This is an Accepted Manuscript for *Global Sustainability*. Subject to change during the editing and production process.
DOI: 10.1017/sus.2021.23

Scaling behaviour change for a 1.5 degree world: Challenges and opportunities

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Non-technical summary box *(100 word max)*

Scaling sustainable behaviour change means addressing politics, power and social justice to tackle the uneven distribution of responsibility and agency for climate action, within and between societies. This requires a holistic understanding of behaviour that bridges the 'individual' and 'systemic', and acknowledges the need for *absolute* emissions reductions, especially by high-consuming groups, and in key 'hotspots' of polluting activity, namely, travel, diet and housing. It counters the dominant focus on individuals and households, in favour of a differentiated, but collective approach, driven by bold climate governance and social mobilisation to reorient institutions *and* behaviour towards just transitions, sufficiency and wellbeing.

Technical summary box *(200 word max)*

Sustainable behaviour change has been rising up the climate policy agenda as it becomes increasingly clear that far-reaching changes in lifestyles will be required, alongside shifts in policy, service provision and technological innovation, if we are to avoid dangerous levels of global heating. In this paper, we review different approaches to behaviour change from economics, psychology, sociology and political economy, to explore the neglected question of scalability, and identify critical points of leverage that challenge the dominant emphasis on individual responsibility. Although politically contentious and challenging to implement, in order to achieve the ambitious target of keeping warming below 1.5 degrees, we propose urgent structural interventions are necessary at all points within an *ecosystem of transformation*, and highlight five key spheres for action: a 'strong' sustainability pathway; pursuing just transitions (via changes to work, income and infrastructure); rebalancing political institutions to expand spaces for citizens vis-à-vis elite incumbents; focusing on high polluting actors and activities; and supporting social mobilisation. We call for a move away from linear and 'shallow' understandings of behaviour change, dominated by traditional behavioural and mainstreaming approaches, towards a 'deep', contextualised and dynamic view of scaling as a *transformative* process of multiple feedbacks and learning loops between individuals and systems, engaged in a mutually reinforcing 'spiral of sustainability'.

Social media summary box *(120 character max)*

Scaling behaviour change means addressing power and politics: challenging polluter elites and providing affordable and sustainable services for all.

Key words

Behaviour change; consumption; governance; transformation

1. Introduction

Can we change our ways of life quickly enough to address the climate crisis? We now know that we need to urgently halve greenhouse gas (GHG) emissions by 2030 to achieve the Paris Agreement goal of limiting global warming to 1.5 degrees Celsius (IPCC, 2018). Yet despite decades of political rhetoric, technological advancement and high-level international policy and pledges, we have neither put peak GHG emissions behind us nor set out a convincing path to radically reduce emissions. Instead, under a business-as-usual scenario, we can expect between 3-4°C of warming by the end of the century, with catastrophic consequences for humanity and the ecosystems on which we depend (Sherwood et al., 2020; O'Neill et al., 2016). Even the onset of a global pandemic, triggering unprecedented restrictions on mobility, resulted only in a fall in emissions of 6.4% in 2020 (Nature News, 2021) – less than the carbon reductions of 7.6% required *annually* over the next decade to make a 1.5-degree world possible (UNEP, 2020). Hence, although the Covid-19 pandemic has shown that behaviours can change rapidly and in unexpected ways, the emissions reductions achieved have been modest at best.

Against this backdrop, it is becoming increasingly apparent that far-reaching changes in lifestyles will be required, alongside shifts in policy, service provision and technological innovation, if we are to avoid dangerous levels of global heating, and importantly, buy time for communities to adapt to the climatic impacts projected to occur at an unprecedented scale and speed in human history. In response, sustainable behaviour change has been rising up the climate policy agenda after a long period of neglect. Notably, the recent IPCC SR15 (2018) and UNEP *Emissions Gap* reports (UNEP, 2020) have devoted concerted attention to the role of behaviour change in reaching ambitious climate goals, and governments increasingly view it as a necessary element in their climate change strategies. As UN Secretary-General, António Guterres, proclaimed in his *State of the Planet* speech in December 2020,

> COVID-19 lockdowns have temporarily reduced emissions and pollution. But carbon dioxide levels are still at record highs – and rising. [...] This is a moment of truth for people and planet alike. [...] Every individual must also do their part. [..] More and more people are understanding the need for their own daily choices to reduce their carbon footprint and respect planetary boundaries.

Nevertheless, views have long been divided on the significance of behaviour change relative to other drivers of emissions trajectories, and how best to apportion *responsibility* for emissions when *agency* to address them is so uneven (Akenji, 2014; Maniates, 2001). In empirical terms, there is little doubt that behaviour is a key site for potential change, both in terms of direct and indirect effects on emissions from households' consumer choices, where according to some estimates, they are responsible for up to 72% of GHG emissions (Hertwich & Peters, 2009). Its significance is greater still, if broadened to include the license that citizen support through voluntary actions gives governments and businesses to be more ambitious in their climate actions.

On the other hand, there are real concerns about placing the burden for collective change on individual shoulders, when capacity to modify behaviour is often limited by financial barriers and physical infrastructures, such as energy, transport, housing and food production systems, over which most people exercise little direct control. They are also influenced by social values and practices, which create the motivational and habitual frameworks within which behaviour occurs. From this perspective, generic approaches to behaviour change are misguided because responsibility for the majority of emissions is so heavily concentrated in the hands of a powerful few, referred to by Kenner (2019) as the 'polluter elite'. These top consumers use their considerable economic and political influence to perpetuate the unsustainable and inequitable systems that underpin the fossil fuel economy (Wiedmann

et al., 2020). According to Kartha et al. (2020:7), almost half of total emissions growth between 1990 and 2015 was attributable to the richest 10% – the top 5% strata being responsible for over a third (37%) – whereas the contributions of the poorest half were "practically negligible".

Despite a growing academic literature, which brings different approaches to bear from economics, sociology, psychology, science and technology studies and politics, there has been less attention to the question of *scalability*: key points of leverage and traction that bring about shifts in behaviour at the scale (as well as speed) now required to tackle the climate emergency. In this paper, we draw on these theories and perspectives to provide an interdisciplinary synthesis of existing scholarship and policy debates on the question of scaling behaviour change, based on the findings and reflections of the work of the *Cambridge Sustainability Commission on Scaling Behaviour Change* (Newell et al., 2021). This initiative convened a panel of 31 international experts from a variety of disciplines, together with a network of practitioners involved in sustainable behaviour change, to explore these challenges, and identify high-impact, scalable interventions for promoting sustainable behaviour. Based on this review, we suggest the need to re-think the question of scaling and propose five overarching areas for action to catalyse change and create momentum for sustainable behaviour change.

The paper is structured as follows. In Section 2, we empirically situate key discussions about scaling behaviour change, and explore the ecological and social parameters within which attempts to fast-track sustainable actions must operate. We then briefly review the contributions of different disciplines towards understanding how to scale 'behaviour' change, specifically: (i) behavioural economics (ii) psychology, (iii) sociology and social practice, and (iv) political economy, and illustrate how these approaches emphasise different drivers of behaviour change, which in turn cause them to prescribe different interventions and pathways for achieving a 1.5-degree future (Section 3). Building on these findings, we call for a rethink in approaches to scaling behaviour change and present a new typology to highlight the core differences with contemporary interpretations. We identify the corresponding tools and methods they propose, along with their strengths and weaknesses. Crucially, we infer from this analysis, the need for a contextualised, transformative and dynamic view of scaling that synthesises feedbacks between the individual and systems levels (Section 4). To avoid transgressing critical climatic thresholds, five central areas of action are identified to maximise prospects for sustainable behaviour change (Section 5). We conclude by proposing future directions for the sustainable behaviour change agenda, policy and research (Section 6).

2. Background and context: the scale of the challenge

2.1 The potential of behaviour change

A large body of evidence indicates that opportunities for household GHG reductions could be substantial, ranging from two-thirds to 72% of current output (Ivanova et al. 2020; Hertwich & Peters, 2009, Akenji et al., 2019; Williamson et al., 2018; Stern et al., 2016; Dietz et al., 2009, Moll et al., 2005). Interestingly, it seems individuals themselves accept a high degree of responsibility for climate change mitigation. In a recent climate survey, 39% of European respondents reported, "the best way to drastically limit climate change" is through "radical changes in individual behaviour", compared with 29% favouring technological improvements, and 14% preferring regulation (European Investment Bank, 2021).

Recent research points to the growing consensus that rapid behaviour change demands a shift away from a traditional focus on incremental household actions, largely relating to appliances and energy provision, towards more high-impact sectors and activities (Dubois et al., 2019: 152; Thøgersen & Crompton, 2009: 141). Instead, evidence suggests that the most promising behavioural climate mitigation measures will come from food, transport, residential energy use and housing. The first three of these alone, are estimated to comprise 20%, 19% and 17% of total GHG emissions respectively (Hertwich & Peters, 2009). Looking at food specifically, the carbon emissions of the average European diet are around 1,070kg CO_2 equivalent per year (Sandström et al., 2018), with

meat, eggs and dairy making up 83% of the total (Ritchie, 2020). To add to this, UN studies estimate that food systems account for over a third of total GHG emissions (Crippa et al., 2021), and calculate that a third of food is wasted (FAO, 2019, 2011), which taken together, indicates the vast scope for more sustainable food practices. Others highlight the emissions associated with size of housing (Bierwirth & Thomas, 2019; Brown, 2018; Cohen, 2020; Ropke & Jensen, 2018), which is significant, not least due to the additional consumption that living 'larger' facilitates (e.g., energy and water use, appliances etc.). Kuhnhenn et al. (2020), for example, assume a 25% reduction in average personal living space will be necessary as part of their *Societal Transformation Scenario for Staying Below 1.5°C*.

Applying a more holistic approach, the *1.5 Degree Lifestyles* report (Akenji et al., 2019), emphasises the impact of addressing 'clusters' of activity in targeted areas, such as reducing meat and dairy consumption, switching to non-fossil-based energy, and reducing car use and air travel, and calculates that food, housing and transportation combined, comprise approximately 75% of total carbon footprints. This marks a useful departure from more traditional, individual-action oriented perspectives of behaviour change (Gifford, 2008), by instead defining 'sustainable lifestyles' as,

> a cluster of habits and patterns of behaviour embedded in a society and facilitated by institutions, norms and infrastructures that frame individual choice, in order to minimize the use of natural resources and generation of wastes, while supporting fairness and prosperity for all (Akenji and Chen 2016:3).

All this points to the huge *potential* for behaviour change to contribute towards achieving the aims of the Paris Agreement. Yet, in reality, delivering behaviour change at scale is a huge challenge. First and foremost, experts note that, "it is difficult to point to any reliable, generalizable evidence of substantive, sustained behavioural engagement with climate change among the broader general public," which they attribute in part to the limitations posed by "the need to operate within prevailing social scientific, economic and political orthodoxies" (Capstick et al., 2015: 429-430). Second, estimates of behavioural impacts tend to include the entire lifecycle of goods and services, which allocate a higher share of environmental impacts to households than they would realistically be able to influence, for several – often structural – reasons (discussed in Section 3). This is summarised bluntly by Heglar (2019), "This overemphasis on individual action shames people for their everyday activities, things they can barely avoid doing because of the fossil fuel-dependent system they were born into." Third, there is a considerable disparity in responsibility for emissions between and within populations, especially in certain sectors. In aviation, for example, estimates suggest that 2-4% of the global population flew internationally in 2018, while just 1% of the world's population was responsible for 50% of CO_2 from commercial air travel (Gössling & Humpe, 2020). Fourth, in many ways we are in uncharted territory, with few historical precedents to guide us about how to achieve this scale and depth of change. As the IPCC SR15 report noted, the geographical and economic scales at which the required rates of change in the energy, land, urban, infrastructure and industrial systems would now need to take place are larger and have no direct documented historic precedent (IPCC, 2018). Finally, there are key tensions between the depth of change required and the speed at which such change is possible, especially perhaps in social and cultural domains.

What this points to is the need for an array of regulatory, infrastructural and societal interventions to scale behaviour change: what we refer to below as an *ecosystem of transformation*. As Akenji et al. (2019: vi) confirm, "the sheer magnitude of change required for a shift towards 1.5-degree lifestyles can only be achieved through a combination of system-wide changes and a groundswell of actions from individuals and households."

2.2 Living within planetary boundaries

Understanding the physical and social parameters within which behaviour change must take place is a crucial starting point for understanding the scale of the challenge ahead: we have been living beyond

the planet's carrying capacity since 1970, with the global North consuming the resources of five Earths per capita in 2016 alone (WWF, 2020: 20). This is not just about climate change, of course, but a failure to tackle this will render most Sustainable Development Goals impossible to achieve. At the same time, efforts to radically decarbonize through behaviour change need to be cognisant of their impact on other environmental problems such as biodiversity loss, waste, and water pollution, where a narrow focus on decarbonisation may obscure unintended and detrimental consequences (Dasgupta, 2021). This might be the case, for example, with regard to the electrification of transport, if the intensification of mining lithium and cobalt are not taken into consideration (Sovacool, 2019), or moves to plant-based diets, if pursued through monoculture industrial agriculture.

Issues of rationing, allowances and quotas therefore increasingly arise when discussing the need to scale behaviour change in line with Paris Agreement goals (Fuchs et al. 2020; Lorek & Fuchs, 2013). As the originator of ecological footprint analysis, William Rees (2020:7), explains, "One-Earth living requires mechanisms for fair income re-distribution and otherwise sharing the benefits of economic activity". Moore's eco-footprint analysis (2015: 4747) demonstrates the implications for the average urban dweller globally:

> The dimensions of transformation needed commensurate with ecological carrying capacity include: a 73% [absolute] reduction in household energy use, a 96% reduction in motor vehicle ownership, a 78% reduction in per capita vehicle kilometres travelled, and a 79% reduction in air kilometres travelled.

Although politically contentious, this has led to discussions about 'fair shares' or 'shrink and share' schemes to reconcile the need to address sustainability alongside current and historical inequalities within and across societies (Rees & Moore, 2013). Proposals include: 'contraction and convergence' (Global Commons Institute, 2018), sustainable consumption corridors (Di Giulio & Fuchs, 2014), carbon allowances and budgets (van den Berg et al., 2020); carbon fee and dividend (Citizens' Climate Lobby); a Greenhouse Development Rights framework (GDR, 2018); and 'doughnut' economics (Raworth, 2017). These tools set limits and parameters within which economic activity can take place, and tie-in with the 'strong' sustainable consumption agenda, which calls for changes not only in patterns of consumption, but importantly, in *absolute* reductions in consumption levels in industrialised countries (Fuchs & Lorek, 2005; Lorek & Fuchs, 2013; Anantharaman, 2018).

Importantly, this demands a shift in thinking from efficiency to *sufficiency*, which establishes limits and seeks absolute reductions in energy consumption (Spangenburg & Lorek, 2019; Princen, 2005;). By contrast, the prevailing 'weak' sustainable consumption model, focuses on efficiency gains in existing production and consumption through technological innovations and small-scale behaviour change within a context of sustained economic growth, but fails to acknowledge that current lifestyles trends are unsustainable, and efficiency gains are often counterbalanced by negative rebound and spill-over effects (Sorrell et al., 2020). Furthermore, the social and physical contexts in which consumption occurs and underlying drivers of energy demand (e.g. mobility, comfort, convenience. etc.) are not addressed by the 'weak' sustainability approach, thereby limiting opportunities to bring about the more fundamental, structural changes necessary to bring behaviour in line with a 1.5 degree world (see Section 3).

2.3 Social dimensions of behaviour change

Turning to social considerations, it is clear that a small percentage of humanity needs to make the greatest transformations in their lifestyles in order to prevent us from breaching planetary and climatic limits. The UN *Emissions Gap Report* explains, "the richest 1 per cent would need to reduce their current emissions by at least a factor of 30, while per capita emissions of the poorest 50 per cent could increase by around three times their current levels on average" (UNEP, 2020: xxv). For this reason, it

is important to contextualise and globalize the conversation about scaling behaviour change across cultures and regions, exploring the interface with different social cleavages and dynamics, such as race, class and gender. The focus to date has been on behaviour change in richer societies, for obvious reasons relating to their higher carbon footprints, historical responsibility, and because most behaviour change research is conducted there. There is also increasing attention to the role of the richest – the top 1%, 'polluter elite' – in driving climate change (Kenner, 2019; Wiedmann et al., 2020), given that estimated emissions from the highest 0.1% of earners are several hundred times greater than the average footprint of the poorest half of humanity (Gore & Alestig, 2020). At the same time, rapidly industrialising countries are projected to contribute almost all the growth in carbon emissions, with increases in household consumption driving much of that increase as the expanding middle classes in China and India reach the per capita levels of the USA and EU. This underscores the importance of what has been referred to as 'lifestyle leapfrogging': supporting sustainable lifestyles in emerging economies that side-step the high-carbon emissions pathways of Northern consumerism (Schroeder & Anantharaman, 2017).

Both in terms of apportioning historical and contemporary responsibility for accumulated and ongoing emissions associated with high emitting behaviours and recognising uneven agency to change them, racial, gender and class dimensions need to inform efforts to scale behaviour change. This is important for reasons of equity, ownership and effectiveness. It is important to avoid the problems of women and poorer groups being burdened with the responsibility of adopting new sustainable behaviours (Anantharaman, 2014) or the low uptake of low carbon technologies among marginalised and racialised communities, for example, whose needs and everyday practices are often overlooked in policy design (Hooper et al., 2021). This points to the need for just transitions and more participatory governance innovations highlighted below.

3. Understanding behaviour change: theoretical perspectives

So, what does existing scholarship suggest about the ways in which behaviour change can be scaled? We incorporate insights from a range of perspectives that address individual and system change, but focus on four disciplinary traditions for understanding sustainable behaviour change. Two of these schools view the *individual* or households as the central unit of analysis: namely, 'nudge' theory, founded in behavioural economics; and psychological approaches, mainly drawn from environmental and social psychology. The remaining pair - sociology and social practice, and political economy - see *systems* as the key analytical focus. We discuss these briefly in turn.

3.1 Behavioural economics: 'nudge'

The concept of 'nudge' hails from the tradition in behavioural economics that asserts people can be coaxed into making 'better choices' using the power of suggestion and positive reinforcement, without the need to change the alternatives available to them (Nature Human Behaviour, 2020). As popularised by Thaler and Sunstein (2009: 6), a *nudge* is defined as, "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives". Lehner et al. (2016) suggest that nudge interventions make use of four tools to alter the choice architecture: simplification and framing of information (Thøgersen & Schrader, 2012); adjustments to the physical environment; changing default policies (Momsen & Stoerk, 2014, Kaiser et al., 2020); and the use of social norms, such as gamifying recycling through neighbourly competition (John et al., 2013). By altering the 'choice architecture', optimal outcomes (in this case more sustainable behaviours) become more predictable, without infringing on individual liberties. For this reason, critics have labelled it 'neoliberal' or 'soft

paternalism' (Jones et al., 2011), due to its emphasis on the individualisation of responsibility (Nagatsu, 2015: 481).

Although evidence shows that nudging individuals in the right direction can achieve a degree of success in changing behaviour (Shepherd et al., 2014), it is clear that its reach is generally confined to specific, simple and narrow contexts (Nisa et al., 2019), and its capacity to affect behaviour change to date has been notoriously limited, with even its mixed and modest claims of achievement thought to have been overstated due to publication bias towards positive cases (Nature Human Behaviour, 2020).

In quantitative terms, nudge efforts are also notoriously vulnerable to 'rebound' effects; for example, buying a more fuel-efficient or hybrid car might cause a driver to make longer or more frequent journeys (direct rebounds), and even spend the money saved on energy-intensive goods and services, such as a second car (indirect rebounds/negative spillovers). Sorrell et al. (2009) estimate that direct rebounds in certain sectors can be as much as 30%. Furthermore, individuals may use time saved engaging in environmental behaviours (e.g., cycling to work to avoid traffic) to consume other energy-intensive good and services, such as watching television (time-use rebounds) (Sorrell et al., 2020). The need to take into account the balance between financial, moral and temporal trade-offs resulting from individual actions is therefore evident (Sorrell et al., 2020), and relates in part to some of the more substantive, qualitative critiques levelled at nudge from other approaches (discussed below): that rationalist assumptions and reductive tendencies leave them blind to the complex interplay between psychological, sociological and eco-political structures, ultimately to the detriment of achieving the desired behavioural outcomes.

3.2 Psychological perspectives

From a psychological perspective, a major deficiency in the effectiveness of nudge as a tool for behaviour change is that it fails to engage with the attitudes, values and beliefs underlying individuals' motivations for taking action. In this vein, social and environmental psychology bring greater cognitive depth to our understandings of how human behavioural responses can be used to promote climate mitigation and adaptation.

At their core, psychological perspectives essentially see *values* (personal, guiding principles) and *identity* (how people define themselves) as the "building blocks of public engagement" (McLoughlin et al., 2019: 16), which tend to be more stable and consistent across contexts, and therefore helpful in targeting interventions to promote conscious change and embed low-carbon lifestyles – rather than simply triggering a collection of disparate pro-climate actions (Nash et al., 2017). They emphasise the importance of: *perceptions* and *motivations* (e.g. attitudes to risk, cognition, denial); *values* (conservation vs. openness to change, self-transcendence vs. self-enhancement), (Schwartz, 2012; Kasser, 2016; Crompton et al., 2014); *identity* (e.g. virtue-signalling and 'conspicuous consumption' (Frank, 2020)); *emotional* responses, such as climate anxiety, guilt and shame (from psychosocial and psychoanalytical perspectives: Lertzman, 2015; Weintrobe, 2013); and *wellbeing* (highlighting its inverse relationship with materialism), (Dittmar et al., 2014; Brown & Kasser, 2005).

In the field of climate change, psychological studies have made considerable inroads into our understandings of scaling behaviour change, by identifying targets and exploring the potential of specific interventions to improve the uptake of high climate-impact actions (Nielsen et al., 2020: 25), often by highlighting individual and social barriers and constraints (information, financial, confidence, time, mobility, expertise), and indicating how they can be overcome (Atari et al., 2009; Lorenzoni et al., 2007; Dietz et al., 2009; Poortinga & Whitaker, 2018). Findings suggest there are various key elements to successful sustainable behaviour interventions. One is *priming* to motivate

environmentally conscious behaviour, by activating intrinsic (altruistic) values at the point of choice (Thøgersen & Alfinito, 2020). This ties in with research proposing the use of more empowering cues, such as telling a positive story and highlighting the *co-benefits* of pro-environmental actions – such as health, wellbeing, community cohesion (McLoughlin et al., 2019), as well as citizenship (Bauer et al., 2012). In particular, communicating the co-benefits of environmental actions can mitigate against 'negative spillovers' and 'moral licensing', whereby one environmentally 'virtuous' action (such as recycling) may be used to justify other unsustainable behaviours (e.g. buying heavily packaged items) (Capstick et al., 2019; Bain et al., 2016; Zhong et al., 2010). Instead, 'positive spillovers' are sought, where one eco-behaviour leads to another (e.g. recycling at home extending to the workplace), and may even result in more radical structural changes over time, especially if behaviour spills into the social and political realms (DEFRA 2008: 22; Nash et al., 2017; Thøgersen & Ölander, 2003; Thøgersen & Noblet, 2012).

Psychologists also point out there are many additional layers of complexity because individuals can be conflicted, by: (a) mixed *external* messages (e.g. 'buy more' vs. 'be green'); (b) incompatible *internal* motivations (hedonism or altruism), while at the same time, (c) holding multiple roles simultaneously, where their expectations and influence may vary. Understandably, this can result in overwhelm, denial and disengagement (Lertzman, 2015; Weintrobe, 2013), but as a member of our Commission, Professor Stuart Capstick, explained, "If we can think of behaviour in expansive terms, then there are lots of different entry points into the system via our different roles (decisions, consumption, behaviours). We can exert influence formally and informally, and also via coalitions." Further, by tackling actors' motivations in a more holistic way, using a range of complementary sustainability strategies, they are likely to have greatest impact. As Kasser (2016: 489) explains,

> Successful interventions encourage intrinsic/self-transcendent values/goals, increase felt personal security, and/or block materialistic messages from the environment. These interventions would likely be more effective if policies were also adopted that diminished contemporary culture's focus on consumption, profit, and economic growth.

3.3 Sociology and social practice

The need to place individual behaviours within a wider social context points to the value of employing systemic theories to help identify the enabling conditions for achieving sustainable lifestyles. Sociologists argue that by focusing too much on individuals, behavioural models fail to sufficiently account for complex social and cultural processes (Sovacool & Griffiths, 2020; Stephenson et al., 2010), as well as physical and economic 'lock-in' (Unruh, 2000; Sanne, 2002). Instead, they believe social and physical structures are woven together into webs of understandings, strongly derived (and perpetuated) by culture, and co-determined by norms, objects, symbols, identities and practices, which give meaning to life (Jackson, 2006).

In relation to sustainable lifestyles, behavioural approaches also neglect what social practice theorist, Shove (2003), calls the "social organization of normality", whereby social and infrastructural factors produce certain patterns of demand, which correspond to the normalisation of (unsustainable) habits, routines and everyday practices of consumption, for example, around washing, showering and laundry, as well as travel and heating. Therefore, by tackling the systemic conditions and drivers of these practices, we can potentially reconfigure systems in a more sustainable way.

The need to create a counterculture to consumerism has brought a renewed focus from scholars within sociology on inequality and excess consumption (Evans, 2019, Dietz et al., 2020, Urry, 2010). As Evans and Jackson explain,

> Consumerism is best understood as a cultural condition in which economic consumption becomes a way of life. It is a state of affairs in which more and more cultural functions are handed over to the activity of consumption such that it colonises more and more aspects of human experience (2008: 6-7).

Sociological perspectives also have a role to play in understanding *intersectionality* and how the interplay between social and political identities, such as gender, class, disability, race and sexual orientation, structure behaviours and mediate the impact of interventions aimed at scaling behaviour change (Dietz et al., 2020). For example, around efforts to address fuel poverty through home insulation to reduce carbon emissions, studies have revealed the intersection of gender and age, ableness and ethnicity in shaping vulnerability (Johnson et al., 2020). This highlights the need for better integrated policy programmes (Evans et al., 2012), which are more adaptive, attentive to webs of practice, and cognisant of how 'envirogenic' environments evolve (Shove, 2010), so that sustainable social practices can be supported.

3.4 Political economy

Though there is some common ground with sociological approaches, political economists argue that approaches to consumption from economics, sociology and psychology tend to "ignore structural elements of the problem grounded in political and economic systems" (Princen et al., 2002: ix), where economists equate consumption with the 'demand function' and sociologists as an expression of identity and search for meaning in modern society (Giddens, 1991). For political economists, consumption is viewed, "not just as an individual's choice among goods, but as a stream of choices and decisions winding its way through the various stages of extraction, manufacture and final use, embedded at every step in social relations of power and authority" (Princen et al., 2002: 12).

Where such approaches are useful is in pointing to the need to disrupt power relations in order to get to the roots of unsustainable consumption, by addressing the economic sources of unsustainable behaviours in patterns of work, income and social and economic inequalities (Schor, 2011), exacerbated by the growth orientation of the economy (Jackson, 2021; Hickel, 2020; Kallis et al., 2020). Many scholars working on behaviour change within this tradition attend to the intrinsic links between sustainable production and consumption and tend to place more emphasis on the role of social movements as the disruptors of consumer culture and the sites of alternatives given the close relationship between the state and capital which is thought to compromise the ability of the former to regulate the latter. This can be through protest against particular products or business practices, the co-production of 'civil regulation' of the private sector through codes of conduct and certification (Newell, 2001) or building alternatives as 'prosumers' get involved in community energy production and local food networks (Seyfang, 2006), for example.

Some political economy approaches do, nonetheless, point to the need to bring back the state into the debate about sustainable behaviours, as the only institution with a specific mandate and means to advance and protect the public interest. They emphasise the need for 're-commoning' to socialise control over the provision of key services that have been ceded to the private sector. In this view, legislative and regulatory frameworks provide the policy context within which individual and institutional actions can be most effective (Lorek & Fuchs, 2013).

4. Rethinking 'scaling'

The challenge of scaling behaviour change suggests the need to work across all sites of behaviour change from individual to systemic levels, but also to consider *ecosystems of transformation* where change can be accelerated and deepened via multiple entry points. We proceed by presenting a new

typology, which distils the way in which different disciplinary perspectives and policy traditions understand 'scaling' behaviour change. A conceptual distinction is drawn between *'shallow' scaling*, which emphasises change within existing social and political structures (Section 4.1), and *'deep' scaling*, which refers to a social transformation compatible with a 1.5 degree world (4.2). We then present *'spiral' scaling* as a heuristic for integrating the two: a way of capturing the dynamic of how incremental shifts can evolve into more transformational change over time and across different contexts (4.3).

4.1 'Shallow' scaling: mainstreaming and contagion

'*Shallow' scaling* is the conceptualisation we apply to the dominant, rational and behavioural approach to sustainable behaviour change. It emphasises numbers and roll-out in a generic and socially un-differentiated way that obscures where the predominant responsibility and agency lies, as well as overlooking important cultural and contextual differences in what works, where and for whom. The emphasis on size and reach, rather than directly acknowledging limits, implies mainstreaming without disrupting key trends around consumption, work, growth and production. It can be instrumental or cognitive, vertical or horizontal, and may represent a response to a nudge, market mechanism, policy instrument or new information, but does not alter underlying values or worldview. It is informed by classic behavioural economic and psychological approaches, aligns with socially-conservative and economically libertarian political persuasions, and incorporates the idea of behavioural contagion, whereby people copy and imitate the behaviours of their peers, both consciously and unconsciously, as exemplified by the popularity of plant-based diets (Kamiński et al., 2020) or the diffusion of rooftop solar panels in suburban areas (Bollinger & Gillingham, 2012). Shallow scaling also incorporates top-down infrastructural de-scaling, which curates the choice architecture through choice editing. This is achieved through the provision of services to shape behaviours in line with a desired outcome, such as reducing waste or the energy intensity of certain actions and can involve a degree of 'lifestyle leapfrogging' across contexts (Schroeder & Anantharaman, 2017). Such an approach may be effective at shifting behaviours at scale, addressing both the demand and supply-side of the economy, but will not challenge the social values, norms and practices that underpin consumption behaviours. Examples include car-free cities, the pedestrianisation of city centres or the *energiesprong* insulation initiative which delivers net zero energy in housing in the Netherlands. Crucially, this approach can also fall prey to the 'scalar trap': the notion that what works in one place will work elsewhere or that small changes can be automatically and unproblematically scaled. Associated with 'weak' sustainability, it is also prone to rebounds, negative spillovers and moral licensing without disrupting dominant paradigms.

4.2 'Deep' scaling: social transformation

We contrast the approach above with 'deep' scaling which refers to behavioural change as a process of social *transformation* or paradigm shift (Kuhn, 1962), occurring when sustainable values and norms become culturally and institutionally embedded by individuals and institutions. Such a transition calls for a diversity of means to be employed and adapted to different social, cultural, political and economic contexts, and for ends to be specified in terms of limits and timeframes. This can be done by harnessing 'deep leverage points' (Meadows, 1999), and 'social tipping points' (Otto et al., 2020: 3). Shifts of this nature can have multiplier effects, enabling individuals to make more consistent and significant behavioural changes as sustainable lifestyle choices become embedded in collective social identities, practices and infrastructures and supported by deeper institutional change. Referring back to Section 3, 'deep' scaling aligns epistemologically with structural and systems-

centric accounts, associated with sociology, sociological institutionalism, and political economy. It implies an important role for regulation, choice-editing, and the socialisation of sustainable behaviours in personal, private and public arenas. It envisages normative feedbacks between international and domestic institutions and structures, supported by civic and transnational movements. This goes beyond the more incremental versions of scaling change through the 'ecological modernisation' of institutions, markets and behaviours which Mol (2002: 93) uses to describe 'the centripetal movement of ecological interests, ideas and considerations in social practices and institutional developments' which result in 'ecology-inspired and environment-induced processes of transformation and reform going on in the core practices and central institutions of modern society'. More relevant historical examples might include society wide value shifts around equality, civil, and human rights with regard to race and gender, for example, now enshrined in law in many countries after decades of social struggle. From a political economy perspective, 'deep' scaling will also involve –contentious – concerted efforts to 'scale back' existing ways of doing things and incumbent control over systems, infrastructures, finance and production (Newell, 2021). Because social transformations are context-driven, 'strong' global sustainability will require multiple, differentiated transformations across cultural, geographic and temporal contexts.

4.3 'Spiral' scaling: transformational diversity and reflexive learning

'Spiral' scaling characterises the ongoing *process* of transformation from 'shallow' to 'deep' scaling as a dynamic sequence of feedback learning loops between individuals, society, institutions and infrastructures, towards strong global sustainability. It is inspired by O'Brien et al.'s (2013: 6) 'axial revolution' for transforming education and capacity-building for global sustainability, as well as Risse et al.'s (1999) 'spiral model' of human rights change, which charts the internalisation of norms occurring at the interface between actors, norms, institutions and structures, domestically and internationally. It envisages an iterative, reciprocal and reflexive social learning approach, and responds to the need to move away from linear and even circular understandings of scaling, towards multiple, deep, but differentiated transformations in the form of *axial* behaviour and systems change across diverse contexts, conceptualised as an upward-moving vortex or 'spiral of sustainability'. It aims to better reflect the empirical reality whereby elements of shallow *and* deep scaling will need to operate in tandem, producing different shades of sustainability within and across contexts, in ecosystems of transformation, over time. It is precisely the interaction and interrelationship between wider social norms, actors and institutions that is critical to overcoming the well-documented stubbornness of institutions to change (North, 1990; Ostrom, 1990), which we discuss in the next section.

5. Towards transformative scaling

Recognising the pace and scale of the sustainability transitions now required, it is a key moment to consolidate knowledge, evidence, and insights about the role of behavioural change contributing to societal system transformations. Although behaviour change is often assumed to be voluntary, we need to recognise the changing circumstances that give rise to it. The responsibility for societal transformations cannot be put on the sum of all individual shoulders. Such transformations can only be achieved when embedded in sustainable systems change, integrating shifts from individual values and community behaviour with socio-economic change and changes in institutions and governance. Below we propose five overarching areas for action to catalyse change and create momentum for sustainable behaviour change, which can positively contribute towards a 'spiral of sustainability'.[1]

[1] For a more in-depth discussion of future interventions, see Newell et al., (2021).

5.1 One planet living: 'strong' global sustainability

To achieve the goals of the Paris Agreement, countries need to look beyond 'shallow' scaling via efficiency improvements towards absolute reductions in energy consumption, requiring a shift in thinking from efficient production and consumption to embracing ideas of *sufficiency* (Princen, 2005). In this context, Creutzig et al.'s (2018) 'avoid-shift-improve' framework, with its hierarchy where avoiding unnecessary resource use comes first, is instructive. It resonates in current regulatory moves and community-based efforts to build a 'repair' economy and prolong the life of goods to challenge practices of planned obsolescence, as well as the idea of a circular economy. But 'deep' scaling also requires a more sophisticated understanding of the social and cultural drivers of over-consumption: addressing advertising and the media's role in the normalisation and reification of high consumption behaviours. To do this, regulation and 'choice editing' needs to take place whereby governments, businesses and those with direct control over production restrict the availability of high carbon products and services in line with targets and benchmarks consistent with one planet living, fair shares and sustainable consumption corridors (Di Giulio & Fuchs, 2014). Controls and bans on advertising as adopted by cities as diverse as Chennai, Sao Paulo, Amsterdam and Grenoble illustrate this approach in practice.

Such a shift would fundamentally question cultural and social values around what it is to live a 'good life' within the means set by one planet living: living better with less (quality over quantity). There is growing interest in well-being, sustainable prosperity (Jackson et al., 2016), prosperity without growth (Jackson, 2011), de-growth (Kallis, 2018; Hickel, 2020; Kallis et al., 2020), and the idea of 'plentitude' (Schor, 2011). Much existing research suggests it is possible to live a 'good life' within planetary boundaries (Hickel, 2020; Millward-Hopkins et al., 2020), and research on the 'spirit level' shows that beyond a certain level of income, well-being indicators do not improve (Wilkinson & Pickett, 2009). As discussed, psychological approaches prescribe that activating intrinsic values, stressing efficacy, and emphasising the co-benefits grounded in a 'new materialism' (Simms & Potts, 2012; Schlosberg & Craven, 2019), are more likely to spill-over *positively* into other patterns of behaviour than appeals to financial self-interest or social status (Kasser, 2011; van der Linden, 2015). 'Deep' scaling also implies the need for new indicators of progress which focus on sustainability and wellbeing within planetary boundaries, such as Gross National Happiness (as adopted by Bhutan) or the Happy Planet Index (New Economics Foundation, 2016).

5.2 Just Transitions: climate justice

To be effective and politically accepted, shifts in behaviour towards 1.5 degree lifestyles need to address social and economic justice and, at the very least, not further entrench existing inequalities or exacerbate the climate impacts already experienced by vulnerable populations (Patterson et al., 2018). In the words of the UN Secretary-General Guterres (2020), "a just transition is absolutely critical. We must recognize the human costs of the energy shift. Social protection, temporary basic income, re-skilling and up-skilling can support workers and ease the changes caused by decarbonization."

Infrastructures, income, location and social status all have a huge bearing on peoples' ability to modify their behaviour. Almost 10% of the global population continue to live in extreme poverty (World Bank, 2020), and lack basic food, housing, energy, and transport; in this context, 'lifestyle leapfrogging' can support spiral scaling, via the adoption of more sustainable pathways, avoiding fossil-fuel lock-in in the first place (Schroeder & Anantharaman, 2017). And across the board, key intervention points lie in creating enabling environments to facilitate sustainable practices among broad sections of society. Given that faith in the future – and individual perceptions of their capacity to act and influence that future – depend to a degree on livelihood security (Solovjew-Wartiovaara, 2021), addressing social, employment and welfare provision will be critical alongside more traditional techno-environmental measures, such as low-cost, electric vehicle provision and home insulation to

address energy poverty and reduce emissions. Delivering welfare sustainably will mean decoupling welfare and growth in richer societies (Büchs, 2021).

Placing economic justice at the heart of efforts to 'deep' scale behaviour change has the advantage of reducing inequality between the so-called polluter elite and the poorest groups in society. Linking the two, concrete measures might reallocate revenues from frequent flyer levies on the flights of wealthier consumers (deterring a high carbon behaviour) to subsidized forms of public transport for poorer consumers (encouraging a lower carbon one). There are important racial, class and gender dimensions to *access* (to resources and systems) and *responsibility* (for the emissions associated with them), which all spiral scaling interventions need to explicitly address, speaks to the need to decolonise the sustainable living debate, as research on ecologically uneven exchange and global environmental justice clearly shows (Roberts & Parks, 2008; Sikor & Newell, 2014; Patel & Moore, 2018). This will be a prerequisite to broadening the conversation about behaviour change beyond silos of privilege and spheres of voluntarism among those already committed to environmental action.

5.3 Governing change: enabling a power shift

From providing affordable, low-carbon transport to setting green tariffs for renewable energy, enormous power resides in governments, corporations and cities to chart new pathways, and communicate clearly the need for change – and hold themselves accountable for delivering it. Yet scaling behaviour change in line with the goals of the Paris Agreement will not come without shifts in power and institutional innovations. It will only be possible if incumbent power is rolled back, new regulatory pathways and political spaces are created, and representation is enhanced for those most vulnerable to the dual impacts of poverty and climate change. Undoing incumbent power requires moves to take money out of politics through controls on party donations, greater transparency in lobbying and directorships, and closing the revolving doors between politics, corporations and finance, so that democracies are fit for purpose in tackling the climate crisis (Newell & Martin, 2020). Rebalancing politics more profoundly might mean creating mechanisms of indirect representation for future generations (such as parliamentary ombudspeople as several parliaments have done) or lowering the voting age to amplify the voice of younger generations.

Overseeing transformative sustainable change calls for innovations in governance, to enhance coordination, broaden representation, and foster meaningful engagement in discussions about the complex trade-offs in getting to a zero-carbon economy. As social psychological and socio-political approaches imply, cursory participation in behavioural change actions alone ('shallow' scaling) will not be sufficient to stimulate change at the speed and of the order necessary to stay within the safe climatic limits. Rather, 'deep' scaling implies a more reciprocal and dynamic process between citizens, private actors and governing institutions – where all parties learn and are listened to (Hall, 1993: 288). This may involve 'remaking' new democratic frameworks to govern climate change and using the multiple sites of decision-making afforded by 'polycentric' climate governance (Ostrom, 2010) where non-state actors and sub-national actors are increasingly involved in climate governance (Hale, 2016). Evidence suggests that a more decentralised approach can also broaden scope for 'rapid and deep' household transitions to sustainability, promoting inclusion, accountability, and even equity (Sovacool & Martiskainen, 2020). The flexibility that polycentricity affords also makes it possible to incorporate innovations and feedbacks through experiential learning (Jordan et al., 2018; Bulkeley et al., 2014), which is integral to securing sustainable transformation as well as generating the reflexivity that 'spiral' scaling demands, though the need for leadership to provide a guiding framework to orchestrate change should not be understated (Jordan et al., 2018). Others emphasise how participatory (Chilvers et al., 2021), and deliberative approaches can advance legitimacy and help ensure broad social ownership (Dryzek et al., 2019). The recent report of the UK Climate (citizen's) Assembly, for example, proposed a series of progressive measures targeting carbon-intensive

behaviours, such as frequent flyer taxes, support for dietary shifts and bans on Sports Utility Vehicles (Climate Assembly UK, 2020).

Change will of course be achieved in different ways in different places. There is no one theory of change - or behaviour change - that applies to all settings. The capacity and view of the appropriate role of government, the market and civil society varies hugely around the world. This should make us wary of blanket and universal policy prescriptions for behaviour change.

5.4 Transforming society: 'deep' scaling change

At a deeper level, there is a huge amount of work to be done in nurturing values and culturing practices of care and community, whereby human needs can be met in more sustainable and less materialistic ways, guided by attempts to imagine alternative ways of being that reposition today's economy as abnormal, impermanent and unsustainable. Connecting these intervention points through *cycles of reciprocity* is vital, ratcheting up ambition so that efforts by individuals, communities and cities are matched by government leadership that opens up space for further bottom-up experimentation and integrates demands from social movements.

Social mobilisation will be key to harnessing the collective ownership and agency of individuals to accelerate sustainable behaviour change. Revitalising citizenship also contests the dominant idea that individuals are passive consumers, while ongoing pressure from social movements will play a role in challenging polluter-elite incumbents around the disproportionate social and political space they occupy. Other actors may be instrumental as facilitators, influencers, cultural leaders, social guides, intermediaries, and institutional entrepreneurs. As Westley et al. (2011: 771) suggest, "Key persons can play pivotal roles…including providing leadership, building trust, developing visions, and sense-making. These individuals can be important brokers for connecting people and networks and also play a key role as nodes in learning networks." This ties in with the need for reflexive and adaptive social learning to forge the degree of innovation that 'deep' scaling relies upon. There is also much to learn from grassroots groups whose primary social imperatives successfully achieve environmental goals (Webb et al., 2021), and from unusual alliances unifying diverse groups with common aims to bring about social change, such as low-caste waste pickers and middle-class environmental groups in Bangalore (Anantharaman, 2014); all of which feeds back into earlier discussions about the need for just transitions and inclusive governance to support deeper forms of social transformation.

5.5 Focus on high impact behaviour and lifestyles

In the context of climate change, immediate challenges for behaviour change are reducing the lifestyle emissions of the polluter elite and concentrating on the consumption hotspots of food, transport and housing. Relying on conscientious individuals to 'do their bit' will never be enough without substantial shifts in the behaviour of the polluter elite where responsibility and agency to effect change is most concentrated (Kenner, 2019; Wiedmann et al., 2020). Strategies that specifically target the behaviours of the richest would have vast implications for emissions (Druckman & Jackson, 2009; Kenner, 2019; Fouquet & O'Garra, 2020). It may call for upper limits on income since levels of wealth and consumption are so closely correlated. Enacting such policies, however, will prove politically challenging as the polluter elite have sway and influence within policy making circles (further reinforcing the need for governance reform), as well as substantial resources to pay for the privilege of polluting (which can undermine the effect of incremental taxes on flying, for instance). But addressing the vast inequalities in carbon emissions - both between the Global North and South, as well as within nations - is crucial for advancing notions of fairness in our collective response to climate breakdown, which is an important precursor for scalable change now and in the future (Drews & van den Bergh, 2015; Maestre-Andrés et al., 2019; Cook et al., 2019).

6. Conclusions and future directions

The debate on behaviour change needs to move on. While there is a tendency to talk in terms of 'nudges' and 'tools' for behaviour change, the challenge is more profound. We need an account of the role of behaviour change that is more political and social, and brings questions of limits, power and social justice to the fore in order to appreciate how questions of responsibility and agency are unevenly distributed within and between societies. This leads to a more holistic understanding of behaviour, as just one node within an ecosystem of transformation that bridges the individual and systemic. There are many unspoken assumptions about what 'behaviour' is, often reduced to small-scale consumer actions. But personal action can also be linked to other forms of collective activities, social practices, political influence, and engagement with the wider world. This shift in approach allows for a more empowering view of personal agency that is better equipped to drive social and economic change.

We have emphasised the need to *re-think scale*. We suggest that *deeper* scaling needs to be transformative, from the individual to the systemic level and back again, geared towards addressing the root causes of our predicament. Because 'shallow' and 'deep' scaling will, in practice, operate concurrently within and across societies over time, *spiral* scaling seeks to enhance the feedbacks between the two: moving from a linear understanding of scaling, towards multiple transformations across diverse contexts in an upward-moving, 'spiral of sustainability'.

Filling research gaps will necessitate moving beyond household contexts in the Global North, engaging more southern-facing scholarship and communities, and undertaking studies to develop more contextualised ways of measuring and understanding behaviour change and its impacts. Interdisciplinary synergies must also be pursued, such as the linkages between psychology and sociological approaches being explored in the habit (Kurz et al., 2015) and affordances (Kaaronen, 2017) literatures, where social practices and context overlap Greater efforts must be made to acknowledge and navigate the politics of power and drivers of institutional change, and better understand how the alliances necessary to broker broader networks of change can be initiated and sustained. Empirical studies exploring the role of different models of governance in supporting behaviour change would be a fruitful avenue to pursue. Furthermore, greater efforts would be welcome in uncovering how different strategies aimed at behaviour change interact with other dominant trends, such as the entrenchment of surveillance society, where multinational corporations now have the capacity to monitor the behaviours, movements and consumption choices of individuals in real time, via apps, satellite navigation technology, membership schemes and social networks. There is also a need to challenge the way in which the individualisation of responsibility is being used to deflect attention away from the need for system change, while also recognising the limited agency some groups may have in the absence of macro changes.

As the world emerges from a mass behaviour change event induced by the Covid-19 pandemic, attention will return to the climate crisis and how collective behaviours can be aligned with the goals of the Paris Agreement. When this happens, we would do well to heed some of the lessons from history and insights from scholarship and practice that we have reviewed here about how best to scale behaviour change.

Acknowledgements

We are grateful to the KR foundation for supporting this work and would like to thank the 31 members of the Cambridge Sustainability Commission on Scaling Behaviour Change, and members of the Boundless Roots Community, for their time, expertise and insights.

Author contributions

All three authors contributed to the interviews, research and review work underpinning the paper and to the writing of this article.

Financial support

This work was generously funded by the KR Foundation, Copenhagen, Denmark.

Conflict of interests

None.

Publishing ethics

This paper complies with Global Sustainability's publishing ethics guidelines.

Research transparency and reproducibility

Further data supporting the findings of this paper can be accessed from Newell et al. 2021. All other references are publicly available.

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