Behaviour change or lifestyle change?
Evidence and prospects for behavioural spillover

Prof. Lorraine Whitmarsh, Cardiff University

Climate change poses serious risks to society. The latest IPCC (2013) assessment confirms the impacts will range from more extreme weather events, flooding, and species extinction, to spread of disease, failure of crops and infrastructure, and human conflict. Responding to these risks, global leaders agreed in Paris in December 2015 to limit global warming to below 2 degrees Celsius relative to pre-industrial levels, and to pursue efforts to limit it to 1.5 degrees. The UK has already committed to reducing carbon emissions by 80% by 2050, compared to 1990, although other analysis indicates we will need to reach net zero emissions by the middle of this century (Allen et al., 2013; Figure 1).
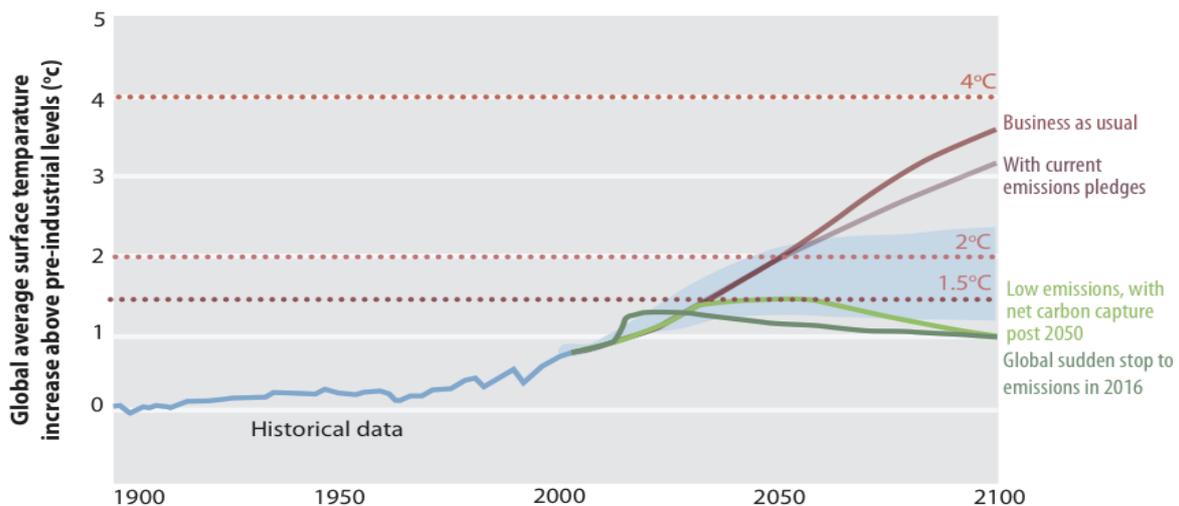

Figure 1. Carbon emissions reductions required to reach 1.5°C and 2 °C climate targets (Allen et al., 2013)

This level of decarbonisation has enormous implications for all sectors of society and for both energy supply and demand. Individuals will be asked to accept new energy infrastructures (e.g., smart grids) and technologies (e.g., electric vehicles), to change when and how much energy they use, as well as what they consume. Low-carbon behaviour change interventions typically focus on domestic energy conservation (e.g., switching off lights, adopting A-rated appliances) or travel behaviours (e.g., driving less). But individuals impact on climate change in more ways than just through direct consumption of gas, electricity and petrol. They also consume goods and services which have 'embedded' carbon from the energy used to make them. Together, the direct and indirect energy consumed by households accounts for around 90% of the UK's carbon footprint (Druckman & Jackson, 2010). Individuals, though, can also act in other roles to exacerbate or mitigate climate change. They are citizens – they may vote, protest, or lobby in order to, for example, support or campaign for wider societal change to support low-carbon lifestyles. Individuals are also employees or employers, who take action in the workplace with implications for climate change. These actions range from direct energy use (e.g., for computers or other equipment, lighting, travel to meetings) and indirect energy use (e.g., purchasing choices) to implementing energy efficiency schemes or influencing the behaviour of colleagues in more informal ways (e.g., modelling low-carbon choices). Individuals also occupy a range of other roles, too, such as members of local communities and interest groups, as well as parents, and in these roles can work with others on low-carbon schemes or educate the next generation (Whitmarsh et al., 2010).

Behaviour change interventions need to target all these roles that individuals occupy and the diverse range of behaviours associated with them. This means we need to move beyond the traditional focus of interventions on piecemeal ,'small and painless' (Crompton, 2010) behaviour changes – like switching off lights or turning down the thermostat, which might achieve a few per cent reduction in emissions – to more ambitious and holistic lifestyle change that reduces emissions in the order of 40% or more, which would be commensurate to the scale of the climate change challenge. This level of change requires that we target our interventions to: high-emitting groups (e.g., high earners, sub-urbanites); high-emitting behaviours (e.g., leisure/recreation); context change moments (e.g., relocating) when habits are more amenable to change; organisations, such as workplaces (e.g., telecommuting schemes can reduce vehicle miles by up to 66%); and to multiple behaviours (Capstick et al., 2015).

It is this final point on which we are currently focusing in our research group at Cardiff University by exploring the notion of 'behavioural spillover'. This is when adopting one pro-environmental (i.e., green) action leads to taking up other, pro-environmental behaviours (Thøgersen, 1999). This then holds the promise of changing a whole suite of behaviours, moving beyond piecemeal behaviour change towards more holistic lifestyle change. There is much interest amongst policy-makers in finding levers to produce wholesale shifts in lifestyles towards 'greener' (particularly, low-carbon) living. In general, governments are reluctant to regulate in large part because of the fear of public backlash and loss of political support (Carter & Ockwell, 2007). Behavioural spillover appears to hold the promise of changing a suite of behaviours in a cost-effective manner with little regulation (Austin et al., 2011).

On the one hand, the literature on pro-environmental behaviour highlights the diversity of factors that influence different environmentally-significant behaviours. Although environmental values or concern may play a role, other motivations and structural factors often play a greater role (Bamberg & Schmidt, 2003). Indeed, 'pro-environmental behaviour' need not be motivated by environmental concern or values at all (Stern, 2000). Whitmarsh (2009), for example, found that energy conservation was more commonly motivated by financial or health benefits than by environmental concern. There are also various psychological, social, economic and physical barriers that militate against environmental concerns being translated into pro-environmental behaviour (Lorenzoni et al., 2007). This evidence would appear to undermine any expectation that people act consistently across diverse behavioural domains, or that there is a common motivational basis for pro-environmental behaviour.

On the other hand, there are good theoretical reasons and growing empirical evidence to suggest that behavioural spillover does, under certain conditions, occur. First, there is some theoretical support from models of behaviour that postulate cross-situational goals or general values (e.g., Keizer et al., 2008). Furthermore, several social psychological theories support the notion that one behaviour may trigger another; these include cognitive dissonance (Festinger, 1957) and self-perception (Bem, 1967), which highlight the psychological drive for behavioural consistency. Considerable literature demonstrates that people may change their behaviours to achieve consistency (e.g., Thøgersen, 2004); and infer their attitudes or identity by observing their behaviour, triggering subsequent behaviour change (Sparks & Shepherd, 1992). Furthermore, there is increasing evidence of spillover effects in relation to pro-environmental behaviour (e.g., Thøgersen, 2004). Recent studies suggest behaviour may be clustered in some way that reflects either similar 'types' of behaviour, in respect of context, frequency or different levels of environmental commitment (easy/difficult), or similar individual characteristics, such as values or demographics (e.g., Barr et al., 2005). For example, Whitmarsh and O'Neill (2010) found that seven behavioural clusters (e.g., political actions; waste reduction; one-off domestic energy conservation) emerged from analysis of 24 pro-environmental actions, which were distinguished in terms

of frequency (regular versus one-off) and domain (e.g., transport, shopping, waste; Figure 2). This analysis was correlational, however, so while spillover may have occurred within each behavioural cluster, no causal link between one behaviour and another could be established.
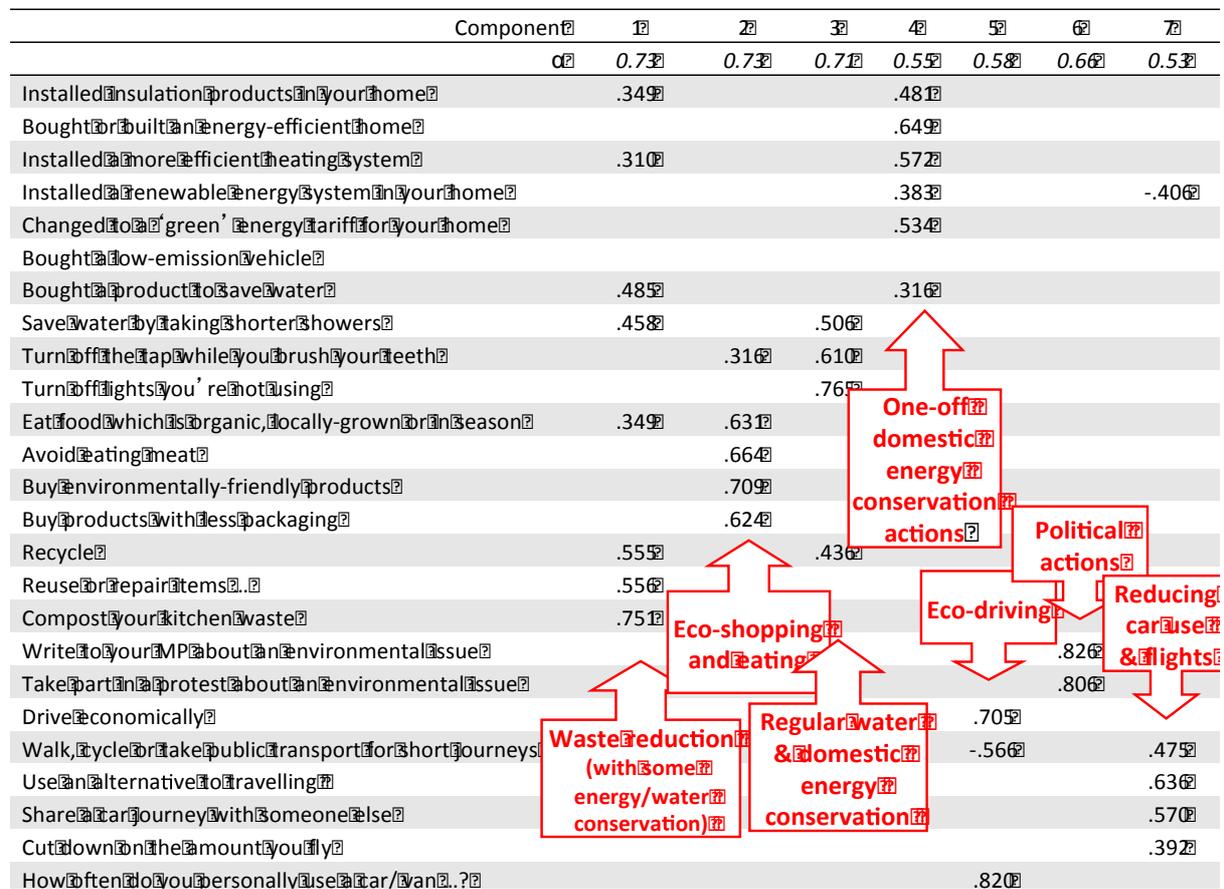
Component	1	2	3	4	5	6	7
α	0.73	0.73	0.71	0.55	0.58	0.66	0.53
Installed insulation products in your home	.349			.481			
Bought or built an energy-efficient home				.649			
Installed a more efficient heating system	.310			.572			
Installed a renewable energy system in your home				.383			-.406
Changed to a 'green' energy tariff for your home				.534			
Bought a low-emission vehicle							
Bought a product to save water	.485			.316			
Save water by taking shorter showers	.458		.506				
Turn off the tap while you brush your teeth		.316	.610				
Turn off lights you're not using			.765				
Eat food which is organic, locally-grown or in season	.349	.631					
Avoid eating meat		.664					
Buy environmentally-friendly products		.709					
Buy products with less packaging		.624					
Recycle	.555		.436				
Reuse or repair items …	.556						
Compost your kitchen waste	.751						
Write to your MP about an environmental issue						.826	
Take part in a protest about an environmental issue						.806	
Drive economically					.705		
Walk, cycle or take public transport for short journeys					-.566		.475
Use an alternative to travelling							.636
Share a car journey with someone else							.570
Cut down on the amount you fly							.392
How often do you personally use a car/ van …?				.820			

Cluster labels (Figure 2 annotations): One-off domestic energy conservation actions; Eco-shopping and eating; Waste reduction (with some energy/water conservation); Regular water & domestic energy conservation; Political actions; Eco-driving; Reducing car use & flights.

Figure 2. Clusters in pro-environmental behaviours (Whitmarsh & O'Neill, 2008; UK survey N=551)

Longitudinal studies have also suggested spillover may occur: our study of loft insulation adoption in south Wales showed that those with insulation were significantly more likely to save energy in other ways (e.g., turning off lights, not overfilling the kettle, draught-proofing). This relationship held when controlling for environmental identity and demographic factors; in other words, it wasn't just because these people were 'green' that they had both insulation and saved energy, but there seemed to be a direct impact of adoption one behaviour on the likelihood of adopting another (Whitmarsh et al., 2013). Again, this work was not experimental, though, so we cannot establish the direction of causality. Some experimental research is beginning to establish this causal link (e.g., Truelove et al., 2016; Van der Werff et al., 2014): one US study by Thøgersen and Noblet (2012), for example, found a positive spillover from 'everyday green consumerism' to acceptance of wind power in the local area; i.e., undertaking regular pro-environmental actions partly causes (through 'action-based learning') support for environmental policies.

Spillover evidently does not always – or even often – occur: it seems to have particular preconditions. First, behaviour must be seen as diagnostic of an internal disposition (e.g., environmental values or identity). A major reason why spillover often does not occur is that pro-environmental behaviours are often conducted for various reasons, which reduces their diagnosticity. Using public transport may be undertaken for reasons of cost or convenience, whereas signing an environmental petition is unambiguously an indicator of environmental concern. Related to this, if one is coerced into undertaking an action, it will be seen as less

diagnostic of an internal motivation; i.e., it will be externally (not internally) attributed (Malle, 2004). Critically this internal disposition must be pro-environmental if subsequent environmentally sustainable behaviours are to be promoted. In other words, pro-environmental spillover effects will occur if the behaviour is (perceived to be) undertaken for environmental reasons. On the other hand, if behaviour is undertaken for economic reasons, for example, spillover effects may occur in relation to other money-saving behaviours. This underlies the rebound or 'take-back' effect, i.e., the potential for efficiency savings to be undermined by consequent wasteful behaviour (e.g., money saved on energy through loft insulation may be spent on heating the home to a higher temperature or on unrelated energy-consuming activities, such as travel; Herring & Sorrell, 2008). This internal disposition is most likely to influence behaviour if it is central to self-concept or self-identity (Verplanken & Holland, 2002). Although environmental concern is widely expressed in most nations (WVS, 2005), the strength with which people identify as pro-environmental varies. Assertion of identity may be understood as an attempt to establish consistency in our attitudes and actions and continuity across experiences, and therefore is highly relevant in exploring consistency and spillover effects across pro-environmental behaviours. Indeed, various studies highlight the identity-behaviour link for green behaviours; and suggest green identity may be a stronger influence on behaviour than values or attitudes (e.g., Whitmarsh & O'Neill, 2010).

Second, the subsequent behaviour must be seen as relevant to the first (and similarly diagnostic; Austin et al., 2011). Critically, expert judgements about the similarity of behaviours (e.g., from an environmental point of view) do not necessarily correspond to citizens' understanding. Yet, understanding the conceptual categories held by individuals is key to understanding relationships between their actions (Canter et al., 1985). Similarly, the sociological literature highlights that actions are undertaken in spatial-temporal 'bundles' of social practices (e.g., Schatzki, 2010) and that because these bundles are underpinned by common meanings, rules and material arrangements and evolve over time, they may seem 'inconsistent' from an environmental impact perspective but are, rather, socially meaningful. Thus, two pre-conditions of spillover seem to be internal attribution of behaviour (specifically, attribution to pro-environmental self-identity), and perceived similarity of spillover behaviours.

So, how common is behavioural spillover and do policies designed to promote green behaviours lead to spillover? Our recent field experiment of the Welsh carrier bag charge (Poortinga et al., 2013) examined whether the charge had impacted on other waste behaviours (e.g., recycling), as well as broader pro-environmental actions (e.g., walking/cycling short distances). While reuse of carrier bags was found to increase as a result of the charge, no significant change in other behaviours was observed (Figure 3). However, a significant rise in 'waste-conscious' identity was observed, suggesting favourable conditions for spillover which may be realised if pro-environmental diagnosticity and similarity of behaviours were also present. In the case of the charge, however, the behaviour may primarily have been undertaken for financial reasons, which would explain why the Welsh public do not perceive inconsistency in their waste practices. Indeed, more recent analysis has compared behaviour in Wales following the carrier bag charge with England and Scotland (before respective charges were brought in). This analysis suggests that the Welsh charge, as an extrinsic (financial) motivator for behaviour change, may, in fact, have suppressed further lifestyle change (Thomas et al., 2016). In the other countries, the research found that taking your own bag to the shops led to an increase in public transport use and using less heat in the home; however, this relationship was not found in Wales. This finding is consistent with values research which has shown that financial framing (i.e., appealing to 'money saving' argument in communications) promotes self-interest and reduces the likelihood of making further green choices (Evans et al., 2012).

Recycle household waste

Buy energy-saving light bulbs

Turn off tap while brushing your teeth

Wash clothes at 30 degrees or less

Repair or maintain an item to avoid
buying something new

Walk or cycle short distance

Buy products with less packaging
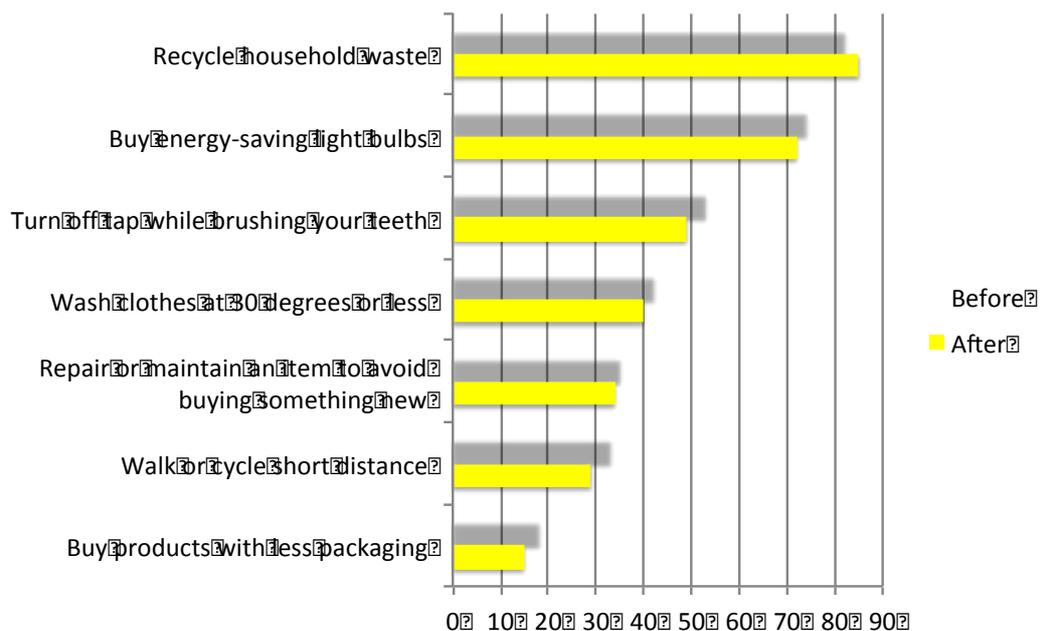
Before
■ After

0 10 20 30 40 50 60 70 80 90

Figure 3. No significant change in pro-environmental behaviours before versus six months after the introduction of the Welsh carrier bag charge (Poortinga et al., 2013; % respondents saying they 'always' take this action; Welsh sample N=500)

As yet, pro-environmental behavioural spillover between home and work contexts has barely been examined, although sociological studies highlight home-work spillover effects in domains such as parenting and volunteering (Austin et al., 2011). Work-home spillover is an example of 'situational' spillover – i.e., adopting a behaviour in one context leads to adoption of the same behaviour in another – which is differentiated from behavioural spillover as defined above (behaviour 1 leads to behaviour 2, usually in the same context; Thøgersen, 1999). We may expect spillover between work and home to be limited: different motivations and barriers operate at work versus home – e.g., financial benefits of energy saving may not exist at work, control over equipment may be lower at work. Indeed, our latest data indicates that workplace pro-environmental behaviours (e.g., setting up a recycling scheme at work) do not tend to co-occur (and may even be negatively correlated with) domestic or consumer behaviours, like recycling, turning off lights and buying green products (Whitmarsh et al., submitted). Even when comparing the same behaviour across different behaviours, we see limited spillover: in a study of laboratory workers, we found 39% recycled at work, while 68% recycled at home – although there was a significant correlation between these behaviours (r=.39, p<.01; Whitmarsh et al., in prep).

Perhaps the only detailed study of home-work pro-environmental spillover was conducted by Littleford et al (2014), who compared two Council workplaces and found notable differences between them in adoption of energy-saving behaviours due primarily to control factors (e.g., automated lighting). They also found limited spillover to home energy-saving behaviours, although it was more likely to occur in one of the workplaces (where there was more control) than the other. They conclude "*people behave more consistently across settings when they have greater control over their own behaviour*", including physical and social control (p.165). Spillover is also more likely where behaviours share same equipment (e.g., PC) or trigger (e.g., leaving room; Figure 4). Other work also suggests home-work spillover may be possible if there is organisational or social support in both environments (Rashid & Mohammad, 2011).

Table 5
Correlations between office and home behaviours for respondents from the City Central and County Individual buildings.

Behaviour	Building	n	1. Office lights	2. Meeting room lights	3. Home lights not needed	4. Home lights empty	5. Office monitor finished	6. Office monitor away	7. Home computer finished	8. Home monitor away
1. Office lights off when not needed[a]	Central	—	—	—	—	—	—	—	—	—
	Individual	141	1.00	.25**	.27**	.14	.15	−.06	.22*	.11
2. Meeting room lights off when leave empty	Central	289		1.00	.12	.08	.02	.01	.12	.12
	Individual	120		1.00	.17*	.23*	.15	.23**	.30**	.23*
3. Home lights off when not needed	Central	316			1.00	.66**	.07	.10	.41**	.23**
	Individual	130			1.00	.55**	.16	−.06	.54**	.30**
4. Home lights off when leave room empty	Central	315				1.00	.12*	.15**	.25**	.17**
	Individual	132				1.00	.15	.16	.19*	.21*
5. Office monitor off when finished for the day	Central	334					1.00	.33**	.08	.13*
	Individual	144					1.00	.15	.02	.21*
6. Office monitor off when away ten minutes	Central	334						1.00	.08	.35**
	Individual	144						1.00	.06	.31**
7. Home computer off when finished using it	Central	305							1.00	.27**
	Individual	128							1.00	.25**
8. Home monitor off when away ten minutes	Central	280								1.00
	Individual	113								1.00

Spearman's rho (r). * Correlation significant at $p < .05$ (2-tailed). ** Correlation significant at $p < .01$ (2-tailed).
[a] Asked only of County Individual Building as occupants of City Central Building had no individual control over office lights.

Figure 4. Correlations between energy-saving behaviours in two Council buildings and at home (Littleford et al, 2014)

There is clearly much more research to be undertaken to explore home-work spillover effects. For example, how can we promote spillover effects between contexts? Should we start in the home or the workplace with our interventions? Previous work appears to assume that any spillover is more likely to originate from a home behaviour and be carried – via 'attitudes' or some other psychological construct – to the workplace (Tudor et al., 2008; Young et al., 2015; Figure 5). But while environmental attitudes or values may ultimately originate from parental (or other non-work) influence, it is conceivable that workplace green initiatives could trigger environmental awareness that transfers to other contexts, including the home.
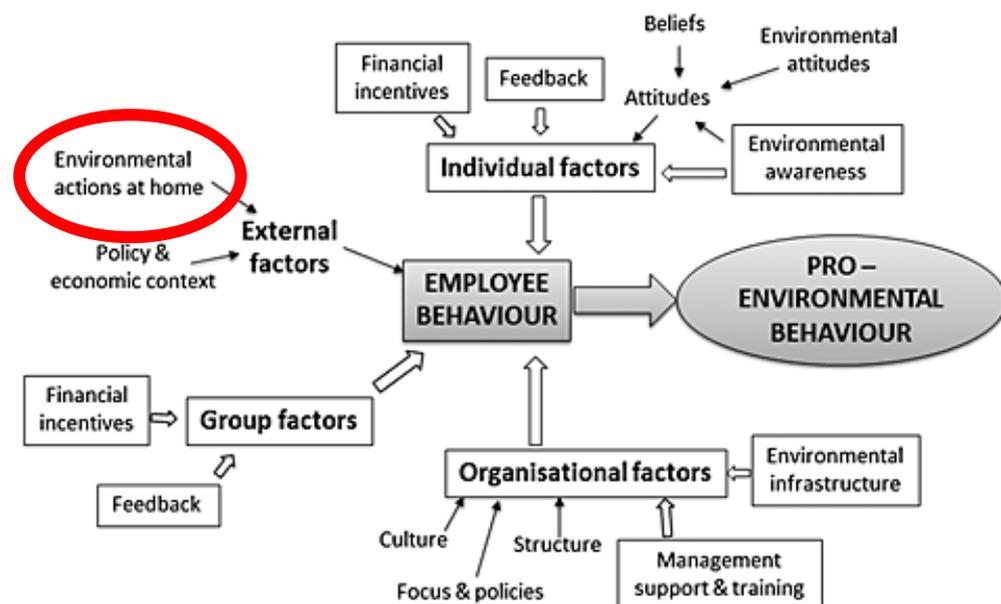

Figure 5. Meta-analysis of successful environmental programmes in the workplace (Young et al., 2015) with role of environmental actions at home highlighted.

In sum, spillover may be a way to realise more ambitious low-carbon lifestyle change than has been achieved through most previous initiatives. Previous findings from the literature

indicate spillover may occur under certain circumstances – but often won't occur; and policies may even suppress it. Situational spillover (e.g., work-home) is limited; this is largely because contextual factors (e.g., infrastructure) are often more important than individual ones (e.g., values) in driving green behaviour. If we are interested in encouraging workplace behaviour change (and spillover), several key elements need to be considered: provide control (including physical ability, skills, social norms); foster organisational identity, culture and trust; and focus on (or reframe around) intrinsic motivations. Further work is needed to explore the direction and mechanisms of home-work spillover and to bring together the sub-disciplines of organisational and environmental psychology.

References

Allen, P., Blake, L., Harper, P. et al (2013). Zero Carbon Britain: Rethinking the Future. Centre for Alternative Technology. http://www.zerocarbonbritain.org/images/pdfs/ZCBrtflo-res.pdf

Austin, A. et al. (2011). Exploring catalyst behaviours. Report to DEFRA. Brook Lyndhurst.

Bamberg, S., & Schmidt, P. (2003). Incentives, morality, or habit? Environment & Behavior, 35, 264-285.

Barr, S. et al. (2005). The household energy gap. Energy Policy, 33, 1425–1444

Bem, D. (1967). Self-perception: an alternative interpretation of cognitive dissonance phenomena. Psychological Review, 74, 183–200.

Canter, D.V. et al. (1985). A multiple sorting procedure for studying conceptual systems. In M. Brenner, J. et al. (Eds.). The Research Interview. Academic Press.

Capstick, S., Lorenzoni, I., Corner, S. & Whitmarsh, L. (2015). Social science prospects for radical emissions reduction. *Carbon Management, 4*(5), 429-445.

Carter, N., & Ockwell, D.G. (2007). New Labour, new environment? Centre for Ecology Law & Policy.

Crompton, T. (2010). Simple and painless? The limitations of spillover in environmental campaigning. WWF. http://assets.wwf.org.uk/downloads/simple_painless_report.pdf

Druckman, A. & Jackson, T. (2010). An Exploration into the Carbon Footprint of UK Households. University of Surrey, Guildford.

Evans, L. Maio, G.R., Corner, A., Hodgetts, C.J., Ahmed, S. & Hahn, U. (2012). Self-interest and pro-environmental behaviour, *Nature Climate Change.* http://dx.doi.org/10.1038/nclimate1662.

Festinger, L. (1957). A Theory of Cognitive Dissonance. Stanford University Press.

Herring, H., & Sorrell, S. (Eds.). (2008). Energy efficiency and sustainable consumption. Palgrave Macmillan

IPCC (2013) *Climate Change 2013: The Physical Science Basis.* Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Keizer, K. et al. (2008). The spreading of disorder. Science, 322, 1681-1685.

Littleford, C., Ryley, T. & Firth, S.. (2014). Context, control and the spillover of energy use behaviours between office and home settings. Journal of Environmental Psychology, 40, 157-166.

Lorenzoni, I. et al. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. Global Environmental Change, 17, 445-459.

Malle, B.F. (2004). How the Mind Explains Behavior. MIT Press

Poortinga, W., Whitmarsh, L. & Suffolk, C. (2013). The introduction of a single-use carrier bag charge in Wales: Attitude change and behavioural spillover effects. *Journal of Environmental Psychology, 36,* 240-247.

Rashid, N. & Mohammad, N. (2011). Spillover of environmentally-friendly behaviour phenomenon: The mediating effect of employee organizational identification. *OIDA International Journal of Sustainable Development, 2*(12), 29-42.

Schatzki, T. (2010). The Timespace of Human Activity. Lexington Books.

Sparks, P., & Shepherd, R. (1992). Self-identity and the theory of planned behaviour. Social Psychology Quarterly, 55, 388–399.

Stern, P. (2000). Toward a coherent theory of environmentally significant behavior. Journal of Social Issues, 56, 407–424.

Thøgersen, J. (1999). Spillover processes in the development of a sustainable consumption pattern. Journal of Economic Psychology, 20, 53-81.

Thøgersen, J. (2004). A cognitive dissonance interpretation of consistencies and inconsistencies in environmentally responsible behaviour. Journal of Environmental Psychology, 24, 93–103.

Thøgersen, J., Noblet, C., (2012). Does green consumerism increase the acceptance of wind power? Energy Policy, 51, 854–862.

Thomas, G., Poortinga, W., & Sautkina, E. (2016). The Welsh Single-Use Carrier Bag Charge and behavioural spillover, Journal of Environmental Psychology 47, 126-135.

Truelove, H., Yeung, K. Carrico, A., Gillis, A., & Raimi, K. (2016). From plastic bottle recycling to policy support: An experimental test of pro-environmental spillover. Journal of Environmental Psychology 46, 55-66

Tudor, T., Barr, S. & Gilg, A. (2008). A Novel Conceptual Framework for Examining Environmental Behavior in Large Organizations: A Case Study of the Cornwall National Health Service (NHS) in the United Kingdom. Environment and Behavior, 40 (3), 426-450.

Van der Werff, E., Steg, L., & Keizer, K. (2014a). Follow the signal: when past proenvironmental actions signal who you are. Journal of Environmental Psychology, 40, 273e282.

Verplanken, B. & Holland, R.W. (2002). Motivated decision-making. Journal of Personality & Social Psychology, 82, 434-447.

Whitmarsh, L. (2009). Behavioural responses to climate change: Asymmetry of intentions and impacts. Journal of Environmental Psychology, 29, 13-23.

Whitmarsh, L., O'Neill, S. & Lorenzoni, I. (Eds) (2010). *Engaging the public with climate change: behaviour change and communication.* London: Earthscan.

Whitmarsh, L. & O'Neill, S. (2010). Green identity, green living? Journal of Environmental Psychology, 30, 305–314

Whitmarsh, L., Suffolk, C., Poortinga, W. & Howard, A. (2013). *Loft insulation adoption and spillover effects in home energy efficiency.* Report to Welsh Government. Available from www.understanding-risk.org.

Whitmarsh et al., in prep. Do we take our habits with us? Recycling spillover across home, work and holiday.

Whitmarsh, L., Capstick, S. & Nash, N. (submitted). Who is reducing their material consumption and why? A cross-cultural, longitudinal analysis of dematerialisation behaviours. Philosophical Transactions of the Royal Society A.

WVS (World Values Survey, 2005). International values data. www.worldvaluessurvey.org.

Young, W., Davis, M., I. McNeill, et al. (2015). Changing Behaviour: Successful Environmental Programmes in the Workplace. Business Strategy & the Environment, 24 (8), 689–703