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RESEARCH ARTICLE

Who is sufficient, and why? A mixed-methods approach to the social determinants of sufficiency lifestyles in the pursuit of decarbonisation

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Sufficiency consists of less materially intensive consumption patterns that focus on wellbeing rather than material wealth. Such consumption patterns are commonly referred to as sufficiency lifestyles and are increasingly seen as a key driver for achieving decarbonisation. However, while research finds that sustainable consumption and environmental behaviour are often associated with high social status, lower carbon footprints and lower consumption more broadly are associated in the literature with poverty and deprivation. This article aims to investigate whether a combination of low carbon footprint and high wellbeing exists, what socio-demographic characteristics are associated with it, and to explore the actual experiences of people engaged in sufficiency lifestyles through initiatives and their characteristics.

We use a mixed-methods design with data from demographically representative surveys in Denmark, Germany, Italy and Latvia (N=5,080), and in-depth interviews with participants from sufficiency-oriented intentional communities (N=90).

We find that sufficiency lifestyles are linked to a stronger inclination towards sufficiency orientation or a heightened stronger environmental identity, accompanied by a negative correlation with social deprivation aspects. Drawing on the interviews, we find that individuals engaged in sufficiency-oriented practices tend to benefit from economic, social and cultural resources that allow them to overcome energy dependency and constraints, and that their motivations are not limited to pro-environmental behaviour. Based on these empirical findings, we explore potential avenues for the diffusion of sufficiency-oriented lifestyles, including the establishment of binding rules through a democratic process that curb overconsumption while providing attractive low-carbon lifestyles for all.

Keywords sufficiency • lifestyles • decarbonisation • social inequalities • wellbeing

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Introduction

Sufficiency is defined as a voluntary reduction in resource consumption that maintains quality of life while staying within the planet's boundaries (Alcott, 2008; Creutzig et al, 2022). Sufficiency is increasingly seen as a key driver for decarbonisation pathways (Samadi et al, 2017; Costa et al, 2021). It is often described as a lifestyle shift towards less carbon-intensive daily practices (Baumgartner et al, 2022). Indeed, households account for between 60 and 70 per cent of global greenhouse gas (GHG) emissions (Ivanova et al, 2016; Dubois et al, 2019) and, thus, altering lifestyles holds a crucial potential to reduce GHG emissions, that has been recently underlined by the Intergovernmental Panel on Climate Change (IPCC)'s report on mitigation of climate change (IPCC, 2022). Yet, the social stratification aspects of sufficiency lifestyles and its drivers remain largely under-studied, with energy modelling approaches being dominant in this field (Süsser et al, 2022).

In the literature, lower carbon footprint emissions are associated with lower income (Büchs and Schnepf, 2013; Duarte et al, 2021; Hardadi et al, 2021) while pro-environmental purchase behaviour is associated with higher social status (Carfagna et al, 2014; Moser and Kleinhüeckelkotten, 2018; Kennedy and Givens, 2019). However, sufficiency should be distinguished from pro-environmental behaviour, since sufficiency designates absolute reduction of consumption levels (Kropfeld, 2023) and, thus, lower demand for goods and services (Samadi et al, 2017) while simultaneously considering wellbeing and the fulfilment of needs (IPCC, 2022).

While the notion of wellbeing is pivotal in the concept of sufficiency, empirical investigations of the sociological dimensions of sufficiency including wellbeing are scarce. This hinders the potential for diffusion of sufficiency as it results in inadequate and undesirable policies. This article aims at addressing this research gap by investigating the socioeconomic, but also cultural, normative and behavioural dimensions of sufficiency, using both quantitative and qualitative research methods to uncover its relationships with wellbeing. Doing so, we provide insights on relevant characteristics, social as well as societal structures, drivers and barriers to sufficiency-oriented lifestyles.

After having presented the conceptual framework, this article first explores the socioeconomic characteristics of sufficiency lifestyles across Europe today, using a unique combination of both carbon footprint and wellbeing indexes and based on large-scale survey data (N=5,080) in four European countries (Denmark, Germany, Italy and Latvia). We combine this with a socio-anthropological investigation of sufficiency-oriented practices. Based on in-depth interviews (N=90) of participants

in various sufficiency-oriented initiatives in Denmark, Germany, Italy, Latvia and France, we investigate their motivations, rationales, and the relationships between sufficiency and wellbeing.

Then, we investigate policy avenues aimed at alleviating these barriers and, concurrently, promoting sufficiency at the European Union (EU) level. Our panel of European countries aims at representing the diversity of the EU geographically and by including small and big countries with different energy policies and histories. Focusing on commonalities between countries allows us to generalise our results and discuss their implications at the EU level.

Conceptual framework

Sufficiency has been differentiated from efficiency and consistency (Samadi et al, 2017). Efficiency means that at a given level of consumption, the environmental impact is reduced because fewer energy and raw material are used (resource reduction), while consistency means that for a given level of consumption, the environmental impact is reduced because the sources of raw materials and energy are less harmful to the environment (resource substitution) (Schäpke and Rauschmayer, 2014), while sufficiency means lowering the consumption level itself.

Vita et al (2019) contrast ‘demand-side options for reducing consumption (sufficiency) with consuming less polluting alternatives (green consumption)’. The latter can derive from consumption options that are more efficient, more consistent, or both. Alcott (2008) also differentiates between the ‘sufficiency strategy’ (consuming less) from the ‘efficiency strategy’ (lowering ratios of resource inputs). Fuchs and Lorek (2005: 264) have also referred to sufficiency as ‘changes in consumption patterns and reductions in consumption levels’.

Efficiency and consistency alone are not likely to provide the massive changes to meet the targets of the Paris Accord (Spangenberg and Lorek, 2019). Both are pointed out for generating important rebound effects and for involving technologies and innovation that need time for maturation (Sorrell et al, 2020; Dütschke et al, 2021). There is thus a growing consensus on the need for absolute reduction of resource consumption (Alfredsson et al, 2018), and current consumerist lifestyles have been pointed out to contradict this (Akenji et al, 2019).

Despite growing scientific consensus on the necessity of integrating sufficiency to meet the EU’s climate objectives (Faber et al, 2012; Samadi et al, 2017), sufficiency remains largely absent from the EU’s policy frameworks. The European agenda has historically emphasised efficiency and renewable energy, overlooking sufficiency. The ‘Fit for 55’ package, which aims to reduce the EU’s net GHG emissions by at least 55 per cent by 2030, highlights this gap. Although elements reflect sufficiency principles like the Ecodesign Regulation promoting durability and reparability and some definitions in the Energy Performance of Building Directive, these are sporadic and not systematically integrated in a comprehensive strategy. The energy price crisis of 2022 led to temporary measures aimed at reducing energy consumption, demonstrating their potential. However, sufficiency is absent from major strategic documents, such as the European Climate Law, the Energy Union’s pillars, and the Regulation on the Governance of the Energy Union and Climate Action.

However, there is also consensus that not all Europeans need to cut their consumption levels by the same factors or at all, raising the issue of the social justice dimension of decarbonisation policies (Flipo et al, 2024). Within European countries, carbon emissions at the individual level appear to be primarily determined by socio-demographic variables, especially income and urbanisation forms (Abrahamse and Steg, 2009; Oswald et al, 2020; Lévy et al, 2021; Theine et al, 2022). Higher income is associated with an increase in consumption levels and increased carbon footprints (Duarte et al, 2021). In Germany, the highest income group has almost three times the carbon footprint of the lowest income group (Hardadi et al, 2021). The contribution of the different sectors to the individual carbon footprint is also uneven across social categories, with transportation being the sector most associated with higher incomes (Büchs and Schnepf, 2013; Hardadi et al, 2021). Income seems to predict the carbon footprint more than pro-environmental orientation (Moser and Kleinhüchelkotten, 2018), because of rebound effects and of inconsistent practices across sectors (Bartiaux and Reátegui Salmón, 2012).

The role of income has led some authors to argue that carbon footprint emissions are essentially ‘a distributional issue’ (Bergman, 2019) and to think of sufficiency as a ‘corridor’ of consumption (Fuchs et al, 2021; Bärnthaler, 2024), adding to the necessity of an overall reduction of consumption the issue of ‘floor’ (Spangenberg and Lorek, 2019) or ‘minimum’ (Spengler, 2016).

The issue at stake here is the distinction between sufficiency and poverty and deprivation (Gorge et al, 2015). This brings us to the challenge of distinguishing economic wellbeing from wellbeing in a more holistic sense. While economic wellbeing has often been used as an indicator of quality of life overall, some studies have shown that reduced consumption levels are positively related to wellbeing (Hook et al, 2023), while consumption can also increase stress levels (Luthar, 2003). Calls have been made for a broader conceptualisation of wellbeing including aspects such as health, social networks or personal freedom (OECD, 2020) or absence of time pressure (Geiger et al, 2021).

The issue of wellbeing is central to the definition of sufficiency (Samadi et al, 2017). The IPCC defines sufficiency as ‘a set of measures and daily practices that avoid demand for energy, materials, land and water while delivering human wellbeing for all within planetary boundaries’ (IPCC, 2022: 42). Thus, sufficiency is defined as a voluntary change, contrary to forced deprivation (Baumgartner et al, 2022). Individual households but also grassroots communities have been particularly identified as potential sources for fostering voluntary lifestyle changes (Vita et al, 2019; Thredgold et al, 2022).

By bridging two approaches of sufficiency that are rarely considered jointly (quantitative and qualitative), this article aims at exploring in detail the conditions for achieving both a low carbon footprint and high wellbeing.

Data and approach

This article is based on a complementary mixed-methods design (Greene et al, 1989). The quantitative approach is used to quantify sufficiency lifestyles and to examine variables associated with them. The qualitative data enables to understand the adoption processes, motivations and benefits of sufficiency-oriented practices, although they are not representative of the general population. Therefore, our objective is not to pursue

homogeneity, comparison or data triangulation between both samples. Instead, we aim to establish articulations between lifestyles, citizen initiatives and daily practices, which have rarely been described jointly in the literature.

Quantitative data and approach

We conducted an online survey in Denmark, France, Germany, Italy and Latvia using NORSTAT, a market research institute's household panel, between July and October 2022. Respondents received compensation for participation. We employed quota sampling to ensure the representativeness based on gender, income, age (18 and above), and regions in each country. Comprehensive pre-tests assessed the clarity of the questionnaire.

The survey included socioeconomic factors, sufficiency orientation, deprivation, health, wellbeing, attitudinal variables and a carbon footprint calculator. Due to data cleaning procedures and missing values, 5,080 participants remained from the initial sample of 6,349. Due to a survey error, we could not estimate the lifestyle group of French respondents and had to exclude their data from the analysis.

We categorise respondents into sufficiency lifestyle groups based on their carbon footprint and the wellbeing measure, an adapted version of the quality-of-life scale from the World Health Organization¹ (see Appendix). The wellbeing questions referred to aspects of quality of life, physical and psychological health, social relationships and life satisfaction.

Our carbon footprint calculator considered GHG emissions stemming from four activities: space and water heating; electricity consumption; individual motorised transport; and food consumption. These activities are the primary sources of household GHG emissions within the EU (Ivanova et al, 2016). However, by focusing on these activities, the lifestyle groups may be somewhat biased towards respondents living in urban areas which are characterized by smaller living space per person and more available transport options.

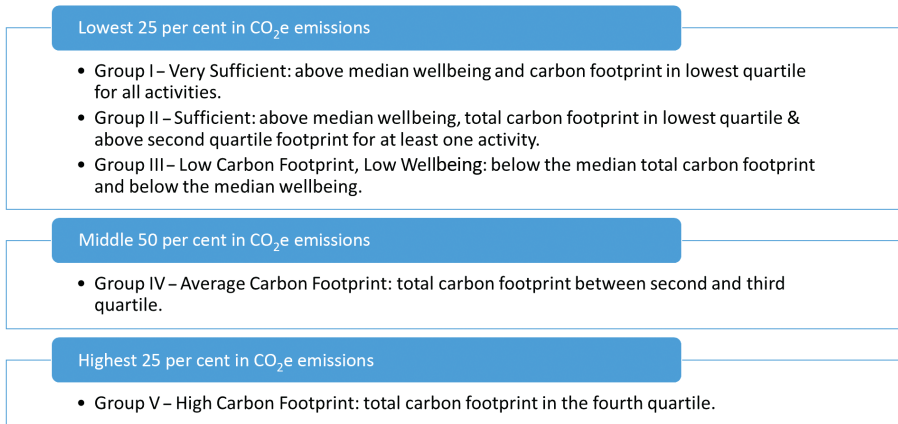
For space and water heating and individual motorised transport, we considered both direct carbon dioxide equivalent (CO₂e) emissions (such as those arising from the combustion of fossil fuels on-site or in internal combustion engine vehicles) and indirect emissions when they were relevant (for instance, emissions resulting from electricity generation using fossil fuels at power plants or for district heating). In the case of food, we also accounted for methane emissions associated with livestock. When participants provided implausible information or none, we employed default values usually according to household characteristics.²

Aviation was not considered due to 2021 COVID-19 restrictions, which may also affect data on travel frequency, distance and time spent at home.

We operationalised a sufficiency lifestyle as a lifestyle with a low-carbon footprint and a high score on the wellbeing index, both in relative terms. A footprint in the lowest quarter within the respective country is considered as low and wellbeing above median as high.

Based on the previous steps, we created five lifestyle groups (see Figure 1).

To establish connections between lifestyle group membership and various socioeconomic and additional variables, we employ neural networks to estimate multinomial log-linear models using the R package nnet (Venables and Ripley, 2002). Given that the model coefficients lack intuitive interpretation, we present

Figure 1: Lifestyle groups from the survey

the results in terms of average marginal effects and, for binary variables, discrete probability effects. This means we quantify the change in the probability of belonging to a specific group in response to a one-unit change in the covariate. It is important to note that the interpretation of these findings assumes that all other conditions remain unchanged (*ceteris paribus*). To account for country-specific contextual factors and to avoid the bias of a lumped sample, we created separate models for each country. A comprehensive description of the included variables is available in the Appendix.

Qualitative data and approach

Ninety semi-structured interviews were conducted in Denmark, France, Germany, Italy and Latvia to research sufficiency-oriented practices and their social and material contexts. Sufficiency-oriented initiatives screened for the research project (Schepelmann and Moser, 2022) have been used as sources for individual interviews. Based on the sufficiency hypothesis used in a set of decarbonisation scenarios and in Sandberg's (2021) typology, we researched four types of consumption changes: absolute reductions, modal shifts, product longevity and sharing practices, within three of Sandberg's four domains: housing, nutrition, miscellaneous consumption (see Table 1). Ecovillages were included for their holistic lifestyle approach, reflecting voluntary choices and lower carbon footprints (Daly, 2017). Mobility was not treated separately but included in the analysis for all interviewees.

It is important to note that we neither undertook a systematic quantitative assessment for the initiative nor the individual participants. However, a limited share of interviewees also filled in our carbon footprint calculator from the survey,³ and the results indicate a lower total carbon footprint on average compared to the corresponding national survey respondents. In fact, 50 per cent of the interviewees had a carbon footprint lower than that of 75 per cent of the survey respondents in their respective countries. This points out that, given that some initiatives only target selected domains, there is some basis to assume that the initiatives contribute to lowering the environmental impact of consumption. However, it also points out that deeper analyses are needed in this regard.

Table 1: List of initiatives researched, drawn from Sandberg's typology of sufficiency practices

	Absolute reductions	Modal shifts	Product longevity	Sharing practices
Housing	Reduce space of living size: both tiny houses and shared housing	Tiny houses		Shared housing Ecovillages
Nutrition		Shift to a more plant-based diet through community-supported agriculture and home-grown food	Initiative against food waste	
Miscellaneous consumption	Freecycling Zero-waste initiative Ecovillages		Repair cafés	Initiative for renting instead of buying Ecovillages

Source: Sandberg, 2021.

Participants were selected to be as diverse as possible in terms of location (rural/urban), age and gender (see Table 2). Individual interviews were conducted face-to-face. They included a biographical account of the participants' trajectories and interest in consumption issues; a precise description of their daily practices and habits regarding consumption and energy, and on how participating to a sufficiency-oriented practice might have affected them; the difficulties they might have encountered in the process; the effects on their wellbeing (both positive and negative); and their opinion on what sufficiency is and on its positive and negative impacts on their lifestyle. Our objective was to look for people possibly belonging to Group I or II of the quantitative survey, which we try (and partially succeed) to verify by using the carbon calculator, and to explore their motivations, lifestyles and relationships with wellbeing.

Interviews were conducted across the five countries, employing both face-to-face and virtual formats. Each interview lasted about one hour and was conducted by country partners in their national languages. Thematic, cross-national analysis was then performed based on English interview summaries following a standardised template. This analysis focused on the individual biographies, motivations, adoption processes and impact.

This approach also bears some important limits. The sample of initiatives is very wide and not representative of all initiatives in all countries. Despite having sought for diversity of individual profiles, it is also important to acknowledge that individuals who declined to participate could differ from those who agreed, particularly in terms of their available free time or social skills.

Results

In the following section, we first present quantitative outcomes from representative surveys, followed by qualitative insights from interviews with sufficiency initiative members.

Quantitative results

The quantitative analyses focus on factors identified via statistical analyses that characterised people with low-carbon lifestyles and more specifically those who

Table 2: Summary of the interviewees' characteristics

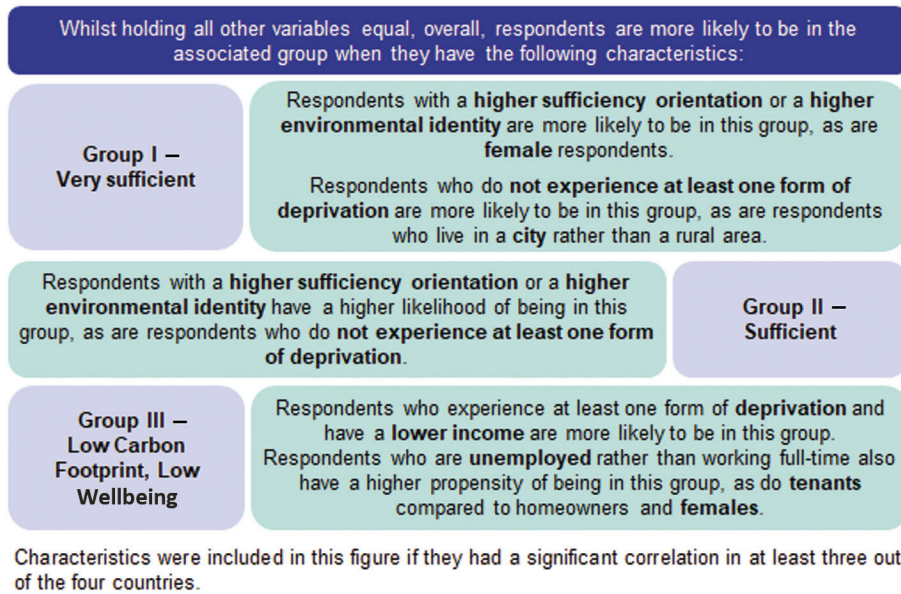
	Denmark	Germany	France	Italy	Latvia	Total
<i>By type of initiative</i>						
Housing	–	8	9	6	–	24
Food	–	9	4	–	4	17
Goods	5	–	12	6	4	27
Ecovillages	12	2	–	6	3	23
<i>By gender</i>						
Men	8	8	10	9	3	38
Women	9	11	15	9	8	52
<i>By location</i>						
Rural areas	2	1	4	7	3	17
Small and medium-sized city	12	5	18	6	1	42
Urban centre	3	13	3	5	7	31
<i>By age group</i>						
18–30	1	3	3	3	–	10
31–45	5	8	14	4	8	39
46–60	3	7	3	6	3	22
61 and over	8	1	5	5	–	19
Total	17	19	25	18	11	90

fulfil the definition of living sufficiently, that is, high wellbeing and low emissions. The results are based on multinomial regression models across the four countries studied and emphasise commonalities in their interpretation.⁴ An overview of the main findings is provided by [Figure 2](#), while detailed regression tables can be found in the Appendix.

People who are identified as being very sufficient (Group I) show corresponding attitudes (higher sufficiency orientation, environmental identity). This also applies to Group II (sufficient). Both groups do not show signs of deprivation. The lack of deprivation differentiates the sufficient groups (I and II) from Group III, the group with a low carbon footprint together with a low level of wellbeing. It is important to note that while wellbeing is part of defining the categories, deprivation was not. Deprivation captures aspects like having to reduce expenditures for household necessities, being unable to afford an unexpected expense or a week's holiday. Group III shows further characteristics in line with this, that is, a higher probability of having a lower income, being unemployed, being a tenant. Like in Group I, women are overrepresented in group III.⁵ Respondents who live in a rural area rather than in a city are less likely to be in Group I, pointing to differences associated with place of living such as mobility options and habits.

Age also played a role, however the pattern is not consistent across countries: younger respondents are more likely to be in Group I in Denmark and in Group II in Germany and Italy, but in Germany respondents in Group III are also younger.⁶ In addition, in some countries there are also some relationships between further categories of occupational status, education and group membership. Respondents living in a house instead of an apartment are less likely to be in Group I in Germany; in Denmark members of Group II are more likely to live in a house and members of Group III are not.⁷ In Germany and Italy, homeowners are less likely to be in Group

Figure 2: Summary of group characteristics for Denmark, Germany, Italy and Latvia



III. This variation in patterns is possibly related to the differences in the structure of the housing market regarding the role of houses versus apartments and owning versus renting and the quality of the housing stock. As mentioned earlier, living in a rural area is connected to a lower probability to be in Group I. In addition to this some further differences for some groups were observed in relation to place of living, for example, people from rural areas were less likely to be in Group III in Germany. Again, this points to country-specific conditions.

Qualitative results: exploration of motives, values and profiles associated with the participation in sufficiency-oriented initiatives

Our socio-anthropological investigation encompasses a wide range of initiatives engaged in various sufficiency-oriented practices. In this section, we focus on the commonalities across sectors and countries, to highlight the structural drivers and barriers to participation in a sufficiency-oriented initiative.

Motivations and values: decreasing one’s carbon footprint, while increasing wellbeing

As underlined in the quantitative results, environmental identity and sufficiency orientation frequently emerge in participants’ narratives, reflecting concerns about the environment and climate change. However, our interviews show that the motivations that are behind the adoption of sufficiency-oriented practices are diverse. The desire to belong to a community, to strengthen social bonds, to access healthier options and to learn new things is also highlighted by participants, as factors increasing their wellbeing and quality of life.

Solidarity and support provided by shared practices impact wellbeing, as this 67-year-old woman living in shared housing in Italy explains: ‘There’s a world full of lonely

people out there. The idea of having someone helping you should be a lever.' Living with less also brings less mental load, as this 53-year-old German man living in a tiny house explains: 'I find it easier to take care of the house, because the previous one was so big.' The quality of the sufficient options, compared with the mainstream ones, is also put forward in food initiatives ('The freshness of the food is just amazing', explains a 58-year-old woman in Germany) and housing ('I've never experienced such comfort', says a 25-year-old woman living in a tiny house in France).

Participating in a sufficiency-oriented initiative allows individuals to access a lifestyle that is more consistent with their values, providing them with a sense of fulfilment and control. For instance, a 36-year-old man in Germany explains that residing in a cohousing project 'makes it much easier to live in a more resource-conserving and ecological way'. Living in an ecovillage is also sought after for its potential to facilitate a greener lifestyle: 'Here, you can come with your dream and your ambition of the most sustainable life you can imagine, and then you can work to realise that dream! This place was ambitious, trying to find new methods and ways of doing things' (man, 45, Denmark). All in all, all interviewees report positive effects on their wellbeing: 'I always say that participating to this initiative gives me a lot of energy', says a 47-year-old Italian woman.

Affordability and accessibility of initiatives

Our interviews show no clear-cut pattern concerning the relationships between participation in sufficiency-oriented initiatives and income levels. Participants from initiatives have different levels of income, some of them are affluent while others have relatively modest incomes. Indeed, some respondents from the initiatives chose to work less, to dedicate more time to volunteering activities or leisure. They embrace what they define as a 'slow life', and never declare themselves economically deprived, which supports the idea of sufficiency as being distinct from energy poverty and deprivation, even though classical socioeconomic indicators such as a monthly revenue do not seem to fully capture the difference between chosen sufficiency and deprivation.

However, the availability of indirect sources of income, such as savings, are decisive to adopt more sufficient practices and to access some initiatives, especially in housing. Investing in green energy production equipment such as solar panels, renovation work and insulation, and electric bikes involve significant upfront costs – even though there can be a return on investment in the long run and important subsidies (for example with solar panels). Investing in a different kind of living (tiny house, shared houses, ecovillages) often requires buying shares or the house itself. Although tiny houses are much cheaper than regular houses, traditional mortgages are not available thus requiring important savings. Homeownership also appears as an important lever for the adoption of sufficiency practices, since it allows interviewees to modify elements of their material environment. This shows that sufficiency lifestyles are often associated with a certain degree of economic freedom, which is clearly antinomic with the idea of deprivation.

Education

Almost all of the participants interviewed have an academic degree and most of the active ones work in the tertiary sector. Managers, teachers, care and social

work professionals, engineers, and IT professionals are among the most common occupations we have come across while interviewing. Interviewees have also mentioned university as a time of their life when they could learn and experience new things, thus reinforcing their environmental awareness and interest for sufficiency-oriented initiatives, like this 53-year-old Latvian permaculture consultant living in an ecovillage: ‘My whole journey started from my experience abroad where I lived in several ecovillages and learned permaculture design. After I visited several projects, I started to develop similar ideas in Latvia and we founded a permaculture association.’ This appears to be consistent with the literature on sustainable lifestyles, but distinct from our quantitative results in which education does not seem to have an effect, all things equal. One potential explanation could be that more educated people are more prone to actively engage in initiatives which also require cultural resources and skills.

Time affluence

Even though participants in these initiatives typically come from the educated middle class, a quarter of all interviewees are currently not in employment, highlighting the importance of time as a crucial resource for the engagement in sufficiency practices and initiatives, but also as a powerful incentive. For people who are not retired, the decrease in consumption is expected to decrease the need to rely on the labour market to generate income and cover household expenditures. As a 29-year-old French tiny house owner explains, ‘[I]t’s a lot of people in their thirties, who want to settle, to get out from the rental system and to access property without the 25-year loan’. Self-sufficiency is sought after to decrease the reliance on external sources of money, especially in the case of ecovillages.

Time affluence is related to the importance of volunteering in most initiatives. Moreover, engaging in sufficiency-oriented practices may require additional time to access places where second-hand items are available, to commute by bike, to perform tasks by oneself instead of buying ready-to-go items and to cook instead of buying processed food. This can be observed, both in daily life (working part-time, being on leave), and also across the life cycle. An important similarity among the participants in initiatives is their experience of extended periods of free time and travel, particularly through backpacking and WWOOFing⁸).

Community and trust

Interviewees’ narratives indicate that the main lever for engaging in a sufficiency-oriented initiative is the opportunity to meet like-minded individuals and become part of a community. Indeed, sharing relies on trust. Sharing a house or a car with unknown people is perceived as unappealing because it raises concerns related to mistrust, a potential lack of intimacy and possible conflicts. To increase trust, people prefer to share with individuals that are socially close to them – with whom they share the same values, ways of living, social norms, and that they refer to as ‘people like me’ or who have ‘the same state of mind’.

Interviewees talk about ‘creating a network of trust’ through the initiatives, that provides solidarity and support: ‘I got the feeling that you are not alone, in short, in these choices and in doing things that are sometimes particular or difficult or that do not go in line with the rest of the world’ explains a 31-year-old male participant

in a repair café in Denmark. Through the initiatives, people find pleasure in being together, learning new practices through sharing experiences, goods and skills, as a 29-year-old woman in Germany explains about cohousing: ‘[I]f you need anything, if you want to build anything, if you want to do anything, you either find it or you post in the discussion group and ask if anyone has it. And then it will be found.’

Gender

Our research shows that in most cases under study, more women than men were engaged in initiatives. When men are involved, they are more likely to be in a leadership position (founder, administrator), while women are more likely to be participants, especially in the initiatives that are linked with food, directly or indirectly (community-supported agriculture, zero waste). Within the initiatives, gender equality is sought after, especially in ecovillages and shared housing, where various planning systems are used to ensure a fair division of housework. However, technical tasks, and hence decision-making about them, appears gender-divided: ‘Men have the knowledge about construction, so women need their approval before making a decision about renovation work’, explains a man living in shared housing (60, France); while childrearing also comes with a gendered division of work: ‘My girlfriend has parental leave; especially in the beginning, when there is a lot of breastfeeding, it doesn’t work very well with “equal sharing”’ (man, 36, Germany).

Discussion and conclusion

Summary of the results, discussion and limitations

Our research reveals commonalities in respondent characteristics across countries and research methods in relation to sufficiency lifestyles. Starting the discussion with motivations to pursue sufficiency lifestyles, as anticipated from previous research, we observe in the quantitative study that membership in the very sufficient and sufficient groups is linked to a stronger inclination towards sufficiency orientation or a heightened environmental identity. This is also supported by results from qualitative fieldwork. It seems that the two constructs replace each other and that it depends on the national context which of them is more relevant. This pattern is in line with prior research from Germany (Verfuërth et al, 2019; Tröger and Reese, 2021). The qualitative inquiry into the motivations of initiative participants shows that both are present in interviewees’ narratives, though differing from one initiative to another. While sufficiency orientation seems stronger in initiatives connected with goods (low-tech labs, repair cafés, and so on) and housing (tiny houses and shared houses), environmental identity is more central in ecovillages, and present in community-supported agriculture. Beyond the environment, the interviews point to further motivations, such as social motives, better health or curiosity, which were not covered by the survey study.

The quantitative study does not reveal a clear relationship between sufficiency lifestyles and income, however, those with a low carbon footprint and low wellbeing are characterised by low or unstable income, and the membership in one of the sufficiency groups is negatively associated with at least one aspect of deprivation. In the interviews, again, the role of resources is more diverse. Respondents tend to be

well-educated, which enables them to earn higher wages, while some can draw on savings or familial background for initial investments. Time affluence also plays a role, both as a driver (motive for adopting a less consumerist lifestyle) and as an enabler (allowing to dedicate time for lifestyle changes). However, time affluence also suggests that respondents could potentially increase the level of paid work if they wanted or needed to. Taking this together, our interpretation is that realizing sufficiency lifestyles requires access to resources linked to economic wellbeing.

A topic that is significant in the interview study and was not included in the survey is the quality of social relationships and social inclusion. This is frequently put forward and associated with wellbeing, supporting the idea of 'relational wealth' as a determinant of the quality of life (Diwan, 2000). In addition, belonging to a group appears as a crucial lever for adopting sufficiency lifestyles, because it allows to pool resources, to provide solidarity and social support, and to maximise impact through spillover effects (Elf et al, 2019). All in all, this supports health, social networks and personal freedom as being important aspects of wellbeing (OECD, 2020).

However, voluntary participation in grassroots initiatives often relies on social homogeneity. Social selection based on 'like-minded' individuals is likely to create social distinctions. The need to share common culture and social norms, and to have resources to contribute, limits the potential for the democratisation of those initiatives.

Our research also raises the issue of the gender gap issue in sustainability transitions and society overall. Quantitative data shows that women have smaller carbon footprints in all countries; it is important to note that this is partly due to the way we estimated the carbon footprint, which assumes a lower calorie intake for women. Qualitative data also indicated that more women than men are involved in sufficiency-oriented initiatives and appear to take on different roles. These results are consistent with the literature (Isenhour and Ardenfors, 2009; Druckman et al, 2012) and warrant a deeper examination. It also calls for continued attention to the challenge of unpaid care work, typically performed by women, which could increase as a result of sufficiency policies, for example, when food preparation becomes more time-consuming.

What are the implications for policy making?

The examination of the social dimensions and determinants of sufficiency invites us to consider the policy implications of our findings. In the prevailing paradigm of unsustainable growth that underpins our societal structures (Asara et al, 2015), wasting energy continues to be structurally encouraged in various contexts (Kuss and Nicholas, 2022). To mainstream sufficiency, policies must have the capacity to succeed in establishing a low-carbon, high wellbeing lifestyle as the standard and accessible choice for all (Verfuert et al, 2019). At the same time, they need to be designed in a way that prevents energy poverty, enhances social inclusion and does not create prejudices, as exemplified earlier by the discussion on the gender dimension.

Both the quantitative and the qualitative research indicate that adopting a sufficient lifestyle is a complex endeavour that, paradoxically, necessitates a certain amount of resources. While the quantitative research shows that people who do not experience deprivation are more likely to be sufficient or very sufficient, the qualitative research emphasises the importance of both financial resources and time affluence for participation in initiatives. These prerequisites act as barriers to mainstream sufficiency adoption.

Sufficiency goes beyond individual investment decisions and behaviour change; it relies on structural factors. Individual decisions and personal behaviour changes are influenced by the availability and accessibility of alternatives which are in turn influenced by regulation, policies and infrastructures. To mainstream sufficiency within the EU's policy framework, a comprehensive and multifaceted approach is necessary. First, the importance of sufficiency-oriented societal changes needs to be officially recognized by the EU alongside energy efficiency and renewable energy, in accordance with the growing body of research, such as the IPCC report. Additionally, the EU should systematically integrate sufficiency policies and measures into its climate scenarios, statistics and wealth indicators. Clear definitions and targets for sufficiency must be established, guiding member states to incorporate these principles into their national plans and strategies. Once sufficiency is established at the European level, member states have the flexibility to tailor sufficiency measures to incentivise low-carbon, sufficient behaviours while discouraging wasteful and carbon-intensive activities based on their country's specific circumstances.

In the absence of widely available sufficiency infrastructures, sufficiency initiatives often provide micro-scale sufficiency infrastructures to their members or the broader public. However, our research shows that participation in sufficiency initiatives and the associated sufficiency infrastructures may not be accessible to everyone. While sufficiency initiatives provide a valuable alternative within the current unsustainable systems, they remain niche developments and often struggle to find enough municipal support, resources and volunteers or find themselves in opposition to current legislation. Recognising the societal and environmental value of sufficiency initiatives, municipalities could support them by providing financial aid and training, offering formal recognition and networking opportunities, and ensuring political legitimation and communicative support. To go one step further and spread sufficiency lifestyles across the population, sufficiency infrastructures such as accessible public transport and secure bike lanes should be made widely available and accessible by public provision. On a European level, this could include expanding trans-European rail networks to offer viable alternatives to short-haul flights and implementing building policies that encourage modularity and shared communal spaces.

Our research indicates that financial resources emerge as prerequisites for sufficiency lifestyles. While our quantitative data shows that deprivation also leads to low carbon lifestyles but is associated with low wellbeing, sufficiency aims to achieve both wellbeing and a low carbon footprint. This suggests the need for policy instruments that target resource redistribution, such as progressive pricing based on consumption levels through specifically designed tariffs or carbon pricing (Okushima, 2024). For example, reduced VAT rates could be applied to sustainable goods and services such as public transport, bikes or vegetables, while levies could be introduced on luxury items with high environmental impact such as SUVs or frequent flights. Curbing luxury consumption emissions of the wealthiest companies and households is efficient for both climate action and social justice, given the strong positive correlation between income and emissions (Chancel, 2022). Another option could be adopting pricing mechanisms like progressive tariffs for water and electricity which could incentivise households towards more sustainable consumption patterns, ensuring basic needs are met affordably while discouraging excessive use.

Designing sufficiency policies in a socially just way is also indispensable to increase acceptance of sufficiency policies (Dechezleprêtre et al, 2022; Barbas and

Breucker, 2024). Given that sufficiency policies aim to reduce overall resource use while ensuring the wellbeing of all, a democratic approach that favours fairness and equity principles while protecting the most vulnerable is imperative for decisions regarding the distribution of limited resources. Citizens should be enabled to meaningfully influence decision making. Citizen assemblies have demonstrated a greater inclination to support sufficiency policies than many governments (Lage et al, 2023). Consequently, incorporating more sufficiency measures in the National Energy and Climate Plans, and implementing additional sufficiency policies, should be met with high approval rates by citizens.

Establishing binding rules through a democratic process to prioritise energy use and curb overconsumption, while providing appealing alternatives through sufficiency infrastructures can pave the way to democratising sufficiency, rendering a low-carbon and high wellbeing lifestyle accessible to all.

Notes

¹ <https://www.who.int/tools/whoqol>.

² Specifically, we sought values at the household level for electricity consumption and space heating. To compute individual carbon footprints for electricity consumption and space heating, we divided the household-level carbon footprint by the number of household members.

³ All of them were given the opportunity to complete the online carbon footprint calculator used for the survey, but only a little less than half (48 out of 105) did so.

⁴ For conciseness, we only describe the results of significant correlations (at $p < 0.10$) for the three low carbon footprint lifestyle groups, that is, Group I – very sufficient, Group II – sufficient, and Group III – low carbon footprint, low wellbeing (LCFLWB).

⁵ It is important to note that the calculation of the carbon footprint assumes that women consume fewer calories than men. Thus, for the same type of diet, the estimated nutrition-related carbon footprint is lower for women.

⁶ It is important to note that the calculation of the carbon footprint is influenced by the assumption in the carbon footprint calculator that older respondents consume fewer calories. Thus, for the same diet, the estimated nutrition-related footprint is lower for older respondents.

⁷ It is important to note that the calculation of the carbon footprint is influenced by the use of different default energy consumption values for space heating for houses and flats, with houses having a higher baseline default energy consumption than flats per m^2 .

⁸ WOOF stands for Worldwide Opportunities on Organic Farms and means volunteer work on organic farms, typically abroad.

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Conflict of interest

The authors declare that there is no conflict of interest.

References

- Abrahamse, W. and Steg, L. (2009) How do socio-demographic and psychological factors relate to households' direct and indirect energy use and savings?, *Journal of Economic Psychology*, 30: 711–20. doi: [10.1016/j.joep.2009.05.006](https://doi.org/10.1016/j.joep.2009.05.006)
- Alcott, B. (2008) The sufficiency strategy: would rich-world frugality lower environmental impact?, *Ecological Economics*, 64(4): 770–86. doi: [10.1016/j.ecolecon.2007.04.015](https://doi.org/10.1016/j.ecolecon.2007.04.015)
- Alfredsson, E., Bengtsson, M., Brown, H.S., Isenhour, C., Lorek, S., Stevis, D. and Vergragt, P. (2018) Why achieving the Paris Agreement requires reduced overall consumption and production, *Sustainability Science, Practice and Policy*, 14(1): 1–5. doi: [10.1080/15487733.2018.1458815](https://doi.org/10.1080/15487733.2018.1458815)
- Asara, V., Otero, I., Demaria, F. and Corbera, E. (2015) Socially sustainable degrowth as a social-ecological transformation: repoliticizing sustainability, *Sustainability Science*, 10: 375–84. doi: [10.1007/s11625-015-0321-9](https://doi.org/10.1007/s11625-015-0321-9)
- Barbas, A. and Breucker, F. (2024) *Report on Citizen Engagement Activities (FULFILL Project No. Deliverable 7.1)*, Paris: Jacques Delors Institute.
- Bärnthaler, R. (2024) When enough is enough: introducing sufficiency corridors to put techno-economism in its place, *Ambio*, (53): 960–9. doi: [10.1007/s13280-024-02027-2](https://doi.org/10.1007/s13280-024-02027-2)
- Bartiaux, F. and Reátegui Salmón, L. (2012) Are there domino effects between consumers' ordinary and 'green' practices? An analysis of quantitative data from a sensitisation campaign on personal carbon footprint, *International Review of Sociology*, 22: 471.
- Baumgartner, A., Krysiak, F.C. and Kuhlmeier, F. (2022) Sufficiency without regret, *Ecological Economics*, 200: 107545. doi: [10.1016/j.ecolecon.2022.107545](https://doi.org/10.1016/j.ecolecon.2022.107545)
- Bergman, N. (2019) Energy efficiency or energy demand? ECEEE Summer Study Proceedings 2019. Presented at the ECEEE Summer Study.
- Büchs, M. and Schnepf, S.V. (2013) Who emits most? Associations between socio-economic factors and UK households' home energy, transport, indirect and total CO2 emissions, *Ecological Economics*, 90: 114–23. doi: [10.1016/j.ecolecon.2013.03.007](https://doi.org/10.1016/j.ecolecon.2013.03.007)
- Carfagna, L.B., Dubois, E.A., Fitzmaurice, C., Ouimette, M.Y., Schor, J.B., Willis, M., et al (2014) An emerging eco-habitus: the reconfiguration of high cultural capital practices among ethical consumers, *Journal of Consumer Culture*, 14(2): 158–78. doi: [10.1177/1469540514526227](https://doi.org/10.1177/1469540514526227)
- Chancel, L. (2022) Global carbon inequality over 1990–2019, *Nature Sustainability*, 5: 931–8. doi: [10.1038/s41893-022-00955-z](https://doi.org/10.1038/s41893-022-00955-z)
- Costa, L., Moreau, V., Thurm, B., Yu, W., Clora, F., Baudry, G., et al (2021) The decarbonisation of Europe powered by lifestyle changes, *Environmental Research Letters*, 16: 044057. doi: [10.1088/1748-9326/abe890](https://doi.org/10.1088/1748-9326/abe890)
- 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, *Nature Climate Change*, 12: 36–46. doi: [10.1038/s41558-021-01219-y](https://doi.org/10.1038/s41558-021-01219-y)

- Daly, M. (2017) Quantifying the environmental impact of ecovillages and co-housing communities: a systematic literature review, *Local Environment*, 22(11): 1358–77. doi: [10.1080/13549839.2017.1348342](https://doi.org/10.1080/13549839.2017.1348342)
- Dechezleprêtre, A., Fabre, A., Kruse, T., Planterose, B., Sanchez Chico, A. and Stantcheva, S. (2022) *Fighting Climate Change: International Attitudes Toward Climate Policies (No. 1714)*, Paris: OECD.
- Diwan, R. (2000) Relational wealth and the quality of life, *The Journal of Socio-Economics*, 29(4): 305–40. doi: [10.1016/S1053-5357\(00\)00073-1](https://doi.org/10.1016/S1053-5357(00)00073-1)
- Druckman, A., Buck, I., Hayward, B. and Jackson, T. (2012) Time, gender and carbon: a study of the carbon implications of British adults' use of time, *Ecological Economics, The Economics of Degrowth*, 84: 153–63. doi: [10.1016/j.ecolecon.2012.09.008](https://doi.org/10.1016/j.ecolecon.2012.09.008)
- Duarte, R., Miranda-Buetas, S. and Sarasa, C. (2021) Household consumption patterns and income inequality in EU countries: scenario analysis for a fair transition towards low-carbon economies, *Energy Economics*, 104: 105614. doi: [10.1016/j.eneco.2021.105614](https://doi.org/10.1016/j.eneco.2021.105614)
- Dubois, G., Sovacool, B., Aall, C., Nilsson, M., Barbier, C., Herrmann, A., et al (2019) It starts at home? Climate policies targeting household consumption and behavioral decisions are key to low-carbon futures, *Energy Research & Social Science*, 52: 144–58. doi: [10.1016/j.erss.2019.02.001](https://doi.org/10.1016/j.erss.2019.02.001)
- Dütschke, E., Galvin, R. and Brunzema, I. (2021) Rebound and spillovers: prosumers in transition, *Frontiers in Psychology*, 12: 36109. doi: [10.3389/fpsyg.2021.636109](https://doi.org/10.3389/fpsyg.2021.636109)
- Elf, P., Gatersleben, B. and Christie, I. (2019) Facilitating positive spillover effects: new insights from a mixed-methods approach exploring factors enabling people to live more sustainable lifestyles, *Frontiers in Psychology*, 9: 2699. doi: [10.3389/fpsyg.2018.02699](https://doi.org/10.3389/fpsyg.2018.02699)
- Faber, J., Schrotten, A., Bles, M., Sevenster, M., Markowska, A., Smit, M., Rohde, C., et al (2012) *Behavioural Climate Change Mitigation Options and their Appropriate Inclusion in Quantitative Longer Term Policy Scenarios*, Main Report, Delft CE Delft.
- Flipo, A., Alexander-Haw, A., Breucker, F. and Dütschke, E. (2024) The socio-economic factors of sufficiency lifestyles: empirical evidence for the elaboration of socially just decarbonisation policies. ECEEE Summer Study. Presented at the ECEEE Summer Study, Paris.
- Fuchs, D.A. and Lorek, S. (2005) Sustainable consumption governance: a history of promises and failures, *Journal of Consumer Policy*, 28: 261–88. doi: [10.1007/s10603-005-8490-z](https://doi.org/10.1007/s10603-005-8490-z)
- Fuchs, D., Sahakian, M., Gumbert, T., Giulio, A.D., Maniates, M., Lorek, S., et al (2021) *Consumption Corridors: Living a Good Life within Sustainable Limits*, 1st edn, New York: Routledge.
- Geiger, S.M., Freudenstein, J.P., von Jorck, G., Gerold, S. and Schrader, U. (2021) Time wealth: measurement, drivers and consequences, *Current Research in Ecological and Social Psychology*, 2: 100015. doi: [10.1016/j.cresp.2021.100015](https://doi.org/10.1016/j.cresp.2021.100015)
- Gorge, H., Herbert, M., Özçağlar-Toulouse, N. and Robert, I. (2015) What do we really need? Questioning consumption through sufficiency, *Journal of Macromarketing*, 35(1): 11–22. doi: [10.1177/0276146714553935](https://doi.org/10.1177/0276146714553935)
- Greene, J.C., Caracelli, V.J. and Graham, W.F. (1989) Toward a conceptual framework for mixed-method evaluation designs, *Educational Evaluation and Policy Analysis*, 11(3): 255–74. doi: [10.3102/01623737011003255](https://doi.org/10.3102/01623737011003255)

- Hardadi, G., Buchholz, A. and Pauliuk, S. (2021) Implications of the distribution of German household environmental footprints across income groups for integrating environmental and social policy design, *Journal of Industrial Ecology*, 25(1): 95–113. doi: [10.1111/jiec.13045](https://doi.org/10.1111/jiec.13045)
- Hook, J.N., Hodge, A.S., Zhang, H., Van Tongeren, D.R. and Davis, D.E. (2023) Minimalism, voluntary simplicity, and well-being: a systematic review of the empirical literature, *The Journal of Positive Psychology*, 18(1): 130–41. doi: [10.1080/17439760.2021.1991450](https://doi.org/10.1080/17439760.2021.1991450)
- Institute for Global Environmental Strategies, Aalto University, and D-mat Ltd, (2019) *1.5-Degree Lifestyles: Targets and Options for Reducing Lifestyle Carbon Footprints*, Technical Report, Hayama: Institute for Global Environmental Strategies.
- IPCC (2022) *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge and New York: Cambridge University Press.
- Isenhour, C. and Ardenfors, M. (2009) Gender and sustainable consumption: policy implications, *International Journal of Innovation and Sustainable Development*, 4(2-3): 135–49. doi: [10.1504/IJISD.2009.028068](https://doi.org/10.1504/IJISD.2009.028068)
- Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., et al (2016) Environmental impact assessment of household consumption, *Journal of Industrial Ecology*, 20(3): 526–36. doi: [10.1111/jiec.12371](https://doi.org/10.1111/jiec.12371)
- Kennedy, E.H. and Givens, J.E. (2019) Eco-habitus or eco-powerlessness? Examining environmental concern across social class, *Sociological Perspectives*, 62(5): 646–67. doi: [10.1177/0731121419836966](https://doi.org/10.1177/0731121419836966)
- Kropfeld, M.I. (2023) Lifestyles of enough exploring sufficiency-oriented consumption behavior from a social practice theory perspective, *Journal of Consumer Culture*, 23(2): 369–90. doi: [10.1177/14695405221095008](https://doi.org/10.1177/14695405221095008)
- Kuss, P. and Nicholas, K.A. (2022) A dozen effective interventions to reduce car use in European cities: lessons learned from a meta-analysis and transition management, *Case Studies on Transport Policy*, 10(3): 1494–513. doi: [10.1016/j.cstp.2022.02.001](https://doi.org/10.1016/j.cstp.2022.02.001)
- Lage, J., Thema, J., Zell-Ziegler, C., Best, B., Cordroch, L. and Wiese, F. (2023) Citizens call for sufficiency and regulation: a comparison of European citizen assemblies and national energy and climate plans, *Energy Research & Social Science*, 104: 103254. doi: [10.1016/j.erss.2023.103254](https://doi.org/10.1016/j.erss.2023.103254)
- Lévay, P.Z., Vanhille, J., Goedemé, T. and Verbist, G. (2021) The association between the carbon footprint and the socio-economic characteristics of Belgian households, *Ecological Economics*, 186: 107065. doi: [10.1016/j.ecolecon.2021.107065](https://doi.org/10.1016/j.ecolecon.2021.107065)
- Luthar, S.S. (2003) The culture of affluence: psychological costs of material wealth, *Child Development*, 74(6): 1581–93. doi: [10.1046/j.1467-8624.2003.00625.x](https://doi.org/10.1046/j.1467-8624.2003.00625.x)
- Moser, S. and Kleinhüchelkotten, S. (2018) Good intents, but low impacts: diverging importance of motivational and socioeconomic determinants explaining pro-environmental behavior, energy use, and carbon footprint, *Environment and Behavior*, 50(6): 626–56. doi: [10.1177/0013916517710685](https://doi.org/10.1177/0013916517710685)
- OECD (2020) *How's Life?: Measuring Well-Being*, Paris: OECD.
- Okushima, S. (2024) Measuring energy sufficiency: a state of being neither in energy poverty nor energy extravagance, *Applied Energy*, 354: 122161. doi: [10.1016/j.apenergy.2023.122161](https://doi.org/10.1016/j.apenergy.2023.122161)
- Oswald, Y., Owen, A. and Steinberger, J.K. (2020) Large inequality in international and intranational energy footprints between income groups and across consumption categories, *Nature Energy*, 5: 231–9. doi: [10.1038/s41560-020-0579-8](https://doi.org/10.1038/s41560-020-0579-8)

- Samadi, S., Gröne, M.C., Schneidewind, U., Luhmann, H.J., Venjakob, J. and Best, B. (2017) Sufficiency in energy scenario studies: taking the potential benefits of lifestyle changes into account, *Technological Forecasting and Social Change*, 124: 126–34. doi: [10.1016/j.techfore.2016.09.013](https://doi.org/10.1016/j.techfore.2016.09.013)
- Sandberg, M. (2021) Sufficiency transitions: a review of consumption changes for environmental sustainability, *Journal of Cleaner Production*, 293: 126097. doi: [10.1016/j.jclepro.2021.126097](https://doi.org/10.1016/j.jclepro.2021.126097)
- Schäpke, N. and Rauschmayer, F. (2014) Going beyond efficiency: including altruistic motives in behavioral models for sustainability transitions to address sufficiency, *Sustainability: Science, Practice, and Policy*, 10(1): 29–44. doi: [10.1080/15487733.2014.11908123](https://doi.org/10.1080/15487733.2014.11908123)
- Schepelmann, P. and Moser, R. (2022) *Mapping of Local Sufficiency Initiatives (No. Deliverable 4.2 of H2020 Project FULFILL)*, Wuppertal: Wuppertal Institute.
- Sorrell, S., Gatersleben, B. and Druckman, A. (2020) The limits of energy sufficiency: a review of the evidence for rebound effects and negative spillovers from behavioural change, *Energy Research & Social Science*, 64: 101439. doi: [10.1016/j.erss.2020.101439](https://doi.org/10.1016/j.erss.2020.101439)
- Spangenberg, J.H. and Lorek, S. (2019) Sufficiency and consumer behaviour: from theory to policy, *Energy Policy*, 129: 1070–9. doi: [10.1016/j.enpol.2019.03.013](https://doi.org/10.1016/j.enpol.2019.03.013)
- Spengler, L. (2016) Two types of ‘enough’: sufficiency as minimum and maximum, *Environmental Politics*, 25: 921–40. doi: [10.1080/09644016.2016.1164355](https://doi.org/10.1080/09644016.2016.1164355)
- Süsser, D., Martin, N., Stavrakas, V., Gaschnig, H., Talens-Peiró, L., Flamos, A., et al (2022) Why energy models should integrate social and environmental factors: assessing user needs, omission impacts, and real-world accuracy in the European Union, *Energy Research & Social Science*, 92: 102775. doi: [10.1016/j.erss.2022.102775](https://doi.org/10.1016/j.erss.2022.102775)
- Theine, H., Humer, S., Moser, M. and Schnetzer, M. (2022) Emissions inequality: disparities in income, expenditure, and the carbon footprint in Austria, *Ecological Economics*, 197: 107435. doi: [10.1016/j.ecolecon.2022.107435](https://doi.org/10.1016/j.ecolecon.2022.107435)
- Thredgold, C.J., Daniel, L. and Baker, E. (2022) Reducing everyday consumption: mapping the landscape of grassroots social movements and activist households in Australia, *Energy Research & Social Science*, 91: 102741. doi: [10.1016/j.erss.2022.102741](https://doi.org/10.1016/j.erss.2022.102741)
- 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, *Sustainability Science*, 16: 827–40. doi: [10.1007/s11625-020-00871-1](https://doi.org/10.1007/s11625-020-00871-1)
- Venable, W.N. and Ripley, B.D. (2002) *Modern Applied Statistics with S*, New York: Springer.
- Verfuerth, C., Henn, L. and Becker, S. (2019) Is it up to them? Individual leverages for sufficiency, *GAIA*, 28(4): 374–80. doi: [10.14512/gaia.28.4.9](https://doi.org/10.14512/gaia.28.4.9)
- Vita, G., Lundström, J.R., Hertwich, E.G., Quist, J., Ivanova, D., Stadler, K., et al (2019) The environmental impact of green consumption and sufficiency lifestyles scenarios in Europe: connecting local sustainability visions to global consequences, *Ecological Economics*, 164: 106322. doi: [10.1016/j.ecolecon.2019.05.002](https://doi.org/10.1016/j.ecolecon.2019.05.002)