

Article

Unsustainable Consumption: A Systemic Exploration of Everyday Behaviours

Alexandra Ganglmair-Wooliscroft ^{1,*} and Ben Wooliscroft ^{2,†}¹ Massey Business School, Massey University, Auckland 0632, New Zealand² Marketing Department, Faculty of Business, Economics and Law, Auckland University of Technology, Auckland 1120, New Zealand; ben.wooliscroft@aut.ac.nz

* Correspondence: a.ganglmair@massey.ac.nz

† These authors contributed equally to this work.

Abstract: Overwhelming evidence suggests that we need to consume less and/or differently. Academic research and the popular media provide recommendations on what consumers should or should not do to live more sustainably. However, for the majority of consumers, the uptake of sustainable behaviours is low. Sustainable consumption finds itself in constant tension with mainstream ‘normal’ (unsustainable) behaviours. We not only need to understand more about sustainable consumption behaviours already undertaken (often by only a few consumers), but we also need a clearer picture of unsustainable consumption—the current behaviour that needs to be changed. We take a systemic approach to unsustainable consumption and, after an extensive literature review, develop a hierarchy of 25 unsustainable consumption behaviours that span multiple categories of everyday life, including the ‘big three’ (household energy use, food consumption, and personal transportation), recycling, cosmetics, and clothing purchases. Our results support that—for a broad sample of average consumers (n = 850)—unsustainable behaviours are cumulative and follow the same patterns. In everyday life, unsustainable behaviours of different categories are interspersed, supporting the need to explore multiple behaviours at the same time if systematic changes away from unsustainable consumption behaviours are required. It follows that we know in which order to address unsustainable consumption choices to move society towards more sustainable consumption norms.



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1. Introduction

Household consumption is linked to more than 70% of carbon dioxide emissions in the world [1] and is an important signal for industry of what (resource-intensive) products and services are required [2,3].

The need to consume differently and to consume less is well established. Academic research investigating the environmental/ecological impact of unsustainable or problematic behaviours is mainly found in fields like environmental science or industrial ecology [4] and is based on complex indicators that determine, for example, Greenhouse Gas Emissions (GHG) over the whole lifecycle of a product [5]. In spite of the complexities and challenges associated with measuring negative impacts, there is agreement that three areas of consumption—food and beverages, household energy use, and personal transportation—are responsible for the majority of household consumption emissions [6].

In the mainstream media, consumers can find recommendations and lists compiled by various organizations about what they should or should not do to live sustainably or environmentally friendly; for example, “Five tips for living more sustainably” [7]; “12 ways to live more sustainably” [8]; and “Sustainable Living: 59 Tips for a more sustainable lifestyle” [9]. The high visibility of sustainability is reflected in national surveys reporting that consumers think sustainability is important and mainstream. While 78 percent of US consumers say that a sustainable lifestyle is important to them [10], 87% of New Zealanders consumers state that sustainability is a mainstream concern [11].

In spite of this high awareness, most sustainable behaviours have not reached the mainstream [12]. Although there is growth in sustainable consumption, its uptake in the general population is slow [13]. Even in a country like New Zealand, which has a strong market position as ‘clean and green’—for example, through its long-running campaign for a 100% pure New Zealand (<https://www.newzealand.com/nz/>, accessed on 21 November 2024)—only recycling is undertaken by almost all consumers, and even in that area, only 58% of packaging material is recycled [14]. Organic products only have a market share of 2.5% in the grocery market [15], and while the number of Flexitarians (people who have some meat-free meals or meat-free days) is on the rise, 93% of New Zealanders eat red meat [16]. This low percentage of vegetarians is also found in other Western developed countries; for example, 4% of Americans consider themselves vegetarian [17], and while sales revenue of organic groceries are rising, the increase is mostly due to price rather than volume increases [18].

Extensive research has investigated barriers and motivations to consume sustainably (e.g., [3,19]), but we also need a clearer picture of unsustainable consumption—the current behaviour that needs to be changed. Consumer behaviours do not happen in isolation but build a consumption system, containing multiple inter-related behaviours [12] that are influenced and constrained by social norms and cultural meanings [4]. For the majority of the population, unsustainable consumption is the ‘normal behaviour’, behaviour that reflects the social norm, with multiple feedback loops locking in ‘normal’ behaviour. An exploration of (un)sustainable consumption systems also highlights that consumers are influenced by and dependent on other players in the market, most notably businesses and government policy.

Based on an extensive literature review, this paper develops a hierarchy of (everyday) unsustainable consumer behaviours (U-SCBs)—behaviours that are not environmentally or socially sustainable. U-SCBs span multiple categories of (everyday) consumption and reflect patterns of consumption. This research extends our knowledge of complex consumption systems [12]. Using a consumer behaviour lens, this study develops the first behavioural hierarchy of unsustainable consumption using Rasch Modelling [20] contributing to and extending existing research on consumption hierarchies [21–25]. It further shows the complexity of unsustainable behaviours and their measurement.

Literature Review: Unsustainable Behaviour and Some Key Reasons for It

Consumption, including sustainable and unsustainable consumption behaviours, is complex and influenced by many personal, contextual, and situational factors that restrict behavioural choices [6]. While in theory, consumers can make (sustainable) choices, in large parts of their everyday lives, consumers are “locked-in in infrastructures, social norms and habits that limit consumer choice in practice” [26] (p. 1220).

A large number of studies investigate how and why people consume sustainably, often focusing on the environmental facet of sustainability and on one behaviour or behavioural area (e.g., recycling [27,28]), as well as on investigating a small group of already sustainable consumers rather than the general population [12]. In the marketing discipline, [29]

provide an extensive review of the academic literature exploring how to shift consumers to sustainable consumption—their SHIFT framework explores five categories relating to social influence (S), habit (H), individual self (I), feelings and cognition (F), and tangibility (T), and how they can be applied to encourage changes in behaviour.

The number of studies that look at unsustainable behaviours—behaviours that consumers should not undertake—is comparably small, even though “research on environmentally harmful behaviour is equally important for environmental policy” [4] (p. 85). Given its frequency, unsustainable behaviours undertaken by a large group of people will cause more damage than the positive effect of a small number of people who are virtuous consumers. Policy makers need to understand what unsustainable behaviours are undertaken, behaviours that are undertaken concurrently and how widespread they are in the population to target interventions effectively, targeting particularly unsustainable consumers to move the dial.

Ecological economics is the disciplinary base of several unsustainable consumption studies focusing on aspects like the price of consumer goods and overconsumption [30], affluence and the role of consumer credit relating to unsustainable consumption levels [31], or an exploration of resource caps and their policy and societal implications [32].

Ref. [33] provide an extensive review and classification of various forms of behaviour cessation, including voluntary and involuntary changes in behaviour (for example, due to policy and/or law changes), the involvement of conscious thoughts (for example, deciding to give up smoking), and the length of cessation (temporarily giving up alcohol consumption). Except for specific health-related research (e.g., smoking cessation) the long-term, voluntary, and conscious dis-adoption of behaviours has received less systematic attention than the adoption of new behaviours, for example, Rogers’ (1995) [34] Diffusion and Adoption framework [33].

All consumption has some environmental and/or social impact, and one key challenge is to determine behaviours with the most impact (e.g., the highest CO₂ emissions). For example, Ref. [35] suggest that in the U.S., private motor vehicles account for 38% of household energy use, followed by heating, air conditioning, and hot water (19%, 6%, and 6%). However, their study did not include any aspects of food consumption, which other studies include as having one of the highest mitigating potentials [5].

Unsustainable consumption behaviour has been explored in select studies; for example, Ref. [36] explored inter-related factors that drive (growing) unsustainable consumption while other studies looked at specific aspects of unsustainable behaviours, for example, the unsustainable food consumption of students [37] or consumers’ views on unsustainable consumption and their perceived responsibilities [38].

Consumer studies frequently include demographic characteristics, though their impact is complex. Research on sustainable consumption has sometimes found positive relationships between sustainable consumption and age [39] or being female [40,41]. However, there is increasing agreement that demographics provide limited explanations when exploring sustainable behaviours [42,43].

On the other hand, personal values are strong drivers of sustainable behaviours with self-transcendent values, especially universalism, showing a positive relationship [27,44,45], while self-interest values like hedonism are negatively related to pro-environmental or sustainable behaviours [46]. These personal influences are expected to also provide some explanation for unsustainable consumption, albeit in the opposite direction.

The remainder of this literature review will discuss key literature streams that explore (un)sustainable decision making and reasons for behaving (un)sustainably, in particular deliberate, rational decision making versus sub-conscious decisions like habits and the influence of social norms. A large body of research views consumers as rational beings

who make well-thought-through, rational choices, which Ref. [47] calls ‘Reasoning’ (or ‘System 2: Slow Thinking’). Many studies explore consumers’ attitudes towards sustainable consumption behaviour using variations and extensions of multi-attribute models, for example, the Theory of Planned Behaviour (ToPB) [48]. Attitudes research assumes that consumers have a “propensity to produce an evaluative response” [49] (p. 329). Attitudes, in conjunction with perceived social pressure to perform in a certain way [50], influence rational, conscious behaviour [49].

Many behaviours, including unsustainable behaviours, are undertaken without thinking, or without making a conscious choice [51]. Behaviour that is governed by automatic or unconscious processes is discussed by [47] as ‘Intuition’ (or ‘System 1: Fast Thinking’). Fast Thinking is also related to the use of heuristics [52], when only a very limited number of choice criteria are considered, e.g., buying the cheapest option or buying fair trade [36]. In a heuristic decision making context, if an attribute like ‘sustainable’ or ‘environmentally friendly’ is not top of mind, it will not be considered at all [53]. Previous research on sustainable grocery shopping in New Zealand has shown that for roughly 80% of consumers, ‘sustainable’ was not considered [54].

Habits and habitual behaviour refer to situations where no conscious choice is made at all. Habits are “a memory-based propensity to respond automatically to cues that led to performance of behaviour in the past” [49] (p. 329). They are characterized as having three important pillars: automaticity, context, and repetition. A stable context and consistent cues are essential to trigger an automatic (habitual) behaviour, and when that habitual behaviour is triggered, control has shifted from the person to the environment [53]. This automaticity also explains why established habits are hard to change, and why information-based campaigns generally have little effect on habitual behaviour [51]. A consumer might be aware of sustainable options, consider sustainable behaviour important (e.g., report highly positive pro-environmental attitudes), and even plan to act sustainably but when they are exposed to a particular cue (going supermarket shopping) with familiar choice architecture, unsustainable behaviour is triggered automatically [49].

Personal habits are embedded in larger structures that outline ‘how I do things’; they are part of personal routines like cooking or shopping [51]. At the social level, habits are part of social practices, which are defined as “a routinized way in which bodies are moved, objects are handled, subjects are treated, things are described, and the world is understood” [55] (p. 250)—‘how we do things’.

Social practices are bundles of behaviours that are culturally meaningful [51]; for example, the social practice of cooking meals or going shopping consists of multiple, culturally determined actions and activities shared by members of a society. Mirroring individual habits, these shared actions are primarily habitual with only “brief moments of deliberation and change” [6] (p. 387).

Social norms also govern stable social practices [56]. They set “what is normal, proper, sanctioned, or expected behaviour” [57] (p. 3) and set “predominant behaviours, attitudes, beliefs and codes of conduct of a group” [50] (p. 1). Social norms and any changes in social norms have gained attention as possible solutions for dealing with environmental challenges, but they can also be viewed as barriers to change [56] as they sanction collective unsustainable behaviour.

In an extensive review, Ref. [49] integrate the literature on habits, and attitudes to discuss key relationships between these two constructs and how they enable or hinder behavioural change. Their research shows that changing everyday behaviour using an attitude-based information campaign will not be successful. Once behaviour is habitual, providing additional information has little effect, and attitude-based campaigns are wasting limited resources and effort. A change in the choice architecture is required to disrupt estab-

lished (habitual) behaviour, and friction relating to these ‘choices’ needs to be introduced or reduced to cause long-term change [49,58].

Everyday household consumption is associated with habitual behaviour [51], as well as social practices [6,55] and is rooted in social and cultural norms [5,56]. Consumers are further trapped in systemic interdependencies [26], and behavioural change also requires changes in business practices and public policy interventions and regulations [12]. While changes in consumption are necessary, the current (relatively) stable choice architecture and related structural cues mean that mainstream consumers will largely continue with their established unsustainable behaviours. In addition to increasing our understanding of barriers and enablers for sustainable behaviour change, it is therefore essential to understand the current status quo—the pattern and sequency of unsustainable consumption behaviours undertaken by mainstream consumers.

2. Material and Methods

This research is based on a commercially acquired dataset containing responses from 850 New Zealanders (age 18 years and older). A reputable market research company was contracted to provide a sample that broadly reflects the demographic characteristics of consumers in the country in terms of age (18 years+), gender, income, and geographic location.

While the sample was required to broadly represent New Zealand consumers, the main emphasis was on data quality and the questionnaire included multiple attention checks, checks for flat-lining answers, and no missing answers on the main question battery, in addition to the research company’s internal quality standards. The online survey was evaluated by the first author’s university research ethics process and considered low-risk (MU Ethics Notification Number: 4000025290).

The sample has a mean age of 49 years, spanning from 18 to 85+ years, 58% of respondents are female, and the average income is NZD 80,000–89,000. In total, 58 percent of the sample are in some form of employment, 20% are retired, 8% are homemakers, and 7% each are students or unemployed.

The core of the online survey consists of 31 questions that cover a range of unsustainable consumption behaviours and form the base for a hierarchy of unsustainable consumption behaviours (U-SCBs). Providing a mirror image to previous research on ‘ethical consumption behaviours’, the behaviours undertaken reflect consumers’ lack of drive to consume sustainably (their unsustainable-ness) and the structural restrictions they encounter [59]. U-SCBs are conceptualized as single-dimension, containing behaviours that spread widely in terms of the required (time and monetary) effort. The unsustainable behaviours are assumed to be cumulative, and the order and pattern of behaviour are consistent within the population. In line with previous research that developed hierarchies of consumption, including ownership patterns for durable goods [24], ethical consumption [25], pro-environmental behaviour [21,22,60], and sustainable consumption [12,54], Rasch Modelling [20] was used to construct U-SCB.

The following section discusses the item development for U-SCB before providing an overview of the data analysis technique, Rasch Modelling.

2.1. Unsustainable Consumption Hierarchy: Item Development Process

The aim of this study is to include a broad range of unsustainable consumption behaviours (U-SCBs) that cover various aspects of everyday consumption. Consumption behaviours can be categorized based on their frequency, from a one-time decision (e.g., buying an electric vehicle), to frequently repeated behaviours (weekly shopping lists) or repeated but infrequent behaviours (e.g., vehicle maintenance) [61]. The item development for U-SCBs focused on frequently undertaken—everyday—unsustainable behaviours with

some impactful infrequent behaviours that are prominent in the literature (for example, the choice of a large car/SUV occurs infrequently, but the vehicle is typically used daily).

The development of U-SCB items is based on 9 academic studies that focus on the (environmental) impact of behaviours [5,6,35,53,60,62–65]. These studies were published in different disciplines (environmental science, psychology, and ecology) and contain various degrees of specificity, ranging from the general discussion of the big three areas of life that are responsible for most emissions—household energy consumption, food, and personal transport [66]—to long lists (up to 50 items) of specific environmental behaviours [60]. In addition, popular media were consulted to include areas of daily life that might not be prominent in the academic literature.

In line with qualitative techniques commonly found in marketing research, a quasi-thematic analysis was conducted [67] by extracting behaviours from each article, before they were categorized according to their underlying themes. This categorization ensured that the included items cover a variety of behavioural categories to reflect the broad view of everyday unsustainable consumption taken in this research.

The number of items/behaviours included in the final questionnaire also had to be manageable in an online survey. Based on the authors' previous experience with Rasch Modelling [20], between 25 and 35 behaviours were sought. In line with Rasch Model [20] requirements (discussed below), the items did not have to cover any and all unsustainable behaviours but rather cover different levels of effort required and provide a broad representation of the phenomena under investigation [12,59]. In the case of unsustainable behaviours, this could mean how easy or how common it is to consume in a certain way, e.g., if (almost) everybody buys groceries only on price, it is 'easy' to do that, while other behaviours that reflect 'wasting electricity' (e.g., having inefficient appliances) might be less common or less socially acceptable.

For this study, unsustainable behaviours needed to be under individual control for most New Zealand consumers; in particular, they had to be appropriate for homeowners and people who rent (the relatively short time orientation of the New Zealand rental market means that people renting generally do not make a large investment in heating/cooling, insulation, and hot water preparation).

The aim of the item development process balanced four goals:

- Impactful behaviours (e.g., behaviours that have high CO₂ equivalent emissions);
- Behaviours covering different aspects of everyday life (including the big 3: food and drink, personal transport, and household energy use, but also other areas of daily life);
- Behaviours that require different levels of effort (time, energy, and finances);
- Behaviours that are relevant for most consumers.

An initial extraction of behaviours discussed in the 9 papers led to 263 suggestions that were categorized into 7 categories and 15 sub-categories as shown in the first 4 rows in Table 1. The categories cover three areas that are generally regarded as causing the most emissions in household consumption—personal transport, food and energy consumption—plus recycling, clothing, and environmental and social engagement (bold headings below). One further category was prominent in popular media (e.g., sustainable lifestyle blogs) but not discussed in the academic papers consulted—beauty products [68,69]. It was decided to add that category as it covers an additional facet of everyday life (bold and italic heading below).

Table 1. Categories and sub-categories of unsustainable behaviour.

Transport Model and Type	Car Maintenance and Driving
<ul style="list-style-type: none"> • Car alternative • Carpooling/combining trips • Car type • Flights 	<ul style="list-style-type: none"> • Driving behaviour • Repair and maintenance
Food and Drink	Energy Use
<ul style="list-style-type: none"> • Dairy and meat • Food waste • Highly processed food • Local food 	<ul style="list-style-type: none"> • Insulation • Whiteware • Appliance use
Packaging and Recycling	Environmental and Social Engagement
<ul style="list-style-type: none"> • Packaging • Recycling 	
Clothing	Beauty

bold font = category level; normal font = sub-category level, italics = based on popular media.

Table 2 visualizes the item development process for U-SCBs in more detail. Expanding the information provided in Table 1, it shows the sub-categories, including references, to the specific studies and more detail of the consumption behaviours discussed. Almost all studies referred to the desired sustainable behaviour (eating no meat; taking public transport), rather than the unsustainable behaviour that is (still) undertaken by consumers. Italics in Table 2 indicate the items that were originally phrased as ‘unsustainable behaviours’, most often in Kaiser and Lange’s (2021) study [60] (e.g., *driving a car into the city; taking a plan for longer trips, high driving speed, buying convenience food; disposing of batteries in the garbage*). Studies and behavioural lists focusing on desirable sustainable behaviours, rather than unsustainable behaviours, mirror a general lack of research to understand unsustainable consumption [66].

Table 2. Detailed item development process and 30 statements of unsustainable behaviour.

Category and Sub-Category	References and Extracted Keywords	Unsustainable Behaviour: Statement in Survey
Transport Mode and Type		
Car—alternatives	[62]: car to public transport [5]: car to public transport/less car/active transport [60]: short distance: car to public or active transport/work or school: active or public transport/ <i>drive car into city</i> [53]: short distance: walk/cycle; <u>take train</u> for day out	I avoid using public transport When I leave the house, I automatically take the car
Carpooling and combining trips	[63]: carpooling and trip chaining [35]: carpool to work/combine trip [5]: carpool/car share	I am alone in the car most of the time
Car type	[62]: smaller car/EV [5]: smaller car	I own a large powerful car/SUV/ute
Flights	[5]: less flights [60]: <i>longer trips: take airplane</i>	I fly as often as I feel like
Car maintenance and driving		
Driving behaviour	[62]: eco-driving [63]: driving behaviour [5]: fuel-efficient driving [60]: <i>driving speed; engine running</i>	I enjoy high performance driving

Table 2. Cont.

Category and Sub-Category	References and Extracted Keywords	Unsustainable Behaviour: Statement in Survey
Repair and maintenance	[63]: routine car maintenance [64]: car repair and service [35]: frequent car tune-up [65]: car repair and service	I wait until there is something wrong with my car before I get it serviced
Food and drink		
Diary and meat	[60]: vegetarian [5]: vegan, vegetarian, and sustainable diets/fewer animal products [62]: from ruminant meat to other protein [5]: lower-carbon meats [64]: meat and poultry [65]: sausages and prepared meat [6]: meat, poultry, and beef [64]: cheese/milk [65]: milk [6]: cheese [53]: sustainably produced food	I eat meat daily I buy eggs only on price I buy chicken and pork only on price I buy food regardless of any environmental label
Food waste	[62]: reuse food waste [5]: food waste reduction [60]: <i>dispose leftovers</i> [6]: dispose of organic waste	I throw out food when it reaches its best before date
Highly processed	[62]: healthy, fresh food to replace processed food [5]: less processed food [60]: <i>buy convenience food</i> [65]: processed food	I regularly buy processed food (prepared meals, prepared sauces)
Local	[5]: regional, local, seasonal, and fresh food [60]: seasonal produce [53]: seasonal food	I don't pay attention to where the food I buy is produced I buy fruit and vegetables regardless of the season
HH energy use		
Using appliances	[64]: general appliance use [62]: energy-efficient appliances [35]: small electric appliances [5]: more efficient appliances/better use of appliances/few appliances [65]: use of cooking equipment [64]: use of HH appliances [53]: switch off appliances	I buy household appliances primarily on price I don't pay attention to how and when I use my appliances
Whiteware	[62]: smaller fridges [64]: fridge/freezer; HH laundry equipment use [35]: efficient fridge/freezer; washing machine [63]: laundry temperature/line drying [35]: wash clothes less hot/line drying [5]: less energy use f. clothes washing [60]: <i>use a dryer</i> [53]: wash clothes at lower temperature	I don't pay attention to the energy efficiency of my whiteware
Insulation	[62]: incremental insulation options [63]: weatherization [35]: attic insulation; efficient windows [5]: thermal insulation	My house/flat does not have good insulation
Packaging and Recycling		
Packaging	[5]: less packaging; less plastic [60]: refillable containers; returnable bottles; reuse shopping bags; <i>buy beverages in cans</i> [53]: reusable shopping bags	I expect my products to be well protected and I don't mind plastic packaging I buy water in plastic bottles

Table 2. Cont.

Category and Sub-Category	References and Extracted Keywords	Unsustainable Behaviour: Statement in Survey
Recycling	[5]: recycle materials [60]: recycle empty bottles, paper; <i>dead batteries into garbage</i>	I don't recycle I accept disposable takeaway cups for my coffee
Clothing		
Clothing and fabrics	[62]: low-carbon fabrics [5]: fewer textiles [64]: natural clothing [65]: natural clothing	I wear clothes only one season I buy cheap clothes from big chains
Environmental and Social Engagement		
	[60]: boycott unecological companies; read about environmental issues. [53]: local area volunteering	If I want something I buy it—no matter how it's made If I want something, I buy it—no matter where it comes from
Beauty		
	[68] [69]	I use conventional (non-organic) beauty products I don't read the labels of beauty products

To construct the item pool for this study, items therefore had to be re-worded. Choosing unsustainable behaviours and appropriately wording the statements to be included in the final questionnaire was an extensive and highly involved process. Negative phrases should be kept to a minimum to avoid negative framing and social bias (e.g., avoiding statements like “I do not [save water]”), and ambiguity/contradictions should be reduced as far as possible (e.g., in New Zealand, a heat pump is generally used for heating and for cooling; to dry clothing in a damp and cold location, using a dryer can be more energy efficient than heating a room).

After extensive considerations and discussions, 29 unsustainable behaviour statements were selected for this first exploration of cumulative unsustainable behaviours that cover broad areas of consumers' daily lives. They are shown in the right-hand column in Table 2.

In the questionnaire, the items were presented in the same order as shown in Table 2, in a binary format (yes/no answers), to reduce cognitive strain on respondents [70,71]. The item battery was introduced as follows:

We all buy things every day—consumption is an important part of life. Below are a lot of things that you might do or products you might buy as a consumer.

Please carefully read through the statements and tick yes if this describes your normal behaviour or no if it does not describe your normal behaviour

Please remember that there is no wrong or right answer and that your answers are anonymous—it is important that you answer honestly.

2.2. Using Rasch Modelling to Construct a U-SCB Hierarchy: An Overview

Rasch Measurement Theory, developed by Georg Rasch in the 1960s [20], is an alternative to the dominant Classical Test Theory [72]. The Rasch Model specifies what data have to look like to constitute measurement and leaves the question of whether that is achieved to the empirical investigation [73]. The Rasch Model is part of the logit-model family, with the following formula:

$$P_{ni}(x_{ni} = 1) = \frac{e^{\beta_n - \delta_i}}{(1 + e^{\beta_n - \delta_i})}$$

with

$P_{ni}(x_{ni} = 1)$ = the probability that person n endorses ($x = 1$)

item i δ_i = the item location parameter of item i

β_n = the person parameter for person n

The Rasch Model has been described as a probabilistic Guttman Scaling [74]. It specifies that the probability of endorsing an item/behaviour ($x = 1$) depends on the item location parameter—the endorsability of an item—and the person’s characteristic on the concept of interest—in this study, the propensity to consume unsustainably [73,75].

Rasch Modelling is extensively used in education and psychology research [75], particularly environmental psychology [21,22,60,76], and applied in different marketing and consumption contexts [12,24,25,54,59,77–79].

Detailed theoretical discussion of the model can be found in [75] or [73]—the latter focusing on marketing contexts. The following explanation outlines key steps when applying a Rasch analysis (for a more detailed exploration in similar contexts, please refer to [25] or [12,59]).

The process of conducting a Rasch Analysis is similar to a stepwise regression: starting with all proposed items/behaviours, the fit of each individual reported behaviour is compared to the theoretical Rasch Model. Sophisticated Rasch analysis software programs like RUMM2030 [80,81] used in this study, provide a range of fit statistics and graphical observations. Empirical observations will always diverge from the theoretical ideal to some degree and it is therefore the researcher’s responsibility to evaluate whether the data fit the model to an acceptable extent [73]. The acceptable level of divergence and researchers’ judgements are related to the breadth of the phenomena under investigation and to the context of the study [82].

In RUMM2030, individual item fit is measured using an Item Residual Statistic (a value of $<\pm 2.5$ is expected) and a Chi-square probability (with a non-significant result expected >0.01) [73]. If an item’s fit statistic reveals an unacceptable misfit compared to the theoretical model, the item’s characteristics are further investigated, and it might have to be deleted for future analysis. Items that are deleted/excluded do not follow the theoretical requirements of the Rasch Model, e.g., the meaning of that statement is interpreted differently in the population and the item does not sufficiently fit the (predominantly) unidimensional conceptualization of unsustainable consumption behaviour. This iterative process is repeated until all remaining items fit the Rasch Model to an acceptable extent.

Additional indices are consulted in order to investigate whether there is a systematic answer bias (Differential Item Functioning—DIF, [81,83]) for groups among the respondents (e.g., systematic answer patterns based on gender). Once all key statistics are at an acceptable level, items/behaviours and respondents can be projected onto one dimension. The original binary Rasch Model applied here (see Formula 1 above) allows items/behaviours to be investigated in a binary (yes/no) format while the results are projected onto an interval scale. This allows the meaningful interpretation of differences between respondents and items/behaviours [25]. Previous studies have shown that asking questions in a binary format (compared to Likert-scale data) leads to a minimal loss of information [70,84] while reducing the cognitive effort required from respondents [71]. Another important characteristic of the Rasch Model is that it does not require identical items in future applications—once the fit of the items/behaviours is established, future applications allow the addition/deletion/substitution of some behaviours [85]. This characteristic is particularly important in the hierarchy development stage, as discussed in the current study.

3. Analysis and Results

For the Rasch analysis, all 850 cases were entered into RUMM2030 [80]. The item battery containing unsustainable behaviours represents the core of this online survey, and the researchers negotiated strict quality criteria with the market research company, including that no missing responses would count towards the paid sample.

The U-SCB hierarchy development followed steps similar to a stepwise regression analysis, where at every step, the empirically observed answers are compared to the theoretical (ideal) model and any misfitting items are carefully investigated (see item-fit characteristics discussed above). If RUMM20030-fit statistics indicate that an item shows an unacceptably high misfit, the item is further investigated and might have to be deleted from the analysis. Items that are deleted/excluded do not follow the theoretical requirements of the Rasch Model, e.g., the meaning of the statement is interpreted differently in the population and the item does not fit sufficiently with a (predominantly) unidimensional view of unsustainable consumption. In the current analysis, this led to the deletion of five items. Table 3 shows that these items relate to four categories. Both (all) items in the Social and Environmental engagement domain had to be deleted from the analysis, indicating that this aspect of U-SCBs reflects a different behavioural dimension.

Table 3. Misfitting items that were deleted from the U-SCB hierarchy.

Item/Statement	Category
I buy food regardless of any environmental label	Food
I expect my products to be well protected and I don't mind plastic packaging	Packaging and Recycling
I use conventional (non-organic) beauty products	Beauty
If I want something, I buy it—no matter where it comes from	Social and Environmental Engagement
If I want something I buy it—no matter how it's made	

Once these items were deleted, the remaining 24 items fit the Rasch Model to a satisfactory extent (item residuals within ± 2.5 ; Chi-square statistic > 0.01). The items are interpreted consistently among the respondents, and they follow the same pattern of cumulative behaviours. Table 4 shows item location (in logits) and the detailed fit statistics for every item. All fit residuals are within ± 2.5 , and their Chi-square probability is > 0.01 , supporting that all remaining items fit the Rasch Model to a satisfactory extent.

Table 4. Item location and fit statistics for a U-SCB hierarchy.

	Location (in Logit)	Fit Residual	Chi ² Probability
I wear clothes only one season	3.02	−0.54	0.79
I don't recycle	2.49	−0.59	0.48
I fly as often as I feel like	1.03	1.22	0.03
I own a large powerful car/SUV/ute	0.78	1.40	0.15
My house/flat does not have good insulation	0.78	1.73	0.07
I wait until there is something wrong with my car before I get it serviced	0.49	0.35	0.45
I throw out food when it reaches its best before date	0.45	0.14	0.81
I buy water in plastic bottles	0.41	0.19	0.94

Table 4. Cont.

	Location (in Logit)	Fit Residual	Chi ² Probability
I don't pay attention to the energy efficiency of my whiteware	0.22	−0.76	0.07
I enjoy high performance driving	0.20	2.17	0.84
I don't pay attention to how and when I use my appliances	−0.01	−1.49	0.14
I don't read the labels of beauty products	−0.14	−0.14	0.55
I don't pay attention to where the food I buy is produced	−0.15	−1.04	0.59
I regularly buy processed food (prepared meals, prepared sauces. . .)	−0.17	−1.57	0.10
I buy household appliances primarily on price	−0.57	−1.20	0.36
I avoid using public transport	−0.68	1.56	0.38
When I leave the house, I automatically take the car	−0.86	−0.96	0.47
I am alone in the car most of the time	−0.96	1.28	0.02
I accept disposable takeaway cups for my coffee	−0.98	0.73	0.48
I eat meat daily	−1.05	−0.08	0.18
I buy eggs only on price	−1.12	−0.18	0.15
I buy cheap clothes from big chains	−1.14	1.55	0.76
I buy fruit and vegetables regardless of the season	−1.33	0.60	0.45
I buy chicken and/or pork only on price	−1.79	−1.11	0.16

Figure 1 projects items and persons onto the same dimension and shows that both spread appropriately over the investigated dimension. The respondents (lefthand side of Figure 1) follow a relatively normal distribution—the higher up a person is located on the U-SCB hierarchy, the more unsustainably they behave while people at the lower end of Figure 1 show the least unsustainable behaviours.

The (red) horizontal line in Figure 1 represents the position of the average respondent. For example, an average person has a high (at least 50%) probability of undertaking unsustainable behaviours right below that line (*buying household appliances on price* and *avoiding public transport*), with the highest probability of undertaking the behaviours at the bottom of the hierarchy (*buying chicken and eggs only on price*).

Looking at Figure 1, the items tend to crowd together but still spread sufficiently over the dimension. The higher up an item is, the more 'extreme' the unsustainable behaviour is. For example, hardly any respondents *wear clothes only one season* or *do not recycle*. And, in line with the cumulative nature of Rasch Modelling, if these behaviours are undertaken, then all other unsustainable behaviours are very likely undertaken as well.

This is the first time that multiple everyday unsustainable behaviours were investigated in a systemic and hierarchical form, and the results have to be viewed as an initial and exploratory investigation of that phenomena, to our knowledge. The progression of behaviours in the hierarchy (from the bottom of the hierarchy to the top) and their relative location of items make sense. The initial U-SCB hierarchy has face validity. Taking the probabilistic nature of Rasch Modelling into account, the 24 items/behaviours are interpreted consistently throughout this broad sample of respondents. The results of the U-SCB hierarchy are therefore theoretically satisfactory and useful for further investigation.

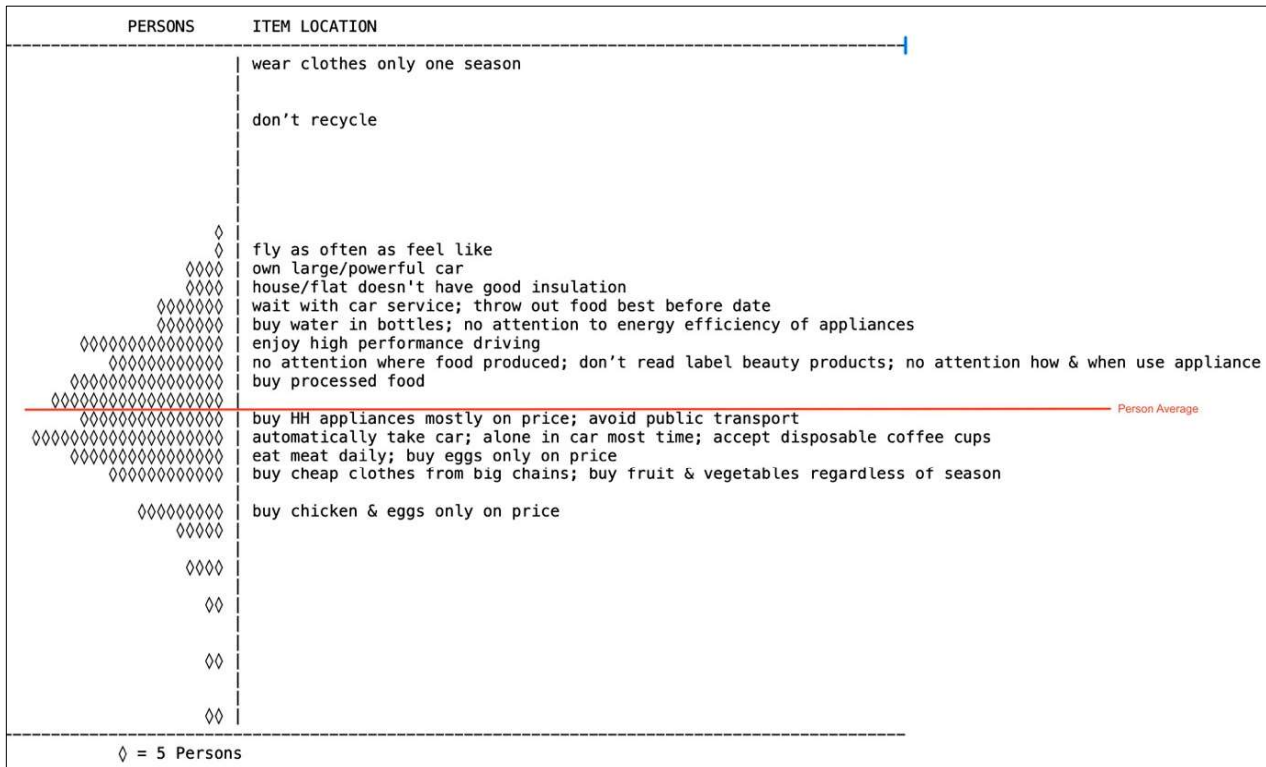


Figure 1. Distribution of respondents and items on the U-SCB hierarchy.

A preliminary investigation of demographic characteristics and personal values on the U-SCB person location supports the previously made assumption that variables that explain (or do not explain) sustainable behaviours are also related to U-SCB, but in the opposite direction. Table 5 shows the results of a regression analysis including age, gender, and household income of respondents as well as the self-transcendence value of universalism and the self-interest value of ‘hedonism’.

Table 5. Location on U-SCB hierarchy and personal characteristics.

	Standardized Beta	Significance
Self-transcendence value: ‘universalism’	−0.18	<0.01
Self-interest value: ‘hedonism’	0.17	<0.01
Age in years	−0.13	<0.01
Gender (base = male)	−0.08	0.18
Combined household income	−0.03	0.35

Linear regression: DV = U-SCB person location; F value: 14.353, $p < 0.01$; adjusted R-square = 0.07.

While the regression analysis is highly significant ($p < 0.01$), the adjusted R-square is 7%, indicating that these personal characteristics only explain a small part of U-SCBs. Within these variables, personal values have the strongest influence on the U-SCB hierarchy position, while age and to a small extent gender are also relevant: lower levels of U-SCBs are related to an increasing importance of universalism as well as to being older and female, while hedonism is positively correlated with U-SCB.

4. Discussion

Figure 2 shows a colour-coded representation of the U-SCB items and their pre-assigned categories: behaviours relating to food are in red, transportation in blue (mode and type in dark blue; car maintenance and driving behaviour in light blue), household

energy consumption in green, recycling and packaging behaviours are in grey, clothing is in purple, and beauty in pink.

Reported Behaviour & Colour Coded Categories	Similar Location *
I wear clothes only one season	3.02
I don't recycle	2.49
I fly as often as I feel like	1.03
I own a large powerful car / SUV / ute	0.78
My house/flat does not have good insulation	0.78
I wait until there is something wrong with my car before I get it serviced	0.49
I throw out food when it reaches its best before date	0.45
I buy water in plastic bottles	0.41
I don't pay attention to the energy efficiency of my whiteware	0.22
I enjoy high performance driving	0.20
I don't pay attention to how and when I use my appliances	-0.01
I don't read the labels of beauty products	-0.14
I don't pay attention to where the food I buy is produced	-0.15
I regularly buy processed food (prepared meals, prepared sauces...)	-0.17
I buy household appliances primarily on price	-0.57
I avoid using public transport	-0.68
When I leave the house, I automatically take the car	-0.86
I am alone in the car most of the time	-0.96
I accept disposable takeaway cups for my coffee	-0.98
I eat meat daily	-1.05
I buy eggs on price	-1.12
I buy cheap clothes from big chains	-1.14
I buy fruit and vegetables regardless of the season	-1.33
I buy chicken and/or pork only on price	-1.79
Codes for Background Colour: Transport Mode and Type; Car Maintenance & driving; Food & Beverages; HH Energy Use; Packaging & Recycling; Clothing; Beauty * Orange boxes = difference less than 1% of scale (<0.045)	

Figure 2. Interspersed U-SCB Categories.

4.1. Category and Type of U-SCBs and by How Many People Are They Undertaken

At the bottom of the hierarchy are the unsustainable behaviours that are most likely to be undertaken. They often relate to grocery shopping (buying pork/poultry and eggs only on price; buying produce irrespective of if they are in season; and eating meat on a daily basis). Many items that are undertaken by most respondents (found at the bottom of Figure 2) have financial implications—buying the cheapest ('only on price'), including buying cheap clothes. Consumers might not be unsustainable on purpose, but they rather emphasize

‘saving money’ over, e.g., concerns for the environment. The frequent endorsement of ‘accepting disposable coffee cups’ is likely related to the general popularity of takeaway coffee, which is a stable component of many people’s lives. While there are enticements to using one’s own cup—including price reductions for bringing a reusable cup—at many NZ coffee shops, the convenience of accepting the readily available disposable cups appears to dominate.

The ‘blue’ groups of items towards the bottom refer to personal transport, using a car—automatically when leaving the house and/or mostly alone, as well as the active avoidance of taking public transport. The remaining two items that relate to personal transport are found at the top of the hierarchy and are endorsed by only a small group of respondents: flying and owning a large, powerful car or SUV. Both responses have high costs associated with them and, in addition to any environmental concerns, consumers might not be able to afford them.

When the focus shifts to the third big group of behaviours causing emissions—household energy use, it can be seen that the items are spread throughout but are mostly found at the top half of the hierarchy. Most of these unsustainable behaviours are—again—costly: not paying attention to energy efficiency or the use of appliances and whiteware will result in higher electricity costs.

4.2. The Importance of Price in Unsustainable Consumption

The prominence of price, and on ‘buying only on price’ is evident among the most frequently undertaken everyday U-SCBs (at the bottom of Figure 2). On the other hand, behaviours that might lead to increased future expenditure—for example, ‘not paying attention to the energy efficiency of whiteware’ or ‘waiting until something is wrong before getting the car serviced’—are seldom reported. The presented results suggest that when un-desired, unsustainable behaviours are investigated, lower prices or cost savings are key. This finding provides alternative yet supporting evidence to previous research that showed that while price played a major role in the decision making for sustainable groceries, only about 20% of consumers assigned any weight to ‘sustainable’ as a purchase criterion [54].

4.3. Everyday, Habitual Behaviours and Infrequently Undertaken U-SCBs

Figure 2 also shows that U-SCBs that are undertaken by most respondents (at the bottom of the U-SCB hierarchy) relate to everyday behaviours like grocery shopping (buying meat, produce, and eggs) and to personal transportation (taking the car). Previous research suggests that grocery shopping or transportation choices are largely habitual [51]. Given the large number of people who undertake that behaviour, it can be concluded that these unsustainable behaviours reflect a social norm; they are expected, normal behaviours [4] and part of existing social practice [6,26]. Changing these widely undertaken unsustainable behaviours to more sustainable options—e.g., consuming no/less meat, or at least choosing free-range, organic, and local options, or choosing active or public transport instead of using the car—will require a change in the encountered cues. Businesses and public policy makers need to change the situational context to change these established habitual behaviours of a large proportion of consumers [12]. Most behaviours at the top of the hierarchy—that are undertaken by a truly unsustainable albeit small group of consumers—relate to one-off or infrequent consumption choices (buying a car, buying whiteware, and having the car serviced). Consumers are generally more involved in these more costly behaviours that are based on rational choices and reasoning [47]. For these—frequently costly—more involved behaviours, decisions might follow (at least part of) the Theory of Planned Behaviour [48], and consumers will pay attention to the attitudinal formation provided [49].

4.4. Interspersed Nature of Different Everyday Consumption and Spill-Over: Unsustainable Lifestyle Patterns

Previous research emphasizes that individual behaviours should be regarded as part of a pattern of consumption that represents a consumer's lifestyle [5] and has shown that, e.g., sustainable behaviours are part of a consumption system [12]. Figure 2 supports and extends these findings to include the consumption system of unsustainable behaviours. Different categories of everyday unsustainable behaviour are interspersed—the average consumer did not only report unsustainable behaviours relating to various aspects of grocery shopping (including price, seasonality, processed food), but they also choose cheap clothing, they are generally driving on their own, avoid public transport, and buy appliances primarily on price.

Several pairs or groups of U-SCBs are located very close together (see orange boxes in the second column 'Similar Location'), and it is suggested that behaviours between the grouped items spill over [44,85]. If a consumer undertakes one of these unsustainable behaviours, they are very likely to also undertake the other(s). Looking at the colour coding, it can again be seen that these behaviour bundles span different consumption categories. For example, 'buying cheap clothes from big chains' and 'buying eggs only on price' or 'not paying attention to energy efficiency of whiteware' and 'enjoying high performance driving'. These behaviour bundles are very likely undertaken together, although they might belong to different everyday consumption categories, again emphasizing the necessity to look at unsustainable consumption in a holistic way.

5. Conclusions

This study presents the first hierarchy of unsustainable consumption behaviours, using a consumer behaviour lens, and provides further support for using Rasch Modelling (Rasch 1960/80 [20]) to construct behavioural hierarchies [12,23–25,59]. The final U-SCB hierarchy includes 24 individual behaviours that are undertaken in a systematic and cumulative pattern. Respondents located at the bottom of the U-SCB hierarchy are the least unsustainable, while consumers located at the top report a highly unsustainable pattern of multiple behaviours.

The item development for the U-SCB hierarchy emphasized the difficulty of capturing 'unsustainable' behaviours in a survey, without negatively framing behaviours and without communicating that these behaviours might be undesired (to avoid socially desired answers). The chosen items represent a first attempt to systematically investigate unsustainable behaviours in a holistic way, but future research will have to replicate, replace, and/or refine items. The unsustainable behaviours chosen were worded to reflect the New Zealand context, and future research will need to replicate and refine the chosen approach in other geographical locations as different social and cultural circumstances will influence consumers' experiences and the unsustainable behaviours they undertake. While the results are not generalizable to different locations, the approach presented is. The theoretical merits of the Rasch Modelling allow for the addition and/or deletion of some items, and future studies should refine and update the items included in U-SCBs to investigate the stability of the hierarchy and reflect changes in the context (e.g., geographic location and developments over time).

Future studies should investigate the influence of demographic and personal characteristics and empirically explore the role of structural and cultural influences on U-SCBs. In addition, studies should compare and contrast unsustainable consumption behaviours with already-undertaken sustainable choices [12]. The current study should be regarded as one building block within a large and complex research area.

The presented U-SCB hierarchy has face validity, it makes sense, and it allowed us to discuss four key findings:

- The category and type of U-SCBs, and how common they are in the population;
- The importance of price in unsustainable consumption;
- The location and general characteristics of everyday, habitual behaviours and infrequently undertaken U-SCBs;
- The interspersed nature of different everyday consumption and spill-over: unsustainable lifestyle patterns.

These key findings also highlight the complex nature of unsustainable consumption and related policy implications. The suggested influence of price ('saving money'), social norms ('everybody else does it, too'; 'it is expected/normal behaviour), or the use of different decision making strategies for different unsustainable behaviours emphasize that a variety of interventions will be required. The high prevalence of many unsustainable behaviours suggests that consumers alone will not shift away from unsustainable behaviours (fast enough). We need systemic change that includes the government/policy makers, businesses, and consumers.

The interspersed nature of some unsustainable behaviours, as well as the preliminary findings about the positive correlation between the importance of hedonism and the negative correlation of unsustainable behaviours, provide additional challenges. Mirroring findings from sustainable consumption, personal values appear to be important drivers of unsustainable behaviours. In addition (and also in line with existing research on sustainable consumption) household income does not play a significant role. These results suggest that if unsustainable consumption behaviour should be reduced overall, social marketing campaigns that target universalism and hedonism as cultural values and change social norms will be required.

Policy makers should take into account that behaviours at the bottom of the hierarchy—that are undertaken by the majority of consumers—frequently refer to habitually repeated behaviours ('buying groceries only on price'). Any significant changes relating to these habitual behaviours will require a change in the choice architecture encountered as consumers undertake little (no) conscious decision making, relying on heuristics. This could require the involvement of businesses, e.g., by making an unsustainable option hard(er) to find, and public policy, e.g., relating to minimum animal welfare requirements. Habitual choices of unsustainable personal transport (e.g., automatically taking the car) will also require the co-ordination of government policies (e.g., relating to the provision of infrastructure), pricing disincentives (e.g., parking and congestion charging), and business engagement (e.g., providing sustainable mobility options/support structures).

The top of the hierarchy shows unsustainable behaviours undertaken by relatively few people. The behaviours also frequently reflect one-time decisions (buying whiteware or a car), namely decisions that are associated with higher costs (either immediately—purchase price—or in the future—running costs). Given the expensive nature of these decisions, consumers will generally use more involved/extensive decision making strategies, and information campaigns or classic marketing campaigns that change consumer attitudes will likely be more successful.

We are only at the beginning of exploring and understanding the system of unsustainable consumption. Future research will have to replicate, refine, and extend our findings to learn more about how, why, and in what behavioural patterns consumers behave unsustainably to develop effective tools for the required change towards a more sustainable lifestyle.

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