Theories and models of behaviour and behaviour change[1]

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1. Introduction

This report presents a review of literature relating to theories and models of behaviour and behaviour change, describes the most prevalent of these, and summarises some of their central elements and cross-cutting themes. Accompanying review reports establish the policy context and describe lessons learned from behavioural interventions. A summary review report is also available, together with a discussion paper which explores how behaviour and behaviour change relate to forestry.

Theories and models of human behaviour emanate from all disciplines of the social sciences. Indeed, in many ways disciplinary boundaries simply serve to demarcate the types and contexts of human behaviour in which scholars are interested, how behaviour is defined, and the methods via which it might be studied. In this sense, attempting a comprehensive review of theories of behaviour would not be possible. Having said this, attempts have been made to develop theories and models of human behaviour which transcend specific contexts. These attempt to isolate the key controlling factors, processes or causes of behaviour, and most originate from within psychology (particularly social psychology) and sociology. Anthropology also offers considerable insight, especially in relation to factors such as habit and ritual, and politics provides a focus on power and institutional structures.

There are several ways in which behaviour is conceptualised and defined. The largest number of studies (primarily from within psychology) focus squarely on the individual as the locus of behaviour (see Section 3 below). These theories posit a greater or lesser impact by external factors such as society, but each hold behaviour to be an outcome of competing influences balanced and decided upon by the individual - thus placing significant emphasis on individual agency. Within this, individual behaviour is conceptualised either as somewhere on a continuum, or at a particular discrete stage, of adopting a behaviour. Continuum theories can be used, for example, to predict how many times a person might conduct a behaviour, such as going for a forest walk, or the extent to which it is done, such as how much tree planting might be undertaken. Stage models are particularly useful for understanding the different factors that may influence individual choice and behaviour at different points on their 'journey' towards adopting a behaviour.

Other behaviour theories move away from the individual to focus either on behaviour itself, or relationships between behaviour, individuals and the social and physical environments in which they occur. Theories of innovation (such as diffusion of

innovation, and disruptive innovation theories), in particular, focus on behaviours themselves as agents of change. Other sociological, anthropological, and geographical research (such as social practice theory and socio-technical systems) has tended to focus on behaviour as an outcome of complex inter-relationships and shared social practice. From these perspectives individuals perform or reproduce behaviours that are themselves a product of relationships between people, their environment, and the technology that surrounds them. In this sense objects and environments become active in the production of behaviour. These theories draw heavily on social theory.

In many ways the analysis of behaviour is profoundly political (Goodwin 2012) and research often reflects the structures and complexities of the behaviour it seeks to investigate (Shove 2010b). Certain formulations of behaviour are clearly easier to integrate with current dominant paradigms of policy and policy-making than others. The objective of this paper is to highlight common themes across this body of research and the usefulness of different types of theoretical approach in informing how the forestry sector might further the cause of sustainability.

2. Review methods

To complete this review we followed established practices set out in the literature and institutional Standard Operating Procedures. Initially a number of bibliographic databases (Science direct, Taylor and Francis online, Google Scholar and Web of Science) were searched using pre-defined keywords (see Table 1), identifying a large number (<120) of potentially relevant papers, reports and items of 'grey' literature. Given the large number of references, we focused on reviews in order to refine the analysis. 20 reviews were tabulated by named theories and models so as to establish coverage and prevalence of each (in total 25 theories and models were covered by these reviews). Consideration was given to the disciplinary bias of existing reviews (e.g. psychological theories receive relatively more coverage in review papers than sociological theories) and, subsequently, a short list of theories and models was selected so as to reflect the most prevalent, and cover the most important conceptual differences between, theories. Once this short-list was established further targeted literature searches were undertaken relating to those theories and models – which identified further literature (see Table 2).

Table 1. Keywords used

Behaviour	Change Maintain Understand	Theory, Principle(s), model(s), value(s), attitude(s)

Table 2. Bibliographic searches results and selection criteria

Bibliographic search results	Documents selected for review	Selection criteria
121 (+59)	87	Reviews of behavioural theory and/or models. Seminal literature describing the most prevalent theories and models (short listed). Literature applying the most prevalent theories to the analysis of forestry, or other environmental behaviours.

3. Theories of Individual Behaviour and Behaviour Change

3.1. The Theory of Planned Behaviour & Theory of Reasoned Action

The theory of planned behaviour (TPB) is one of the most widely cited and applied behaviour theories. It is one of a closely inter-related family of theories which adopt a cognitive approach to explaining behaviour which centres on individuals' attitudes and beliefs. The TPB (Ajzen 1985, 1991; Ajzen and Madden 1986) evolved from the theory of reasoned action (Fishbein and Ajzen 1975) which posited intention to act as the best predictor of behaviour. Intention is itself an outcome of the combination of attitudes towards a behaviour. That is the positive or negative evaluation of the behaviour and its expected outcomes, and subjective norms, which are the social pressures exerted on an individual resulting from their perceptions of what others think they should do and their inclination to comply with these. The TPB added a third set of factors as affecting intention (and behaviour); perceived behavioural control. This is the perceived ease or difficulty with which the individual will be able to perform or carry out the behaviour, and is very similar to notions of self-efficacy (see Bandura 1986, 1997; Terry et al. 1993). These key components of the TPB are illustrated in Figure 1. Existing literature provides several reviews of the TPB (e.g. Armitage and Conner 2001; Hardeman et al. 2002; see also Rutter and Quine 2002; Munro et al. 2007; Nisbet and Gick 2008; Webb et al 2010).

The TPB is suited to predicting behaviour and retrospective analysis of behaviour and has been particularly widely used in relation to health (Armitage and Conner 2001; Taylor et al. 2007). Evidence suggests that the TPB can predict 20-30% of the variance in behaviour brought about via interventions, and a greater proportion of intention. Strong correlations are reported between behaviour and both the attitudes towards the behaviour and perceived behavioural control components of the theory. To date only weak correlations have been established between behaviour and subjective norms.

Armitage and Conner (2001), however, suggest that this issue is most likely to be methodological and state that the few studies which measured subjective norms appropriately actually illustrate reasonably strong relationships with behaviour. The TPB is not considered useful or effective in relation to planning and designing the type of intervention that will result in behaviour change (Hardeman et al 2002; Taylor et al. 2007; Webb et al. 2010). Using the theory to explain and predict likely behaviour may, however, be a useful method for identifying particular influences on behaviour that could be targeted for change. As Hardeman et al. (2002: 149) conclude:

> *'even when authors use the TPB to develop parts of the intervention, they seem to see the theory as more useful in identifying cognitive targets for change than in offering suggestions on how these cognitions might be changed'.*

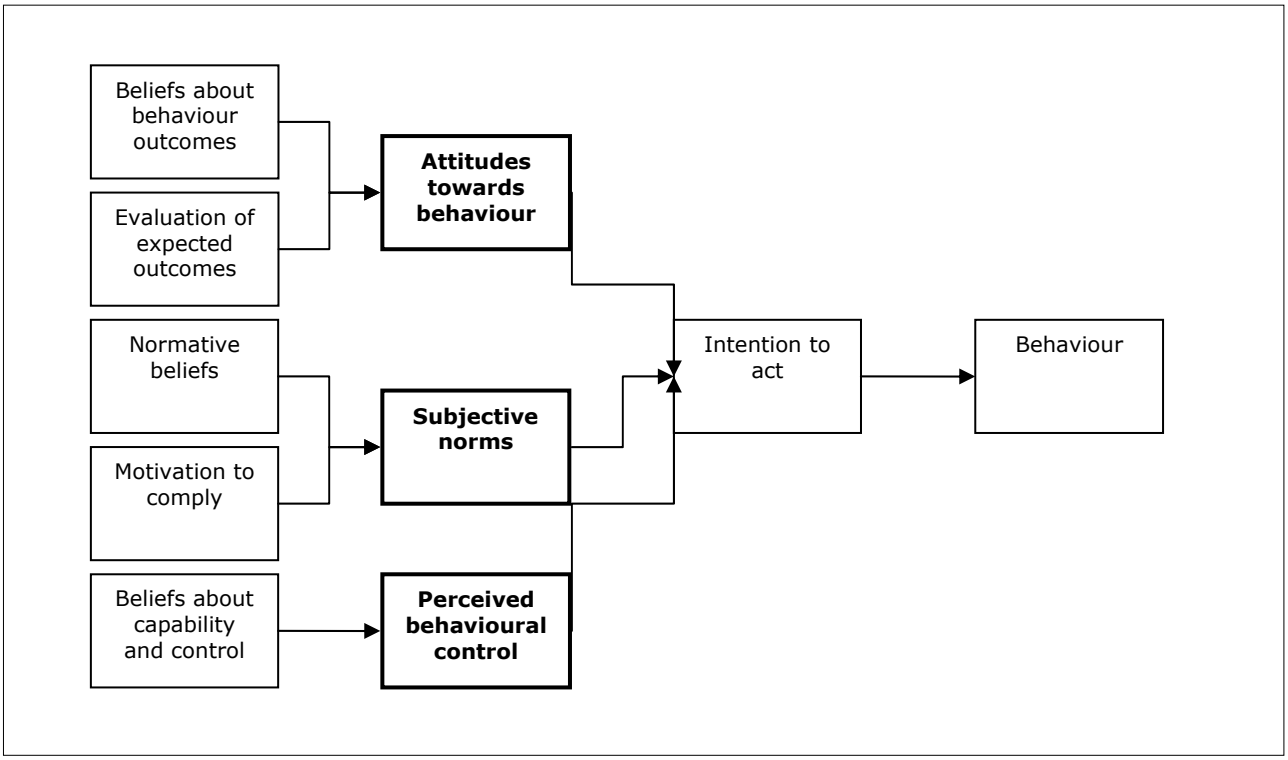

Figure 1. The Theory of Planned Behaviour (adapted from Munro et al. 2007)

3.2. The Health Belief Model

The health belief model (HBM) (Hochbaum, 1958; Rosenstock 1966; Becker, 1974; Sharma and Romas, 2012) is a cognitive model which posits that behaviour is determined by a number of beliefs about threats to an individual's well-being and the effectiveness and outcomes of particular actions or behaviours. Some constructions of the model feature the concept of self-efficacy (Bandura 1997) alongside these beliefs about actions. These beliefs are further supplemented by additional stimuli referred to as 'cues to action' which trigger actual adoption of behaviour. Perceived threat is at the

core of the HBM as it is linked to a person's 'readiness' to take action. It consists of two sets of beliefs about an individual's perceived susceptibility or vulnerability to a particular threat and the seriousness of the expected consequences that may result from it. The perceived benefits associated with a behaviour, that is its likely effectiveness in reducing the threat, are weighed against the perceived costs of and negative consequences that may result from it (perceived barriers), such as the side effects of treatment, to establish the overall extent to which a behaviour is beneficial. The individual's perceived capacity to adopt the behaviour (their self-efficacy) is a further key component of the model. Finally, the HBM identifies two types of 'cue to action'; internal, which in the health context includes symptoms of ill health, and external, which includes media campaigns or the receipt of other information. These cues affect the perception of threat and can trigger or maintain behaviour. Nisbet and Gick (2008: 297) summarise the model as follows:

> *'in order for behaviour to change, people must feel personally vulnerable to a health threat, view the possible consequences as severe, and see that taking action is likely to either prevent or reduce the risk at an acceptable cost with few barriers. In addition, a person must feel competent (have self-efficacy) to execute and maintain the new behaviour. Some trigger, either internal ... or external ..., is required to ensure actual behaviour ensues'.*

Of course the opposite to much of this is also true. When an individual perceives a threat as not serious or themselves as unsusceptible to it, they are unlikely to adopt mitigating behaviours. Low benefits and high costs can have the same impact. The main elements of the HBM are illustrated in Figure 2. There are a number of reviews and summaries of the model available (Janz and Becker, 1984; Harrison et al 1992; Armitage & Conner 2000; see also Rutter and Quine 2002; Munro et al. 2007; Nisbet and Gick 2008; Webb et al. 2010)

Although designed and developed in the healthcare context, the HBM has been applied to the analysis of other types of behaviour, such as recycling (Lindsay and Strathman 1997), and is most suited to explaining or predicting patterns of behaviour. Formal reviews have, however, concluded that it has generally weak predictive power, suggesting it can predict only around 10% of behavioural variance (Harrison et al. 1992). Literature suggests that, of the HBM's components, perceived barriers are the most significant in determining behaviour (Janz and Becker 1984). The two established criticisms of this model are that its components and rules about their inter-relationships are not well defined, and (in common with other cognitive rational choice based models focused on the individual) that it does not include social or economic or unconscious (e.g. habitual) determinants of behaviour, which are generally considered to be at least as important as the personal cognitive factors covered by the model. Jackson 2005: 133) clearly explains this latter problem:

> *'this model* [rational choice] *is inadequate as a basis for understanding and intervening in human behaviours for a number of reasons. In particular it pays*

insufficient attention to the social norms and expectations that govern human choice and to the habitual and routine nature of much human behaviour. It also fails to recognise how consumers are locked into specific behaviour patterns through institutional factors outside their control.'

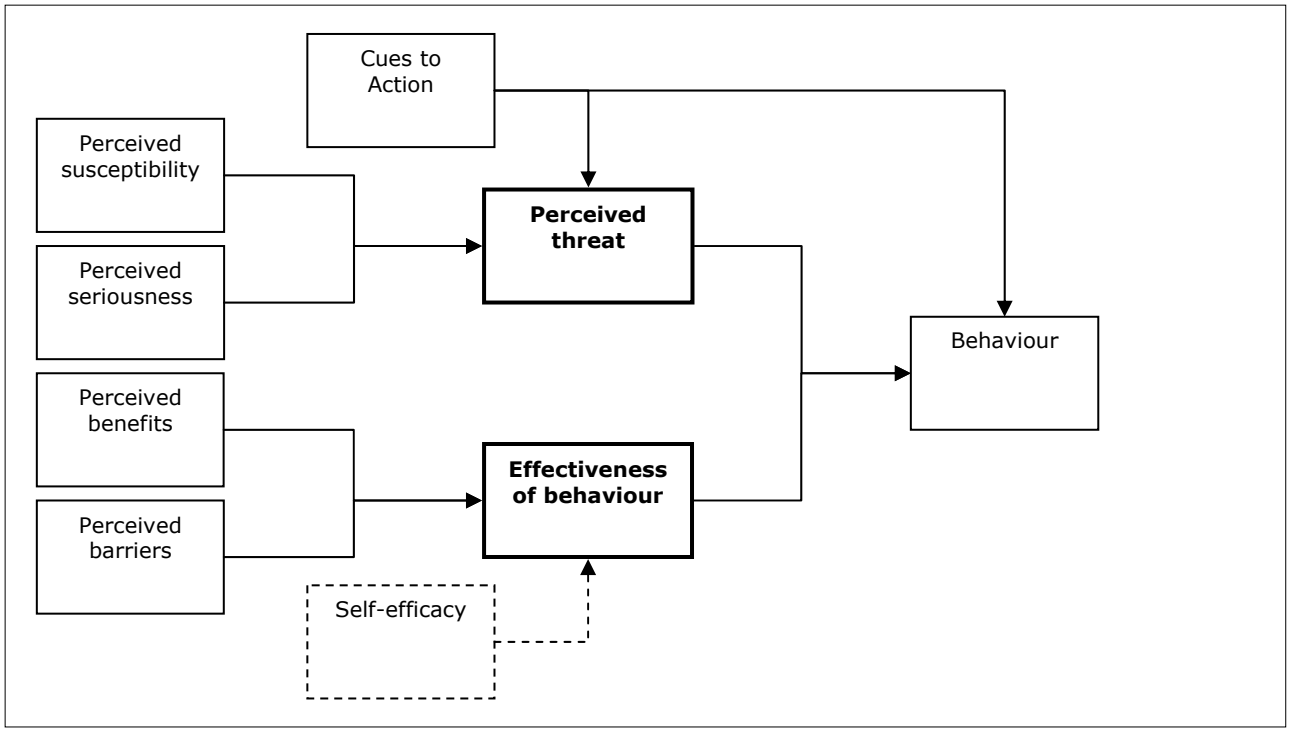

Figure 2. The Health Belief Model

3.3. Stages of Change (Transtheoretical Model)

The Stages of Change (SoC) model (also referred to as the Transtheoretical Model) (Prochaska 1979; Prochaska and DiClemente 1983; Prochaska et al 1992) is a widely applied cognitive model which sub-divides individuals between five categories that represent different milestones, or 'levels of motivational readiness' (Heimlich and Ardoin 2008: 279), along a continuum of behaviour change. These stages are (i) pre-contemplation, (ii) contemplation, (iii) preparation, (iv) action, and (v) maintenance (see Table 3 for a summary). First developed in relation to smoking, and now commonly applied to other addictive behaviours, the rationale behind a staged model is that individuals at the same stage should face similar problems and barriers, and thus can be helped by the same type of intervention (Nisbet and Gick 2008). Whilst practitioners acknowledge many hundreds of different interventions, the SoC model identifies ten types ('processes') which are most widely used and investigated (see Table 3). Movement or transition between stages is driven by two key factors (i) self-efficacy and (ii) decisional balance (that is, the outcome of individual assessment of the pros and cons of a behaviour) (Heimlich and Ardoin 2008; Armitage et al 2004). Relapse, moving

backwards through the stages, is common. There are a number of summaries and reviews available (Prochaska et al. 1992; Sutton 2002; Littell and Girven 2002; Rutter and Quine 2002; Armitage et al. 2004; Munro et al. 2007; Nisbet and Gick 2008).

The SoC model is more popular amongst practitioners than researchers as its constructs and concepts are not particularly well defined. Questions regarding how discrete the stages actually are and whether an individual *must* move through each (and not jump stages) are common. Further to this, the model is not clear on how individuals change or why some change more effectively or quickly than others. A number of critical

Table 3. The Stages of Change Model - in a Health Psychotherapy Context, adapted from (Prochaska et al. 1992)

Stage	Stage Definition	Process	Process Definition	Psychotherapy Interventions
Pre-contemplation	Individual is unaware of problem; No intention to change behaviour in foreseeable future	**Consciousness raising**	Increasing information about self and problem	observations, confrontations, interpretations, bibliotherapy
		Dramatic relief	Experiencing and expressing feelings about one's problems and solutions:	psychodrama, grieving losses, role playing
		Environmental re-evaluation	Assessing how one's problem affects physical environment	empathy training, documentaries
Contemplation	Individual is aware of problem; Serious consideration of change in behaviour	**Self-re-evaluation**	Assessing how one feels and thinks about oneself with respect to a problem	value clarification, imagery, corrective emotional experience
Preparation	Individual is intending to take action	**Self-liberation**	Choosing and commitment to act or belief in ability to change	decision-making therapy, New Year's resolutions, logotherapy techniques, commitment enhancing techniques

Action	Individuals modify their behaviour, experiences and/or environment in order to overcome problem	**Counter-conditioning**	Substituting alternatives for problem behaviours	relaxation, desensitization, assertion, positive self-statements
		Stimulus control	Avoiding or countering stimuli that elicit problem behaviours	restructuring one's environment (e.g., removing alcohol or fattening foods), avoiding high risk cues, fading techniques
		Helping relationships	Being open and trusting about problems with someone who cares	therapeutic alliance, social support, self-help groups
		Reinforcement management	Rewarding one's self or being rewarded by others for making changes:	contingency contracts, overt and covert reinforcement, self-reward
Maintenance	Individual works to prevent relapse and consolidate gains.	**Social liberation**	Increasing alternatives for non-problem behaviours available in society	advocating for rights of repressed, empowering, policy interventions

This model shares the problem of other cognitive models in that it is egoistic (centred on the self) and consequently misses the structural economic, environmental and social factors which affect an individual's ability to change behaviour. It is not that the influence of these factors is denied by the model, but rather that they lie outside its boundaries. For example, Prochaska et al. (1992: 1103) note that:

> '*Families, Friends, neighbours, or employees ... are often well aware that the precontemplators have a problem. Where precontemplators present for psychotherapy, they often do so because of pressure from others'.*

SoC also focuses on individual problem behaviours, such as addictions. This has implications for its transferability to behaviours which bring public costs or benefits. The over use of pesticide, for example, could be a problem behaviour in terms of water pollution but this is not necessarily a problem for the pesticide user directly.

4. Social and Technological Theories of Behaviour and Behaviour Change

4.1. Social Practice Theory

Social practice theory (SPT) is increasingly being applied to the analysis of human behaviour, particularly in the context of energy use and consumption[2]. Rather than a single theory or 'model', SPT is something of an umbrella approach under which various aspects of theory are pursued[3]. The central insight of SPT is the recognition that human 'practices' (ways of doing, 'routinized behaviour', habits) are themselves arrangements of various inter-connected 'elements', such as physical and mental activities, norms, meanings, technology use, knowledge, which form peoples actions or 'behaviour' as part of their everyday lives (Reckwitz 2002). The approach particularly emphasises the material contexts (also 'socio-technical infrastructures') within which practices occur, drawing attention to their impact upon behaviour (the production and reproduction of practices). The notion that non-human 'actors' have a role to play in causing certain outcomes or 'behaviour' draws on the actor-network theory of Bruno Latour. Shove (2010a) notes:

> *'Put simply, roads, railways, freezers, heating systems, etc. are not innocent features of the background. Rather, they have an active part to play in defining, reproducing and transforming what people take to be normal ways of life. The key insight here is that the material world and related systems of production and provision are important in organising, structuring and sometimes preventing certain practices'.*

The three elements model (Figure 3) has been developed from Shove's work and incorporates:

Materials: The physical objects that permit or facilitate certain activities to be performed in specific ways

Meanings: Images, interpretations or concepts associated with activities that determine how and when they might be performed

Procedures: Skills, know-how or competencies that permit, or lead to activities being undertaken in certain ways

[2] See the Sustainable Practices Research Group (at http://www.sprg.ac.uk/) for examples.
[3] This is sometimes contrasted with apparently coherent cognitive theories, however there is similarly considerable heterogeneity within the application, development and analysis of cognitive models belied by rather effective labelling and a focus on particular quantitative research and analysis methods.

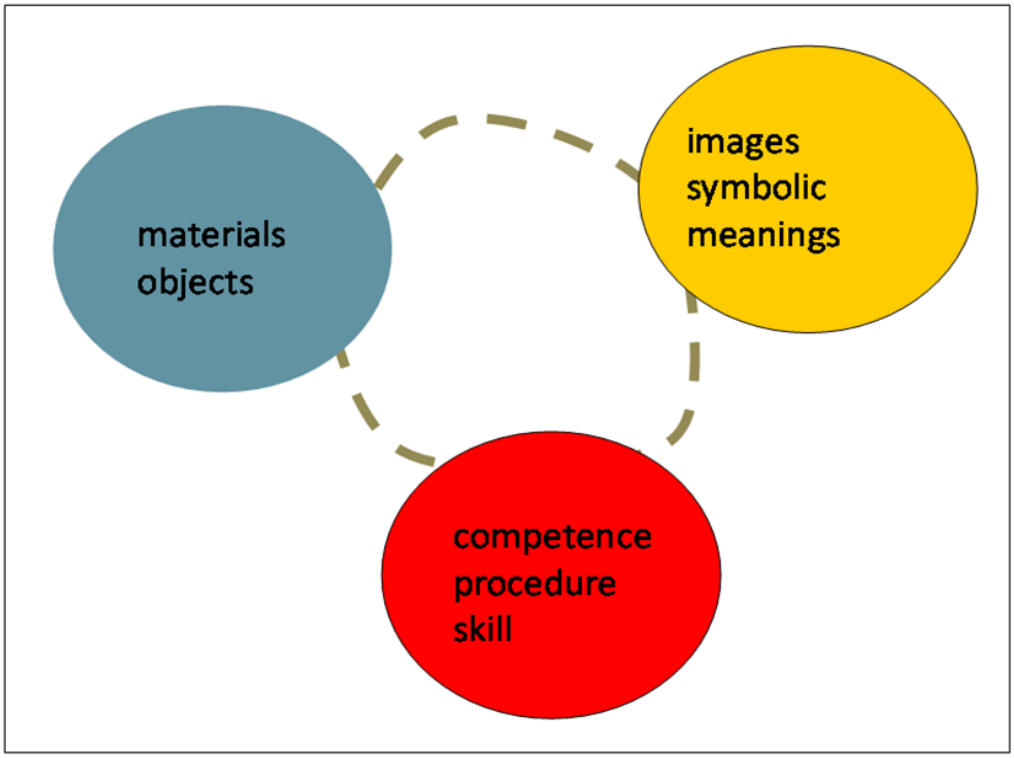

Figure 3. Three elements model (cited in Chatterton, 2011)

The literature on 'socio-technical' systems and regimes (e.g. Geels 2004; Smith et al 2005) shares this focus on material context and technologies, and their interaction with social practices. It particularly identifies the resilience of existing practices which underpin 'trajectories' of development in technological transition, away from which it is difficult to break (Smith 2007: 428). Practices and material contexts are often self-perpetuating. Randles and Mander (2009) describe this resilience as 'stickiness', noting that we do not often or easily reflect on social practices, and their internal arrangements make them structurally rigid. For social practice theorists then, the choices and attitudes of individuals are, more often than not, secondary to these contextual factors, with people becoming 'carriers' (Reckwitz 2002) of practices or routines rather than autonomous agents. Shove and Southerton (2000) provide a useful insight into the application of SPT via an analysis of the adoption of the freezer (a particularly large consumer of household energy) in British households. Upham et al (2009: 17) refer to this study, noting:

> *'This account is framed not in terms of attitudes or the functions performed by the object, but in terms of the way in which freezers have fitted into the changing organisation of domestic life, particularly the increasing participation of women in the workforce and associated sales narratives. ... the freezer partly creates the conditions that it alleviates - by helping to solve the problem of limited domestic*

> *time under conditions of increased working hours, it in part perpetuates that condition by enabling it to continue'.*

SPT has been applied to understanding various sets of sustainable behaviours, in particular in the fields of energy use, transport and waste. It is beginning to be acknowledged within some policy-focused analyses of behaviour (e.g. Chatterton 2011) although in seemingly somewhat redacted form and explicitly *'to enrich and supplement conventional understandings of behaviour'* (Chatterton 2011: 22). Shove (2010b: 1279) suggests that attempts to integrate individual behaviour models with social practice theory are *'doomed to failure'*, stating that *'It is useful to be clear about the incommensurability of these contrasting paradigms, and hence about the impossibility of merger and incorporation'*.

SPT suggests a plethora of new routes to understand and explain behaviour, and a similarly broad range of potential responses. The primary insight is, of course, a need to focus not on *individual behaviour* but on *social practice* - and on the interaction of people's practices and their *material contexts* in particular. This leads away from 'intervening' in 'choices' or decisions and towards reflecting upon why certain practices are done ('produced' and 're-produced'), how and why others are prevented, and considering the role of technology in how they are done and evolve. Sustained critical reflection is then an important response which the state could (should) promote through various outreach activities. In some ways, despite their focus on the individual, this reflection might be considered akin to 'elaboration' which some cognitive models (particularly the Elaboration Likelihood Model (Petty and Cacioppo 1986)) identify as an important element of behaviour change. The ELM posits that sustained behaviour change is most likely subsequent to careful scrutiny of the issues and problems by the individual concerned. Jackson draws parallels between 'elaboration' and 'deliberation':

> *'evidence suggests that discursive, elaborative processes are a vital element in behaviour change – in particular in negotiating new social norms and 'unfreezing' habitual behaviours. This shift from 'deliberation' to 'elaboration' as a working model of behavioural change can be seen as a key message...'* (Jackson 2005: 133)

It is now widely acknowledged that face-to-face advice is an important influence on behavioural outcomes and it is likely that, in addition to constituting knowledge exchange, this social interaction promotes critical reflection upon (elaboration, deliberation) why and how certain activities occur.

4.2. Diffusion of Innovation Theory

Instead of focusing entirely on individual decision-makers or social structures, the Diffusion of Innovation (DoI) theory places its emphasis on innovation as an agent of behaviour change, with innovation defined as *'an idea, practice, or object perceived as new'* (Rogers 2003: 12). Consequently, it is perceived attributes of an innovation that

determine its rate of adoption to a greater extent than the characteristics of the adopters. Originally published in 1962, building particularly on rural sociology research into the uptake of agricultural technology in the US (e.g. Ryan and Gross 1943; Bohlen et al. 1958), the theory has subsequently been very widely applied to issues including marketing, development and health (Greenhalgh et al. 2004). DoI theory posits four 'main elements' of behaviour change: innovation, communication channels, time and social systems (Rogers 2003: 11-38). As Rogers (2003: 15) notes:

> *'Diffusion is a process in which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication in that the message are concerned with new ideas'.*

According to DoI theory, behaviour will change more rapidly if innovations are perceived as being better than previous options (relative advantage) and consistent with the existing values, experiences and needs of potential adopters (compatibility), if they are easy to understand (complexity), testable via limited trials (trialability) and their results are visible (observability). Different information exchange relationships (communication channels) have specific impacts in terms of innovation diffusion. This theory particularly highlights the different roles of 'mass media' and 'interpersonal' channels, with the former especially useful for creating awareness amongst potential adopters and the latter being more effective in terms of persuading actual adoption. It is argued that innovations are evaluated "through the subjective valuations of near peers" rather than via experts or scientific analyses (Rogers 2003: 36), thus close interpersonal communications play a key role.

Social systems, so-called 'diffusion networks', are critical to this theory as diffusion occurs within them – they establish boundaries around the diffusion. Social networks and communication come together around the concepts of homophily and heterophily. Homophily is defined as the degree to which interacting individuals are similar in their attributes (e.g. education, social status, values) with heterophily being the opposite, i.e. degree of difference. Generally, communication is most likely and effective within homophilous social networks where members share common understandings, language and meanings. However, homophily can be problematic in situations where difference in knowledge or views is needed. Prell et al. (2009) recognise natural resource management as one such instance, and DoI theory asserts that homophily can *'act as a barrier to the flow of innovations in a system'* (Rogers 2003: 306) and that some heterophily is therefore essential for diffusion of innovation to occur.

> *'One of the most distinctive problems in the diffusion of innovation is that the participants are usually quite heterophilous. … This difference frequently leads to ineffective communication as the two individuals do not speak the same language. However, when two individuals are identical regarding their technical grasp of an innovation, diffusion cannot occur as there is no new information to exchange. The nature of diffusion demands that at least some degree of heterophily be present*

> *between the two participants in the communication process. Ideally, the individuals would be homophilous on all other variables … even though they are heterophilous regarding the innovation'.* (Rogers 2003: 19)

The diffusion of innovation requires time. This theory describes an innovation-diffusion process which holds significant similarities to stage models of behaviour change such as the 'stages of change' (transtheoretical) model described above. The process begins with the recognition of a problem or need (and is thus problem-orientated) and individual adopters progress through five steps: knowledge » persuasion » decision » implementation » confirmation.

Innovation theory is a large academic field and consequently several useful summaries, reviews and critiques of DoI theory are available (e.g. Lyytinen and Damsgaard 2001; Wright 2004; Greenhalgh et al. 2004). In the last decade innovation has been a significant feature of the analysis within forestry research regularly citing Rogers' DoI theory (e.g. Kubeczko and Rametsteiner 2002; Côté 2002; Schann and Anderson 2002; Stanturf et al. 2003; Rametsteiner and Weiss 2006; Nybakk et al. 2009). Much of this analysis is, however, done within a context dominated by economics (i.e. focused on technological and management innovation as an economic driver. Seemingly little analysis has been done considering the diffusion of innovation in other forms or with non-economic outcomes (i.e. addressing non-economic problems).

5. Integrated tools and frameworks of behaviour and behaviour change

The complexity of behaviour and behaviour change as described in the literature referred to in this chapter has led to many attempts to distil 'core' elements down into integrated frameworks so as to inform research design, policy and intervention design, and assist non-experts such as policy-makers in understanding behaviours and how they might engage with them. This distillation necessarily reduces the complexity of behaviour, trading it off against comprehensibility and usability. Jackson (2005: 23) sums up this problem in his discussion of consumer behaviour.

> *'Beyond a certain degree of complexity, it becomes virtually impossible to establish meaningful correlations between variables or to identify causal influences on choice. Conversely, ... simpler models run the risk of missing out key causal influences on a decision, by virtue of their simplicity ... this means that there will always be something of tension between simplicity and complexity in modelling consumer behaviour. More complex models may aid conceptual understanding but be poorly structured for empirical quantification of attitudes or intentions (for example). Less complex models may aid in empirical quantification but hinder conceptual understanding by omitting key variables or relationships between key variables'.*

As with the behaviour theories outlined in the previous section, numerous frameworks and models are currently in use and we focus on a small number in current use including "4 E's" (HM Government 2005; DEFRA 2008), MINDSPACE (Dolan et al 2010), 'energy cultures' (Stephenson et al 2010), and the 'behaviour change wheel' (Michie et al 2011). Each of these brings together a particular set of factors and suggests ways to intervene.

The "4 E's" model (Figure 4) emerged from research (Jackson 2005) focused on consumption (i.e. individual consumer behaviour) and advocates behaviour change strategies under four categories: enable; encourage; engage; exemplify. In addition to these the model states that in some circumstances, in particular where behaviour is entrenched or habitual, government may also need to 'catalyse' people to behave differently. Behaviours and attitudes of individual consumers are at the core of this model and the majority of interventions (information; education; incentives) are aimed at affecting individual consumer choices. However, it also features other routes to behaviour change, such as 'deliberative fora', 'leading by example', and 'community action' which begin to affect the social contexts in which individuals make choices. Despite this, and the emphasis on context within the underlying research (see Jackson 129-131, for example), by focusing on individuals and affecting consumer choices the "4 E's" model does not provide clear opportunities for critical reflection on the impact of dominant political, social, and economic forces and structures on the context of decision-making. Nor does it enable consideration of the influence of technology and innovation. The forestry sector might want to consider how its delivery of public access to woodlands fits with the four categories of enable, encourage, engage and exemplify. In turn, this could be used to inform debates about whether the mix is appropriate or whether changes in emphasis are required.

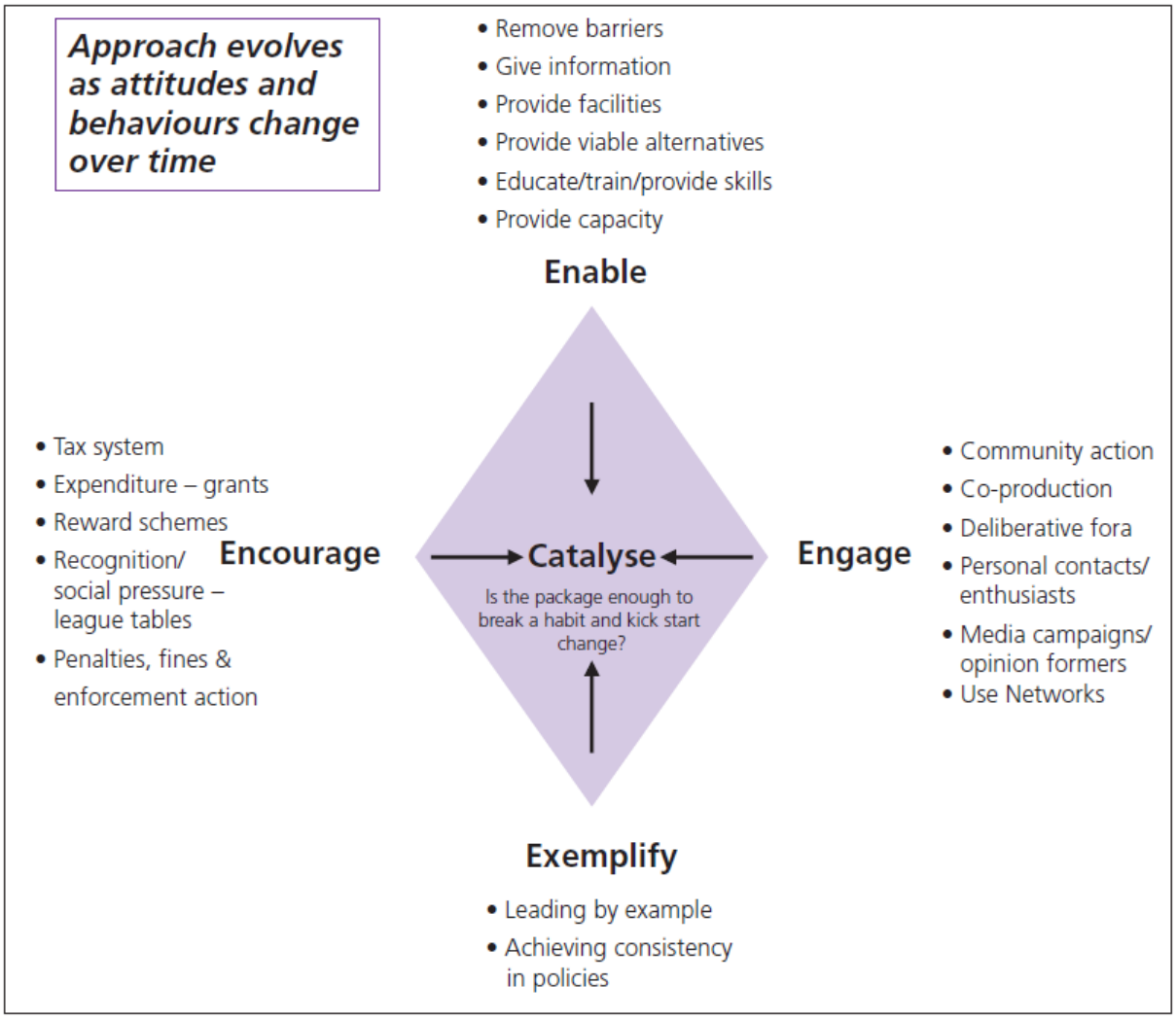

Figure 4. The "4 E's" Model (HM Government 2005: 26)

The MINDSPACE approach (Dolan et al. 2010, see Table 2) draws on research in behavioural economics and psychology in an attempt to identify key non-coercive influences on behaviour. As such, it is strongly focused on the individual decision-maker. The approach does cite the importance of 'context', although this conceptualisation is restricted to automatic and unconscious judgements (individual cognitive processes) and does not engage with structural political, social or economic influences on behaviour. The MINDSPACE approach does, however, offer some useful pointers for the forestry sector, although there is a significant gap between these and appropriately tailored, 'concrete' forestry interventions. Its conclusions relating to the 'messenger', for example, suggest that attention should be given to issues such as how communications are undertaken, who should communicate with whom, and which networks the sector should seek to engage with, but provides no guidance as to how to go about this. The approach is perhaps more relevant to how the sector can revise and deliver its current suite or

interventions - such as incentives and regulation, rather than providing ideas about fresh strategies for behaviour change.

Table 4. The MINDSPACE Approach (Dolan 2010: 8)

Messenger	we are heavily influenced by who communicates information
Incentives	our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses
Norms	we are strongly influenced by what others do
Defaults	we "go with the flow" of pre-set options
Salience	our attention is drawn to what is novel and seems relevant to us
Priming	our acts are often influenced by sub-conscious cues
Affect	our emotional associations can powerfully shape our actions
Commitments	we seek to be consistent with our public promises, and reciprocate acts
Ego	we act in ways that make us feel better about ourselves

One area of sustainable behaviour in which theory has been widely applied is energy use and a useful recent development here is the 'energy cultures' framework (Stephenson et al. 2010). This multi-disciplinary integrated model posits that energy behaviours should be understood as outcomes of the interaction between cognitive norms, material culture and energy practices (see Figure 5, 1-3). Whilst there appears ample space for the agency of individuals within these three broad dimensions of the framework, it also draws heavily on social practice and socio-technical systems theories, as it recognises the impact of wider social factors. This framework has considerable potential for translation into the forestry sector. It would facilitate a broad review of, for example, woodland creation encompassing factors such as market and price structure, the norms promoted and perpetuated by land-management culture, regulations, and technology. It would also serve to highlight possible responses and interventions (see Figure 5, (3)).

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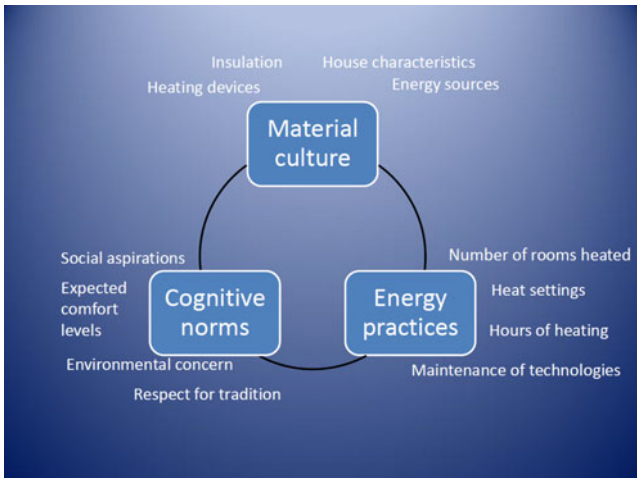

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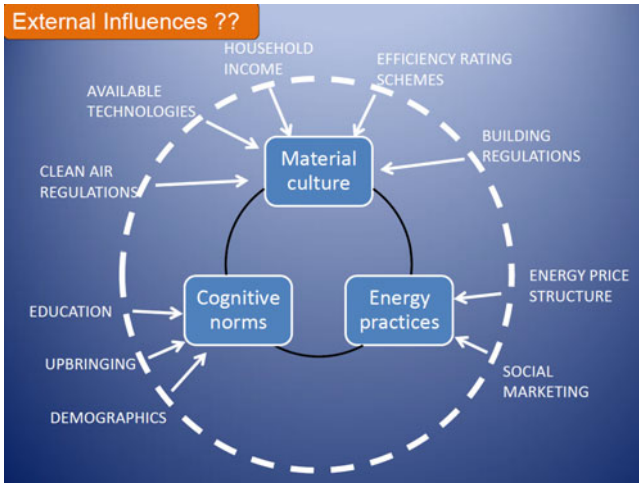

(3)

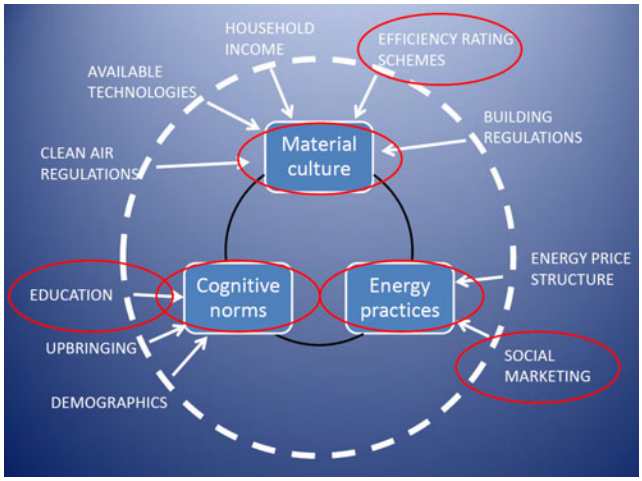

Figure 5. The Energy Cultures Framework (Stephenson et al. 2010)[4]

[4] Images from http://www.otago.ac.nz/oerc/Symposium%202010/Presentations/7.%20Rob%20Lawson%20-%20Energy%20cultures%20framework.pdf

6. Conclusions: common theoretical themes

Whilst diverse and sometimes conflictual, existing theories and models of behaviour and behaviour change do provide some central cross-cutting insights which can usefully inform actors in the forestry sector as to how to promote sustainable behaviours. In this section we begin to move beyond our review to identify and describe some of the insights which we believe to be most important.

6.1. Individual and Social

Critiques of individualistically focused theories of behaviour and behaviour change are quick to identify the social 'gap' in these analyses and question-framing. However, these analyses should not necessarily be rejected because of this. Not only are individual models of behaviour strongly intuitive, evident and explicit, especially when considered against the rather shadowy and diffuse impacts of social structures and technology which are often very difficult to discern. Furthermore, it is clear that individual agents do play some (variously strong) role in deciding upon or choosing their behaviour.

Having said this, most models of behaviour change that focus on individual cognitive processes and decisions vastly underestimate the impact of social contexts. This appears to be largely a consequence of the complexity associated with measuring social factors. There is a tendency to treat society as an externality, which may bring individuals to a decision-making process, but which is not as such a part of the mental accounting that constitutes that process - and thus not of interest to psychologists or some economists. But social 'pressures' or 'context' again clearly do play a role in determining behaviour. Whether conceptualised as a pressure felt and processed by an individual decision-maker, or as a context which unconsciously structures and determines individuals' actions, society does have an impact on the agency or power of individuals.

Interventions or responses need to address both the individual as a decision-maker and the wider social context in which they live. This means that multiple interventions are likely to be required for the effective promotion of sustainable behaviours. Indeed this constitutes the weight of opinion emanating from the evaluative evidence regarding interventions to affect behaviour. This can be effectively embraced by the forestry sector as it has the resources to affect both individual decisions and - through the trees, woods and forests it owns and manages - the material context in which people live. Well co-ordinated approaches have considerable potential here.

6.2. Control

Notions of control cut across several behaviour theories. If an individual believes they cannot do something, either because of their limited individual skill or knowledge, or due to their restrictive environment, or if they feel that an alternative action is easier, they are unlikely to do it. Although this insight comes primarily from cognitive models, this need not be restricted to conscious notions of control or 'do-ability'. Clearly how do-able something is relates in many ways to how widespread it is across society - how much it is known as do-able, recognised or practiced. Having said this, interventions can likely be similar in each situation. Responses must maximise the actual and perceived 'do-ability' of sustainable behaviours. This involves promoting sustainable behaviours as attractive and socially acceptable (through, for example, leadership and exemplification), removing barriers to them, and assisting in the spread of innovation. Behaviours must also be meaningful and effective.

6.3. Threat, risk and problem-orientation

Several theories identify threats or risks as a critical influence on behaviour, whilst others are problem-oriented. Most theories identify these as some sort of cue to behave in a certain way, to change behaviour or, at least, to reflect on behaviour. In order to influence behaviour, threats or problems need to be 'real' in the sense of immediate and with the potential to have an actual impact on stakeholder outcomes, lifestyles or livelihoods. The notion of effectiveness, highlighted by some theories, becomes relevant here as interventions, or new behaviours, need to effectively address these 'real' threats. Responses must, therefore, focus on addressing particular threats, risks or problems experienced by the forestry sector, and on explaining and communicating them appropriately and in a meaningful way. This has the potential to transform problems such as climate-change, flooding and disease outbreak into opportunities for the forest sector to engage stakeholders and promote the adoption of sustainable land-management behaviours. It also highlights the potential difficulties in changing stakeholder behaviour in circumstances where they do not perceive or have a problem, or where a problem affects them only indirectly or at some point in the future. The latter point is especially relevant to climate change as the threats posed by this are often distant and somewhat abstract.

The forestry sector has a number of options for responses to this issue. The use of established expertise, modelling and decision support systems, for example, could have an important role to play in appropriately casting risks and problems. In particular, participatory modelling approaches are increasingly being shown to be effective ways to encourage communication and reflection about long-term natural resource management problems (e.g. Irvine et al. 2010). At a different scale, schemes such as GP referrals (i.e. physical exercise on prescription) and Green Gyms, if not especially well adopted, are examples of interventions through which the forestry sector can engage individual

stakeholders who are trying to address personal health threats. This perspective also highlights the need to review mainstream interventions, such as grants schemes, in relation to their role addressing and managing risks and stakeholder problems.

6.4. Reflection, Deliberation and Elaboration

Behaviour change theory in particular highlights the role of deliberation and elaboration in achieving change. Put simply, change is considered more likely to occur and to be sustained as the amount of reflection about specific behaviours or issues increases. Social practice theory demands critical reflection in order to appropriately understand behaviour and acknowledge its drivers. Responses and interventions therefore need to create situations and processes where actors are free to reflect critically on their actions and the context in which they act. Stakeholders must be able to communicate this critique to other actors and be allowed to challenge the existing context.

This presents a potentially substantial challenge to public bodies as it may result in criticism of the very economic, legal and social institutions which it creates and perpetuates. Having said this, recent 'think' strategies (John et al. 2009) emphasise deliberation, and the forestry sector is well placed and experienced in a number of important dimensions which encourage deliberation and elaboration, such as long-term forestry planning with embedded stakeholder participation and public deliberation processes. Further to this, and returning to the material context of trees, woods and forests which the sector can mobilse, natural settings such as forests have been strongly linked to improved social interaction and individual mental well-being through their capacity to create used environments and facilitate particular cognitive processes. Therefore, trees, woods and forests should not be underestimated as physical contexts in which reflection and deliberation can occur - both individually and socially.

6.5. Technology and Innovation

Alongside the material context of trees, woods and forests, some theories of behaviour and behaviour change emphasise the impact of technology on behaviour and the role of innovation as an agent of change. In essence, established technology can in some instances perpetuate unsustainable behaviours and adherence to particular economic models and scales. Innovation can facilitate alternative behaviours, some of which may initially fill a particular niche requirement but subsequently spread to challenge or replace dominant technologies (so-called 'disruptive' innovation). Responses must promote technological innovation and its spread and challenge entrenched technology use which perpetuates unsustainable behaviour.

Technology and skills are a key aspect of the forestry sector, and are often considered in short supply. Having said this, the technology and skills actually utilised in the sector can be considered relatively narrow and specialised, with many attached to certain modes of economically oriented production forestry. Theories from this perspective suggest that

interventions which encourage novel forestry technologies and training could lead to significant behaviour change within the sector.

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