



## Review article

# Lifestyle can be anything if not defined. A review of understanding and use of the lifestyle concept in sustainability studies

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## A B S T R A C T

A holistic understanding of human behaviour is considered key for a successful fight against climate change and environmental degradation. In the pursuit of a holistic understanding, empirical research frequently applies the concept of “lifestyle”. The concept, which plays a significant role in segmenting customers in the field of marketing, is increasingly used in the cross-domain analysis of behaviour in the field of sustainability. This increase is tied to the challenge that the meaning and operationalisation of the lifestyle concept are still highly fragmented after decades of empirical studies. While this methodological heterogeneity and pluralism of research traditions bring creativity and dynamic to the field, it makes the orientation and a comparison of studies challenging. Previous attempts to streamline lifestyle oriented research have often aimed for a single mode of operationalisation, but this does not meet the diversity of possible applications of the concept. Therefore, a better understanding of the field seems necessary. To fill this gap, we review the understanding and use of the “lifestyle” concept in 53 empirical studies in the field of sustainability and identify 12 variants of lifestyle related research, differing along three dimensions. According to our results, (I) lifestyle can either be used as a cause or as a consequence, (II) the analytical scope can be on a micro-, meso- or macro level, and (III) the behavioural scope can be either limited to a single behavioural domain or cover multiple domains. The three dimensions allow a mapping of existing and future empirical research using the “lifestyle” concept, improve the orientation in the field, facilitate the identification of relevant studies, and avoid imprecise comparisons due to methodological differences.

## 1. Introduction

In times of urgent need for strategies that reach different target groups and successfully tackle climate change and environmental degradation through changes in sustainability related behaviour across various consumption domains [88], a lifestyle perspective often seems like an obvious choice. With approaches focused on single behaviours reaching their limits, the promise of an improved understanding about how people conduct their lives and what makes them change their habits towards more sustainability is attractive to many researchers and decision makers [1].

Therefore it comes as no surprise that a keyword search using the CORE database (as of April 24, 2024) reveals that the number of yearly hits for “sustainable lifestyle” increased from 37 publications in 1985 by a factor of over 400 to more than 15,000 in 2022. In

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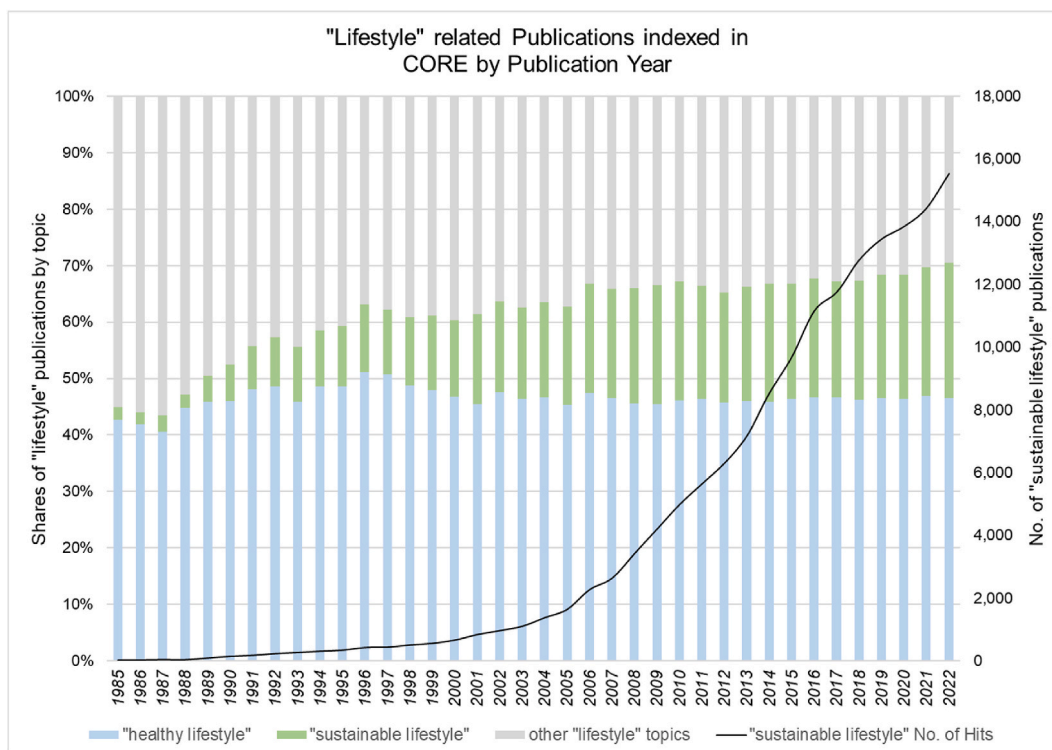
comparison, the number of health related publications using the lifestyle concept grew by a factor of 42 (from 711 to 30,152), and the number of other lifestyle related publications grew by a factor of 20 (from 915 to 19,074) (Fig. 1).

Historically, the concept “lifestyle” dates back until at least 1900, when the German philosopher and sociologist Georg Simmel introduced it as “*style of life*” in his work “The Philosophy of Money” [2]. His choice of words already shows that “lifestyles” usually take a broader view on human activities instead of focusing on single behaviours. The aim usually is to identify patterns of specific behaviours, which interact with each other, correspond to overarching preferences and affect an outcome variable. In the sustainability context, this “style of life” perspective could include, for example, a range of individual behaviours like using energy for appliances, space heating or mobility; outcomes could be the overall energy demand or greenhouse gas emissions. In health related “lifestyle” research, behaviours could comprise smoking, eating habits and everyday physical activity; outcomes could be life expectancy or physical and mental wellbeing. “Lifestyle” research typically pursues the aim to understand the targeted behaviours and their driving factors in detail so to influence their outcomes in a desired way [3–10].

The concept of sustainable lifestyles was originally influenced by theories of individualistic consumer behaviour, assuming that individuals act rationally to maximize their utility and that their lifestyle is the sum of many specific behavioural choices [11]. However, this “Homo Oeconomicus” view of consumers and lifestyles was debunked by acknowledging, that besides the own utility, also the influence of others (social pressure, social influence) simultaneously affects multiple behaviours and therefore plays an important role in the composing of lifestyles [12]. The more contemporary literature furthermore acknowledges, that lifestyles are strongly shaped by structural conditions (e.g. mobility infrastructure, availability of certain products) which align many specific behaviours [13]. Apart from the term “lifestyle”, there are also different understandings what “sustainable” means and how it can be operationalised. In an attempt to bring these research strands together, Gilby et al. define sustainable lifestyle as “a cluster of habits and patterns of behaviour embedded in a society and facilitated by institutions, norms and infrastructures that frame individual choice, in order to ensure that the use of natural resources and generation of wastes are within the regenerative and assimilative capacities of ecosystems, while supporting fairness and prosperity for all.” [14].

As this broad and abstract definition already implies, the field of climate-related lifestyle allows for a wide range of research approaches. It seems that the field is fragmented and does not progressively develop towards a broadly shared and well-established understanding; apparently, the critique of disjunct and inconsistent approaches brought forward in the German-language lifestyle literature two decades ago by Hunecke [15] and Kleinhüchelkotten [16] still remains valid today.

To this end, we conducted a critical review of how empirical lifestyle studies in the field of sustainability understand and use the lifestyle concept and structured their approaches by using the “Grounded Theory” method. This method allows considering a broad range of characteristics of reviewed literature, relating them to each other and identifying key dimensions that jointly form a framework into which existing and future work may be categorised. We applied a strict focus on differences in the studies’ use of the



**Fig. 1.** Use of the concept “lifestyle” over time, data derived from <https://core.ac.uk/> on April 24, 2024 (Note: Indexing latency leads to 2023 figures not being reliable yet, therefore the chart ends with 2022.).

lifestyle concept in order to illustrate how such differences shape the findings, and how findings might turn out ambiguous or even misleading if the specific understanding of the concept is not made explicit.

Based on our review, we come to the conclusion that studies focusing on sustainability related implications of lifestyles use methodological approaches that differ in at least three dimensions.

1. **Lifestyle as a cause or as a consequence:** “Lifestyle as a Cause” approaches use sets of personal characteristics (e.g. values, beliefs, sociodemographic characteristics, etc.) as part of the lifestyle to explain different behaviour patterns. An example of this approach is the LOHAS- the Lifestyles of Health and Sustainability [17]. “Lifestyle as a Consequence” approaches on the other hand operationalise lifestyles solely based on behaviour and then try to identify variables that can explain the identified differences in these behaviours. An example is the identification of lifestyles as a system of energy-related behaviours as used by Schwarzinger et al. [18].
2. **Level of Analytical Scope:** Analytical scopes in lifestyle research span from Macro-level approaches (e.g. the “Western Lifestyle” [19]), over Meso-level (comparing segments within a given population, e.g. different lifestyle-types [20]) to Micro-level (e.g. tailor an intervention towards specific clients’ characteristics [21]).
3. **Number of behavioural domains included within a lifestyle:** While some studies focus on behaviour within one domain (e.g. mobility [22]), others consider behaviour from a variety of domains (e.g. mobility, domestic energy use, diet [23]).

These differences are rarely acknowledged in the interpretation and discussion of the achieved results, despite the approaches having different implications with regard to the results they are able to provide. For example, “Lifestyle as a Cause” and “Lifestyle as a Consequence” apply to different research questions and may lead to entirely different results using the same data [24,25]. Furthermore, clarity about the Analytical Scope is key to whether results from different studies are comparable or not. Finally, there is also a need for clarity about the Behavioural Scope of “lifestyle”: A lifestyle study focusing on a specific behaviour will yield different results than a segmentation of lifestyles in the general population using multiple behavioural domains. The aim of this paper is to provide an easy to use scheme to classify and compare different approaches how the concept “lifestyle” is used in empirical work.

## 2. Materials and methods

Instead of reviewing or *meta*-analysing the evidence provided by the selected publications [26], we put a focus on the methodological qualities of the literature and opted for a critical review (Grant and Booth, 2009). The concrete method we applied is “Grounded Theory”, which was first described by Glaser and Strauss and is commonly used in qualitative content analysis in social science [27]. Due to this origin, it is well suited as a systematic method for selecting and organizing literature and analysing its methodological qualities. Concretely, Grounded Theory enables bottom-up theory building, that is, deriving a theory based on data when there is few preliminary information about the research question available and the review starts without pre-defined hypotheses. The qualitative analysis applies a coding sequence by decomposing the raw data (here: the corpus of “lifestyle” literature) into minimal elements of meaning and then re-aggregating into larger conceptual units that are still “palatable pieces for digestion” [28]. While quantitative research often follows a linear process, a qualitative approach for a literature review is more iterative, sometimes even circular. This

**Table 1**  
Operationalisation of presented Review Process based on [30].

Phase	Task	Operationalisation
<b>1. Define</b>		
1.1	Define criteria for inclusion/exclusion	Inclusion: empirical work using “lifestyle” in the context of studying behaviour Exclusion: theoretical work, reviews
1.2	Identify fields of research	Empirical work using a “lifestyle” perspective on citizen behaviour with an impact on energy demand or greenhouse gas emissions
1.3	Determine appropriate sources	(I) Peer-reviewed publications (II) Work cited in peer-reviewed publications
1.4	Decide on specific search terms	Selected search terms: (“lifestyle” OR “life-style” OR “life style”) AND (“sustainability” OR “energy” OR “climate”)
<b>2. Search</b>		
2.1	Search	(I) “Lifestyle” related work already stored in the authors’ literature management tools (initial list: 47/final pool: 15) (II) References in aforementioned literature (initial list: 18/final pool: 11) (III) Google Scholar, Researchgate (initial list: 151/final pool: 27)
<b>3. Select</b>		
3.1	Refine the sample	(I) Check against inclusion/exclusion criteria (II) In later iterations: check novelty against theoretical status-quo
<b>4. Analyse</b>		
4.1	Open coding	Extract methodological and epistemological main categories
4.2	Axial coding	Study structures within the main categories
4.3	Selective coding	Elaborate framework providing a logical overview of findings
<b>5. Present</b>		
5.1	Represent structure and content	(I) Create structural representation of findings about how the concept “lifestyle” is used (II) Account for logical and conceptual links and prerequisites
5.2	Structure results	Integrate review findings into a well comprehensible storyline that still allows cross-reading

iterative course allows agile modifications and continuous refinement of the methodology used for information extraction. Thereby, newly discovered features may enter and expand the conceptual framework as they emerge. This was particularly useful in our review of the methodological features of the literature.

Theoretical research using a qualitative approach obtains its results by the meaning-based ordering/categorization of the elements found in the data. The creation of categories, properties and dimensions, and the discovery of their relationships happen epistemologically analogous to the processing and analysis of empirical raw data. The deduction of framework components and relationships relies on data, existing knowledge and experience, and discussions emerging during the research process. According to Corbin and Strauss [29], the result is ideally a set of well-developed and systematically interconnected categories which form a framework explaining relevant phenomena. The main advantage of using Grounded Theory for a review of conceptual differences reflected in existing research is its iterative process. It allows taking into account the unique methodological characteristics of individual publications while elaborating differences, analogies, and relationships amongst the concepts found in the literature corpus. Ideally, the review reveals more than just the sum of its parts.

We used the adaptation of the original Grounded Theory review approach as described by Wolfswinkel et al. [30]. They propose five iterative phases with a number of intermediate steps. Table 1 shows how each step was operationalised.

The “Define” phase (1) was the entry point and was refined several times during the review process. Criteria for inclusion and exclusion (1.1) were defined according to the focus on empirical work that uses “lifestyle” in the context of studying sustainability related behaviour. Fields of research (1.2) were defined relatively broadly in order to accommodate lifestyle related research from a wide range of disciplines that addresses sustainability related issues. As lifestyle related work is often strongly oriented to practical application, we used a less strict cut-off criterion for the selection of appropriate sources (1.3): a source (i.e. a publication) did not necessarily need to be peer-reviewed itself, but had to be cited by at least one peer-reviewed publication. This allowed project reports or whitepapers to be included in the review, if their consideration in peer-reviewed publications indicated scientific relevance.

In the “Search” phase (2), we started with an initial set of publications with which we had already familiarised ourselves in the course of earlier research. We then progressively expanded the search to references cited therein, and to the freely available services Google Scholar and Researchgate.

The “Selection” (3) started with a randomly ordered list containing 47 previously known publications, 18 sources cited therein, and an initial sample of 151 publications listed at Google Scholar or Researchgate. In the first iteration, we only checked against inclusion/exclusion criteria, and in later iterations checked the novelty of a source against the accumulated corpus and the already deduced methodological concepts. In order to reach theoretical saturation and data saturation, we added publications to the final pool as long as they introduced new methodological concepts also applicable to all other studies in the corpus. The final corpus consists of 53 empirical lifestyle studies with a focus on sustainability related behaviour. So, technically, this review is not “exhaustive”, but provides an indicative account [31] of how the term “lifestyle” is used in empirical studies in the field of sustainability.

In the “Analyse” (4) phase, the iterative, non-hypothesis-driven character of the “Grounded Theory” approach was applied. During “open coding”, we labelled the concrete understanding and use of “lifestyle” in each reviewed publications with (relatively granular) preliminary codes. During “axial coding”, we identified groups of studies with similar codes and grouped them accordingly. During the final “selective coding”, we compiled the findings into an overarching scheme that could not be further simplified without losing essential pieces of information.

The “Present” (5) phase strived to create a comprehensive answer to the research question of how “lifestyle” is used in empirical research on sustainability related behaviour. The result is the three-dimensional framework presented in the next section, which allows the mapping and categorization of lifestyle related empirical research according to how the concept “lifestyle” is used.

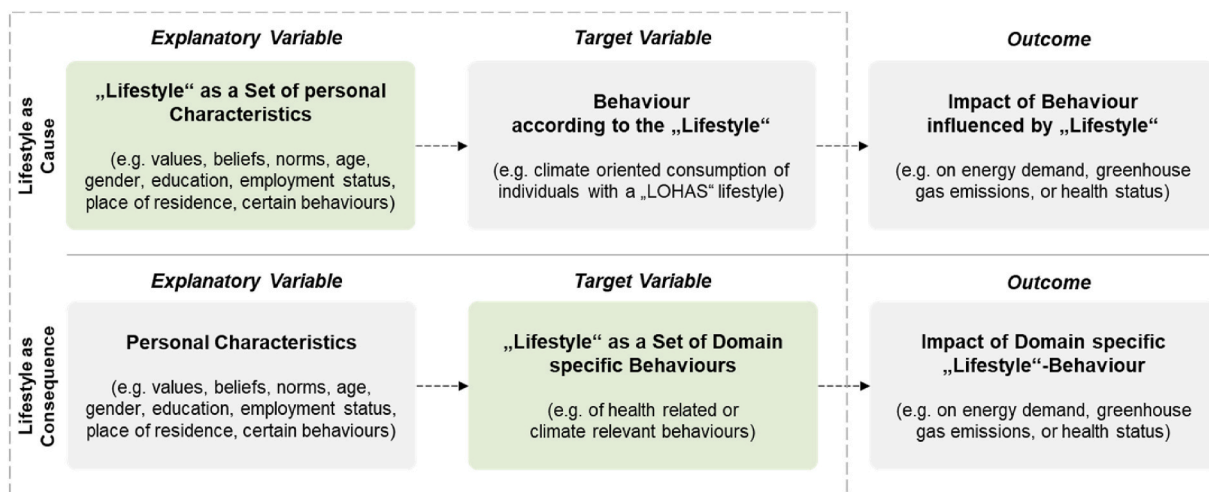


Fig. 2. “Lifestyle” being used as either explanatory or target variable. (Note: The dashed line marks the system boundaries within which we apply the terms “Explanatory Variable” and “Target Variable”.)

### 3. Results

As outlined above, the use of the “lifestyle” concept in empirical publications can be mapped on three dimensions, which strongly reflect the nature of different research questions and to some extent the foci of different disciplines: Dimension 1 contrasts “Lifestyle as Cause” versus “Lifestyle as Consequence” approaches, and, in our view, represents the most important dimension from a methodological perspective. Dimension 2 differentiates the Micro, Meso, or Macro analytical levels in “lifestyle” research. Dimension 3 distinguishes the behavioural scope of “lifestyle” research, depending on the number of behavioural dimensions that are considered. Finally, we discuss the multiple variants of “lifestyle” research arising from interrelating these three dimensions and map all empirical studies in our literature corpus according to all three identified dimensions.

#### 3.1. Dimension 1: “lifestyle as cause” versus “lifestyle as consequence”

The “Lifestyle as Cause” and “Lifestyle as Consequence” approaches reflect separate research traditions and are fundamentally different in both their methodological basis and in the kind of research questions to which they are primarily applied. “Lifestyle as Cause” approaches focus on providing a rich description of people in a variety of sociodemographic, psychological, and behavioural characteristics. This set of personal characteristics serves to explain behaviour. “Lifestyle as Consequence” approaches instead understand “lifestyle” as a specific set of behaviours that are relevant in a certain area, like sustainability or health. Personal characteristics may be used to explain this set of area specific behaviours.

These two approaches differ in the causal direction they assume. As indicated in Fig. 2, the “Lifestyle as Cause” approach uses “lifestyle” as explanatory variable to explain behaviour whereas the “Lifestyle as Consequence” approach uses “lifestyle” as a target variable that is explained by personal characteristics. In both approaches the target variables can again be used to explain outcomes in terms of behavioural impacts, so distinguishing the approaches is only useful within the system boundaries depicted by the dotted line in Fig. 2.

“Lifestyle as Cause” approaches are used to draw conclusions about (or explain) people’s behaviour based on their “lifestyle” specific set of personal characteristics. This approach is strongly represented in general lifestyle models [7,9,32,33] and in market research for the segmentation of entire societies [34]. They often aim at identifying and describing (lifestyle-)groups of people that differ along lines of common attitudes, perceptions, values, or certain behaviours (such as “LOHAS”, Lifestyles of Health and Sustainability [17]). Different variations can be found, emphasising either expressions of group membership, recognisability and identity, or the activities or behaviour affected by values and attitudes [35].

“Lifestyle as Cause” approaches have a strong tradition in the German-language literature. Back in 1991, Prose and Wortmann developed a lifestyle typology for market-segmentation on energy saving in Kiel, Germany [36]. Götz et al. used lifestyle segmentation as a basis for interpreting leisure mobility behaviour [22]. Jetzkowitz et al. used the “lifestyle” concept by Lüdtke [9] for explaining suburbanisation and associated mobility behaviour [37]. Hierzinger et al. developed a lifestyle typology based on attitudes, values and behavioural intentions to identify potential target groups for policy design [38], while Bohunovsky et al. [24] applied an adopted version of the general typology by Schulze [33] to support target group specific communication strategies. In both cases, the target variable was behaviour, which was supposed to change towards more sustainable patterns. Bogner et al. analysed determinants for electricity consumption in Austrian households and tested membership in a certain “lifestyle” group as a starting point for specific interventions [39]. Newton and Meyer created a “lifestyle” typology on the basis of perceptions, attitudes, and self-reported readiness to take action, and used this typology to explain differences in resource consumption [40]. Thøgersen analysed the influence of “housing-related lifestyle” on energy-saving innovativeness and behaviour [41]. Arnold et al. operationalised “lifestyle” using the General Ecological Behaviour scale to explain household electricity consumption [3]. Studies from this tradition usually use the lifestyle concept with relatively little focus on concrete behaviour, which, according to some authors, leads to low reliability in finding groups that differ in their actual behaviour [3,18,25,42]. However, there are also “Lifestyle as Cause” studies in which “lifestyle” is represented by certain behaviours that are used to explain other behaviours (see e.g. Ref. [43]). Against the background of the reviewed literature, the most important benefit of “Lifestyle as Cause” approaches lies in the typology itself providing a holistic picture.

By contrast, “Lifestyle as Consequence” approaches explicitly aim to distinguish “lifestyles” that differ as much as possible in their behaviour. Here, “lifestyle” explicitly represents a set of relevant behaviours, explained by a variety of personal characteristics, as well as place and context related factors [18]. This approach has long been used in health-related work [21,44–46] and could be hardly found in sustainability related research. This is somewhat surprising, as psychological action theories such as the widely used theory of planned behaviour [47–51] seem well suited for using person related characteristics like personal attitudes, norms or self-efficacy to explain domain specific behavioural patterns. Consequently, authors following the “Lifestyle as Consequence” approach argue that “lifestyle” should represent domain relevant behaviour instead of e.g. psychological characteristics or proxy behaviours that show a statistical relationship with the behaviour of interest. They refer to findings indicating an unreliable link between proxy indicators and actual behaviour, like the value-action-gap or the attitude-action-gap [40,52], and the behaviour-impact-gap [53]. Examples are Schwarzinger et al. who used the “Lifestyle as Consequence” approach for an analysis of “energy lifestyles” as a system of energy related behaviours on a multinational level [54], and Hadler et al. who applied it in a country specific study on the Austrian population [20]. Both studies emphasize limitations of “Lifestyle as Cause” studies that draw conclusions from psychological characteristics on (energy) related behaviour. Concretely, they argue that “lifestyle” typologies based on behaviour are better suited to identifying target groups with specific behavioural patterns than psychometric typologies.

When it comes to choosing between the two approaches a decision must be made for either a rich description of easy-to-use target groups (“Lifestyle as Cause”), or best possible separation of groups with distinct behavioural patterns (“Lifestyle as Consequence”). In

addition, the strict focus on behavioural patterns as target variable in the “Lifestyle as Consequence” approach tends to lead to a clearer distinction between dependent and independent variables.

### 3.2. Dimension 2: analytical scope

The second dimension to map empirical “lifestyle” related work is Analytical Scope. It spans from the highly aggregated Macro Level to the individual Micro Level.

The **Macro Level** defines its scope by a geographic boundary that includes all residents of the respective area. Examples could be the northern hemisphere, a certain country or a large city. The study by Notter et al. with its focus on the “western lifestyle” typical for citizens in developed countries is a good example for the Macro Level [19]. Similarly, Akenji et al. studied differences in the lifestyles between developed and developing countries [55]. A Macro Level perspective on “lifestyle” is also possible on special populations like the residents of specific neighbourhoods or villages [56]. Similarly, Miller and Bentley took a Macro Level perspective on the “lifestyles” of pioneering ecovillage residents and contrasted them to the surrounding “non-sustainable world” [57]. Macro Level approaches can be based on secondary statistics [58] or primary survey data [19]. If only a descriptive picture of the population’s average “lifestyle” is needed, secondary data can be used, even drawing on separate data sources for different domains like housing and mobility, as long as the data sources refer to the same population and originate from reasonably close time periods [59]. However, if multivariate analyses (e.g. for studying cross-domain behaviour) are to be made, the data must contain values in all variables for all individuals, which is usually achieved by surveys covering multiple domains.

In the field of sustainability related “lifestyle” research, some authors have emphasised that inter-individual differences in behaviour and potential for sustainability improvements might remain hidden when looking at “average citizens” only [20,54]. The **Meso Level** perspective recognises variance between citizens by contrasting segments with specific characteristics. Some Meso Level studies define segments on the basis of *demographic characteristics*, like the study conducted by Sippel et al. who analysed the carbon footprint related “lifestyles” of a very specific demographic segment in the form of university students in Constance, Germany [60]. Similarly, Karjalainen et al. distinguished residents in Helsinki Metropolitan Area based on places of residence with different mobility related conditions in their study on carless lifestyles [61]. Other Meso Level studies define segments by behavioural frequency. Schwarzinger et al. compared “High Impact” and “Low Impact” energy “lifestyles” among citizens in 31 European countries, and identified energy “lifestyles” with specific patterns of energy demand across different domains [54]. Similarly, Hadler et al. identified five energy “lifestyles” from specific patterns of energy behaviour in Austria [20]. As an example for a “lifestyle” segmentation study applied to marketing related questions, Pícha and Navrátil surveyed customers in Czech shopping centres and segmented them using a LOHAS typology [17].

The **Micro Level** “lifestyle” perspective is concerned about individual interventions, for instance when tailoring medical and psychological applications to a specific client’s characteristics [21,62–64]. Individual monitoring and interventions are less common in sustainability related research, especially when studying multi-rather than single-domain behaviours like energy use at home [65]. Consequently, no Micro Level study with an energy or climate focus was part of our literature corpus.

The different Analytical Scopes show that the concept of lifestyle can be helpful in a variety of contexts to capture the complexity of human behaviour. Macro Level views often put global and economic aspects into the spotlight. Meso Level views may reveal social structure patterns, patterns of resource consumption, and point to potential target groups for more sustainable development. The Micro Level may illustrate exemplary cases, similar to health related and medical case reports. Sustainability related “lifestyle” research is usually conducted on a Meso or a Macro Level. While individuals are in most cases *data subjects*, analysis and modelling commonly aim to aggregate and generalise across individuals.

### 3.3. Dimension 3: behavioural scope

The third dimension distinguishes “lifestyle” related empirical studies according to the number of behavioural domains they encompass. This distinction might appear surprising, as the term “lifestyle” suggests that multiple behavioural domains are addressed. However, our literature corpus also includes studies with a focused behavioural scope.

On the lower end of the Behavioural Scope dimension there are studies using the term “lifestyle” with a focus on a certain behavioural domain. This focused behavioural scope applies e.g. to lifestyle oriented research on mobility behaviour [22,66] or domestic energy use [67–69]. A slightly broader scope usually applies to health related studies, when health-related practices such as diet, exercise and substance use (e.g. alcohol, smoking) together constitute a health relevant “lifestyle” [44–46].

Empirical studies with a broader scope focus on energy use and greenhouse gas emissions related to multiple behavioural domains, like mobility, domestic energy use and diet [18–20,24,38,54,59]. The broader scope, however, usually comes with the cost of higher complexity in the analysis and in the discussion of results, as the behaviours from different domains can be related to each other in many combinations within and between individuals and groups. Moreover, the underlying presumption of a broad behavioural scope that behaviours do relate to each other need not hold empirically. Meta-analyses show that spillover effects that potentially increase behavioural consistency across domains might be small or even negligible [70–72]. Dumitru et al. demonstrated a similar independence between the behaviours conducted in different places [73]. Hadler et al. referred to this independence as “*multidimensionality of consumption*” [20].

The broadest scope can, theoretically, be achieved with general lifestyle models [32,33]. While such models are usually designed to enrich empirical research by using lifestyle in addition to stratification variables in social segmentation, they are sometimes used with the idea of drawing conclusions from general individual “lifestyle characteristics” on behaviour in a broad range of behavioural

domains, resembling a milieu typical behaviour. Therefore, studies applying general lifestyle models usually adopt “Lifestyle as Cause” approaches. Despite their dominance in German-language research literature, they represent only a small part of the reviewed literature corpus.

As there are no universally followed rules as to which behaviours belong to which behavioural domain (e.g. electricity demand resulting from the use of a fridge can be either counted as home energy [59] or diet related [74]), we differentiate only between “**Single Domain**” and “**Multi Domain**” research. The broader the Behavioural Scope, the more precise “lifestyle” studies should define their research question since multiple behaviours imply a high number of combinations and a higher likelihood of relative independence of behaviours from different domains.

### 3.4. Possible variants of lifestyle research

In the above sections 3.1 to 3.3, we referred to exemplary papers that illustrate the differences along each the respective dimensions particularly well. However, if combined, the three identified dimensions (Table 2) allow 12 different combinations, representing 12 possible ways to conduct “lifestyle” related research.

Each of the combinations found in the literature allows for a very specific look at certain “lifestyle” related questions and has specific requirements in the research design. Although our sampling approach does not claim quantitative representativity, there is a clear tendency in the studies represented in our pool: 90 % of the studies fall into five of the 12 possible combinations (Table 3). The overall heterogeneity of the represented studies gives an impression of the difficulties in establishing a clear understanding of the “lifestyle” term.

Some of the studies in our literature corpus might appear very similar at a first glance, but turn out to have substantial methodological differences at a closer look against the background of the three dimensions. For example, two lifestyle studies conducted in the same country, using the same data and the same Meso Level and Multi Domain Scope led to completely different results. On the one hand, Bohunovsky et al. used a “Lifestyle as Cause” approach (based on a general lifestyle model) and found four groups with largely similar cross-domain energy consumption patterns [24]. On the other hand, Schwarzinger et al. used a “Lifestyle as consequence” approach (lifestyle as a combination of energy related behaviours) and identified six groups with distinct behavioural patterns and corresponding energy demands [25].

## 4. Discussion

“Lifestyle” is a prominent concept in empirical research on sustainability related behaviour. However, the understanding and use of the concept differ widely, which makes it very difficult to interpret, compare and assess the relevance of empirical studies. By reviewing and structuring a corpus of 53 empirical lifestyle studies with a focus on sustainability related behaviour using the modified Grounded Theory approach by Wolfswinkel et al. [30], we identified three dimensions along which empirical lifestyle studies may be mapped.

First, lifestyle can be either a concept carrying assumptions about how differences in behaviours come about (Lifestyle as Cause), or an approach to capture the complexity of behaviour as the result of personal or structural factors (Lifestyle as Consequence). Both perspectives can provide valuable insights and answer very specific research questions. While Lifestyle as Cause studies stand out by the rich descriptions they provide for target groups or customer segments, Lifestyle as Consequence studies are clearer in delineating behaviour from its predictors.

Second, lifestyle may be analysed at a Macro, Meso or Micro Analytical Scope, all of which come with specific requirements and implications. The choice of the Analytical Scope offers the opportunity to precisely adapt the research design to the specific unit of analysis to be studied: entire populations or areas (Macro), segments within a population or area (Meso), or selected individuals (Micro).

Third, the Behavioural Scope of lifestyle research may address single or multiple behavioural domains. From its historical origins, the “lifestyle” concept takes a broad view on human activities; however, if a large number of behaviours is analysed, it might be hard to identify lifestyles that can be empirically distinguished from each other, and the system boundaries of a study might be blurred.

Mapping our literature corpus on these three dimensions highlights the heterogeneity in which “lifestyle” is understood and used in current empirical research. In total, the three dimensions combine to 12 possible variants of lifestyle research. No ideal research approach emerges from this review. Each concrete understanding and use of lifestyle comes with its particular implications for concrete use cases, of which many will likely remain a subject for future debates.

**Table 2**  
Options along the 3 identified dimensions.

Role of “Lifestyle”	Analytical Scope	Behavioural Scope
Option 1: Cause	Option 1: Macro Level	Option 1: Single Domain
Option 2: Consequence	Option 2: Meso Level	Option 2: Multi Domain
	Option 3: Micro Level	

**Table 3**

Representation of combinations in our literature pool (Total deviating from 100 % due to rounding).

	Lifestyle as Cause			Lifestyle as Consequence		
	Micro	Meso	Macro	Micro	Meso	Macro
<b>Single Domain</b>	0	11 (21 %)	1 (2 %)	0	3 (6 %)	9 (17 %)
<b>Multi Domain</b>	0	5 (9 %)	2 (4 %)	0	9 (17 %)	13 (25 %)

## 5. Limitations

It should be kept in mind that this framework necessarily takes an umbrella perspective and cannot fully cover *all* aspects of each analysed publication. The authors of the original publications chose their research designs carefully with respect to their highly diverse research questions. Thus, the framework enables the systematic mapping and discussion of existing lifestyle related empirical research but can and should not replace a “deep dive” into individual publications. Due to its Grounded Theory methodology, the findings of this review may be biased by our previous experience and subjective assessments. Collating the literature corpus started from lifestyle related literature we were already familiar with; coding and structuring the corpus was most likely coloured by our own expertise from conducting lifestyle, and behaviour related studies in the context of sustainability. We used discursive validation within our circle of authors to compare, control and confirm the results; however, other authors would probably not arrive at the exact same dimensions. Future iterations with an expanded and updated corpus might provide more clarity or more nuances on the range of lifestyle related research in the field of sustainability.

## 6. Conclusions and outlook

The “lifestyle” concept will likely continue to play a relevant role in sustainability related Social Sciences and Humanities (SSH) research. However, the rapidly increasing number of publications and the lack of shared definitions and understanding complicate the integration of results and the future development of lifestyle research. Methodological heterogeneity and pluralism of research traditions bring creativity and dynamic to the field. For a productive discourse, a better understanding of the terms, definitions and methods seems necessary though. We explicitly do not advocate any standardisation of lifestyle related methods or narrowing future research to only few of the possible variants of lifestyle research. Still, we suggest that other researchers using the lifestyle concept allocate their work on the three dimensions identified in this review. This would provide higher transparency on the specific lifestyle concept a particular research activity or publication applies and would help other researchers to quickly identify relevant work and compare methods and results.

Political and economic decision makers face an increasingly tight timetable for decarbonisation. According to the Intergovernmental Panel of Climate Change, “the magnitude and rate of climate change and associated risks depend strongly on near-term mitigation and adaptation actions” [75]. Consequently, there is an urgent need to understand what is needed to initiate both broadly accepted behaviour and technology change and make our lifestyles more sustainable. Presumably, the “lifestyle” perspective will gain importance in policy making as soon as most of the “low hanging fruits” by modifying single behaviours are picked and single domain approaches reach their limits. Our three dimensions point to future avenues how lifestyle research may contribute to the grand challenge of combating climate change: shifting from frequency to the temporal pattern of behaviour in Lifestyle as Consequence; linking Multi domain lifestyle insights to the use of coupled technologies; and exploring the boundary between Micro and Meso levels.

Previous and current lifestyle research relies on behavioural frequency data, that is, aggregated numbers on how often people engage in sustainability related activities per day or per month. However, these activities follow specific temporal patterns where behavioural activity varies by daytime. For instance, energy demand may be operationalised as the frequency of turning on the washing machine or as the kWh readout of an electricity meter; or it may be operationalised as the load profile how a household’s energy demand fluctuates during the day. Renewable energy production, especially if dominated by wind and solar power, is volatile and additionally challenged by climate change impacts such as floods or forest fires [76,77], requiring increased flexibility of the energy system [78,79]. Demand response models are discussed as potential solutions for stabilising grids in view of this volatility [80, 81]. Deriving price elasticities of demand from lifestyle insights based on temporal patterns could allow to go beyond unidimensional approaches that only compare electricity loads [82,83].

While technology integration and sector coupling are already a major topic in the design of technical systems [84,85], the social sciences are not yet as advanced in linking usability and user experience of new sustainable technologies with the potential users’ daily routines and lifestyle related behaviour in different domains. For instance, the mobility and housing domains intersect when the batteries of electric vehicles are used to buffer and store the intermittent electricity production by photovoltaics panels on private roofs. Multi-domain lifestyle studies would need to measure not just the use of the car and electrical appliances in the household, but also how these behaviours interact and may be shifted to maximize self-consumption of the produced electricity. Estimating and improving the decarbonisation potential of technical solutions might thus substantially benefit from a detailed understanding of the multi-domain “lifestyles” of potential users. However, introducing lifestyles in the energy system also adds complexity to the analysis and modelling of energy production and demand by providing a higher resolution of information [86].

Finally, as sustainable consumption calls for a shift from private ownership to shared assets, future lifestyle research could aim to transcend the boundaries between Meso and Micro levels. Individual behaviours and the resulting lifestyles rarely stand alone, but are



nested within the lifestyles of other household members, residents in the same building, neighbours in the district, work colleagues etc. As energy communities, car sharing, co-working spaces or other forms of the sharing economy evolve from niche experiments to mainstream services, lifestyle research could similarly expand its analytical scope to better cover niche lifestyles. Concretely, Micro Level qualitative case studies, for instance on “extreme lifestyles” (e.g. very high or very low energy demand of the very rich or the very poor), could inspire subsequent Meso or Macro Level research.

To conclude, existing research already offers an established basis for the further development of an increasingly integrated and holistic view about the role of individual users, user groups and larger collectives within a sustainable energy system. The “lifestyle” perspective may support the goal of engaging a diverse range of audiences in different contexts and with different social backgrounds. The three dimensions proposed here shall guide our research colleagues’ navigation through the maze of lifestyle related research, enable meaningful comparisons, and finally support the active shaping of a more sustainable future.

### CRedit authorship contribution statement

**Stephan Schwarzinger:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Michael Brenner-Fliesser:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Writing – original draft, Writing – review & editing. **Sebastian Seebauer:** Supervision, Writing – original draft. **Giuseppe Carrus:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Writing – original draft. **Eugenio De Gregorio:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Writing – original draft. **Christian A. Klöckner:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Writing – original draft. **Hanna Pihkola:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Writing – original draft.

### Declaration of competing interest

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### Appendix

The final pool of empirical lifestyle related publications with an energy or climate focus, classified according to the three identified dimensions.

Reference	Role of „Lifestyle”	Analytical Scope	Behavioural Scope
Akenji et al. [55]	Consequence (consumer choices)	Macro Level (Residents of 5 case countries)	Multi Domain
Anable et al. [89]	Consequence (consumer choices)	Macro Level (UK consumers)	Multi Domain
Anable et al. [90]	Consequence (mobility behaviour)	Macro Level (UK consumers)	Single Domain (transport)
Arnold et al.[3]	Cause (lifestyle approximated by General Ecological Behaviour scale)	Macro Level (German households)	Single Domain (household electricity consumption)
Axsen et al. [4]	Cause (lifestyle classification based on themes in qualitative interviews)	Meso Level (Types of early EV buyers in Canada)	Single Domain (EV purchasing/usage)
Baiocchi et al. [91]	Cause (geodemographic lifestyle classification)	Meso Level (Geodemographic types of UK households)	Multi Domain
Barr and Gilg [92]	Consequence (environmental behaviour)	Meso Level (“Lifestyle” groups of Households in Devon, UK)	Multi Domain
Belaïd and Garcia [93]	Consequence (energy usage behaviour)	Macro Level (French households)	Single Domain (residential energy consumption)
Bin and Dowlatabadi [59]	Consequence (consumer choices)	Macro Level (US households)	Multi Domain
Bogner et al. [39]	Cause (general lifestyle model as descriptive typology)	Meso Level (“Lifestyle” groups of Austrian households)	Single Domain (household electricity consumption)
Bohunovsky et al. [24]	Cause (general lifestyle model as descriptive typology)	Meso Level (“Lifestyle” groups of Austrian households)	Multi Domain
Brand et al. [66]	Consequence (mobility behaviour)	Macro Level (Scottish households)	Single Domain (mobility behaviour)
Brown et al. [43]	Cause (selected pro-environmental behaviours)	Macro level (Georgia residents)	Multi Domain
Damari and Kissinger [94]	Cause (typology of household size, composition and religion)	Meso Level (Household types in Israel)	Single Domain (household energy consumption)
Diao et al. [95]	Cause (lifestyle expressed by occupants presence at home)	Meso Level (Clusters of New York State households)	Single Domain (household energy consumption)

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Reference	Role of „Lifestyle“	Analytical Scope	Behavioural Scope
Ding et al. [58]	Consequence (household consumption)	Macro Level (Chinese households)	Multi Domain
Druckman and Jackson [96]	Cause (lifestyle aspirations as drivers for emissions)	Macro Level (UK households)	Multi Domain
Eyre et al. [5]	Consequence (energy related behaviour)	Macro Level (UK households)	Multi Domain
Fong et al. [97]	Consequence (energy related behaviour)	Meso Level (Sociodemographic groups of households from 3 Japanese cities)	Single Domain (household energy consumption)
Götz et al. [22]	Cause (mobility lifestyle model as descriptive typology)	Meso Level (“Mobility Style” groups of German households)	Single Domain (mobility)
Guerra Santin [98]	Cause (lifestyle as determinant of behaviour)	Meso Level (Groups of Dutch households with similar behavioural patterns)	Single Domain (heating energy consumption)
Hadler et al. [20]	Consequence (energy related behaviour)	Meso Level (“Energy Lifestyle” groups of Austrian households)	Multi Domain
Heinrich et al. [6]	Consequence (residential energy behaviour)	Meso Level (“Behavioural Archetypes” among French households)	Multi Domain
Hierzinger et al. [38]	Cause (energy specific lifestyle model as descriptive typology)	Meso Level (“Energy Styles” groups of Austrian households)	Multi Domain
Hirano et al. [67]	Consequence (emission relevant behaviour)	Macro Level (Japanese households)	Multi Domain
Hong and Vicdan [56]	Consequence (consumption behaviour)	Macro Level (ecovillage residents)	Multi Domain
Howell [99]	Consequence (emission relevant behaviour)	Meso Level (“lower carbon lifestyle” interviewees)	Multi Domain
Jalas and Juntunen [100]	Consequence (energy related behaviour)	Meso Level (Household types in Finland)	Multi Domain
Jetzkowitz et al. [37]	Cause (general lifestyle model as descriptive typology)	Meso Level (“Lifestyle” groups of residents in a certain area near German city)	Single Domain (mobility)
Karjalainen et al. [61]	Consequence (mobility related behaviour)	Meso Level (Different urban fabrics in Helsinki Metropolitan Area)	Single Domain (mobility)
Koide et al. [101]	Consequence (emission relevant behaviour)	Macro Level (Households from Finland and Japan)	Multi Domain
Kwac et al. [83]	Consequence (energy consumption patterns)	Meso Level („Lifestyle” groups of households in California)	Single Domain (household electricity consumption)
Le Gallic et al. [102]	Consequence (energy related behavior)	Macro Level (French households)	Multi Domain
Lutzenhiser and Gossard [103]	Cause (lifestyle approximated by income and ethnicity)	Meso Level (“Lifestyle” groups of households in northern California)	Multi Domain
Miller and Bentley [57]	Consequence (sustainable behaviour)	Macro Level (communities in south-east Queensland, Australia)	Multi Domain
Nakagami [104]	Consequence (household equipment use)	Macro Level (Japanese households)	Single Domain (household energy use)
Newton and Meyer [40]	Cause (own lifestyle segmentation typology)	Meso Level (Segments of Melbourne households)	Multi Domain
Notter et al. [19]	Consequence (climate related behaviour)	Macro Level (Swiss citizens)	Multi Domain
Ouyang and Hokao [68]	Consequence (energy usage behaviour)	Macro Level (Hangzhou citizens)	Single Domain (household energy use)
Ozawa et al. [105]	Cause (lifestyle expressed by occupants time use)	Meso Level (Structure types of Japanese households)	Single Domain (household energy consumption)
Přcha and Navrátil [17]	Cause (LOHAS lifestyle model as typology)	Meso Level (“Lifestyle” groups of buyers in shopping centres in Czech Republic)	Single Domain (buying behaviour)
Prose and Wortmann [36]	Cause (energy specific lifestyle model as descriptive typology)	Meso Level (“Lifestyle” groups of households in Kiel, Germany)	Single Domain (household energy use)
Abu-Rayash and Dincer [87]	Consequence (energy usage behaviour)	Macro Level (Households of Ontario, CN)	Single Domain (household energy use)
Sanquist et al. [69]	Consequence (energy usage behaviour)	Macro Level (US citizens in urban and rural locations)	Single Domain (household energy use)
Sardianou [106]	Consequence (energy related behaviour)	Macro Level (Athens households)	Single Domain (energy-saving behaviour at home)
Schwarzinger et al. [25]	Consequence (energy related behaviour)	Meso Level (“energy lifestyle” groups of Austrian citizens)	Multi Domain
Schwarzinger et al. [54]	Consequence (energy related behaviour)	Meso Level (“energy lifestyle” groups of EU citizens)	Multi Domain
Sippel et al. [60]	Consequence (climate related behaviour)	Meso Level (students at a German university of applied science)	Multi Domain
Sukarno et al. [107]	Consequence (energy related behaviour)	Macro Level (Households in different Indonesian district areas)	Single Domain (household energy use)
Thøgersen [41]	Cause (housing related lifestyle model as descriptive typology)	Meso Level (“housing related lifestyle” groups of citizens from 10 European countries)	Single Domain (energy-saving behaviour at home)
Weber and Perrels [108]	Consequence (energy and emission relevant equipment use)	Meso Level by demography (Households in Germany, France and Netherlands, typology according to lifecycle position)	Multi Domain

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Reference	Role of „Lifestyle“	Analytical Scope	Behavioural Scope
Wei et al. [23]	Consequence (consumer choices)	Macro Level (Chinese households)	Multi Domain
Whitmarsh et al. [109]	Consequence (climate related behaviour)	Macro Level (citizens from Norfolk and Hampshire, UK)	Multi Domain

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