

Changing Behaviour: Successful Environmental Programmes in the Workplace

William Young,^{1*} Matthew Davis,² Ilona M. McNeill,³ Bindu Malhotra,¹ Sally Russell,¹
Kerrie Unsworth³ and Chris W. Clegg²

¹*Business and Organisations for Sustainable Societies research group (BOSS), Sustainability Research Institute, School of Earth and Environment, University of Leeds, Leeds, UK*

²*Socio-Technical Centre, Leeds University Business School, University of Leeds, UK*

³*Business School, University of Western Australia, Perth, Western Australia, Australia*

ABSTRACT

There is an increasing focus on improving the pro-environmental attitudes, behaviour and habits of individuals, whether at home, in education, travelling, shopping or in the workplace. This article focuses on the workplace by conducting a multi-disciplinary literature review of research that has examined the influence of organization-based behaviour change initiatives. The review includes only research evidence that measured actual environmental performance (e.g. energy use) rather than solely using self-reported methods (e.g. questionnaires). The authors develop an 'employee pro-environmental behaviour' (e-PEB) framework, which contains individual, group, organizational and contextual factors that have predictive relevance across different behaviours and organizations. The review shows that the strongest predictors are environmental awareness, performance feedback, financial incentives, environmental infrastructure, management support and training. A key finding from this review is that attitude change is not necessarily a pre-requisite for behaviour change in the workplace. Copyright © 2013 John Wiley & Sons, Ltd and ERP Environment

Received 19 July 2013; revised 23 October 2013; accepted 29 October 2013

Keywords: workplace; employee; behaviour change; environmental; sustainability

Introduction

RECENT YEARS HAVE SHOWN AN INCREASED POLICY, PRACTICE AND RESEARCH ACTIVITY AROUND CHANGING THE behaviour of individuals and organizations to reduce their impacts on the natural environment. The topic of workplace behaviour has become increasingly important as more and more organizations implement corporate social responsibility (CSR) and/or organizational sustainability strategies (Young and Tilley, 2006). For the majority of organizations (companies and public institutions), CSR and sustainability strategies can improve environmental performance, especially when employees are involved in the development of these strategies (Boiral, 2005; Michailides and Lipsett, 2013).

*Correspondence to: William Young, Business and Organisations for Sustainable Societies research group (BOSS), Sustainability Research Institute, School of Earth and Environment, University of Leeds, Leeds, UK.
E-mail: C.W.Young@leeds.ac.uk

Research has shown that environmental infrastructure (Ucci, 2010) and system changes (Hertin *et al.*, 2008; King *et al.*, 2005) can only reduce an organization's environmental impacts to a limited extent and that employee responses to such changes are a crucial boundary condition (Davis *et al.*, 2011). In addition, organizations are increasingly using employee behaviour change interventions to address a range of issues, such as increasing recycling, reducing energy use, reducing greenhouse gas (GHG) emissions, reducing water use and increasing public transport use. Appreciating the factors that influence employee responses and intervention uptake is thus critical, and behaviour change research can help organizations to significantly improve their environmental performance and assist in addressing critical ecological issues such as climate change and biodiversity loss (Rockström *et al.*, 2009).

To date, much of the research on the effectiveness of such behavioural interventions has focused on the methods and tools of changing behaviour patterns relating to a specific behaviour. This research is often deductive, examining only those factors relevant to the particular theoretical model or behavioural focus (Osbaldiston and Schott, 2012; Tudor *et al.*, 2007, 2008). In addition, relatively little research has focused on the actual environmental performance outcomes of an intervention, making it impossible to calculate the overall effectiveness of such an intervention within an organizational context (Steg and Vlek, 2009).

We argue that what influences employee uptake of behaviour change interventions, and the impact of this on an organization's environmental performance, is complex and is in need of a multi-disciplinary review of the research evidence. Furthermore, we argue that this review should be of research focusing not only on behaviour changes (e.g. self-reported behaviour) but also on environmental performance indicators (EPIs) (e.g. waste recycling rates calculated from comparing quantities in recycling bins compared with general waste bins). The reason is that factors elsewhere in the organization's structure or operations may counterbalance an employee behaviour change and cause rebound effects (Berkhout *et al.*, 2000). Hence, the main aim of this paper is to review research evidence and to develop a conceptual framework of the factors that contribute to the successful change in EPIs through changing the behaviour of employees.

To do this we use the following approach. We take an existing framework that was developed to map the key antecedents of a particular sustainable environmental behaviour, namely waste management, performed by employees in a large organization (Tudor *et al.*, 2008). Next, we review research evidence at both the individual and organizational levels and examine the successfulness of workplace behaviour change initiatives in changing EPIs with a wide focus on environmental sustainability issues such as transport, energy, resource and water use. We map these findings onto the framework by Tudor *et al.* (2008), and discuss its strengths and shortcomings in explaining the effectiveness of behaviour change interventions aimed at improving an organization's environmental performance.

In the following section we first present our baseline framework based on the work of Tudor *et al.* (2008). We then outline the method of our review. Next, we offer a systematic review of the literature in this area and highlight the key findings to date in light of the baseline framework. In the final sections of this article we present a revised framework for behaviour change and offer implications for business strategy and suggestions for managers and for future research in this area.

The Baseline Framework

We started with the process framework of determinants for sustainable waste management behaviour identified by Tudor *et al.* (2008), which resulted from a case study of a National Health Service (NHS) Trust. The NHS Trust is a provider of state healthcare through family doctors and hospitals in the Southwest of England. We chose this framework as it is unique in specifying factors that influence employee behaviour change at both the individual and organizational levels. In addition, it was conceptualized as a result of research measuring the impact of interventions on actual environmental performance (Lo *et al.*, 2012). Their case study framework details which determinants helped change employee behaviour to better manage and reduce waste including clinical, food and paper waste along with monitoring of the organization's EPIs. The framework provides a valuable starting point to attempt to integrate the variety of psychological and organizational behaviour change techniques that have been implemented in the area of environmental sustainability and to identify common mechanisms or pathways to change.

Changing Behaviour

The framework identifies employee-level factors on the top half and the organizational level factors on the bottom half of the framework (see Figure 1). Tudor *et al.* (2008) emphasize that the key individual level factors to affect employee behavioural intentions were

1. the attitudes of staff, especially as a result of the value placed on the environment and job satisfaction, and
2. waste management behaviour at home.

The key organizational level factors were

1. the focus and structure of the organization, the associated management support and availability of resources (finance and personnel) and their contribution to the organization's culture and levels of motivation and
2. the organization's culture (both formal and informal), and its association with levels of motivation.

Furthermore, the relation between intentions and actual behaviour was mediated by an intention-behaviour gap.

Review Method

We reviewed the literature available in English on workplace interventions (Dwyer *et al.*, 1993) designed to increase pro-environmental behaviour, which measured the intervention's effects on environmental performance using EPIs. In finding and selecting the research we used a multi-disciplinary approach (Young and Middlemiss, 2012) bringing together research evidence from different disciplines, including environmental science, geography, social psychology, organizational psychology and business management. To ensure generalizability, we included research conducted within a broad range of industries, such as universities, health organization, construction companies, banks and manufacturers.

For evidence to be included in the review, sources had to meet all three of the following inclusion criteria.

1. The paper examined an intervention in the workplace to increase pro-environmental behaviour (PEB). The intervention could have been part of a researcher instigated experiment (similar to the inclusion criteria for Osbaldiston and Schott, 2012), an intervention instigated by the organization or an intervention from outside the organization such as a government policy. Importantly, the paper had to include pre- and post-intervention measures.
2. It included the actual environmental performance outcome of the intervention using an EPI appropriate for the specific intervention (e.g. recycling rate using data calculated from quantity of materials in recycling bins compared with general waste bins or researcher observation). This criteria was set because self-reporting can be unreliable or exaggerated (Chao and Lam, 2011). The EPIs used could be either for the specific intervention or

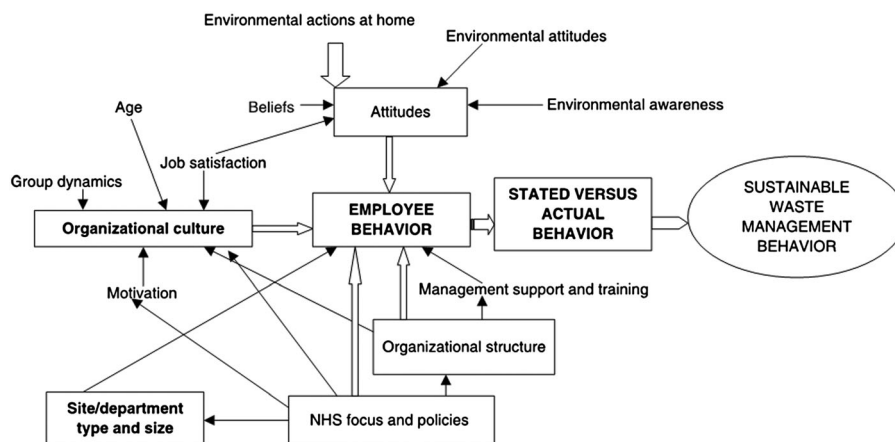


Figure 1. Process framework of macro determinants for sustainable waste management behaviour in Cornwall NHS (Tudor *et al.*, 2008 p. 445)

for the organization as a whole, which often varies with the size of the intervention and/or the organization. Both improvements and null effects were included. Papers on null effects were scarce, which unfortunately is a general researcher reporting problem (Saunders, 2000).

3. It was published after 1980. The reason for limiting research by date is that organizational settings and their concern with environmental performance have changed significantly over time, and older research findings would have a strongly reduced validity in current organizations, thereby making these findings less useful for practitioners (Osbaldiston and Schott, 2012).

To identify appropriate publications we used three techniques. The first technique was a keyword search in the databases PsycINFO, Science Direct, Web of Knowledge, Wiley Online, EBSCO Business Source Premier and Google Scholar, using the terms *environmental, green, recycling, waste, energy, carbon dioxide, greenhouse gases, water and/or transport* combined with *employee behavio(u)r and/or intervention*, e.g. 'environmental AND employee behavio(u)r'. Table 1 shows the total results returned by these databases. The second technique was a Google search for grey literature. The third technique was to search the reference lists of the articles, books and grey literature from the first two techniques for any relevant further references.

A researcher was employed for six months to use the inclusion criteria above to systematically go through the results from the initial search. From the large number of initial search results shown in Table 1, approximately half the articles were on topics not relevant to environmental sustainability in organizations. Another quarter of articles were discounted as they reviewed employee behaviour, attitudes, beliefs and habits in relation to environmental sustainability in general surveys, but did not evaluate any behavioural intervention. After excluding those articles that did not meet our review criteria, 17 articles were left. Table 2 shows the methods, geographical focus and impact factor of the journals in which the articles were published.

Results

The 17 articles that were included in our review were evaluated for key conclusions and for how those conclusions related to the factors presented in the baseline framework (Tudor *et al.*, 2008). During this process we were able to identify several additional factors that were not present in the framework. This led to the development of a new, slightly adjusted framework for the effectiveness of behaviour change interventions in improving an organization's environmental performance.

In reviewing the articles we initially set out to sort them into individual factors versus organizational factors, which is in line with the baseline framework. *Individual* factors relate to the psychological/cognitive factors that are involved in individual decision-making by the employees. *Organizational* factors operate at the broader scale of the organization, acting as part of the organizational context, which may enable or constrain the success of any behaviour change initiatives. However, after an initial review of the 17 articles, it became clear that two categories needed to be added to the individual versus organizational factors division, namely group factors and external factors. *Group* factors are the day-to-day influences of managers and colleagues on an employee's behaviour. They fall in between individual factors and organizational factors. *External* factors are contextual factors and experiences

Database	Number of results
PsycINFO	1 730
Science Direct	0
Web of Knowledge	1 130
EBSCO Business Source Premier	24
Wiley Online	5
Google Scholar	375 000

Table 1. Results of database search for research evidence

Changing Behaviour

Paper	Methods	Geographical focus	Impact factor of journal
Boiral (2005)	<ul style="list-style-type: none"> • 3 case studies using interviews • Site observations • Documented environmental performance data 	Canada	3.236
Cairns <i>et al.</i> (2010)	<ul style="list-style-type: none"> • 21 case studies • Interviews • Car arrival counts 	UK	2.725
Carrico and Riemer (2011)	<ul style="list-style-type: none"> • 2 feedback interventions in 24 buildings at a University • Electricity consumption and temperature records 	USA	2.549
Dwyer <i>et al.</i> (1993)	<ul style="list-style-type: none"> • Review of 53 articles 	International	1.282
Holland <i>et al.</i> (2006)	<ul style="list-style-type: none"> • Field-experiment on repetitive behaviour • 109 employees of six different departments at a tele-company • Questionnaires • Recording of paper disposal 	Netherlands	2.219
Jones <i>et al.</i> (2012)	<ul style="list-style-type: none"> • Interventionist techniques • Questionnaires • Audits of energy and waste 	UK	1.047
Lingard <i>et al.</i> (2001)	<ul style="list-style-type: none"> • Multiple-baseline experiment • Workshops • Material input and waste output recording 	Australia	N/A
Schelly <i>et al.</i> (2011)	<ul style="list-style-type: none"> • 2 case studies • Focus groups • Unstructured interviews • Energy use and cost data collected 	USA	1.282
Schwartz <i>et al.</i> (2010)	<ul style="list-style-type: none"> • Participatory action research approach • Focus groups and workshops • Energy use monitoring 	Germany	N/A
Shiftan <i>et al.</i> (2012)	<ul style="list-style-type: none"> • 640 Questionnaires • National average travel statistics 	Israel	1.541
Siero <i>et al.</i> (1996)	<ul style="list-style-type: none"> • Quasi-experimental design. • Questionnaires and information • Observations of energy-wasting behaviour 	Netherlands	2.549
Staats <i>et al.</i> (2000)	<ul style="list-style-type: none"> • Informational interventions • Unobtrusive observation of energy use 	Netherlands	0.762
Tam and Tam (2008)	<ul style="list-style-type: none"> • Interviews • Cost record for the quantities of materials and waste generation 	Hong Kong, China	1.989
Tudor <i>et al.</i> (2008)	<ul style="list-style-type: none"> • An ethnographic study • Interviews • Questionnaires • Waste bin analysis 	UK	2.549
Vanhouten <i>et al.</i> (1981)	<ul style="list-style-type: none"> • Multiple-baseline design • Information • Energy consumption meter 	Canada	0.762
Wu <i>et al.</i> (2013)	<ul style="list-style-type: none"> • Questionnaires • Observation of waste disposal behaviour 	Canada	N/A
Zhen <i>et al.</i> (2002)	<ul style="list-style-type: none"> • Interventionist techniques • Recording of quantities of materials and waste generation 	Hong Kong, China	1.82

Table 2. Methods and geographical focus of articles and journal impact factors

outside the organization that can influence the employees' behaviours. These factors can range from being individual specific, for example household norms. However, they can also be community, state, or even government wide, such as policies that favour certain behaviours over others. We will now present the factors within each of the four categories in more detail, starting with the individual factors.

Individual Factors

The role of individuals' influence on their own behaviour is critical and covers employees' beliefs, attitudes and awareness through value-belief-norm (VBN) theory (Stern, 2000) and the theory of planned behaviour (Ajzen, 1991). This category includes the baseline framework's factors of beliefs, environmental attitudes and environmental awareness, but also individual feedback and financial incentives. While much research has examined individual factors in pro-environmental behaviour (Bamberg and Möser, 2007; Steg and Vlek, 2009), far fewer researchers have examined these relationships in a workplace setting. We will discuss the research that has been done in relation to each of these factors, starting with the factors mentioned in the baseline framework.

Beliefs and Environmental Attitudes

Hoffman (1993) suggested that, for better employee motivation, companies need to balance employee and company environmental values. The evidence Tudor *et al.* (2008) found showed that environmental attitudes were a strong predictor for behaviour and underlying beliefs shaped employees' environmental attitudes. Individual's beliefs and attitudes affect the organization's incentives towards environmental sustainability and vice versa. There was no further evidence in the literature to support this, with some studies showing changes in behaviour without changes in attitudes (Schelly *et al.*, 2011; Schwartz *et al.*, 2010). Interventions attempting to use informational techniques to induce attitude change have had mixed success with staff training having better success (Jones *et al.*, 2012). Indeed, it is likely that focusing on attitude change alone to bring about behaviour change will not achieve great success.

Environmental Awareness

Environmental awareness can be split into procedural knowledge and informational interventions. Knowledge about recycling materials, methods of recycling and disposal processes have been shown to influence employee behaviour. Tudor *et al.* (2008) found that employees who were aware of their organization's waste management practices were more likely to act sustainably. This was also the case in a follow-up case study in the construction sector, where a combination of training and posters increased awareness and hence recycling (Jones *et al.*, 2012). Operators in the Canadian chemical industry were more likely to improve environmental performance if made aware of their environmental duties (Boiral, 2005). In a comparative study of energy conservation in two public schools, respondents reported that reminders to turn off lights and computers influenced their behaviour (Schelly *et al.*, 2011).

Individual-Level Feedback

In addition to the above, we augmented the Tudor *et al.* (2008) framework in two ways. First, there is substantial evidence that feedback on employees' efforts influences their behaviour. Staats *et al.* (2000) found that a 6% reduction in office heating gas consumption was obtained through providing information (instructions on altering office thermostats) followed by collective, and then individual, feedback.

This information offers reflection and potential for energy conservation. Schwartz *et al.* (2010) found that providing feedback on power usage, together with supporting workshops, reduced consumption. However, the behaviour change weakened and reverted to previous habits once this feedback and support was removed. The results suggest that information should be presented in simple ways for employees to make sense of it and to draw connections to their own practices of energy usage.

Changing Behaviour

Schelly *et al.* (2011) reported that feedback provides information regarding the outcome of employee's actions as well as an opening to discuss conservation in a simple and meaningful language. One student from the study stated 'I think another thing that really helped the school – they started doing lots of graphs and charts, putting dollar amounts. It made is easier; it made a lot of sense to people when you put a dollar amount on it' (Schelly *et al.*, 2011, p. 332).

Lingard *et al.* (2001) conducted a quasi-experiment to determine the effectiveness of goal setting and feedback in improving solid waste management performance in the construction industry. They selected the construction of a sports stadium in Melbourne, Australia. The intervention process included participative goal setting and feedback on performance. Feedback charts were displayed at the site. The interventions were carried out for timber and concrete usage. The results showed that the average waste disposal as landfill for the timber intervention fell from 30 m³ to 10 m³ per fortnight; in the concrete intervention it fell from 19.8 m³ to 18.7 m³ per fortnight. The reductions in waste generated between pre- and post-intervention periods for both the timber and concrete conditions were found to be statistically significant, suggesting that goal setting and feedback can be used successfully for solid waste management programmes.

Individual-Level Financial Incentives

Another additional factor we identified based on the review is financial incentives. Financial incentives have been assumed to encourage behaviour change in employees, including environmental sustainability related behaviours, for example, 'introducing incentive payments for those not driving to work had often helped to achieve higher than average levels of behaviour change' (Cairns *et al.*, 2010, p. 481). Tam and Tam (2008) studied the influence of a stepwise incentive scheme in Hong Kong to assess the motivation of construction employees to reduce waste generation. A stepwise incentive scheme works on the idea that the '...higher the waste reduction level being achieved, the higher is the required incentive' (Tam and Tam, 2008, p. 39). Performance of the construction projects was evaluated on a regular basis. Reducing material wastage and waste sent to landfill resulted in monetary rewards. If employees reduced materials wastage and waste sent to landfill by 10% or more, employees received a reward of 30% of the total cost saved. The proportion of incentive increased as the percentage of the material saved increased. To confirm its success a local hotel development project was used. The project was assessed three times at intervals of three months. Results showed positive improvements at each stage. The second assessment reported double the cost saving compared with the first assessment; the third assessment reported three times more cost savings compared with the second assessment. In total, 23% less waste was generated for the construction projects.

Group Factors

This is a key category that focuses on employees' day-to-day relationships with colleagues and managers. It was not included in the baseline model, and hence added to our revised model. It contains two factors that were found to be of influence on the individual level as well, namely feedback and financial incentives.

Team-Level Feedback

Siero *et al.* (1996) studied the influence of comparative feedback to encourage employee energy conservation behaviour in two Dutch metallurgical plants. Two units from the organization were selected and educational information about the energy conservation behaviour was provided. Both groups received feedback on their energy conservation behaviour in the form of graphs. One group only received feedback about their own unit's performance, whilst the other group received comparative feedback of their own unit's performance versus the other units. The results showed that energy conservation behaviour was significantly higher for the comparative feedback group. In addition, this group was also more conscious of and curious to know about energy conservation. This energy conservation behaviour was sustained over the entire six-month study period. Carrico and Riemer (2011) reported that provision of feedback on changes in energy consumption as compared with the previous month can be effective

in reducing energy consumption – ‘On average, buildings that received feedback used 7% less energy than buildings assigned to the control group’ (Carrico and Riemer, 2011, p. 10).

Financial Incentives

Zhen *et al.* (2002) examined the influence of a group based incentive reward programme (IRP) for construction work in a housing project in Hong Kong. They used a bar code tracking system to track and account for all the building materials on the site. The IRP involved rewarding the group with a proportion of the value of the saved materials. The workers were divided into two groups, an IRP group and a control group. This intervention lasted for 3 months. The results showed that the group with the IRP *saved* construction materials worth HK\$ 705 344.85 while the control group *wasted* construction material worth HK\$ 747,947.71 with the difference between the two groups being HK\$ 1 453 292.5. The result indicates that financial incentives may motivate employees to reduce unnecessary waste in construction materials on site.

Organizational Level Factors

Organizational factors shape how employees react and ultimately behave when faced by new interventions such as environmental sustainability. Our literature review identified several organizational factors that can influence the effectiveness of sustainability interventions. The factors cover environmental infrastructure, management support and organizational culture.

Environmental Infrastructure

Our review also supported the idea that accessibility of equipment influences environmental practices. Physical layouts of the provisions can be critical in influencing employee behaviour.

For example, Holland *et al.* (2006) investigated two tools to change habitual behaviour of employees towards recycling. They used conscious planning followed by the installation of facilities and situational cues. They reported that the conscious planning of ‘where, when, and how to recycle’ improved the recycling habits of employees and that these were stable and observable after two months. Waste bin analysis indicated 75 and 80% more recycling of cups and paper respectively. This is supported by the work of Wu *et al.* (2013), who found a sustainable building with food composting and recycling facilities improved behaviour.

Similarly, based on the study of 38 organizations representing best travel planning in the UK, Cairns *et al.* (2010) discovered that pioneering practices among these case studies included better security for bikes (e.g. individual lockable parking stands and offering cycle insurance schemes), cycle equipment loans, site specific maps, financial incentives and complimentary products. Several organizations also provided showers, changing and drying rooms, and locker facilities. Organizations that provided services such as free shuttle buses or cheap tickets for buses that connected local towns with bus or train stations achieved the greatest increase in public transport behaviour of employees. Infrastructural limitations such as limited bus services and distance between the bus stop and workplace can be improved by working in partnership with public transport operators and employees (Cairns *et al.*, 2010).

Finally, Vanhouten *et al.* (1981) conducted experiments in two Canadian university buildings to reduce the use of lifts and as a consequence conserve energy. They reported that changing the setting of the lifts – that is increasing the time delay for lift doors to close – considerably reduced the number the employees travelling by lift and significantly reduced the energy consumed by the three lifts, by 31, 29 and 33%. Their results suggest that convenience or infrastructure provided by organizations plays a vital role in changing employee behaviour toward environmental sustainability and that such techniques can be used to either increase or decrease target behaviour.

Changing Behaviour

Management Support

The attitude and direct personal involvement of top management and line managers and their ability to articulate why environmental sustainability is helpful to the organization is also vital. If senior management have a strong belief in and commitment to environmental sustainability they set an example for the rest of the employees (Cairns *et al.*, 2010).

For example, the success of travel plans at an organizational level has been shown to depend on the support by senior management leading by example, and with dedicated coordinators, targets, written plans and actions (Cairns *et al.*, 2010). Also, in a comparative study of energy conservation in schools, Schelly *et al.* (2011) reported that charismatic leadership in one of the schools helped to reduce its energy consumption by 50%. The principal of the school conveyed his personal values and commitment towards environmental sustainability through initiating a programme called 'care and repair'. Through the programme he also set new behavioural expectations of employees and pupils. The school's environmental science teacher also displayed good leadership qualities. He led and maintained recycling programmes and supported improvements in students' self-efficacy through involving them in these programmes.

In sum, employees are more likely to take responsibility for environmental sustainability practices if they get sufficient support from above, and 'green leadership' in organizations is helpful to support environmental sustainability (Schwartz *et al.*, 2010), as these leaders inspire cultural changes and are recognized by the employees (Jones *et al.*, 2012).

Organizational Culture

There is only a little evidence that there is a relationship between organizational culture and sustainability, which is in line with the finding by Tudor *et al.* (2008). Organizational culture can be intangible, but possess exclusive language, which influences employee perception and enforces norms that are socially accepted. One way in which an organization could thus aim to influence behaviour through its culture is by environmental communication. In fact, an important finding identified in the literature is the means, quality and frequency of communication about environmental initiatives to employees. Employees might have mistaken beliefs about an organization's policies and ideas and they can sometimes be ignorant about the initiatives taken by organizations to promote environmental sustainability. Environmental communication could thus potentially both change the culture and enable the visibility of its environmental infrastructure and positive performance as a potential employee motivation (Onkila, 2013).

In line with this, research by Schelly *et al.* (2011) on the comparison of energy conservation behaviour between two public schools reported communication as one of the factors explaining the more successful intervention at one school. Communication works with other aspects of change in organizations, not in isolation. Communication took place at several levels and conveyed behavioural expectations and success efforts. The school communicated its success through e-mails, posters, newspapers and announcements.

External Factors

Policy and Economic Context

Our review revealed that one contextual factor that can influence the effectiveness of an employee behaviour change intervention is government policy. Government policy can potentially have a negative impact, for example through a favourable taxation policy encouraging company car use. Such a policy was shown to increase personal use of company cars over and above personal use of a private car and hence increase transport emissions (Shifan *et al.*, 2012).

Presenting a Modified Framework

The new modified process framework of macro determinants for employee pro-environmental behaviour (e-PEB), as shown in Figure 2, is based on the limited research evidence available and hence should be seen as a next step in framework development rather than a complete and final framework. It shows the factors that have strong evidence (boxes and arrows shown with emphasis) and limited evidence to support their positive influence on e-PEB.

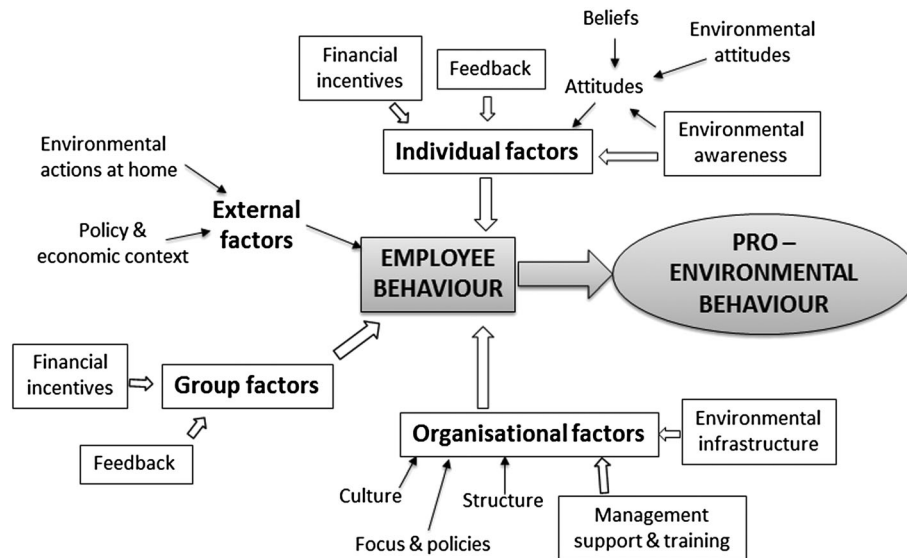


Figure 2. Process framework of macro determinants for employee pro-environmental behaviour (e-PEB) (stronger evidence shown by larger arrows or bold text)

Based on the available research, there are four broad categories that have been clearly shown to play a role in employee behaviour change, namely individual level, group level, organizational level and external factors. Within these categories, specific factors that are important are as follows.

At the individual level.

1. Employee environmental awareness is important in terms of being aware of the organization's potential impacts and more importantly knowing their individual responsibility in helping to reduce this input. This included knowledge about recycling materials, methods of recycling and disposal processes (Boiral, 2005; Jones *et al.*, 2012; Tudor *et al.*, 2008) or reminders to turn off lights and computers (Schelly *et al.*, 2011).

At the individual and group levels.

1. Feedback is important both at the individual level (Staats *et al.*, 2000) and group level (Carrico and Riemer, 2011; Siero *et al.*, 1996). In particular, feedback regarding performance on an environmental initiative improves environmental performance significantly more than general communication alone. Individual- or group-level feedback on targets act as an additional motivational and effective tool (Lingard *et al.*, 2001) as well as opening a dialogue on performance (Schelly *et al.*, 2011).
2. Financial incentives for individuals and for groups of employees were also shown to have had a positive influence on behaviour. This was focused on travelling less (Cairns *et al.*, 2010) and wasting less/recycling more (Tam and Tam, 2008; Zhen *et al.*, 2002).

At the organizational level.

1. Provision of environmental infrastructure was important, including not only installing equipment such as recycling bins (Holland *et al.*, 2006; Wu *et al.*, 2013) or bicycle facilities (Cairns *et al.*, 2010) but also other incentives such as better provision of bus services (Vanhouten *et al.*, 1981).
2. Management support from direct line supervisors as well as top management was shown to be essential in not only setting an example (Cairns *et al.*, 2010) but also providing clear leadership (Jones *et al.*, 2012; Schelly *et al.*, 2011; Schwartz *et al.*, 2010).

All other factors in the Tudor *et al.* (2008) framework do not currently have support from the current research using our selection criteria, and hence have less emphasis in our e-PEB framework.

Changing Behaviour

We suggest that practitioners can use our e-PEB framework as a guide to the factors to focus on when designing a programme to influence e-PEB in their organizations. In an ideal world, a programme should include all factors in our e-PEB framework to maximize changes in the target environmental behaviour. In reality, limited staff and financial resources are often available for environmental programmes, hence we recommend practitioners focus on the five important factors discussed above. An area that practitioners should probably avoid is allocating limited resources to changing employees' attitudes through information and training, as further discussed below.

Conclusions

In summary, our review has highlighted the complexities involved in improving environmental performance through changing employee behaviour and that the underlying mechanisms and linkages require greater empirical examination. We have integrated findings stemming from an array of studies involving various EPIs to produce an e-PEB framework to capture supported techniques at the individual, group and organizational levels as well as external factors. This is a valuable step toward understanding the antecedents of environmental behaviour change in the workplace, contingent organizational conditions and potential efficacious intervention techniques. Specifically, our review and integration of findings offer four major contributions to researchers and practitioners involved in this area. We outline these contributions below.

Multi-environmental Behaviours

First, our e-PEB framework for changing employee environmental behaviour (see Figure 2) is for multi-environmental behaviours. We therefore significantly expand the Tudor *et al.* (2008) framework that focused solely on waste behaviour. We also go beyond single behaviour efforts and consider the conditions that may support environmental behaviour in its broader sense, broadening both the theoretical and practical application of the framework. Practitioners could make use of our e-PEB framework when planning employee behaviour change initiatives, focusing efforts on the factors that have received greatest empirical support. By focusing our analysis on interventions and programmes that achieved real EPI change, practitioners can have increased confidence that the factors identified as efficacious have demonstrable practical impact. This will, in our view, create conditions for changes in behaviour and as a consequence, improvements in environmental performance.

Improving EPIs

Second, we have based our e-PEB framework on research evidence that measured actual environmental performance, rather than relying on problematic self-reported performance. Research approaches that focus on actual behaviour are needed if future efforts are to adequately distinguish between the interventions that are effective and those that are less effective for improving the environmental bottom-line. This is a methodological issue, as many additional studies may have resulted in environmental performance improvement but unfortunately they did not record EPI data and were therefore excluded from our analysis. Although the existing studies provide a good starting point in identifying some of the key antecedents for effective e-PEB initiatives, there is a strong need for further research to enhance and extend our e-PEB framework.

Individual, Group and Organizational and External Level Factors

Our third contribution is that we have developed an e-PEB framework that shows four distinct levels: namely individual or employee level factors; groups of employees (e.g. in operational units or floors of buildings); organizational level particularly on management support and environmental infrastructure and finally external factors such as spillover of environmental actions from home. The combination of these levels provides a powerful route toward changing behaviour, particularly by encouraging the targeting of behavioural antecedents at multiple levels. This goes beyond more micro-level conceptualizations of environmental behaviour change (Osbaldiston and Schott, 2012).

Environmental Awareness

In the domestic and consumer context strong environmental attitudes are generally needed before environmental behaviours occur (Young *et al.*, 2010). A key finding from this review is that attitude change is not necessarily a pre-requisite for behaviour change, which is contrary to recent findings by Bissing-Olson *et al.* (2013). It should be noted, however, that Bissing-Olson *et al.* (2013) did not measure actual environmental performance resulting from behaviour. The strength of environmental attitude may be important in determining behavioural intention or self-reported behaviour. Our results, however, suggest that attitude change is not a prerequisite for behaviour change. We have found that environmental behaviour change may be achieved when employees are aware of environmental issues/policies and are provided with the practical or procedural knowledge regarding sustainable actions, even in the absence of techniques directed at attitude change. In other words, once employees know why and how to switch off machines at the end of shifts they may do so even without having pro-environmental attitudes, because of the work structure, systems, culture and rewards for doing so.

Implications for Environmental Business Strategy

The findings from our review suggest that employees within an organization should have a clear and meaningful influence on the development of business strategy, which includes environmental issues. This will provide the organization's leadership with information on the barriers and motivators of the workforce in product/service provision. As a result, the culture and awareness of the majority of employees should be more amenable to implementing the strategy. The environmental strategy typology developed by Albino *et al.* (2009) is a useful way of expanding on the implications of the e-PEB framework on environmental business strategy; see Table 3.

Recommendations for Business Managers

Sustainability or CSR programmes need to be integrated into core business functions such as human resource management (HRM) and organizational management structures. This is critical if any proactive sustainability strategy is

Environmental business strategies (Albino <i>et al.</i> , 2009, p.88)	Implications from e-PEB framework
<i>Material eco-efficiency</i> is considered as a strategic approach focused on the reduction of resources used to produce unitary output.	Financial incentives on material eco-efficiency should be focused on individuals and groups producing the product/service. Management support and awareness training of the strategy as well as feedback to groups and individuals of material eco-efficiency is required.
<i>Energy efficiency</i> is a strategic approach aiming at increasing energy savings, and the use of renewable energy sources.	This should involve all staff focusing on environmental awareness, training and management support as well as individual and group feedback. Energy saving infrastructure should be installed.
<i>Green management</i> is considered as a strategic approach aiming at the development of a systematic and comprehensive mechanism to improve environmental and business performance inside a company.	The general approach should be focused on management support and training, environmental awareness and feedback on performance.
A <i>green supply chain</i> is a strategic approach addressed to extend environmental measures to the whole supply chain.	Product/service design and procurement should be the focus using management support and training, environmental awareness, feedback and financial incentives. Employees in suppliers can also be targeted using environmental awareness and feedback.

Table 3. Environmental business strategy implications of e-PEB framework

Changing Behaviour

to be successful for the majority of the workforce rather than just those with positive pro-environmental attitudes. Hence we take the strongest factors in the e-PEB framework, as follows.

1. Environmental awareness should be the focus of training and information rather than attitudinal changes. Furthermore, a focus at the group level as well as the individual level may be more effective. Although this may be more resource intensive, it has been shown to be effective in areas such as quality and safety.
2. Traditional financial reward structures in the organization should incorporate and be focused towards environmental issues, which will again incentivize the majority of employees rather than the motivated minority.
3. Environmental responsibilities should be incorporated into organizational management structures so that employees see that these are important to the organization and to their own line managers.
4. The biggest task the sustainability team should take responsibility for is the feedback of environmental performance data to the group level and the individual level. These data should not be just general organizational-level performance but rather be focused on each group and if possible also on individuals. The individual focus could be on managers, team leaders and staff in key roles, such as buildings operational staff, operators of key equipment and HRM staff.

Further Research

In general, the research evidence we have identified provides valuable insights into workplace environmental behaviour change; however, there is also a need for further high quality field studies measuring EPIs to specifically address this area. We highlight the following three specific areas that would benefit from immediate research.

1. Individual factors such as levels of education (Ghosal, 2013).
2. Group factors that influence behaviour at the department, site, task, floor or building level, particularly for large organizations with multiple sites and operations.
3. The impact of organizational culture on e-PEB change initiatives, particularly investigations that examine employee motivation and job satisfaction, including human resource management practices (Celma *et al.*, 2012; Zhu *et al.*, 2012). Influences of a gender and ethnically diverse workforce (Ciocirlan and Pettersson, 2012).
4. Examining the extent to which the external factors encourage or limit sustainable behaviours at the workplace are different from those in a home or community settings, e.g. geographical, economic and cultural influences. A significantly higher number of studies are available that examine such initiatives in a home or community setting. There may therefore be important lessons from those settings that are applicable to workplace settings.

To conclude, our review has highlighted the potential for behavioural interventions within the workplace to deliver demonstrable environmental benefits, as measured in the form of EPIs. Our e-PEB framework integrates the research findings, illustrating the influence of pre-existing organizational structures and processes inherent within the workplace and their relationship in supporting employee environmental behaviour. These organizational-level factors provide additional complexity to the situation, but also an extra set of levers and approaches with which to target employee environmental behaviour change. It is these contextual factors that we believe open up an exciting and challenging field of enquiry for environmental researchers and practitioners alike. However, our ability to develop new theoretical insights, or to develop more sophisticated practical guidance for business, is constrained by the continuing neglect of the work context in favour of domestic settings. The time is right for a concerted drive by our community to match the current interest shown by organizations to improve their environmental performance with a fresh wave of research targeting this domain.

Acknowledgements

We are grateful to the World Universities Network for funding the 'Greening Organisations and Work (GROW)' network, of which this paper is an output. We are also grateful to the School of Earth and Environment and Socio-Technical Centre at the University of Leeds for funding the initial evidence review, which was the basis for this paper.

References

- Ajzen I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50(2): 179–211.
- Albino V, Balice A, Dangelico RM. 2009. Environmental strategies and green product development: an overview on sustainability-driven companies. *Business Strategy and the Environment* 18(2): 83–96. DOI: 10.1002/bse.638
- Bamberg S, Möser G. 2007. Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behavior. *Journal of Environmental Psychology* 27(1): 14–25.
- Berkhout PHG, Muskens JC, Velthuisen JW. 2000. Defining the rebound effect. *Energy Policy* 28(6/7): 425–432. DOI: 10.1016/S0301-4215(00)00022-7
- Bissing-Olson MJ, Iyer A, Fielding KS, Zacher H. 2013. Relationships between daily affect and pro-environmental behavior at work: the moderating role of pro-environmental attitude. *Journal of Organizational Behavior* 34(2): 156–175. DOI: 10.1002/job.1788
- Boiral O. 2005. The impact of operator involvement in pollution reduction: case studies in Canadian chemical companies. *Business Strategy and the Environment* 14(6): 339–360. DOI: 10.1002/bse.431
- Cairns S, Newson C, Davis A. 2010. Understanding successful workplace travel initiatives in the UK. *Transportation Research Part A: Policy and Practice* 44(7): 473–494. DOI: 10.1016/j.tra.2010.03.010
- Carrico AR, Riemer M. 2011. Motivating energy conservation in the workplace: an evaluation of the use of group-level feedback and peer education. *Journal of Environmental Psychology* 31(1): 1–13. DOI: 10.1016/j.jenvp.2010.11.004
- Celma D, Martínez-García E, Coenders G. 2012. Corporate social responsibility in human resource management: an analysis of common practices and their determinants in Spain. *Corporate Social Responsibility and Environmental Management*. DOI: 10.1002/csr.1301
- Chao Y-L, Lam S-P. 2011. Measuring responsible environmental behavior: self-reported and other-reported measures and their differences in testing a behavioral model. *Environment and Behavior* 43(1): 53–71. DOI: 10.1177/0013916509350849
- Ciocirlan C, Pettersson C. 2012. Does workforce diversity matter in the fight against climate change? An analysis of Fortune 500 companies. *Corporate Social Responsibility and Environmental Management* 19(1): 47–62. DOI: 10.1002/csr.279
- Davis MC, Leach DJ, Clegg CW. 2011. The physical environment of the office: contemporary and emerging issues. *International Review of Industrial and Organizational Psychology* 2011: 193–237. DOI: 10.1002/9781119992592.ch6
- Dwyer WO, Leeming FC, Cobern MK, Porter BE, Jackson JM. 1993. Critical review of behavioral interventions to preserve the environment: research since 1980. *Environment and Behavior* 25(5): 275–321. DOI: 10.1177/0013916593255001
- Ghosal V. 2013. Business strategy and firm reorganization: role of changing environmental standards, sustainable business initiatives and global market conditions. *Business Strategy and the Environment*. DOI: 10.1002/bse.1815
- Hertin J, Berkhout F, Wagner M, Tyteca D. 2008. Are EMS environmentally effective? The link between environmental management systems and environmental performance in European companies. *Journal of Environmental Planning and Management* 51(2): 259–283. DOI: 10.1080/09640560701865040
- Hoffman AJ. 1993. The importance of fit between individual values and organisational culture in the greening of industry. *Business Strategy and the Environment* 2(4): 10–18. DOI: 10.1002/bse.3280020402
- Holland RW, Aarts H, Langendam D. 2006. Breaking and creating habits on the working floor: a field-experiment on the power of implementation intentions. *Journal of Experimental Social Psychology* 42(6): 776–783. DOI: 10.1016/j.jesp.2005.11.006
- Jones J, Jackson J, Tudor T, Bates M. 2012. Strategies to enhance waste minimization and energy conservation within organizations: a case study from the UK construction sector. *Waste Management and Research* 30(9): 981–990. DOI: 10.1177/0734242X12455087
- King A, Lenox M, Terlaak A. 2005. The strategic use of decentralized institutions: exploring certification with the ISO 14001 management standard. *Academy of Management Journal* 48(6): 1091–1106.
- Lingard H, Gilbert G, Graham P. 2001. Improving solid waste reduction and recycling performance using goal setting and feedback. *Construction Management and Economics* 19(8): 809–817. DOI: 10.1080/01446190110070952
- Lo SH, Peters G-JY, Kok G. 2012. A review of determinants of and interventions for proenvironmental behaviors in organizations. *Journal of Applied Social Psychology* 42(12): 2933–2967. DOI: 10.1111/j.1559-1816.2012.00969.x
- Michailides TP, Lipsett MG. 2013. Surveying employee attitudes on corporate social responsibility at the frontline level of an energy transportation company. *Corporate Social Responsibility and Environmental Management* 20(5): 296–320. DOI: 10.1002/csr.1291
- Onkila T. 2013. Pride or embarrassment? Employees' emotions and corporate social responsibility. *Corporate Social Responsibility and Environmental Management*. DOI: 10.1002/csr.1340
- Osbaldiston R, Schott JP. 2012. Environmental sustainability and behavioral science. *Environment and Behavior* 44(2): 257–299. DOI: 10.1177/0013916511402673
- Rockström J, Steffen W, Noone K, Persson Å, Chapin FS, Lambin EF, Lenton TM, Scheffer M, Folke C, Schellnhuber HJ. 2009. A safe operating space for humanity. *Nature* 461(7263): 472–475. DOI: 10.1038/461472a
- Saunders HD. 2000. A view from the macro side: rebound, backfire, and Khazzoom–Brookes. *Energy Policy* 28(6): 439–449.
- Schelly C, Cross JE, Franzen WS, Hall P, Reeve S. 2011. Reducing energy consumption and creating a conservation culture in organizations: a case study of one public school district. *Environment and Behavior* 43(3): 316–343. DOI: 10.1177/0013916510371754
- Schwartz T, Betz M, Ramirez L, Stevens G. 2010. Sustainable energy practices at work: understanding the role of workers in energy conservation. In *Proceedings of the NordiCHI 2010*, Reykjavik. <http://dl.acm.org/citation.cfm?id=1868966>
- Shifan Y, Albert G, Keinan T. 2012. The impact of company-car taxation policy on travel behavior. *Transport Policy* 19(1): 139–146. DOI: 10.1016/j.tranpol.2011.09.001
- Siero FW, Bakker AB, Dekker GB, vandenBurg MTC. 1996. Changing organizational sustainability energy consumption behaviour through comparative feedback. *Journal of Environmental Psychology* 16(3): 235–246. DOI: 10.1006/jenvp.1996.0019

Changing Behaviour

- Staats H, van Leeuwen E, Wit A. 2000. A longitudinal study of informational interventions to save energy in an office building. *Journal of Applied Behavior Analysis* 33(1): 101. DOI: 10.1901/jaba.2000.33-101
- Steg L, Vlek C. 2009. Encouraging pro-environmental behaviour: an integrative review and research agenda. *Journal of Environmental Psychology* 29: 309–317.
- Stern P. 2000. Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues* 56(3): 407–424. DOI: 10.1111/0022-4537.00175
- Tam VW, Tam CM. 2008. Waste reduction through incentives: a case study. *Building Research and Information* 36(1): 37–43. DOI: 10.1080/09613210701417003
- Tudor TL, Barr SW, Gilg AW. 2007. Strategies for improving recycling behaviour within the Cornwall National Health Service (NHS) in the UK. *Waste Management and Research* 25(6): 510–516. DOI: 10.1177/0734242x07082030
- Tudor TL, Barr SW, Gilg AW. 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. DOI: 10.1177/0013916507300664
- Ucci M. 2010. Sustainable buildings, pro-environmental behaviour and building occupants: a challenge or an opportunity? *Journal of Retail Leisure Property* 9(3): 4. DOI: 10.1057/rlp.2010.11
- Vanhouten R, Nau PA, Merrigan M. 1981. Reducing elevator energy use – a comparison of posted feedback and reduced elevator convenience. *Journal of Applied Behavior Analysis* 14(4): 377–387. DOI: 10.1901/jaba.1981.14-377
- Wu DWL, DiGiacomo A, Kingstone A. 2013. A sustainable building promotes pro-environmental behavior: an observational study on food disposal. *PloS one* 8(1): e53856.
- Young W, Hwang K, McDonald S, Oates CJ. 2010. Sustainable consumption: green consumer behaviour when purchasing products. *Sustainable Development* 18(1): 20–31. DOI: 10.1002/sd.394
- Young W, Middlemiss L. 2012. A rethink of how policy and social science approach changing individuals' actions on greenhouse gas emissions. *Energy Policy* 41: 742–747. DOI: 10.1016/j.enpol.2011.11.040
- Young W, Tilley F. 2006. Can businesses move beyond efficiency? The shift toward effectiveness and equity in the corporate sustainability debate. *Business Strategy and the Environment* 15(6): 402–415. DOI: 10.1002/bse.510
- Zhen C, Heng L, Wong CTC. 2002. An application of bar-code system for reducing construction wastes. *Automation in Construction* 11(5): 521–533. DOI: 10.1016/S0926-5805(01)00063-2
- Zhu Q, Hang Y, Liu J, Lai K-H. 2012. How is employee perception of organizational efforts in corporate social responsibility related to their satisfaction and loyalty towards developing harmonious society in Chinese enterprises? *Corporate Social Responsibility and Environmental Management*. DOI: 10.1002/csr.1302