

Climate Change Behaviours - Segmentation Study

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Executive summary

The Intergovernmental Panel on Climate Change (IPCC) has stated that to keep within 1.5 degrees of global warming will require 'rapid, far-reaching and unprecedented changes in all aspects of society.' Therefore, whilst Scotland continues to lead the world in addressing climate change, it faces profound challenges in order to meet its highly ambitious greenhouse gas emissions reduction targets, set in accordance with its international obligations.

To inform a review of the Scottish Government's climate change public engagement strategy, this report identifies and evaluates different approaches to grouping or segmenting the public according to their attitudes and behaviours related to climate change. In addition, to ensure the new strategy is based on the most up-to-date evidence, it reviews the dominant ideas on how to change behaviour.

We undertook a comprehensive review of the most current literature and compared the findings against the existing ideas on how to segment the public and change behaviour. This review also identifies the most robust work upon which to base recommendations.

Regarding identifying and evaluating different approaches to segmenting the public, the review identified a large number of highly nuanced studies. In this body of work, the variables used and in which combinations varied according to the goal of the intervention (i.e., raising awareness, behaviour change) and the domain being studied (i.e. heating, transport).

Two tables summarise the main findings. Table 1 presents the results of the studies according to the goal of the intervention, and Table 2 shows the results based on the domain being studied. To provide readers access to the findings from the over 100 studies reviewed, a searchable database has been developed. This allows users to identify and analyse the evidence from a subset of studies based on their individual requirements. This can be accessed online at: [Climate Change Segmentation Studies](#).

Overall, there is a shortage of data on how effective campaigns based on segmentation are over the long term and studies focus on the USA, Australia, and the UK. Despite this, a key conclusion we can draw is that campaigns based on segmentation have contributed to an increase in awareness that climate change is occurring, and that it is driven by human activities. However, there is little evidence to suggest that existing approaches contribute to changes in behaviour by increasing awareness.

The secondary aim of this research was to review the dominant ideas on how to change behaviour. The Scottish Government's current preferred behaviour change model is based on the belief-attitude-intention pathway. This pathway proposes that individuals will most likely perform a pro-environmental behaviour (PEB) if they have formed an intention to undertake the action with beliefs and attitudes relevant to the action influencing the intention. Based on this pathway, practice and research regarding PEB change have focused on providing information and changing attitudes to support individuals to adopt low-carbon behaviours.

This approach is now questioned as it assumes people *can* make decisions to change their behaviour and that the combined impact of the actions the public can make is enough to reduce emissions equal to what is required. Instead, social influences drive many behaviours and living low carbon lifestyles rely on factors over which individually we have little or no control (i.e., availability of transport infrastructure). A broad range of barriers also block intentions to act.

Considering the scale of changes required the evidence reviewed highlights that this the belief-attitude intention pathway model is not sufficiently powerful to motivate the changes required to our lifestyles. Instead, we recommend that the most appropriate lens for guiding public engagement is to view our lifestyles as a network of interrelated practices. We make preliminary suggestions as to what these should be. As Practices consist of three elements: competencies (knowledge, skills), materials (objects, infrastructure), meaning (expectations, shared meaning), these provide the targets of interventions aiming to change unsustainable practices (or parts of them).

Key Findings

Key findings regarding how to influence behaviour change are:

- While there have been many studies published in this area recently, behaviours and practices remain the dominant lenses.
- Behaviour change research remains a highly active area, but it has not seen any fundamentally different or significantly more effective approach introduced in the last five years.
- There is a growing evidence base highlighting the limitations of focusing on changing beliefs and attitudes with the intention of changing behaviour.
- Research also highlights the limits on what individual and collective choice can achieve and the limits of 'nudging' or manipulating choice architecture. This is not to say these approaches are not effective. However, a more interventionist approach is necessary to achieve the radical changes to our lifestyles required by the Scottish Government's carbon-reduction targets.
- We find that using an interrelated practice lens rather than the existing behaviour-based approach will have significant benefits in guiding the interventions required by our climate change obligations. We argue this is due to the increased understanding it provides regarding the interrelated nature of actions, materials and cultural influences through which we organise our lifestyles.

Key findings regarding segmentation:

- Segmentation is a useful tool for helping to develop public knowledge and attitudes. However, it has limited effect on stimulating actions supporting new low-carbon behaviours over the long term when used to target information-based campaigns.
- It is challenging to identify which segmentation variables (and in which combinations) are the most effective and should be used as the basis for targeted climate change engagement. This is due to a) the broad range of variables used across the themes of housing, transport, consumption/waste, food and diet; b) inconsistent and missing evidence across a large number of studies reviewed; and c) conceptual limitations of the dominant belief-attitude-intention pathway.
- Therefore, we summarise the most important and trustworthy studies into two tables. Then, to allow users to identify the variables used and to what effect, we have formatted the available evidence into an online database.
- Table 1 provides a summary of the studies organised by their communication goal. For example, if the communication goal is to increase awareness, you can use simple scales on attitudes, feelings and concerns about climate change to segment the population.

- Table 2 provides an overview of variables commonly used for segmentation based on specific behavioural domains. Examples of insight here include encouraging different domain-specific behaviours requires the use of different segmentation variables i.e., those used to increase recycling are unlikely to work for energy or transportation behaviours.

Key findings on the relationship between climate literacy and action:

- If Scotland's communities are to maintain their ability to function and thrive in the face of climate change, citizens must understand why climate change poses such an extreme and imminent risk. They must also be empowered with the knowledge and tools to take action.
- If people understand their actions are the primary driver of climate change, then they start to understand their actions can also limit it.

Recommendations

Climate Change Engagement Strategy

- We recommend that the Scottish Government alter the focus of its climate change engagement strategy from encouraging the public to make different behavioural choices, to building widespread public support for, and acceptance of, the structural and institutional transformation required by the global climate emergency. We recommend that the public should be involved in influencing and guiding *how* these necessary changes are implemented, not whether to implement them.
 - The planned Citizen's Assembly of Scotland may have an important role in this, where a specific part of their remit could be to guide Scotland's response to the global climate emergency.
- The primary aim of the Scottish Government's Climate Change Public Engagement Strategy should therefore shift to building public support for transformational change and engaging publics at local and national levels to develop preferred options.¹
- As groundwork for guiding future campaigns, it would be valuable to undertake work examining the public(s) current understanding of the climate emergency and their willingness and readiness to support transformational change, and monitor how this changes over time.
- The benefits of these structural and infrastructural changes should be effectively communicated to the public in the following ways:
 - Help people answer the question: 'what will our lives be like, how is this "a good life" and how is it better than my life (and those of family, friends, and communities) now?'
 - Make examples and contexts local and tangible, consider using peer-to-peer learning and community asset based planning formats where possible

Moving from KBA to Interlinked Practice approach

- To support this increased ambition and new emphasis, and to increase the effect of targeted campaigns, we recommend changing the focus of pro-environmental behaviour change activities from the key behavioural areas (KBAs) approach to an interlinked practice-based understanding (see Figure 1, p 19).
 - To support this move to an interlinked practices approach, Scottish Government should place greater emphasis in campaigns on the material and social elements of the ISM tool and should

¹ Moving to a wellbeing based sustainable economy has significant benefits: Higher quality locally sourced food; warm, comfortable homes costing less to run and are healthier to live in; health benefits from reduced pollution; fast affordable public transport, empowered communities; reduction in status anxiety and debt cycles as consumer goods are replaced as the markers progress. See also: Trebeck, K. and Williams, J., 2019. The economics of arrival: Ideas for a grown-up economy. Policy Press.

include an element of building social and individual capacity through knowledge, skills and support.

- This move to an interlinked practice approach works within the overarching frame provided by the Scottish Government's current Public Engagement Strategy's four household emissions domains and KBAs
 - The decision of which interlinked practices to examine in order to direct low carbon lifestyle campaigns rests on which of the four main household consumption emissions themes and KBA's are to be addressed. See below for a step-by-step guide to implementing a practice-based approach.
 - As the concept of the KBAs remains relevant, the specific behavioural areas should be re-examined to ensure they reflect the intensification of changes required to our lifestyles
- While focusing on holistic policy interventions based on an interlinked practice understanding, campaigns targeting specific parts of our high carbon lifestyles will still be required.

Segmentation

- The move to an interlinked practice framework as the basis for targeted campaigns (based on segmentation) will guide more insightful engagement through a deeper insight into consumer lifestyles. It will also help identify the specific behaviours, competencies, materials and meanings to modify or make available.
- The searchable online database containing a comprehensive review of the available segmentation research should be used to inform the development of specific segmentation based campaigns.
 - Users can identify, from over 100 sources, the available evidence for specific themes and communications goals matching their requirements

Carbon Literacy/Climate Solutions

- The Scottish Government should champion a climate literacy programme that takes a 'Climate Solutions' perspective. This should be across both the public and private sectors and interwoven across all levels of education.
- Climate Solutions focus on building participants understanding of: The causes and impacts of climate change globally and locally; their role in the causes; a range of solutions; and their part in implementing them.
- Climate Solutions should aim to build confidence in the individual and community regarding their ability to make significant changes. Efforts should include building and strengthening social connections.
- A peer-to-peer community-led approach is the best delivery model for developing Climate Solutions. Effects must be portrayed as local, concrete and occurring now. They should also model successes including where small actions have led to larger ones and positive results have encourage more ambitious ones

Implementing an Interlinked Practice Approach

The following process sets out how to use the interlinked practice lens to identify the key social meanings, competencies and materials upon which to build specific, insightful pro-environmental climate change campaigns. It shows how to bridge the gap between understanding the broad areas of household emissions that must be tackled and understanding what needs to be changed in order to help us live low carbon lifestyles. A case study and further background are provided in Appendix 1.

Step by step guide:

- 1) Identify the household consumption emissions theme, the updated KBA and its high carbon behaviour equivalent.
 - a) For example: Theme: Transport- KBA- Reduce reliance on a personal vehicle. High carbon equivalent- Driving car for short journeys
- 2) Identify the interlinked practices associated with the theme/KBA:
 - a) Use Figure 1 as a guide, though this is not an exhaustive list.
- 3) Identify the *elements* of the individual practices:
 - a) Meanings
 - b) Materials
 - c) Competencies
- 4) Identify and explore the *elements* shared by the interlinked practices:
 - a) Meanings
 - b) Materials
 - c) Competencies
- 5) Identify the shared Meanings, Materials and Competencies that underpin *where, when how* and *why* current high carbon behaviour are performed.
 - a) These can be considered as the key threads that connect practices and which need to be pulled/broken in order to change lifestyles
- 6) Identify how meanings can be built, transferred or changed. For example how transferring or building meaning from the high carbon behaviour into the low carbon behaviour or promoting the meaning of the low carbon behaviour.
 - a) It is important to note that the focus may not be just substituting one action for another but may also include not performing the action (being mobile, purchasing food at all).
- 7) Identify changes required to Materials (objects, technology, clothing, infrastructure)
 - a) For example, do individuals have access to affordable heat; are loft insulation schemes available to households; can individuals cycle to work safely, do they have facilities for showering?
- 8) Identify how the shared competencies needed to achieve the shift to a low carbon lifestyle can be built and improved, this includes psychological characteristics
 - a) Do individuals know how to make their home more comfortable; do individuals know road safety for cyclists; do individuals know how to maintain their bike?
- 9) Choose specific practice/practices from the list generated in step 2 as a context within which to build specific campaigns.

Guide to communications

- Tone: Positive, empowering and show how lives will be better when undertaking these changes.
- Focus: local geographies and communities, building community cohesion, building collective and individual feelings of being able to achieve success.

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Glossary

Adaptation - any activity that helps reduce the negative impacts of climate change or takes advantage of any new opportunities that may arise from climate change. The goal of adaptation is to reduce overall vulnerability to the harmful effects of climate change.

Agency- the ability of an individual to act independently and make choices.

Alternative hedonism – a resistance to the traditional Western culture of consumption, based on a new perspective of pleasure and self-realization, and one not based on the accumulation of ‘things.’

Belief-attitude-intention pathway – a dominant approach to behaviour change that suggests an individual’s beliefs and attitudes will determine their intentions to enact a specific behaviour.

Behaviours / individualist approach – an approach to behaviour change segmentation and modelling that focuses on the individual as the decision-maker, where social influences have a limited effect on decisions.

Construal level theory – A theory explaining how the more distant an object or idea is, either physically or temporally, the more abstract it seems.

Disruption theory – the process by which a product or service takes roots among previously underserved market segments and then eventually displaces well-established competitors.

Interlinked practices – a perspective that explicitly acknowledges the connections (including across time, set sequences, shared materials, competencies and meanings) between social practices.

Mitigation - any activity that helps reduce the flow of heat-trapping gases into the atmosphere. Decreasing the amount of these greenhouse gases released into the atmosphere, reduces the overall rate and magnitude of climate change.

Key behavioural areas (KBAs) – ten actions identified by the Scottish Government that individuals and households can adopt to reach Scotland’s climate change targets. These behaviours span across four main household emissions domains: household, transport, food and waste, and material consumption.

Perceived self-efficacy – an individual’s perceived ability to engage in new or specific behaviours.

Perceived collective efficacy – an individual’s perception that a behaviour has greater impact if other people are also engaging in that behaviour.

Positive spillover – when interventions aimed at promoting one behaviour influences the likelihood that other behaviours will also be adopted.

Social practice theory / practice theory—states that how we act on a daily basis is shaped by institutional and social forces rather than being the outcome of our individual choices. Practices are made up of *competencies* (knowledge, skills), *materials* (objects, infrastructure), *meaning* (expectations, shared meaning).

Theory of Planned Behaviour – a model that states an individual’s attitude towards a behaviour, subjective norms and perceived behavioural control shapes their behavioural intentions to enact a specific action.

1 Introduction

1.1 Background

The First Minister's declaration of a Climate Emergency and the Climate Change (Emissions Reduction Targets) (Scotland) Bill reaffirms the Scottish Government's commitment to tackling climate change and to provide global leadership regarding the depth and speed of response it intends to make. The Bill proposes that Scotland achieve net zero greenhouse gas (GHG) emissions by 2045 with interim targets of a 70% reduction by 2030 and 90% by 2040 (vs. 1990 levels). These targets, updated in May 2019 trigger the need for profound behaviour change.

The most recent evidence highlights that Scottish households have made significant progress at adopting low carbon behaviours across the four themes associated with the most household consumption (housing, transport, consumption/waste, food and diet) and across the more specific 10 KBAs [1]. However, this report also stresses that progress has been variable and that greater impact is required, particularly in Transport and Consumption.

The challenges driving this review and evaluation of the Government's engagement strategy are therefore profound: How can existing changes to individual and household lifestyles be intensified, so they match those demanded by the Paris Agreement [2] and the Scottish Government's proposed emissions targets?

Addressing these challenges requires the new strategy to be based on the best possible understanding of how to change behaviour, consistently and over the long term. This will also involve targeting specific segments, defined using a range of variables and direct policy and infrastructure interventions. Further, segmentation approaches must be grounded in a theoretical understanding of why people act as they do. They also require a deep understanding of individuals and households within each group so that resonant, persuasive campaigns can be produced. The focus of this new strategy will be climate change *mitigation*, though the tools and resultant changes are also relevant to *adaptation*.

Therefore, to support a new engagement strategy, this study presents its findings in three main sections: The first evaluates the theoretical underpinnings of the existing dominant approach to behaviour change and segmentation. The second, which is the focus, evaluates existing and potential approaches to segmenting the public into meaningful, identifiable and reachable groups. The final section briefly explores work on how to encourage transformational change.

1.2 Aims

The main aim of this research is to identify and evaluate different approaches to grouping or segmenting the public by attitudes and/or behaviours related to climate change. The recommendations will inform the revision of the Scottish Government's climate change public engagement strategy: 'Low Carbon Scotland: A Behaviours Framework.' Appendix 2 provides an overview of the methodology used in this report.

1.3 Objectives

- What does present research show are the most effective segmentation approaches to, and drivers (influences) of, significant pro-environmental behaviour change overall and for the specific areas of housing, transport, consumption/waste, food and diet?
- Which segmentation approaches are most successful as the basis for communications motivating significant pro-environmental behaviours?
- Which segmentation approaches and variables are most successful as the basis for communications motivating changes to behaviours associated with housing, transport, consumption/waste, food and diet?
- How can current knowledge and practice be implemented in Scotland, including understanding how limitations in being able to influence behaviour can be overcome?

2 Existing approaches to behaviour change

2.1 The existing dominant lenses: Behaviours and practices

Within the field of pro-environmental behaviour change, the two main perspectives, **behaviours** and **practices**, remain the dominant lenses used to examine climate-related actions and act as the basis for segmenting populations. Work using a behaviours lens tends to focus on understanding what influences (beliefs, attitudes, values) individual actions such as replacing incandescent bulbs with LEDs.

Work using a social practices lens comes from the perspective that the behaviours we observe and undertake, such as shopping or commuting, are *performances* influenced and shaped by institutional and social forces rather than products of individual choices. Here, for example, we understand that daily travel by car consist of more than the act of driving between places. Instead, daily travel routines include interwoven practices such as 'commuting, running errands or taking children to school/activities' [3].

The Scottish Government's Climate Change Engagement strategy recognises and employs both these perspectives within the ISM tool, which considers the Individual, Social and Material components of behaviour. Key differences between a behavioural and practices approach are summarised in Appendix 3.

The main finding from the research reviewed is that, while behaviour change research remains a highly active area, it has not seen any fundamentally different or significantly more effective approach introduced in the last five years. This is not to say that useful and insightful work has not been produced, just that there is no 'game changer' such as practice theory offered over 10 years ago.

We now turn to briefly explain the belief-attitude-intention pathway as the dominant behaviour change model. We then set out findings from recent research into influences on this model and hence the performance of PEBs. Following this, we present the limitations of the dominant individualist approach and justify the recommendation for moving to a practice-based approach to engaging the public on climate change.

2.2 Belief-attitude-intention pathway

To date, the government's preferred approach to behaviour change has been to encourage individuals and household make different choices to perform (or not perform) actions associated across the themes and behaviours associated with household emissions. The focus is heavily on supporting individuals to make different and environmentally 'better' decisions.

This approach is grounded on the belief-attitude-intention pathway. In turn, this pathway is based on the widely adopted Theory of Reasoned Action and its successor, the Theory of Planned Behaviour [4]. These theories suggest that by providing information, changing attitudes and promoting an individual's ability to engage in a behaviour² should increase intentions to undertake in that behaviour. This model treats the performance of PEBs as the outcome of a rational, step-by-step process where beliefs influence attitudes and in turn, attitudes influence behavioural intentions [4].

We reviewed over 100 behaviour change studies and found that a majority use the behaviours lens to understand how to influence PEBs and to understand the barriers that block intentions to act. Based on this review, we echo the conclusion from the literature that this pathway is insufficient as the basis for efforts to motivate the changes required to our lifestyles.

The belief-attitude-intention pathway is viewed as insufficient because it relies on the notion that people *can* make decisions to change their individual behaviour and that the combined impact of these types

² For example via increasing awareness of climate change or developing climate literacy.

of action are sufficient to reduce emissions equal to what is required. This agency is questioned as social influences drive many behaviours and that living low carbon lifestyles relies on factors over which individually we have little or no influence, e.g. availability transport infrastructure. A broad range of barriers also block intentions to act, such as social norms, lack of available infrastructure and whether though likely that the action will have the desired impact.

Despite this overall recommendation, understanding the wide range of psychological, social and contextual variables that influence behaviours is still important. This is because it is the belief-attitude-intention pathway that we question, not whether individual variables such as attitudes, values or financial considerations influence behaviour.

Recent work examining the psychological influences on behaviour falls into three general categories.

- A. Work examining the influence of a specific variable on the pathway, for example the influence of beliefs formed through experience of the behaviour.
- B. Work examining the effect of adding additional variables to build a more comprehensive model (i.e. adding Perceived Collective Efficacy, Identity or Status);
- C. Work examining how information is used in making decisions (Construal level theory).

We now provide a brief review of pivotal work in each of these categories.

Perceived self-efficacy and perceived collective efficacy. Perceived self-efficacy is a strong predictor of the intention to act on climate change across a range of PEBs. In order to act, individuals need to believe their intended behaviours are likely to produce the desired effect. Perceived collective efficacy (PCE), builds upon individual agency with an individual more likely to act if they believe the other people also engaged in trying to achieve the shared outcome have the ability to achieve the goal [5].

Identity. Identity is a critical driver of behaviour including behaving in ways to conserve or protect the environment. By appealing to an individual's sense of their self as being a part of nature, the environmental aspects of identity are activated. This can occur by priming an individual's engagement with natural beauty [6], their pro-environmental self-identity [7], or environmental values and identities. These are more consistent influences than attitudes and beliefs across segmentation studies [8], [9].

However, identity and their associated behaviours shift depending on the specific context or social situation [10], [11], for example, how an individual behaves in the workplace is often very different from how they behave at home or among friends. A further identity-based issue regarding the performance of PEB's is that making significant changes to a consumption-led lifestyle is still considered outside the mainstream and individual's doing so are regarded as 'other.'

Status: Within peer groups, high-status individuals influence the behaviours of others. For example, celebrities owning a Toyota Prius and driving them to high-status events led to an uptick in Prius purchases [12], [13]. Believing that high-status in-group members have adopted a PEB effectively encourages other in-group members to change their intentions [14]. It does this by signalling that the actions are socially desirable, as high-status people are engaging in it. This is important as it highlights a mechanism to overcome a commonly cited barrier to taking action on climate change: 'I will act when others act.'

Construal level theory [15]: This highly regarded framework explains how we represent near and distant objects in our minds and how we use these representations to make decisions. People often perceive climate change as a distant problem that will have little impact on their daily lives, and thus the impetus to take action is limited. This is partly because communications often described it as physically, temporally and therefore psychologically abstract and distant. Many of the behaviours that are promoted as being pro-environmental (easy, painless and fits within current lifestyles) further compounds this extension of psychological distance away from information that means we are likely to act now. This theory suggests engaging the public so they understand: a) the extent and impact of

climate globally and locally, b) that our actions are the cause, and c) these effects are local and concrete [16], [17].

In summary, the theories and studies briefly described above have influenced many of the models used as the basis of climate change interventions. This includes those developed by the Scottish Government and DEFRA. A critical component of this work, aimed at intervening at the belief and attitude stages, has relied on building climate science knowledge and understanding through building Climate Literacy programmes. Despite being based on the belief, attitude intention pathway and the behaviours lens, understanding the effectiveness of these programmes remains important, and we turn now to reviewing relevant work.

2.3 Climate literacy

2.3.1 Current approaches to, and effect of, climate literacy programmes

Climate literacy was first defined in 2007 as ‘an understanding of your influence on climate and climate’s influence on you and society’ [18]. Existing approaches to building climate literacy and engaging the public on climate change have primarily focused on communicating information about climate science [19] or depicting the problem in ways that reflect the different values of diverse audiences [20]. The conceptual foundation of this approach is, therefore, the belief-attitude-intention pathway.

The relationship between building awareness of climate change, understanding climate science and taking action is not, however, straightforward. For example, globally levels of awareness of climate change vary and acknowledgement of human influence remains contested, particularly among conservative-leaning political groups around the world [21]. Work conducted in the United States shows that holding beliefs that climate change is happening and caused by human activities may have less to do with scientific and logical comprehension and more to do with personal belief systems, such as political identity, personal values and peer-group influences. These in turn can act as barriers to behaviour change [22], [23].

However, despite this work questioning the impact of climate literacy, overall there is good evidence that knowledge is a necessary, though not sufficient, precursor of climate change action. Beyond this, some specific types of knowledge are more influential than others, as explained in the following section.

2.3.2 Knowledge leading to concern

A multi-country survey found that knowledge of climate change is an important driver for concern about climate change, even when taking account of differences in individual’s values [24]. Likewise, different dimensions of knowledge play different roles in shaping concern. Findings from a survey deployed across six culturally and politically diverse countries showed that higher levels of knowledge about the causes of climate change are related to heightened concern [24]. However, higher levels of knowledge about the physical impacts of climate change (such as flooding, drought, and extreme weather) had either a negative or no significant effect on concern.

Although the literature does suggest increased climate literacy is critical for increasing concern, there is little evidence to suggest increased concern, knowledge or awareness of climate change results in increased action. Bedford [25] shows that despite high levels of understanding of climate change science, some people (particularly those who are more conservative) are still sceptical that the cause is human activities. Further work is needed on how to bridge the gap between climate literacy and climate action.

Overall, the critical lessons regarding the effectiveness of climate literacy on influencing action on climate change are:

- It is most effective if citizens understand why climate change poses extreme and imminent risks and are empowered with the knowledge and tools to take action [24], [26].

- The best predictor for ensuring individuals and communities are prepared to withstand climate risks, such as increased flooding, is making sure they understand that climate change is caused by human activities [27], [28].
- If people understand their actions are the primary driver of climate change, then they start to understand their actions can also limit the scale and pace of it through mitigation practices [29].
- Beyond providing information on the causes, individuals will act if they understand the immediate, personal or local impacts of the issue, and if they understand which actions make a difference [30], [31]. For younger audiences, however, climate change is a defining issue and can lead to feelings of helplessness and despair when confronted with the impacts of climate change [32].
- Adult beliefs are often strongly connected to their political identities, which can hinder willingness to act across the US, Europe and Australia [21], [33].
- The positive effect of climate literacy increases if programmes also build social and place identity [34], [35], [36], [37], and perceived self and perceived collective efficacy [29].

2.3.3 Improving climate literacy

- **Use peer-to peer learning:** Trained community volunteers or leaders can facilitate learning as trusted peer educators with high credibility [38], [39], [40]. In addition, young people often bring the information home and can convey information to adults in a non-threatening manner.
- **Make it local:** Make climate change more salient and immediate by putting it into a community context. Use local landscapes to highlight climate change issues and focus action.
- **Make it visual:** Make concepts and realities of climate change and carbon clear, compelling and localised. Show what the effects of climate change looks like [41] at the local level; for example, changes in rainfall in Lothian and effects on farming.
- **Make it connected:** Link the local with the 'big picture' and integrate all aspects of climate change that interact with society and affected environments across scales.

Although climate literacy has emerged as a recent trend in pro-environmental behaviour research, there is still a gap between what people understand about climate change, its impacts and its causes, and how to transition that knowledge into action. The psychological influences described in Section 2.2 address this to some degree; however, as described in the following section, there is a gap between attitudes on climate change and behaviours.

2.4 Attitude-behaviour gap

Enhancing climate literacy has been at the cornerstone of many environmental organisations and policies, building on the belief-attitude-intention pathway [26]. However, many studies have also pointed out that knowledge, attitudes or stated intentions to act on climate change does not necessarily lead to changes in behaviour, particularly in the long term. Broadly, this is known as the attitude-behaviour (or green) gap [42].

There is however an extensive range of barriers that can cause this gap, (see Appendix 4). The most recent work examining how to overcome these barriers reaffirms the recommendation that rather than focus on influencing individual choice, it is more effective to intervene with a range of prescriptive/regulatory instruments and infrastructure actions.

A broad range of authors also question the adequacy of the behaviours lens more generally. Organisations concerned with climate change often present PEBs as simple and easy actions that fit within an individual's current lifestyle. The logic behind this approach is based on the sociopsychology concept of positive spillover, where the adoption of small PEBs can lead to ones that are more ambitious [43].

The belief-attitude-intention is no longer thought to be sufficient as it assumes people can make decisions to change their behaviour and that the combined impact of these actions is enough to reduce

emissions equal to what is required [43]. This pathway also assumes an individual will act provided there are motivated and barriers to behaviour are removed [44]. This individualist approach is questioned as social influences drive or inhibit many behaviours and living low carbon lifestyles rely on factors over which individually we have little or no control (i.e., availability of transport infrastructure).

2.4.1 From supporting individual choice to changing behaviour through legislation and regulation

Building on this concern of the effectiveness of using the belief-attitude-intention pathway to guide profound PEB change, recent work argues that there are significant limitations on what individual and collective choice can achieve [45]. A vital part of this is that pro-environmental messages are drowned out by the constant stream of messages from commercial sources encouraging increasing levels of consumption (buying new clothes, ‘gadgets,’ tasting exotic foods, redecorating your home). Research also places limits on how much ‘nudging’ or adapting choice architecture³ can achieve [46], [47], [48].

The size of change required is now profound, and many practices and behaviours are firmly embedded within society. Therefore, we suggest the Scottish Government consider approaches that focus less on an individual choice model and more on engaging the public to build support and acceptance of radical structural and institutional changes. This view is supported by the ‘default bias’ where we are more likely to comply with a requirement than make an effort not to comply.

Public climate change engagement must, however, include engaging and empowering individuals, families and local communities to guide these legislative/regulatory and infrastructural changes. If people see these as fair and equitably implemented across society, then they can support significant changes [49].

While we recommend focusing on more direct interventions, this does not mean individual behaviours are unimportant; however, considering the limitations of this lens, we also recommend that the Scottish Government’s behaviour change strategy focuses instead on interlinked practices. The next section describes this approach.

2.5 Social practices

Social practice theory argues that the behaviours we observe and undertake, such as shopping, commuting or recycling, are performances influenced and shaped by institutional and social forces rather than products of individual choice influenced by psychology constructs such as attitudes or values. Practices are made up of *competencies* (knowledge, skills), *materials* (objects, infrastructure), *meaning* (expectations, shared meaning).

For nearly a decade, it has been argued that this approach provides a better target for interventions, given the greater consideration for infrastructure and institutional organisation, compared to focusing on individual behaviours or choices. It shifts the focus from what an individual does and how that can be changed, to how can social practices be altered to become more sustainable.

For example, if one considers the theme of travel, one identifiable form is ‘*taking children to school or activities.*’ Framing it this way highlights the importance of social forces influencing who does the practice, why, when and how. This view, we argue, provides greater insight into how the practice can be influenced and changed compared to focusing on reducing the individual behaviour of travel by private car.

To further demonstrate how a practice-based approach can be used, consider the goal of encouraging individuals to cycle to and from work. Promoting this low carbon practice would require consideration of the full range of competencies, social activities and materials surrounding it. This would include the

³ Choice architecture is the process of creating environments that indirectly influence decisions, or ‘nudge’ people to engage in certain behaviours over others. See Thaler et al. [46].

need for a shower, concerns over road safety, daily need to transport children and run errands and the weather. Policy makers have successfully used this approach to create a cycling hub in Manchester. The Hub provides spots for parking bikes, showers and assistance with repairs, to encourage commuters to make cycling part of their daily commute. By understanding the socially influenced 'needs' of commuters such as safety, efficiency and grooming, cycling became a more widely adopted commuting practice [50].

The ISM tool currently includes Practices as a concept, however, many of the campaigns based on this tool are centred on individuals and their choices. We recommend moving from a behaviour-based view (as set out in the 10 KBAs) towards using a specific form of Practice orientation- Interlinked Practices.

2.6 Interlinked practices

An interlinked practice approach reflects the common understanding that individual practices such as commuting and running errands are interlinked in terms of sharing materials (infrastructure) competencies (driving) and social meanings (how and when they should be performed). It also explicitly recognises that many practices are performed in sequence and that changing how one activity is performed (i.e., transitioning from commuting by car to commuting by bicycle) may make other practices such as picking up children after school, more difficult. The interlinked-practices approach allows an understanding of how complex sets of interrelated actions can be addressed holistically.

To help guide and illustrate how to conceptualise interlinked practices, we have adapted and extended previous work by Spargaaren [51] and present it in Figure 1. The figure shows how practices, accounting for most of our daily and weekly lives and lifestyles, link to each other. The figure also demonstrates how these practices connect the core carbon-intensive behaviours individuals enact as part of these practices. For example, the act of driving is not solely a component of transport, one of the key behaviour areas identified by the Scottish Government. Instead, driving is interlinked with other groups of practices used as part of food, being mobile, leisure and tourism practices.

Figure 1 also highlights how certain practices cut across the main household consumption emissions domains. This is an important insight required to intensify lifestyle changes in Scotland and beyond. For example, food and diet are more than just eating healthy and cutting down on food waste, as suggested within the 10 KBAs. Food is interlinked with entertaining guests at home, the energy used to store and prepare the food, cleaning up afterward and the transport of food from the shops to the home.

A further valuable insight is that this framing helps understand differences in why specific behaviours are (or are not) performed across domains. For example, individuals that regularly go hill walking may be inclined to remove litter to protect the natural habitat. However, the same individual may not engage in removing litter while on a beach holiday or walking along the street in the town centre.

Given the complexity of lifestyles, addressing more ambitious changes requires greater consideration for both behaviours and practices, with not just a focus on the individual aspects of behaviour, but greater consideration for social and material influences on behaviour.

3 Climate change segmentation studies

3.1 Overview of segmentation

Segmentation is a marketing technique that divides the population into homogeneous or similar groups. It is based on the notion that groups of people of similar demographics, values, attitudes or beliefs have similar needs that can be influenced using targeted messaging and strategies. This approach helps marketers identify which communication channels and messages will appeal to consumers, making the marketing process more effective and less expensive [52]. Segmentation techniques vary in practice, with the variables used to group people coming from economics, psychology and sociology.

This commercial logic has successfully transferred to prosocial and pro-environmental contexts where it helps to promote and influence ideas and behaviours. For example, in healthcare, targeted messages based on segmentation approaches have helped reduce rates of smoking, change diet and increase attendance at healthcare screenings [53]. Furthermore, increasing use of segmentation on political beliefs and attitudes has been effective in political campaigns both in the US and the UK [52], [54].

Overall, segmentation methods used as part of strategies to encourage low-carbon lifestyles tend to group people according to psychological variables such as beliefs, attitudes, perceptions and values. These are typically combined with demographic information such as age, gender, occupation, income and education.

This approach often fails to capture the sociological aspects of behaviours, such as peer groups, key information sources and institutional forces. Hines et al. [52] suggest segmentation approaches should be grounded in behavioural theories and the variables used, reflect the specific project's goals and objectives.

3.2 Climate change segmentation

In this section, we provide a summary of climate change-related segmentation studies reviewed for this project, including an assessment of their effectiveness. It is challenging to make general recommendations regarding which segmentation variables (and which combinations) are the most effective and should be used as the basis for targeted climate change engagement. This is due to a) the broad range of variables used across the housing, transport, consumption/waste, food and diet themes; b) inconsistent and missing evidence across a large number of studies reviewed; and c) conceptual limitations of the dominant belief-attitude-intention pathway.

Studies examining the effectiveness of climate change segmentation are mainly from the United States, Europe and Australia [55]. An overwhelming number of segmentation studies are quantitative and survey-based (see Appendix 5 for an overview of the Country of Origin studies reviewed and Appendix 6 for overall trends in segmentation and the domains upon which they focus).

Therefore, to answer research objectives 2 and 3, we first summarise the most critical and trustworthy studies into two tables. Then, to allow users to identify which variables have been used and to what effect, the available evidence has been formatted in a searchable [online database](#).

3.2.1 Summary of segmentation approaches by goal

Table 1 provides a summary of the studies organised by their communication goal (column 1). Each communication goal requires different strategies and tasks to fulfill it. For example, if the communication goal is to increase awareness, then according to the literature, simple scales on attitudes, feelings and concerns about climate change can be used to segment the population and then craft messages. As another example, Climate literacy goals are consistent with an objective to generate interest among individuals to learn more or do further research. Fulfilling this goal would require more complex combination of segmentation variables such as personal experiences with climate change, risk perceptions, trust in information sources and overall science literacy. Lastly, encouraging behaviour change requires a sophisticated understanding of the individual, social and

material barriers and motivators. Table 1 further summarizes the variables (column 2) typically assessed based on the type of communication goal.

Table 1: Summary of segmentation approaches by goal

Goal	Segmentation variables	Method	Evidence (supporting studies)	Expected outcome
Awareness climate change is happening	Attitudes, concerns, feelings	Quantitative	Hine et al. (2013) Carrington et al. (2010) Peattie & Peattie (2009)	Over a long period and with reminders, expect to see a slight increase in overall awareness. Best for uncommitted types of audiences. Unlikely to result in behaviour change, but may be a necessary initial step.
Belief in climate change/man-made climate change	Beliefs, attitudes, knowledge, political identity	Quantitative	Morrison et al. (2018) Dunlap, McCright & Yarosh (2016) Hine et al. (2013)	Making climate change impacts local and relevant with consideration for political identity can lead to an increased willingness to accept information that climate change is happening.
Increase climate literacy (understanding and knowledge of impacts and causes)	Attitudes, values, beliefs, knowledge, political identity, risk perceptions	Quantitative	Shi et al. (2016) Scannell & Gifford (2013) Lee et al. (2015) Whitmarsh et al. (2013)	Understanding the causes of climate change in addition to the impacts are precursors to action. Once individuals understand how climate change is caused through human activities and how to stop it, they are more likely to take steps towards action to reduce their impact on the climate; however, they need also to understand what they can do and that their efforts will make a difference.
Behaviour change (overall lifestyle)	Attitudes, values, beliefs, knowledge, political identity, occupation, education, gender, perceived self-efficacy, goals	Quantitative	Verplanken (2018) Rodriguez (2018) Corner et al. (2014) Barr, Gilg, & Shaw (2011) Shove (2010)	Making significant lifestyle changes requires an understanding of what influences lifestyle choices, but also life goals. Behaviour change can occur provided the changes fit within an individual's life goals and is done with consideration for how decisions are made across contexts (home, work, travel).

The conclusions presented below come from the comprehensive review of over 100 segmentation studies studied for this research. The main conclusions regarding segmentation approaches by goal are:

- If the communication goal is to increase climate literacy, the segmentation variables used should gather a baseline of the population's knowledge on climate change and its causes, plus educational attainment and demographics.
- If the goal is to shift behaviour, perceived barriers to change among the population, as well as motivations and goals for individuals should be measured and used as the basis for the segments.

- The results of a global poll show that education attainment is the strongest predictor of climate change awareness and understanding the causes of climate change predicts perceptions of risk [55].
- In Europe, and across other developed countries, understanding that human activities are the cause of climate change is strongly linked to the perceived risk of climate change.
- For China, education, income level and geographic location (urban versus rural) predict awareness about climate change [55].
- In the United States, education, civic engagement and access to communication are predictors of climate change awareness.

Organising the review by intended outcome highlights a lack of specific research within a Scottish context. The Scottish Household Survey does provide questions on climate change perceptions and shows over time that a majority of adults agree that climate change is an urgent problem that needs to be addressed. Seventy-three percent of the adults surveyed indicated they know what actions to take to help reduce the impacts of climate change and that as an individual they can have an impact [56]. This self-reported data does not reflect actual behaviour, nor does it indicate that individuals know which steps to take to achieve the ambitious targets set out by the Scottish Government.

A further source of information regarding Scotland comes from broader polling data conducted in the UK and Europe. The results indicate that younger people (age 16–24) are generally more concerned about climate change compared to older adults. Young people in the UK, however, report lower engagement and action compared to the rest of Europe. This is reportedly due to a lack of low-carbon infrastructure, limited media coverage, and little to no shared values or practices in terms of sustainable lifestyles [57].

3.2.2 Summary of segmentation approaches by domain

Table 2 provides an overview of variables commonly used for segmentation based on specific behavioural domains, such as lifestyle change, energy consumption, transport, food and diet, and policy support.

This review indicates that different variables are needed when trying to encourage domain-specific behaviours. For example, variables used in appeals seeking to increase recycling are unlikely to work on energy or transportation behaviours. These behaviours are perceived differently in the mind of the consumer as opposed to general pro-environmental behaviour. In addition, individuals may behave in more environmentally friendly ways in one domain, such as consumer goods, compared to another, such as transportation [58]. This may be attributed to the variety of practices and material or infrastructure constraints on transportation versus individual purchase decisions.

Table 2: Segmentation approaches by domain

Domain	Segmentation variables	Method	Evidence (supporting studies)	Expected outcome
Energy	Geographical, localised, norms	Quantitative	Curtius et al. (2018) White & Simpson (2013) Allcott (2011) Hondo & Baba (2010) Moloney, Horne, & Fien (2010) Schultz et al. (2007)	Making energy use highly visible either through showing how household use compares to neighbours or highly visible installation of PV solar on roofs leads to broader discussions on PEBs within families and an increase in PEBs. This approach also works for recycling, as a household's recycling is often visible to neighbours when it is collected each week.
Transport	Lifestyle, social practices, demographics	Quantitative	Brand et al. (2017) Wang et al. (2015) Spotswood et al. (2015) Heisserer (2014) Anable (2005) James (2002)	Although people travel in similar patterns, the motivations to do so vary greatly. The impetus to cycle is larger driven by safety concerns, but also distance needed to travel. Concern for the environment is often not a factor in choosing to cycle.
Food/diet	Current and potential eating choices, preferences	Quantitative	Louis & Lombart (2018) Graham & Abrahamse (2017) Macdiarmid et al. (2016) Siegrist et al. (2015) De Boer et al. (2014)	Nutrition and health are a primary concern when it comes to a decision about food and diet. Framing low-carbon foods in terms of health and well-being, particularly at the point of purchase, can shift behaviour.
Material consumption	Sociodemographics, morals, values, attitudes, identity, self-efficacy, perceived status, context	Quantitative	Groening et al. (2018) Black & Cherrier (2010) Barr, Gilg, & Shaw (2011)	Building consumer efficacy and priming more ethical or sustainable aspects of identity, while considering consumption patterns as they vary from place to place, can have a significant impact on consumption.
Policy support	Attitudes, values, beliefs, knowledge, political identity, occupation, education, gender, perceived self-efficacy, perceptions of fairness	Quantitative	Schoenefeld & McCauley (2016) Bliuc et al. (2015) Horton & Doron (2011)	If policies on climate change are perceived as fair and justified, they are more likely to receive support; however, individuals need to have an understanding of what the benefits and implications are of policies and why they are relevant within their local and personal context.
Community or social practice	Attitudes, values, beliefs, knowledge, political identity, occupation, education, gender, perceived self-efficacy, collective efficacy, feelings of community	Quantitative	Frezza et al. (2019) Chapman et al. (2018) Shove (2017; 2010) Schoenefeld & McCauley (2016) Spaargaren (2011)	Materials and practices are interwoven across the whole of the consumption and production cycle. Shifts in behaviour can occur when considering how to change expectations in how individuals and communities interact with daily objects and carry out certain practices.

3.3 Dominant segmentation models

As indicated by Tables 1 and 2 (and on the supplemental [online database](#)), researchers typically segment relevant populations using multiple variables, though single-variable segmentation is also used. These tend to use surveys that measure only one factor, such as attitudes or use only question to measure complex ideas such as whether an individual believes climate change is occurring. This approach has the advantages of being easier to process and clearer for respondents as well as being as effective at predicting behavioural intentions.

Multivariable approaches use multidimensional scales to assess complex psychological and social factors, such as attitudes, values, worldviews and knowledge. These types of scales are incorporated into the dominant approaches to public segmentation on climate change such as the Yale Climate Communications Model (or the 'Six Americas' model) and the DEFRA segmentation model.

Leiserowitz and Maibach [59] developed the Yale Climate Communications Model in 2008. Analysis of US revealed six separate groups based on differing levels of concern about climate change, engagement with the issue, policy support and degree of certainty that global warming is occurring. These six groups are: *Alarmed*, *Concerned*, *Cautious*, *Disengaged*, *Doubtful* and *Dismissive*. The model was updated in 2016 and 2018, making it difficult to track changes in beliefs or attitudes over time.

From there, the first global study on climate change awareness and concern used this model, and so have researchers from numerous other countries including Australia and India [55]. Hine et al. (2016) used a variation when surveying 1031 Australian residents about their beliefs, values and responses to climate change. They found only three distinct segments: *Alarmed*, *Uncommitted* and *Dismissive*. The researchers then crafted messages based on the audience type. For all three segments, messages containing strong negative emotional content or giving specific instructions on adaptation increased intentions to perform PEBs. Messages that avoided any description of climate change and focused on local impacts increased the behavioural intentions for the dismissive segment.

Similarly, Ashworth et al. used a range of variables that focused narrowly on climate change beliefs, perceptions, concerns and knowledge, as opposed to global warming, and identified four segments within the Australian population surveyed [60].

3.3.1 Application of Six Americas to Wales

Currently, the Six Americas approach has not been applied to Scotland, however, Poortinga and Darnton [61] applied a similar approach to a Welsh population. They established six segments through surveys, self-reported behaviours and interviews and explored thirteen distinct psychosocial indicators. The variables included: personal values, views on sustainability and sustainable living, attitudes on climate change and energy security, attitudes on community and place such as Welsh identity, social capital and place attachment, and self-reported behaviours on energy, travel, water and waste. The segments identified had distinct behavioural patterns and sociodemographic profiles. For example, the segment labelled *Aspirers* had low levels of concern for energy security, low social capital and low place attachment but was open to change and held high self-enhancement values. This group tended to be the youngest among survey respondents and were in the early stages of adulthood.

3.4 Issues with Climate Change Segmentation

3.4.1 Lack of data on the impact of segmentation approaches

Despite being standard practice, reviews of segmentation studies report little to no effect other than a limited increase in awareness and concern in some studies [62]. In the Hine et al. [52] assessment of segmentation studies, they state, 'almost all segmentation studies have fallen short of this goal' [developing communications that achieve desired responses (p. 454)]. Although segmentation is an agreed-upon approach to tailoring messages, the question regarding how effective it is at eliciting a behavioural change response, particularly one capable of supporting intensive adaptation and mitigation policies, remains unanswered. This is due to a lack of follow-up or evaluative, longitudinal

studies on how segmented messaging changes beliefs, attitudes and behaviours regarding climate change.

3.4.2 Limited effect

A fundamental criticism from Hine et al. [52] is that targeted communications based on segmentation (typically through beliefs, knowledge and attitudes) only address 'shallow' or 'low-hanging' behaviours. The values approach promoted by Thøgersen and Crompton [43] is a further attempt to appeal to an individual's more permanent worldviews and beliefs. This approach may increase concerns about the environment, but there is still little evidence to show that it results in significant change. Further, values may be longer-lasting assessments of how an individual views the world and their motivations; however, as indicated by Hards [63], values change throughout a person's lifetime, particularly after life-changing events. This point is further compounded by earlier examination of values and pro-environmental behaviours by Redcliff and Benton [64] that leads them to state that values are 'negotiated, transitory and sometimes contradictory' and like behavioural intentions are not always enacted.

Grouping people together through combinations of their sociodemographic characteristics (age, gender identity, income) and cognitive variables such values, attitudes or knowledge is relatively straightforward, widely practice and useful from a campaign planning perspective. However, the evidence for how effective it is as the basis for changing behaviour long term is limited. This review also highlights how different variables influence different PEBs (recycling, energy consumption, diet), further limiting the usefulness of developing standard segmentation approaches.

Also, by dividing people into groups such as 'better off villagers' or 'poorer pensioners' (from the Acorn classification) risks losing the opportunity to build social capital between members of the these groups who still hold much in common. As such it reduces the opportunity to foster community cohesions, a characteristic the evidence suggests is important for building higher levels of support for PEBs [65].

A further limitation to the dominant segmentation approaches and corresponding attitude-intention behaviour models is that they 'artificially isolate decision-making' processes from social and environmental cues [42]. In other words, they do not account for decision-making in context. Most segmentation approaches fail to consider place attachment or the emotional and cognitive bonds a person forms with a specific place [66]. Lastly, a majority of segmentation studies are based on quantitative data and lack the depth offered by qualitative investigation [67].

3.5 Summary

Based on our review of segmentation studies, to increase higher-effort behaviours among the public, segmentation approaches need to move beyond the dominant models and their concentration on attitudes, values and beliefs as a predictor of action. These approaches to segmentation are useful to a degree, for example, where they have been part of campaigns increasing awareness of climate change. However, there is little to no evidence to show these approaches lead to significant behaviour change, despite evidence they can be useful in health and political contexts. Lastly, behavioural motivations vary across domains, which requires different approaches to encouraging behaviour change to low-carbon options.

Within the lens of the ISM model, segmentation approaches are dominated by the individual context, with little consideration for the social and material contexts. Among the studies reviewed, social influences and identity can be more effective in terms of communicating and encouraging behaviour change. Furthermore, the literature on materiality and identity could provide a useful perspective on material objects and identity formation, where an individual builds their identity and social and cultural practices through their relationship with a material good [68].

4 Encouraging Transformational Change

This final section presents a range of frameworks and ideas that have profound effects on our lifestyles. They represent additional ideas to feed into the review of public engagement on climate change. The views presented here extend the scope of this report beyond providing answers to the core questions set. They are approaches that move beyond the existing paradigms underpinning climate change engagement.

4.1 Consuming Differently

Moving from 'I' to 'We': National narratives are the stories that describe the history, aspirations and sense of a nation's identity. They are powerful mechanisms for building climate change action and enhancing climate literacy [69]. In recent years, the narrative in Scotland has started to move from the narrative of 'I' to the narrative of 'We' and back towards the collective family and place-oriented traditions rooted in its Celtic past [70], [71].

The narrative of 'I' stresses that individual freedom takes precedence over collective experience and responsibility. 'I' is synonymous with debt-fuelled, wasteful, and unsatisfying cultures of consumerism. Central to this is the role of marketing as an influential force, where social interactions require spending; status and group membership are defined by what, where, how and with whom we consume. It also helps create and support continuous cycles of consumption by fostering a culture of continual change through product differentiation, regardless of social need or environmental sustainability.

The narrative of 'We,' which has been the foundation of collective societies for generations, stresses the importance of our relationships and place within our families, friends and communities, as well as prosperity, health and equity. Further movement to the narrative of 'We' will create a more significant space for re-establishing the value of human life beyond its contribution to GDP, reducing reliance on consumer goods to signal status and identity. Instead, it establishes the precedence of collective experience and responsibility, shared experience and society, and equality, fairness and sustainability.⁴ For further examples of the language required for narrative change, see Appendix 7.

Building on the theme in this report of moving beyond providing information to make better individual choices, below we introduce ideas on how to help citizens consume *differently*. We suggest focusing on supporting different ways of consuming that build community, have a significantly lower environmental impact, and provide alternative ways of being that are not reliant on consumer goods or experiences.

One idea is savouring—taking more time to absorb the sights, smells, sounds and feelings of what is being consumed, leading to smaller amounts being consumed while maintaining the 'utility' or benefit derived. Savouring food, for example, means you eat less but enjoy it more, taking longer to enjoy the taste and laying down memories of the experience so it can be 'consumed' in the future [73].

Beyond savouring, Kate Soper's work on Alternative Hedonism [74], [75] looks to reconnect people with pleasures of consuming differently by refocusing on intrinsic pleasures by slowing down, contemplation, relaxation, sharing and doing. Focusing on the pleasures of consuming differently has the potential to support more sustainable ways of living through its influence on infrastructure, public places and nature. A country more focused on taking its time and slowing down will be more likely to support the pleasures of walking and cycling to work and for errands, making cars less desirable, or restricting commerce in public spaces and instead install public artworks, which invites pleasure, connection and reflection.

⁴ See Black, Shaw and Trebeck [72]. For additional information, see the work of the WellBeing Economy Alliance (<https://wellbeingeconomy.org/>) and the recent publication Trebeck, K., and Williams, J. (2019) *The Economics of Arrival: Ideas for a Grown-up Economy*. Policy Press Bristol.

4.2 Transformation and Disruption

Guidance on how we can make the lifestyle shifts required by the planet and carbon reduction targets are available for the work on disruption [76] and transformation. The ideas proposed by the disruption literature build on those examining transformations. In particular, very recent work by Ioan Fazey at the University of Dundee [69] sets out 10 essential concepts that should be integrated into community-resilience initiatives designed to transform society to meet a 1.5-degree future.

These include actively enhancing adaptability and flexibility in individuals and communities, seeking to address multiple concerns and issues of power and control. In doing so, changes to individual behaviours are supported communally and addressed with increased skill and greater confidence.

Disruption is a process whereby smaller organisations with fewer resources challenge and overcome existing solutions and has been widely studied in the business world. It leads to satisfying the needs of segments that are typically overlooked by existing producers or service providers. Disruption theory is relevant here because governments have smaller public engagement and social marketing budgets aimed at reducing consumption compared to for-profit organisations trying to encourage it. Furthermore, research consistently tells us that what makes people happy is not consumer goods, but instead time spent with family/friends, good health and feeling connected. However, much like in the context of pro-environmental behaviour change, disruptive processes require a shift in deep-seated culture practices and values. To move Scotland forward on achieving its carbon reduction goals would require a similar transformation change in daily practices and values.

Lessons from disruption and transformation to climate change engagement

Disruption is a process using multiple tools over time rather than the launch of one product or initiative. Hence:

- Moving to a focus of policy-led restrictions and institutional change rather than individual choice models could take place over several stages.
- Segmentation is an essential part of the process and starts with identifying key targets and influencers and developing policies supporting them.
- Disruptors build organisational models that often different from a 'business as usual' approach but to achieve this requires a transition away from deep-seated values within a culture, organisational or otherwise. In terms of engaging the public on climate change behaviours this could mean:
 - Moving from ownership to sharing and hence mirroring some of the sharing and collaboration economy successes such as peer-to-peer lending and transport services.
 - Eliminating the need for single-use packaging.
 - Mandating reverse logistics systems, including packaging and durable product return schemes.

5 Conclusions and Recommendations

This report recommends that interlinked practices are the most appropriate lens for guiding interventions aimed at ensuring the people of Scotland change to living low-carbon lifestyles. We also recommend a more interventionist approach rather than focusing on influencing individual behaviours using a belief-attitude-intention model, which is unable to motivate the size and lasting changes required. Public engagement should also focus on building support and acceptance of radical structural and institutional changes.

While focusing on holistic policy interventions based on an interlocked practice understanding, this does not mean public engagement is required across all the linked behaviours. Specific, targeted campaigns conducted at local levels will still be required. These should include the aim of building social and individual capacity through knowledge, skills and support, as is articulated through the ISM model. However, there is potential for greater exploration of the relationship between materiality and identity and how that relationship is influenced by society.

Evidence on the relationship between climate literacy and action shows that once people understand their actions drive climate change, they can begin to understand their actions can limit it. Yet, beyond understanding the causes of climate change, individuals need to know what actions to take and feel that they are capable of significant change, through collective efforts across a community. Efforts using peer-to-peer methods, which build social capital and focus on locally relevant issues, are more likely to be successful and get support from the public regardless of attitudes, beliefs, values, etc.

The dominant approaches to segmentation are useful as the basis for crafting messages about climate change and the appropriate channels for distributing them. However, due to a lack of evaluation on previous campaigns, it is difficult to make overall recommendations. Among the small number of studies that have examined long-term change, results show overall awareness of climate change has increased, as well as greater acceptance that human activities cause climate change. There is, however, little to no evidence that overall changes in behaviour have occurred, with one study indicating people are experiencing issue fatigue [62].

5.1 Additional Research/Updating Understanding:

We suggest that the Scottish Government consider the following additional research:

- Establish and track whether people in Scotland understand why limiting the impacts of climate change is important and understanding their personal experience with climate change.
- Establish and track levels of support from the public and influencers for a range of policy instruments, including those that increasingly restrict individual choice. This should include the public's understanding of these interventions' impacts and how changes to lifestyles reduce these.
- Establish and tracking of understanding by the public regarding why reversing the impacts of climate change are important.
- Examine interlinking practices within the Scottish context to fully understand the material, social and competency elements and how practices relate to one another.
- Developing an understanding of the Scottish public's personal experience of climate change and how they have regulated their emotional response to these experiences, as this guides future behaviour.
- Examine, within a Scottish context, how to encourage personal and community leadership and engagement with structural and policy changes.

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6 Appendices

Appendix 1: Implementing an Integrated Practice approach

The traditional approach to public engagement on pro-environmental behaviour considers the specific behaviour to be changed, for example, cycling to work, recycling, or consuming less electricity. These behaviours are framed within the 10 KBA's.

The objective is set and the audience is segmented in order to efficiently develop messages that will encourage an individual to change his or her behaviour. Messages are then often framed in terms of personal values, costs and benefits, emotions, or social norms and embedded in a national campaign, with the objective of successfully getting a certain percentage of people to engage in the desired behaviour.

This, approach, as established in Black and Eiseman (2019), falls short when it comes to delivering widespread, sustained changes in individual behaviour, thus we describe an interlinked practices approach below.

General approach for interlinked practices

For example, to consider household energy consumption, many of the relevant practice concerned with this fall under **Looking after the home** on figure 1. Energy consumption is connected to *keeping warm or cool*, but also it is further linked to *Entertaining guests*, as well as the practice of **Looking after yourself**, which includes *Getting ready for the day*, *Grooming oneself*, *Maintaining one's health and Food* practices such as *Preparing food for yourself, family and friends and to a lesser extent as Preparing food for special occasions*. These behaviours or activities do not occur in isolation, nor should they be perceived that way when it comes to designing behaviour change policies or campaigns.

Each of these practices can be broken down into the three key elements: Meaning, Materials and Competencies. So, each of these activities, such as keeping warm, entertaining or preparing food, holds a variety of meanings for individuals- for example, comfort, hospitality, status, frugality that need to be understood as these act as both drive and restrain actions. Consideration must be given to the material (infrastructure and objects) elements such housing structures (draftiness, heating technology) and the ability to pay for heating or cooling, purchasing energy efficient appliances, or insulation materials. Lastly, within the competencies element of practices, do the individuals have the ability to engage in behavioural changes, what are their skills, knowledge and competencies?

Thus, the messaging of a traditional campaign falls short when it focuses on a specific behaviour, because it fails to consider the interlinked practices and their shared elements that directly and indirectly guide behaviour. Practices are interlinked because they share meanings, competencies or materials. This view reflects a more meaningful, insightful and accurate frame for understanding how and why people act as they do on a daily/weekly basis and for guiding integrated, cross-functional and cross-institutional action.

An interlinked practice based engagement strategy focused on, for example, heating and more specifically energy consumption may then consider an alternative objective on more universal concepts, such as what it means to be comfortable within a dwelling and the pressure to provide hospitality to visitors. How an individual defines comfort or hospitality most likely varies, but most individuals want to be comfortable in their home and be able to avoid shame at not being able to welcome others in to it.

Engaging the public on energy usage needs therefore to centre upon ways in which people can achieve their personal ideal of comfort and providing hospitality through the provision of a warm welcoming home where food and drink is offered.

This will lead to broad ranging campaigns highlighting actions and meanings from a range of the interlinked practices that are performed across time and in related spaces. A practice centred campaign will include consideration of a range of policies, infrastructure changes, and the provision of skills development, social support and education integrated across multiple levels of governance and including additional key stakeholders. This will support and facilitate existing programmes aimed at allowing low carbon living such as access building codes that ensure proper insulation, refurbishing of existing structures and greater reliance on renewable energy sources.

Case study: Inglorious fruit and vegetables

The Inglorious Fruits and Vegetables campaign shows, to an extent, what campaign based on an interlinked practice view can look like and what it can achieve.

This short video, <https://www.youtube.com/watch?v=qQQMygivn0g> provides an engaging example of what can be done when you think about food waste and healthy eating through a range of practices—shopping, eating, preparing food and consider how campaign and aims of change run over the areas. It identifies and considers *affordability* and conformity as the central meanings affecting low uptake of advice to eat 5 portions of fruit and vegetable a day and very high levels of food waste. This richer understanding of the issue then directs a broad ranging campaigning where key issues are identified (availability, taste acceptance) that become the focus of specific campaigns with the broader campaign. It also highlights the effect of integrated action between governments, industry, consumers and other stakeholders.

This is not to say *The Inglorious Fruits and Vegetables* campaign could not be improved as whilst it addresses food waste and healthy eating from a broad perspective, its objectives are completed in store at the point of purchase. This could be extended by considering *food preparation, cooking and eating* practices. Adding these to the consideration set might highlight whether people have the skills (competencies) to cut and prepare these vegetables and how these different shapes and cuts affect the dishes they can be used for and how appetising they look on the plate (meanings)? This might lead to the insight that there is a need for guidance on how to cut/prepare food and for a series of recipes that takes this into account and the way food looks on a plate?

This approach is a long way from focusing on people's beliefs and attitudes to food waste and expecting changes in behaviour.

Appendix 2: Methodology

To complete this report we conducted a literature review based methodology and engaged with an expert review panel. This ensured that the studies upon which the implications and recommendations are based, were the most appropriate considering the wide range of material available, were rigorously evaluated according to international best practice within climate change and their limitations clearly expressed.

Primary Review of Behaviour Change Literature

Steps:

- Identify and review new and updated conceptual and theoretical literature focusing on behaviour change across Psychology, Sociology and Behavioral Economics.
- Database identification and Keyword search. Databases to include: PsycInfo, ABI/Inform, EconLit, ERIC, and Sociofile. Concepts and theory review to include; work based on Theory of Planned Behaviour (Ajzen, 1985; 2011); Intrinsic Values (Crompton, 2010), Cognitive and Affective information processing (Baumeister et al. 2007), New Ecological Paradigm (Stern, 2001), Practice Theory (Shove, 2010; 2017), ISM model (Darnton and Horne, 2013).
- Identify and review relevant contextual literature based on findings from above.
- Database identification and Keyword search. Databases to include: PsycInfo, ABI/Inform, EconLit, ERIC, and Sociofile. Keywords including 'pro-environmental behaviour', 'behaviour change', 'energy behaviour', 'recycling', 'modal transport shift', anti-consumption, 'voluntary simplicity', low carbon diets.
- Structure reviews according to: Four functional areas (housing, transport, consumption/waste, food and diet). Specific behaviours (10KBA's and others). Intensity and focus of change. Target segments (based on characteristics of sample).
- Review by the Cornell Climate Change Program Work Team

Overview: We examined a broad range of influences and activities that have been shown to promote pro-environmental behaviour to different degrees and different structures including individual, family, community, local and national democratic institutions. We extended the scope of the review to include theories on lifestyle changes addressing disruptive (Marsden & Docherty, 2013), or liminal events such as motherhood (Black & Cherrier, 2010), literature on the limits of individual and collective choice (Gillard et al., 2016), choice architecture (Yeung, 2016) and work exploring barriers that prevent

Focused Review and Evaluation of Segmentation Approaches

Steps:

- Identify and review segmentation profiles used in climate related behaviour change. For example, Defra's Moments of Change, the Yale Climate Communications Six Americas (has been successfully applied to UK), Futurra's 'Sell the Sizzle' and Scottish Government's segmentation tool.
- Identify and review segmentation profiles used in other areas of pro-social, health related to significant behaviour and lifestyle change: For example, Cancer Research Campaign's health foundations life-stage segmentation model, NHS Scotland Health Behaviour Change Competency Framework and Food segments (Roy Morgan Research).

Structure both reviews according to:

- Variables used: Demographic, Lifestyle and Psychological variables (i.e. knowledge, past behaviour, temporal orientation, risk aversion, perceived collective efficacy, group orientation).
- Communication goals targeted

Overview: This section represents the main focus of this project. We examined the segmentation used nationally and internationally, summarized in appendices 3 and 4, to influence climate change and pro-environmental behaviours. After comprehensively reviewing this work, we recommend examining classifications used for related prosocial and health behaviour changes and segments used to effectively promote changes requiring significant alteration to behaviour/lifestyles, such as stopping smoking or addiction control.

We will identify the variables, or combination of variables, used in each segment and structure the review to cover work on the main four functional emissions areas, the size or intensity of the change of behaviour addressed and how effective the profiles have been found to be. In order to highlight which profiles have the most relevance to the review of the public engagement strategy, they will be evaluated so those with the strongest evidence base and closest relationship to the Scottish context are identified.

Review and Evaluation of Segmentation Approaches used in Disruptive Events and Develop Implications and Recommendations.

- Identify and evaluate segmentation used in disruptive events leading to profound changes to market structure and behaviour such as iPhone, Airbnb, and Uber.
- Combine evaluations from all sources of segmentation.
- Compare findings with existing low carbon Scotland segmentation tool.
- Develop implications for policy makers and potential applications of the findings.
- Review by the Cornell Climate Change Program Work team.

Overview: We assessed current strategies used in disruptive events that may be able to shift individual behaviours quickly and on a greater scale.

Appendix 3: Difference Between Behaviour- and Practice-based approach

Behaviour approach	Practice approach
Behaviour is solely within the individual	Practices are stable and reproduced by individuals
Behaviour is the product of drivers and barriers, which determine intentions and thus resulting behaviour.	Practices emerge from the influence of institutions and infrastructure.
Behaviours have costs and benefits	Practices are part of a routine or habit
Behavioural decisions are made in isolation	Practices are shared and social
Behavioural decisions are made as if for the first time	Practices are part of a continuous flow of activity
Behavioural choices shift based on environmental cues	Practices shift as new rules and resources evolve
Values/beliefs influence behavioural decisions	Fulfilling socially constructed needs/desires is the outcome of performing a practice.

As described by Darnton et al. [44] the behaviourist perspective assumes if barriers to engaging in certain behaviours are lifted, then the individual will act. This could be changing attitudes or making low carbon options more affordable, for example. The practice perspective suggests the right combination of elements must be in place for a person to engage in a behaviour. For example, the materials needed are accessible, the person feels as though they are capable of engaging in the behaviour, it fits within socially accepted norms, and fits within his or her schedule.

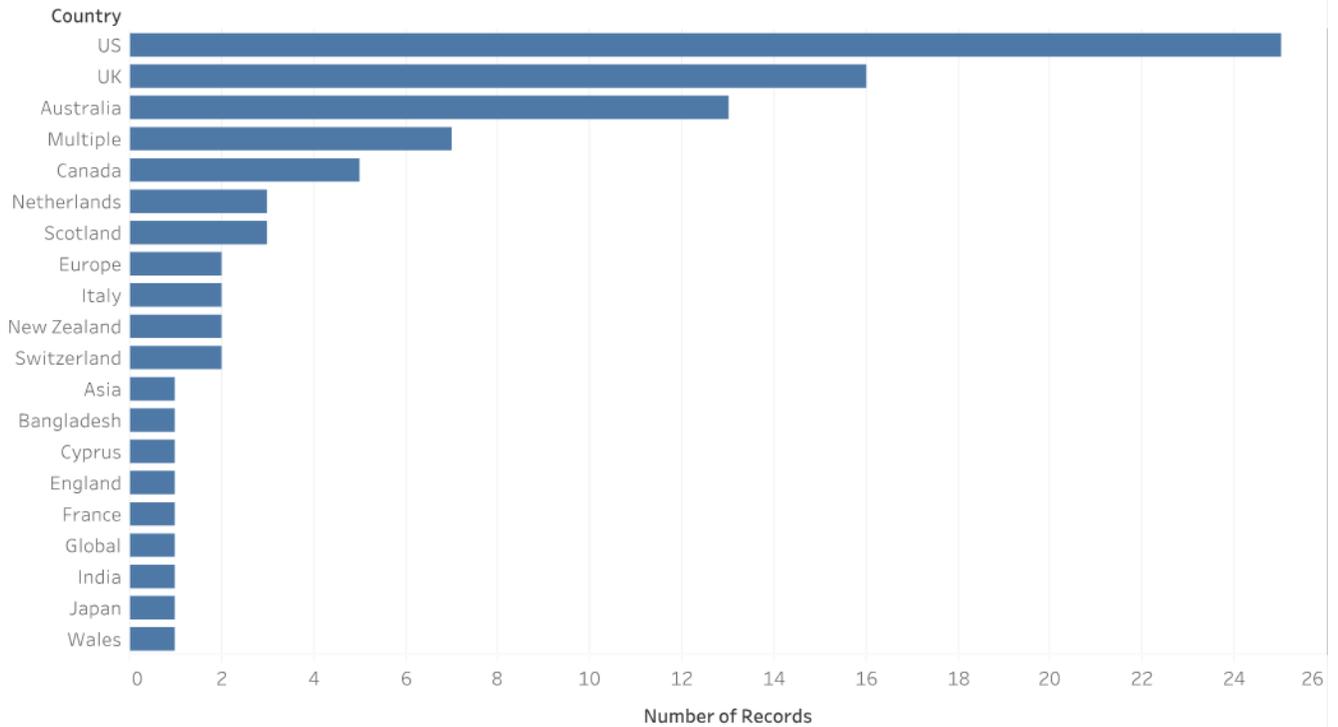
Appendix 4: Barriers to Behaviour Change

There is a very broad range of barriers that can cause the attitude-behaviour gap, and the list below provides a short review of some of these. The most recent work examining how to overcome these barriers reaffirms the recommendation that rather than focus on influencing individual choice, it is more effective to intervene with a range of direct policy and infrastructure actions.

- Evolution (Durante and Griskevicius 2016)
- Attitudes-Behaviour Gap (Carrington, Zwich and Neville, 2016)
 - Conflicting goals (Carrington, Neville and Whitwell, 2010 and 2014)
 - Lack of perceived control (Ajzen and Madden, 1986; Eckhardt, Belk, and Devinney, 2010)
- Social pressure/Conformity/Group power
- Habits (Hull 1943; Verplanken and Roy, 2015)
- Moral/ethical issues
 - 'I do enough' 'If it's legal it's ok' (Eckhardt, Belk, and Devinney, 2010)
 - Level of Moral obligation, (Chen 2015)
- The weight of money and messages (Pierce, Gilpin and Choi, 1999)
- National narrative (Black, Shaw and Trebeck, 2015; 2017)
- Inconsistent signals from Government (Trebeck, Black and Shaw, 2016)
- Identity, (Chaudhuri and Majumday, 2006) Social Identity (White and Dahl, 2007) and Identity conflicts (Black and Cherrier, 2011)
- Mismatch between Construal level (Trope et al., 2003)

Appendix 5: Segmentation Studies by Country of Origin

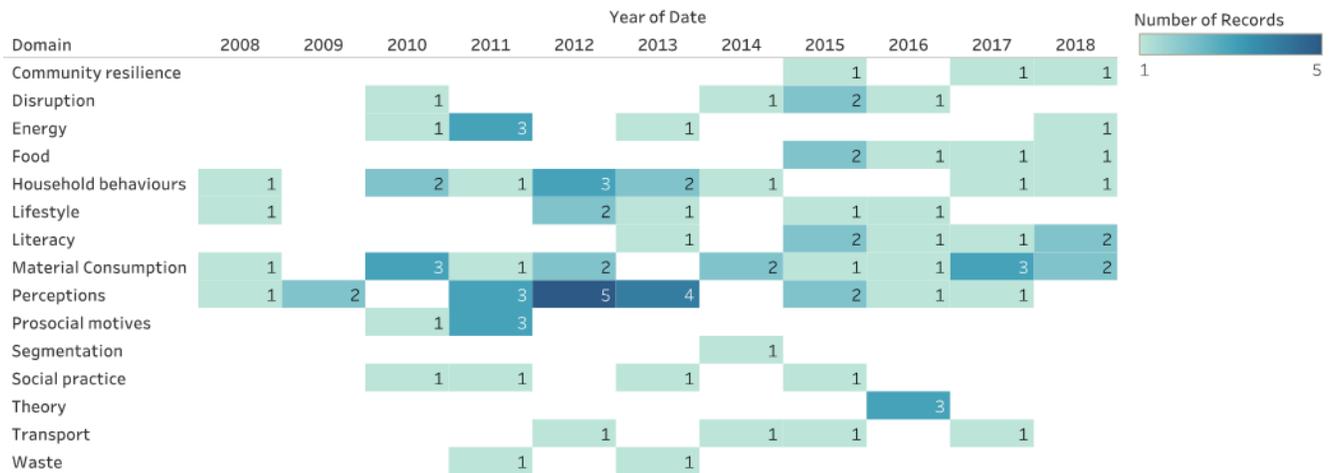
Number of studies published by country



Sum of Number of Records for each Country. The data is filtered on Domain, which excludes Disruption, Identity and Segmentation. The view is filtered on Country, which excludes Conceptual.

Appendix 6: Trends in PEB Research Topics

Trends in research topics



Sum of Number of Records broken down by Date Year vs. Domain. Color shows sum of Number of Records. The marks are labeled by sum of Number of Records. The view is filtered on Date Year and Domain. The Date Year filter keeps 11 of 18 members. The Domain filter excludes Identity.

Appendix 7: The Language of We

Promote		Replace	
We	Rental	I	Individual ownership
Citizens	Needs	Consumers	Wants
Community	Local	Private	Self-regulation
Together	Slow	Competition	Instant
Social	Circular	Individual	Linear
Sharing	Participation	Greed	Depletion
Shared ownership	Interdependence	Privatisation	Spectating
Nourishment	Enough	Exploitation	Insatiability