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# Behaviour change to address climate change

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Behaviour Chang; Climate Change; Psychology

## Abstract

Addressing climate change requires profound behaviour change, not only in consumer action, but also in action as members of communities and organisations, and as citizens who can influence policies. However, while many behavioural models exist to explain and predict mitigation and adaptation behaviours, we argue that their utility in establishing meaningful change is limited due to their being too reductive, individualistic, linear, deliberative and blind to environmental impact. This has led to a focus on suboptimal intervention strategies, particularly informational approaches. Addressing the climate crisis requires a focus on: high-impact behaviours and high-emitting groups; interdisciplinary interventions that address the multiple drivers, barriers and contexts of behaviour; and timing to ensure interventions are targeted to moments of change when habits are weaker.

## 24 1 Introduction

25

26 Behaviour change is a central element of addressing the climate crisis. Most of the interventions required to  
27 reach global emission reduction targets (i.e., climate *mitigation*) require at least some behavioural change  
28 (CCC, 2019) and *adapting* to the growing impacts of climate change similarly requires significant lifestyle  
29 and societal change (IPCC, 2015). Impactful mitigation actions include avoiding flying and driving, and  
30 reducing red meat, dairy, material and energy consumption (Wynes & Nicholas, 2017; Ivanova et al., 2020);  
31 while adaptation measures include emergency and long-term behavioural responses such as preparing for  
32 extreme weather events (Van Valkengoed & Steg, 2019).

33

34 Behaviour change is often narrowly conceived as individual-level consumer action (e.g., buying a low-carbon  
35 product, recycling, reducing meat-eating), but is more appropriately understood as extending across the many  
36 roles and contexts humans occupy: as members of communities, participants in organisations, and as citizens  
37 who can influence policies (Nielsen et al., 2021). In addition to consumer action, behaviour of relevance for  
38 climate action thus encompasses the adoption of low-carbon and climate-resilient technologies (e.g. installing  
39 insulation); support for large-scale low-carbon infrastructures (e.g., windfarms); political action to support or  
40 demand climate change measures (e.g., voting and protesting); participation in policy formulation (e.g.,  
41 through citizen juries) and grassroots activities (e.g., community energy or transport initiatives); and engaging  
42 in climate change conversations and interactions with others that raise awareness, enable and normalise low-  
43 carbon lifestyles. This extensive list highlights the need for all areas of psychology (social, environmental,  
44 community, organisational, political, economic, health, and developmental etc.) to develop, test and apply  
45 behaviour change theories and interventions (Clayton et al., 2015; Nielsen et al., 2021). In this article, we  
46 describe recent progress in psychological research, identify knowledge gaps, and set priorities for further  
47 research to inform more effective mitigation and adaptation behaviour change to address the climate crisis.

48

## 49 2 Behaviour (change) models and their limitations

50

### 51 2.1 Overview of models

52

53 Numerous behavioural theories and models exist to explain and predict mitigation and adaptation actions. The  
54 Theory of Planned Behaviour (TPB; Ajzen, 1991; Yuriev et al., 2020), the Value-Belief-Norm (VBN; Stern,  
55 2000; Stern et al., 1999) and the Transtheoretical Model (TTM, Prochaska et al., 2002) are most commonly  
56 applied to mitigation behaviours. The TPB, originating in broader social psychology research, posits that  
57 intentional behaviour is predicted by attitudes, social norms, and perceived behavioural control (PBC); in other  
58 words, what we think and feel, social pressure, and capacity to act drive action. The VBN, by contrast, was  
59 developed specifically with pro-environmental behaviour in mind, and emphasises the role of personal norms  
60 in personal action, which are a product of people's awareness of consequences and ascription of responsibility  
61 to the self. These beliefs in turn are rooted in deeper personal values and worldviews. Broadly, the VBN has

62 been shown to predict political or low-impact pro-environmental actions (e.g., recycling); whereas the TPB  
63 can explain higher-impact environmental behaviours (e.g., avoiding driving), since it incorporates structural  
64 constraints via the PBC construct (Stern, 2000; Steg & Nordlund, 2018). Unlike the TPB and VBN, the TTM  
65 is a more dynamic theory of behaviour *change*, describing the stages a person moves through in establishing  
66 new behaviours, including contemplation, preparation, action, and maintenance of behaviour change. This  
67 model has been influential in health psychology, but has also been used to predict certain climate mitigation  
68 behaviours such as red meat reduction and cycle use (Wolstenholme et al., 2020; Forward, 2014).

69

70 Protection Motivation Theory (PMT; Rogers, 1983) has been applied to adaptation behaviours such as flood  
71 protection. This model posits that risk-protection measures result from appraisals of a threat and an adaptive  
72 coping response to deal with the threat (Grothmann & Patt, 2005). These appraisals are in turn influenced by  
73 knowledge of available adaptation strategies (Blennow & Persson, 2009); descriptive norms (i.e., what is seen  
74 as ‘normal’), negative emotions, perceived self-efficacy and outcome efficacy (belief that the adaptive actions  
75 will have intended benefit) of adaptive actions (Moser, 2014; van Valkengoed & Steg, 2019).

76

## 77 2.2 Critiques and gaps

78

79 While these models highlight some of the main drivers of and barriers to climate action, recent critiques have  
80 identified limitations and gaps that impede significant progress in this area. First, the models are restricted to  
81 a small number of common theoretical constructs which limits their utility in understanding behaviour and  
82 informing interventions (cf., Sniehotta et al., 2014; Ferguson et al., 2016). Second, a related criticism is that  
83 the models are too *individualistic*. Structural factors (e.g., income, location) have been shown to far outweigh  
84 psychological factors in predicting carbon-emitting behaviours (Whitmarsh et al., 2017; Whittle et al., 2019),  
85 and yet with the partial exception of PBC, the cultural and physical context of action is absent from these  
86 models, and interventions have not been targeted towards high-emitters (Nielsen et al., 2021; Galvin, 2013).  
87 Attempts to offer more integrative and interdisciplinary perspectives on pro-environmental action, such as the  
88 Attitude-Behaviour-Context (ABC; Stern, 2000) or Capability, Opportunity, Motivation-Behaviour (COM-B;  
89 Michie et al., 2011) models, have hardly been taken up by psychologists working on climate action.

90

91 Third, widely-used behaviour models can be considered too *linear*, by assuming that behaviour is the end-  
92 point of a causal chain of attitudinal-psychological factors. Yet, behaviour change can lead to changed attitudes  
93 or identity (Bem, 1972; Thomas et al., 2019) and impact on other behaviours via spillover or rebound effects  
94 (Nash et al., 2017; Nilsson et al., 2016). Fourth, with the exception of some research on collective action (e.g.,  
95 van Zomeren et al., 2019) psychological approaches assume people act alone and in isolation from others;  
96 even social norms are conceived as individual *perceptions* of expectations and obligations held by the  
97 individual, and there have been few attempts to understand how personal action influences others, or affects  
98 the broader contexts within which people act (e.g., via processes of ‘social contagion’ and peer influence;  
99 Wolske et al., 2020). Together, these concerns highlight the need for more interdisciplinary and systems

100 perspectives to understand how to establish pro-environmental behaviour change (cf. behavioural ecology;  
101 Geller, 2002; social influence and cooperation; Henrich & Muthukrishna, 2020; social-ecological systems;  
102 Masterson et al., 2017).

103  
104 Fifth, models typically assume a ‘rational’, or at least *deliberative*, mode of decision-making, whereas much  
105 of our behaviour (including climate-relevant action) is habitual, i.e., unconscious routines triggered by  
106 contextual cues rather than a conscious deliberation of alternatives (Kurz et al., 2015). This omission has meant  
107 interventions have failed to factor in habit-breaking as a precursor to behaviour change (Thomas et al., 2019).  
108 Finally, the models fail to distinguish *types of behaviour* in terms of their impact or malleability, and thus  
109 provide no practical guidance for which behaviours interventions should focus on for maximal climate benefit.  
110 Consequently, there has been a tendency for environmental psychologists to focus on low-impact, incremental  
111 behaviour changes (e.g., curtailment of energy use) that is ‘simple and painless’ (Thøgersen & Crompton,  
112 2009) rather than higher-impact, more transformative behaviour changes, such as purchasing energy-efficient  
113 or renewable energy equipment (Nielsen et al., 2021) which are necessary for lifestyle change that is in line  
114 with effective climate change mitigation (UNEP, 2020). As we discuss in the next section, these gaps and  
115 limitations in theory has led to suboptimal interventions (e.g., information provision).

116

### 117 3 *Behaviour change interventions*

118

#### 119 3.1 *Intervention typologies*

120

121 Different typologies of behaviour change interventions exist that target *individual decision-making*  
122 (‘downstream’) versus the *context* in which decisions are made (‘upstream’; Verplanken & Wood, 2006);  
123 measures that *provide/improve* options (‘pull’) versus *removing* them (‘push’; De Groot & Schuitema, 2012);  
124 or that make use of automatic (‘nudge’) versus more intentional or deliberative processes (e.g., citizens  
125 assemblies; Capstick et al., 2020). In general, evidence from climate change and related areas suggests the  
126 need for combining multiple approaches. Changing choice architecture ‘behind the scenes’ may help to change  
127 specific behaviours, but this is not sufficient for the profound and participatory social transformation required  
128 to respond to the climate crisis (Corner et al., 2014; Otto et al., 2020); information provision and incentives  
129 are more effective when combined with broader social and infrastructural interventions (UNEP, 2020); and  
130 removing high-carbon options may be needed alongside providing low-carbon ones in order to establish the  
131 greatest change (Cairns et al., 2002).

132

#### 133 3.2 *Efficacy of different interventions*

134

135 Psychologists have tended to focus on informational interventions – whether to raise knowledge, or influence  
136 psychological variables – in line with the individualist, deliberative focus of their behavioural models. Yet,  
137 evidence shows that informational approaches are generally less effective than other types of intervention

138 (Abrahamse & Matthies, 2012). Information campaigns may raise awareness and concern, but do not always  
139 produce behaviour change (Staats et al., 1996). Informational approaches that are more effective in changing  
140 behaviour: (a) tailor messages to audience values and beliefs (Whitmarsh & Corner, 2017); (b) communicate  
141 the wider (co-)benefits of climate action (Maibach et al., 2010; Bain et al., 2016; Wolstenholme et al., 2020);  
142 (c) target times and locations of decision-making, such as via product labels (WRAP, 2019; Kaiser et al., 2020)  
143 or energy feedback meters (Abrahamse et al., 2005); (d) leverage moral or social influence through normative  
144 messaging (Kormos et al., 2015; Sweetman & Whitmarsh, 2016); (e) promote self-efficacy instead of, or in  
145 addition to appealing to fear (Peters et al., 2013; Hunter & Rööös, 2016), and (f) encourage setting specific and  
146 realistic goals to motivate action (Abrahamse et al., 2005).

147  
148 Social influence is one of the strongest factors shaping behaviour, yet rarely recognised by individuals  
149 themselves (Nolan et al., 2008). Adoption of low-carbon innovations, such as electric cars and solar panels, is  
150 significantly shaped by social norms and neighbourhood effects (Bollinger & Gillingham, 2012; Graziano &  
151 Gillingham, 2015; Pettifor et al., 2017). The importance of social modelling in low-carbon, climate-resilient  
152 behaviours highlights the relevance of leadership in reshaping social norms (Gössling, 2019) and fostering  
153 collective efficacy (Sabherwal et al., 2021); and the potential for more discursive approaches (e.g., group  
154 discussion) to promoting climate action (cf. Lewin, 1947; Kurz et al., 2010). Among interventions that leverage  
155 social norms, the block leader approach, public commitment, and social modelling have been shown to be  
156 effective, with direct personal influence from similar others a key process shaping action (Abrahamse & Steg,  
157 2013). Effective organisational interventions similarly find that social factors, such as management support,  
158 are important for bringing about behaviour change, alongside informational, financial and infrastructural  
159 measures (Young et al., 2015; Henderson & Mokhtarian, 1996).

160  
161 Public commitment approaches involve asking respondents to make a pledge to change their behaviour, and  
162 rely on the psychological drive for consistency (or reducing ‘cognitive dissonance’) between attitudes and  
163 behaviours (Abrahamse & Matthies, 2012). Commitment interventions can be effective for promoting climate  
164 actions, such as using public transit (Matthies et al., 2006). Consistency processes are also thought to be  
165 relevant for behavioural spillover – the notion that changing one behaviour may trigger further behavioural  
166 changes (Thøgersen, 2012). Yet, a growing evidence base shows that spillover remains an elusive or even  
167 counter-productive phenomenon (Thomas et al., 2016; Thøgersen & Ölander, 2003; Steinhorst et al., 2015;  
168 Maki et al., 2019; Nash et al., 2017).

169  
170 Economic and structural interventions have been studied much less in the psychological literature, consistent  
171 with gaps in the dominant behavioural models. Pricing policies can change incentives in favour of low-carbon  
172 alternatives and/or away from high-carbon options. Congestion charging has been shown to reduce car use  
173 (TfL, 2006) and shift demand towards public transport (Agarwal & Koo, 2016) and lower-emission vehicles  
174 (Percoco, 2014). Charges have also been suggested as a way to disrupt automatic behaviours by making  
175 purchase decisions more deliberative (Thomas et al., 2019), but may need to be combined with other

176 approaches to boost their efficacy (Poortinga & Whitaker, 2018). Physical and broader structural measures  
177 might include designing stair use (rather than lift use) as the default in buildings; pedestrianisation and cycle  
178 lanes; green infrastructure; low-carbon buildings and so on (e.g., RAE, 2015; Cairns et al., 2002).

179  
180 A growing literature points to the importance not only of *how* to intervene to achieve social and lifestyle  
181 change, but also *when*. Habits are one of the strongest impediments to lifestyle change, acting to ‘lock in’  
182 behaviour (Marechal & Lazaric, 2011). Many interventions (e.g., information campaigns) are ineffective  
183 because they are not strong enough to disrupt habits (Verplanken et al., 1997). But since habits are cued by  
184 stable contexts (i.e., the same time, place and/or social group; Wood et al., 2005), change in context disrupts  
185 habits (Verplanken et al., 2008). Consistent with this, times of significant change or transition (Thompson et  
186 al., 2011) have been identified as key opportunities for reconfiguring lifestyles (Capstick et al., 2014; Graham-  
187 Rowe et al., 2011) and identities (Devine-Wright et al., 2020). Research shows that disruptions – either life-  
188 course (e.g. moving home) or structural events (e.g. economic downturn, extreme weather events, the COVID-  
189 19 pandemic) – provide opportunities to more effectively change behaviours (Verplanken et al., 2018;  
190 Birkmann et al., 2010; Marsden et al., 2020; Carroll & Conboy, 2020). For example, low-carbon behaviours,  
191 such as bus use, energy efficiency and waste reduction measures, have been shown to be more effectively  
192 changed using low-cost interventions in the 12 weeks following relocation (Verplanken & Roy, 2016;  
193 Thøgersen, 2012; Ralph & Brown, 2017), as well as at other moments of change (Nicolson et al., 2017).

194

#### 195 4 Conclusion

196

197 While several behaviour models exist to explain and predict mitigation and adaptation behaviours, their utility  
198 in establishing meaningful change is limited due to their being too reductive, individualistic, linear,  
199 deliberative and blind to environmental impact. This has led to a focus on suboptimal intervention strategies,  
200 particularly informational approaches, that are relatively ineffective in changing impactful climate behaviours.  
201 Addressing the climate crisis requires a focus on high-impact behaviours (mobility, food, consumption,  
202 resilience) and high-emitting groups; interdisciplinary approaches to designing interventions that address the  
203 diverse and interacting behavioural barriers and drivers; people’s multiple roles (not only as consumers),  
204 including professional and collective actions; and temporal dynamics to ensure interventions are targeted to  
205 times when habits are weaker.

206

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