. doi: 10.2307/4134353

Shirani, F., Butler, C., Henwood, K., Parkhill, K., and Pidgeon, N. (2015). 'I'm not a tree hugger, I'm just like you': changing perceptions of sustainable lifestyles. *Env. Polit.* 24, 57–74. doi: 10.1080/09644016.2014.959247

Somerville, P. (2020). A critique of climate change mitigation policy. *Policy Polit.* 48, 355–378. doi: 10.1332/030557319X15661682426163

Sovacool, B. K., Bazilian, M., Griffiths, S., Kim, J., Foley, A., and Rooney, D. (2021). Decarbonizing the food and beverages industry: a critical and systematic review of developments, sociotechnical systems and policy options. *Renew. Sustain. Energy Rev.* 143, 110856. doi: 10.1016/j.rser.2021.110856

Spangenberg, J. H. (2013). Pick simply the best: sustainable development is about radical analysis and selective synthesis, not about old wine in new bottles. *Sustain. Dev.* 21, 101–111. doi: 10.1002/sd.1561

Spash, C. L. (2014). Policy analysis: empiricism, social construction and realism. *Österr. Z. Polit.* 43, 401–410. doi: 10.15203/ozp.291.vol43iss4

Spash, C. L. (2016). This changes nothing: the paris agreement to ignore reality. *Globalizations* 13, 928–933. doi: 10.1080/14747731.2016.1161119

Stankuniene, G. (2021). Energy saving in households: a systematic literature review. *Eu. J. Interdiscip. Stud.* 13, 45–57. Available online at: https://ideas.repec.org/a/jis/ejistu/y2021i01id467.html

Støa, E., and Aune, M. (2012). "Sustainable housing cultures," in *International Encyclopedia of Housing and Home*, ed S. J. Smith (Amsterdam: Elsevier Science), 111–116. doi: 10.1016/B978-0-08-047163-1.00556-7

Stoddard, I., Anderson, K., Capstick, S., Carton, W., Depledge, J., Facer, K., et al. (2021). Three decades of climate mitigation: why haven't we bent the global emissions curve? *Annu. Rev. Environ. Resour.* 46, 653–689. doi: 10.1146/annurev-environ-012220-011104

Stones, R. (2005). *Structuration Theory*. New York, NY: Palgrave Macmillan. doi: 10.1007/978-0-230-21364-7

Streck, C. (2020). Filling in for governments? The role of the private actors in the international climate regime. *J. Eur. Environ. Plan. Law* 17, 5–28. doi: 10.1163/18760104-01701003

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

Tziva, M., Negro, S. O., Kalfagianni, A., and Hekkert, M. P. (2020). Understanding the protein transition: the rise of plant-based meat substitutes. *Environ. Innov. Soc. Transit.* 35, 217–231. doi: 10.1016/j.eist.2019.09.004

Vita, G., Ivanova, D., Dumitru, A., Garcia-Mira, R., Carrus, G., Stadler, K., et al. (2020). Happier with less? Members of European environmental grassroots initiatives reconcile lower carbon footprints with higher life satisfaction and income increases. *Energy Res. Soc. Sci.* 60, 101329. doi: 10.1016/j.erss.2019.101329

Wainwright, J., and Mann, G. (2013). Climate leviathan. *Antipode.* 45, 1–22. doi: 10.1111/j.1467-8330.2012.01018.x

Wamsler, C., and Raggers, S. (2018). Principles for supporting city-citizen commoning for climate adaptation: from adaptation governance to sustainable transformation. *Environ. Sci. Policy* 85, 81–89. doi: 10.1016/j.envsci.2018.03.021

Warde, A. (2005). Consumption and theories of practice. *J. Consum. Cult.* 5, 131–153. doi: 10.1177/1469540505053090

Wilcox, H. A. (1975). *Hothouse Earth.* Washington, DC: US Dept. of Defense, Navy's Ocean.

Xiao, Y., and Watson, M. (2019). Guidance on conducting a systematic literature review. *J. Plan. Educ. Res.* 39, 93–112. doi: 10.1177/0739456X17723971

Zurek, M., Hebinck, A., Leip, A., Vervoort, J., Kuiper, M., Garrone, M., et al. (2018). Assessing sustainable food and nutrition security of the EU food system-an integrated approach. *Sustainability* 10, 14271. doi: 10.3390/su10114271