

Factors influencing corporate pro-environmental behaviour – a case study from the UK construction sector

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Abstract

The need for a more sustainable approach to the management of resources is a key focus for all stakeholders, including organisations. Using a range of qualitative and quantitative approaches within a UK case study construction company, this paper examines the key underlying factors impacting on corporate pro-environmental behaviour. The findings indicate that even though staff generally exhibited strong environmental attitudes and beliefs, these did not always translate into sustainable practices. Based on the findings, strategies on enhancing sustainable environmental management practices within organisations, particularly within the construction sector are also presented.

Key words:

Pro-environmental behaviour, Waste minimisation, Resource conservation, Recycling, Sustainability, UK construction

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1.Introduction

Globally, companies have for some time been increasingly seeking to improve their efficiency and increase their competitiveness, while at the same time reducing their environmental impacts (Trung and Kumar, 2005; Link and Naveh, 2006; Welford, 2009; Lopez-Gamero *et al.*, 2009; Lu *et al.*, 2011). In Europe, both public and private sector organisations are increasingly being driven to undertake more sustainable practices (Duarte *et al.*, 2007). This drive has been due to a number of factors including increasingly stringent legislative measures (e.g. The European Union's Waste Framework Directive and European Environmental Action Programme), increasing public pressure for resource consumption, and a realisation of the economic and environmental benefits to be accrued (Stern, 2006; Tudor, 2011; Large and Thomsen, 2011; Agudelo *et al.*, 2011; Mohammad, 2013).

Companies within the construction and demolition sector are a key target for enhanced sustainability, due to the quantity and types of wastes generated (Poon, 2007; Tam and Tam, 2008). Generally, construction and demolition waste consists of building debris, timber, concrete, steel, rubble and earth (Lu and Yuan, 2010). In the United Kingdom (UK), the construction sector at the time of the study, accounted for approximately 32% of the total waste generated (Defra, 2010). Teo *et al.* (2000) note that the intensive nature of the tasks construction and demolition industry impacts significantly on waste generation rates. While Begum *et al.* (2009) argue that a range of factors including the contractor's experience, opportunities for reduction of waste at source and levels of education impact upon levels of waste.

Using a case study company from within the UK construction sector, this paper sets out to examine the underlying factors that govern resource consumption amongst employees.

1.1 The case study company

The case study company was established in 1969 and has grown to become one of the largest manufacturers of off-site modular buildings in the UK. It is situated on a 16 acre site in Northamptonshire, in the UK, with two large manufacturing lines, as well as a large enclosed exhibition centre (Fig. 1). At the time of the study (2007-08), the company's core business was the manufacture of modular buildings, such as bungalows and log cabins. It thus serves as a good case study due to increasing use of modular style of constructing homes, worldwide (Jaillon and Poon, 2008; Lu and Yuan, 2010). The organisation employed around 300 individuals, and had an annual turnover of £30 million.

FIGURE 1 HERE

2. Factors influencing pro-environmental behaviour in organisations

A number of factors have been shown to impact upon corporate environmental management practices, related both to the individual, as well as to the organisation. While these will be discussed individually a number of studies have for some time demonstrated the inter and intra-related nature of the antecedents (Heider, 1958; Stern *et al.*, 1995; Williams *et al.*, 1989; Tudor *et al.*, 2008).

2.1 Attitudes, beliefs and awareness

A number of authors have demonstrated that attitudes, beliefs and awareness play significant roles in facilitating pro-environmental behaviour (Ajzen, 1991; Hawthorne and Alabaster, 1999; Robbins, 2000; Fujii *et al.*, 2006). For example, Fujii *et al.* (2006) found that

to influence waste minimisation, environmental concern was the biggest driver, whilst for gas and electricity reduction it was the desire to be frugal that most greatly influenced an individual's behaviour. Tudor *et al.* (2008), and Steg and Vlek (2009) argue that underlying beliefs and values are important drivers, with individuals who possess more altruistic values being more likely to engage in pro-environmental behaviour than those without. Specifically within the construction sector, Lingard *et al.* (2001) argued that the extent to which reduction and recycling performance could be improved depended heavily on motivating staff. Teo and Loosemore (2001) asserted that attitudes are key influencing factors within the construction industry. Whilst Saunders and Wynn (2004), and Begum *et al.* (2009) note that both knowledge and education played key roles in whether construction workers practiced pro-environmental behaviour.

2.2 Socio-demographics

Steel (1996) identified a significant difference between the waste minimisation behaviour of men and women. Women were far more likely to participate than men, and this difference increased with age. However, other writers contradict this and assert that neither age nor gender could be used to predict recycling behaviour (Schultz *et al.*, 1995; Clarke and Maantay, 2005).

2.3 Organisation type and focus

The overall vision and focus of an organisation as well as its characteristics (e.g. its size) have been shown to impact on its ability to effectively implement sustainable practices. For example, Alberti *et al.* (2000) and Brio and Junquera (2003) contend that larger companies have a standardised and well-structured organisational structure and thus find it easier to respond to external challenges. In addition, Williams *et al.* (1989) and Tudor *et*

al. (2008) concluded that the organisational structure affects not only productivity and economic efficiency, but also morale and job satisfaction.

2.4 Senior management support

Judge and Elenkov (2004) noted that as the views of senior managers and front line workers increasingly diverged, the organisational capacity for change and its environmental performance both faltered. Similarly, Tsui *et al.* (2005) state that creating a common purpose/culture within an organisation is dependent on the management. Indeed, the authors argued that company culture was strongest when middle and senior managers shared the same vision as the Chief Executive Officer. Specifically related to promoting sustainable practices, the support of senior management has been shown to be a critical success factor (Young and Jordan, 2008). In addition to facilitating improved sustainability, companies with highly involved senior managers have been found to have increased sharing of information amongst their workforce, as well as increased financial stability (Papke-Shields and Malhotra, 2001).

2.5 The intention-behaviour gap

Research has shown that there can be a gap between the positive intentions of an individual and their actual environmental behaviour (Kollmus and Agyeman, 2002; Hooft *et al.*, 2005; Holland *et al.*, 2006). For example, Hooft *et al.* (2005) asserted that 'goal intentions' were not enough for the intended behaviour to be carried out, as they were often too vague. Instead, 'implementation intentions' should be set, as they state not only how the behaviour will be carried out, but also when and where.

2.6 Modifying behaviour

A range of techniques have been shown to be effective in modifying corporate environmental behaviour, including training (McDonald, 2004; Perron *et al.*, 2006), use of environmental officers (Remmen and Lorentzen, 2000; Johansson and Magnusson, 2006) and building knowledge and awareness (Sampei and Aoyagi-Usui, 2008).

3.Methods

3.1 Research tools

Based on Knafl *et al.* (1988), the study employed both quantitative and qualitative research tools, as a means of triangulating both the approaches, as well as ensuring the validity and reliability of the findings. Three main tools were utilised, namely:

- Quantitative
 - Questionnaire surveys
 - Waste and energy audits
- Qualitative
 - Narrative interviews

3.1.1 Questionnaires

The questionnaire survey sought to examine the attitudes and beliefs of staff towards waste minimisation and wider conservation of resources both at work as well as within the home. It also sought to evaluate the impact of selected interventionist techniques on these beliefs and attitudes. The questionnaires were piloted amongst a small number of employees to ensure any anomalies or ambiguous questions were rectified before full distribution. All staff with access to email received a copy electronically, and those without email access received a hard copy distributed by the area supervisors and Environmental Manager/Researcher.

The survey was undertaken over two main time periods. The baseline was administered in February 2007. This was then followed by the use of three main interventions, namely: (1) staff training, (2) use of including and (3) visual aids (Jones *et al.*, 2012). A follow up survey was then employed in October 2008, to examine the impact of these interventions. Some 300 questionnaires were distributed in each phase, electronically (100 in each phase) and by hand (200 in each phase). These numbers were based on the number of staff that had access to email, and those working on the manufacturing line that did not, to ensure all employees had the opportunity to complete a copy. Thus a total of 600 questionnaires were distributed over the two phases. Overall, the return rate for the baseline survey was 27% (81 questionnaires) and 20% (60 questionnaires) for the follow up.

The data were analysed using the statistical programme SPSS (ver 11.5). Descriptive analyses were first undertaken to understand the composition of the workforce. Bivariate analyses were then conducted to examine staff behaviours and the underlying factors governing these behaviours.

3.1.2 Narrative interviews

Based in part on Elliott (2006) narrative interviews were employed to examine the experiences of the environmental officers. The interviews focused on the environmental officers' stories, as it was aimed that the interviewer would provide minimal prompting. However, a sheet with discussion headings was provided a week before the interviews and this was used to act as a prompt.

Seven environmental officers were interviewed. They were invited to the interview one month in advance, and a mutually convenient

time arranged. One week before hand, each officer was asked to complete a consent form which detailed their rights and explained how the interview would be conducted. Audio recordings were taken to ensure full records of the interviews were achieved and these were then transcribed. Analysis involved coding of the transcript to identify the key themes.

3.1.3 Waste and energy audits

As a means of providing validity and reliability to the reported environmental practices, environmental audits were also undertaken. The audits were undertaken between January 2007 and July 2008. They involved analysis of company documents (e.g. bills and waste transfer notes) to determine the rates of gas usage, as well as quantities of waste arisings and recycling. Limited visual inspections of waste bins were also undertaken, on a monthly basis.

4. Results

4.1 Attitudes and beliefs towards the environment and resource efficiency

The results for both surveys combined showed that the employees were concerned about the environment and their own impact on it, with 96% viewing themselves as being environmentally friendly. Most staff (98%) were regular recyclers at home, either recycling on a weekly or fortnightly basis (Fig. 2). While around 83% stated that they conserved materials at work. However, despite stating that they recycled at home, levels of recycling at work were low and indeed, tests for correlation showed no link between recycling at home and at work. Some 64% of staff viewed environmental management at work as a major issue and felt that improved waste minimisation at work could be beneficial to them.

FIGURE 2 HERE

When employees were asked in the baseline survey to state whether they considered themselves to be environmentally friendly, 87% either agreed or strongly agreed with the statement. However, by the follow up survey, this had risen to 96% of staff. A much greater indication of attitudinal change was shown when employees were asked whether they believed resource conservation and recycling benefited the environment. In survey one only 47% believed this to be the case, however, this had risen significantly to 95% in survey two.

4.2 Items wasted at work

Figure 3 illustrates that the company generated on average around 40 – 60 tonnes of waste per month, between January 2007 and July 2008.

FIGURE 3 HERE

As these quantities of waste generated were 'visible', they were more apparent to staff. Indeed, when staff were asked what was wasted in the workplace it was apparent that they were much more cognisant of the wastage of physical items (e.g. construction materials and paper), than they were of items such as energy and time (Fig. 4). For example, employees on the production line were observed using the compressed air lines to blow dust off the floor of the homes, instead of using a broom, thus wasting energy. However, this practice was supported at all levels of management, as it was quicker and deemed as being more effective. Figure 4 also shows that only 10% of those individuals directly involved in or with lead responsibility for the construction of the homes reported 'energy' as a wasted resource.

FIGURE 4 HERE

However, an examination of Figure 5 indicates that though gas usage was low in the summer, over the course of the study it was on average, as high as around 30 – 50, 000kWh per month.

FIGURE 5 HERE

4.3 Items recycled at home

Figure 6 illustrates the most common items staff stated they recycled in the home as being paper and plastics. Other main recyclables mentioned were cardboard, glass and green waste.

FIGURE 6 HERE

4.4 The impact of job categories on behaviour

Another key finding was related to links between job categories and recycling activities. One job category that stood out as the most resistant to recycling was that of the technical staff, such as electricians and plumbers. The electricians were the most complained about group by the rest of the workforce. For example, the cleaning staff noted that:

"The electricians regularly leave their rubbish for us to clean up"

When the supervisor of the electricians was asked to encourage greater amounts of recycling amongst his staff, his response was:

"It is hard enough to get them to put the waste into a bin in the first place, let alone different bins, but I will try"

Over a 12 month period, daily inspections revealed fewer recyclable items such as cardboard, polythene, cable and metal in the general waste bin. The one exception to this was the bin found outside of the Pre-Despatch Inspection Unit (where the finishing touches the homes such as light fittings and cupboard doors, were done). The inspections highlighted large quantities of cardboard, cable and polythene being disposed of with the general waste. The polythene was not easily traced back to a certain job category, however, the cable and the cardboard boxes were easily identified as having come from the electricians. The cardboard boxes contained descriptions of the contents on the outside (e.g. light fitting), as well as a code linking it to a specific home under construction. Individuals responsible for putting the cardboard in with the general waste were identified and asked to put the materials into the correct bin. After two weeks, the electricians realised that it was the codes that were giving them away, so they proceeded to tear them off from the boxes, and 'hide' their waste in the general waste bin. It took several more weeks of persistent badgering before they began to recycle regularly. Indeed, after reaching this point they began to take pride in what they were doing, pointing out how much they had recycled and even making suggestions as to how things could be improved.

4.5 The impact of senior managers on behaviour

Supervisors were there to guide the workforce, but informal conversations with individual employees unearthed a degree of distrust towards certain supervisors. In addition, many of the

employees related incidents of informing their supervisors of an issue and it not being rectified.

In addition, senior managers showed significant reluctance to separating out their own waste when in-office recycling was introduced. Instead, they 'delegated' the duty to another member of staff. The company motto 'Build it fast, build it right' and steep production targets meant there was little time for the manufacturing workforce to consider how to get the most out of the resources they used. In addition, a proposal to reduce the production target by one house, in order to increase resource efficiency, was rejected on the basis that the money saved would be less than the profits made from manufacturing and selling the house.

4.6 Drivers and barriers to pro-environmental behaviour

The most frequently stated driver for recycling was convenience. Indeed, around 74% of staff, across both surveys stated that they would be more likely to recycle if it was convenient. The strong link between recycling and convenience was verified through Chi square analyses, as the value of χ^2 (53.75) exceeded the critical value for 0.05 probability level (9.448) and the p-value was less than 0.05 ($\chi^2 = 53.75$, $df = 4$, $p < 0.005$). In addition, they reported that they would recycle more if they were instructed to (65%), and if they knew what went where (64%). The results of Spearman correlations indicated that instructions from supervisors (0.735, $p < 0.01$), and increased knowledge (0.747, $p < 0.01$) were also potential drivers for improved recycling behaviour.

A key barrier to conserving resources was the quantity and availability of recycling bins. Indeed, 78% of employees felt there should be more bins, with a comparatively lower, 48% of the view that the convenience of the bins should be improved upon.

The impact of the number of bins on practices was corroborated during inspections of the site. The number of recycling bins was doubled over the course of the study. Each bin was also more strategically sited so that more work areas were supplied with recycling points. However, as employees began to participate more in recycling activities, the recycling bins filled quicker than they could be emptied. This could account for the high proportion of staff who wanted more bins.

When the results of the two surveys were combined, nearly a third of the employees (30%) stated that if they were unsure of where to discard of their waste they would resort to putting it in with the general waste. While 13% viewed being unsure of where to put waste as a barrier to recycling. Despite these uncertainties, the majority of respondents (79%) stated they would consult with the Environmental Manager if they required assistance with the disposal of waste. Walkabouts of the site, for example, during the bin inspections supported this assertion, with individuals from the manufacturing line and the offices, in particular, asking the Environmental Manager questions, rather than their colleagues or supervisors.

Two further key barriers noted in the combined surveys were lack of time (10%) and lack of motivation (9%). Mention of lack of time suggests that the ethos of the company to build their homes as quickly as possible was inhibiting the participation of the workforce in resource efficiency. Lack of motivation was the barrier most frequently mentioned by line managers and supervisors when referring to their staff.

5. Discussion

5.1 Key overall findings

Even though staff generally reported that they were environmentally friendly and expressed concern about the environment, their actions told a different story. For example, usage of gas was high, staff on the production lines used the compressed air to blow dust from the floor, levels of recycling were initially low and there was significant resistance from directors to change. This dichotomy therefore suggests that similar to a number of previous studies, there was an intention-behaviour gap amongst staff (Hooft *et al.*, 2005; Holland *et al.*, 2006; Tudor *et al.*, 2007). Thus the employees either wanted to act in an environmentally friendly way, but there were barriers in place preventing this, or they were reporting what they thought the researchers wanted to hear. While there was certainly an improvement in the recycling amongst some staff, factors such as the high wastage of gas, and energy consumption would suggest that it may have been the latter reason.

5.2 Influencing factors

Scheme convenience and awareness were highlighted as two key influences on behaviour. Various studies have also suggested that convenience (e.g. Wilson and Williams, 2007; Muller, 2013) and awareness building (e.g. Evison and Read, 2001; Tudor *et al.*, 2008) play a role in sustainability practices. This was certainly borne out for example, with the increase in recycling as the project went on, due to the increased access to recycling bins. Evidently, it is important to give some consideration to scheme design, as well as ensuring that staff are effectively engaged, if sustainable approaches are to be facilitated.

Interestingly, incentives were not found to be as important a driver for the workforce as expected. This was most likely due to scepticism, as there had been cases where rewards had been promised, but not received.

A possible reason why there was a dichotomy between reported and actual practices, might be that employees are more likely to act in a sustainable manner if they believe the behaviour would benefit them, rather than the organisation (Tudor *et al.*, 2007). This may explain why, despite the employees noting that they were environmentally friendly, recyclables were still found in the general waste.

Similar to previous studies, employees reported that they would recycle more if they were told to do so by their supervisors (Judge and Elenkov, 2004; Tsui *et al.*, 2005; Young and Jordan, 2008). This raises an interesting point, as it suggests that the supervisors and managers may not have been doing enough to communicate to their teams that they should be engaging in pro-environmental behaviour. It also suggests that senior managers and directors were not doing enough to communicate and support those below them in implementing resource efficiency initiatives. Limited support from directors was a major barrier as it resulted in supervisors ignoring poor resource efficiency in their teams in order to meet the company's production targets. The incorporation of environmental initiatives in business significantly depends on the backing of senior managers. This is especially true in construction companies where senior management support has been found to impact on other improvement processes such as supply chain management (Lozano, 2006; Akintoye *et al.*, 2006). The resistance to change by the directors therefore played a significant role not only in their own

practices, but also in influencing what middle managers and ordinary employees did.

Job category influenced the quantity of materials wasted. For example, electricians were found to be amongst the most wasteful. What was also evident across all job categories (except supervisors/foremen), was that waste was largely viewed as physical items, such as building materials and paper. Thus, high consumption of electricity and heat was not viewed as a waste, as there was no physical evidence. This belief suggests that there was a gap in the knowledge of the workforce, as to what could constitute waste.

6.Conclusions

Increased sustainability within all segments of society, including within organisations is crucial. At the time of the study, the UK construction sector produced some 32% of all the waste generated. Therefore, improvements in this sector can have a significant impact on the sustainability of resource consumption. Within this overall content, pro-environmental behaviour both at work, as well as within the household plays a significant role in realising wider environmental, social and financial benefits. This is particularly true for the construction sector due to its size and the potential value that could be recovered from the waste produced.

References

Agudelo C.M., Mels, A.R., Keesman, K.J, Rijnaarts, H.H.M. (2011) 'Resource management as a key factor for sustainable urban planning' *Journal of Environmental Management* Vol. 92 No. 10, pp 2295-2303.

Ajzen, I. (1991) 'The theory of planned behaviour' *Organizational Behavior and Human Decision Processes*, Vol. 50, pp. 179 – 211.

Akintoye, A., McIntosh, G. and Fitzgerald, E. (2006) 'A survey of supply chain collaboration and management in the UK construction industry' *European Journal of Purchasing and Supply Management* Vol. 6 No. 3-4, pp. 159-168

Alberti, M., Caini, M., Calabrese, A. and Rossi, D. (2000) 'Evaluation of the costs and benefits of an environmental management system', *International Journal of Production Research* Vol. 38, No. 17, pp. 4455-4466.

Begum, R.A., Siwar, C., Pereira, J.J. and Jaafar, A.H. (2009) 'Attitudes and behavioural factors in waste management in the construction industry in Malaysia' *Resources, Conservation and Recycling*, Vol. 53, No. 6, pp. 321-328.

Brio, J.A. and Junquera, B. (2003) 'A review of the literature on environmental innovation management in SMEs: implications for public policies' *Technovation* No. 23, pp. 939-948.

Clarke, M. and Maantay, J. (2005) 'Optimizing recycling in all of New York City's neighbourhoods: Using GIS to develop the REAP index for improved recycling education, awareness, and participation' *Resources, Conservation and Recycling*, Vol. 46, No. 2, pp. 128-148.

Defra (Department for Environment, Food and Rural Affairs) (2005) 'The UK Government sustainable development strategy', HMSO. London. UK.

DECC (Department of Energy and Climate Change) (2010) 'CRC Energy Efficiency Scheme' HMSO. London. UK.

Evison, T. and Read, AD. (2001) Local authority recycling and waste-awareness publicity/promotion. *Resources, Conservation and Recycling* Vol. 32, No. 3-4, pp. 275 - 291

Fujii, S. (2006) 'Environmental concern, attitude toward frugality, and ease of behaviour as determinants of pro-environmental behaviour intentions' *Journal of Environmental Psychology*, Vol. 26 No. 4, pp. 262-268

Hammersley, M. and Atkinson, P. (2007) '*Ethnography: principles in practice*', Routledge, London, UK

Hawthorne, M. and Alabaster, T. (1999) 'Citizen 2000: development of a model of environmental citizenship' *Global Environmental Change*, Vol. 9, No. 1, pp. 25-43

Heider, F. (1958) *The psychology of interpersonal relations*. New York: John Wiley.

Holland, R., Aarts, H. and 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*, Vol. 42, No. 6, pp. 776-783

Hooft, E., Born, M., Taris, T., Flier, H. and Blonk, R. (2005) 'Bridging the gap between intentions and behaviour: Implementation intentions, action control, and procrastination' *Journal of Vocational Behaviour*, Vol. 66, No. 2, pp. 238-256

Jaillon, L. and Poon, C.S. (2008) 'Sustainable construction aspects of using prefabrication in dense urban environment: a Hong Kong case study. *Construction Management and Economics*' Vol. 26, No.9, pp. 953-66

Johansson, G. and Magnusson, T. (2006) 'Organising for environmental considerations in complex product development projects: implications from introducing a "Green" sub-project' *Journal of Cleaner Production* Vol. 14, No. 15-16, pp. 1368-1376

Jones, J., Jackson, JI., Tudor, TL. and Bates, MP. (2012) Strategies to enhance resource efficiency within organisations: a case study of the UK construction sector. *Waste Management and Research*, Vol. 30, No.9, pp. 981- 990

Judge, W. and Elenkov, D. (2004) 'Organisational capacity for change and environmental performance: an empirical assessment of Bulgarian firms' *Journal of Business Research* Vol. 58, No. 7, pp. 893-901

Knafl, K., Pettengill, M., Bevis, M. and Kirchhoff, K. (1988) 'Blended qualitative and quantitative approaches to instrument development and data collection' *Journal of Professional Nursing*, Vol. 4, No. 1, pp. 30-37

Kolmuss, A. and Agyeman, J. (2002) Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behaviour? *Environmental Educational Research*, Vol. 8, No. 3, pp. 239 – 259.

Large, R.O, Thomsen, C.G. (2011) 'Drivers of green supply management performance: evidence from Germany' *Journal of Purchasing & Supply* Vol. 17, pp. 176 – 184.

Lingard, H., Gilbert, G. and Graham, P. (2001) 'Improving solid waste reduction and recycling performance using goal setting and feedback' *Construction Management and Economics* Vol.19, pp.809-817.

Link, K. and Naveh E. (2006) 'Standardization and discretion: does the environmental standard ISO 14001 lead to performance benefits?' *IEEE Transactions in Engineering Management* Vol. 53, pp. 508 - 519

Lopez-Gamero, M.D., Molina-Azorin, J.F., and Claver-Cortez E. (2009) 'The whole relationship between environmental variables and firm performance. Competitive advantage and firm resources as mediator variables' *Journal of Environmental Management* Vol. 90, No. 10, pp. 3110 - 3121

Lozano, R. (2006) 'Incorporation and institutionalization of sustainable development into the Universities: breaking through barriers to change' *Journal of Cleaner Production* Vol.14, No. 9-11, pp. 787-796

Lu, W. and Yuan, H. (2010) 'Exploring critical factors for waste management in construction projects in China' *Resources, Conservation and Recycling* Vol.55, No. 2, pp. 201-8

McDonald, D. (2004) 'The influence of multimedia training on users' attitudes: lessons learned' *Computers and Education* Vol. 42, No. 2, pp. 195-214

Mohammad, M. (2013) 'Construction environment: adopting IBS construction approach towards achieving sustainable development' *Procedia - Social and Behavioral Sciences*, Vol 85, pp. 8-15

Muller, W. (2013) The effectiveness of recycling policy options: waste diversion or just diversions? *Waste Management*, Vol 33, No. 3, pp. 508 - 518

Papke-Shields, K. and Malhotra, M. (2001) 'Assessing the impact of the manufacturing executive's role on business performance through strategic alignment' *Journal of Operations Management*, Vol. 19, No. 1, pp. 5-22

Perron, G., Cote, R. and Duffy, J. (2006) 'Improving environmental awareness training in business' *Journal of Cleaner Production*, Vol. 14, No. 6-7, pp. 551-562

Poon, C.S. (2007) 'Reducing construction waste' *Waste Management*, Vol. 27, No. 12, pp. 1715-1716

Remmen, A. and Lorentzen, B. (2000) 'Employee participation and cleaner technology: learning processes in environmental teams' *Journal of Cleaner Production*, Vol. 8, No. 5, pp. 365-373

Robbins, S.P. (2000) '*Essentials of organizational behaviour*', Upper Saddle River, Prentice Hall, NJ, USA

Sampei, Y. and Aoyagi-Usui, M. (2008) 'Mass-media coverage, its influence on public awareness of climate-change issues, and implications for Japan's national campaign to reduce greenhouse

gas emissions' *Global Environmental Change*, Vol. 19, No. 2, pp. 203-212.

Saunders, J. and Wynn, P. (2004) Attitudes towards waste minimization amongst labour only sub-contractors *Structural Survey*, Vol. 22, pp. 148-157.

Schultz, P., Oskamp, S. and Mainieri, T. (1995) Who recycles and when? A review of personal and situational factors *Journal of Environmental Psychology*, Vol. 15, No. 2, pp. 105-121

Steel, B. (1996) 'Thinking globally and acting locally? Environmental attitudes, behaviour and activism' *Journal of Environmental Management* Vol. 47, No. 1, pp. 27-36

Steg, L. and Vlek, C. (2009) Encouraging pro-environmental behaviour: An integrative review and research agenda *Journal of Environmental Psychology*, Vol. 29, No. 3, pp. 309 - 317

Stern, N. (2006) 'The Stern review on the economics of climate change' HM Treasury. London. UK

Stern, PC., Dietz, T. and Guagnano, GA. (1995) The new ecological paradigm in socialpsychological context. *Environment and Behavior*, Vol. 27, pp. 723-743.

Tam, V.W.Y. and Tam, C.M. (2008) Waste reduction through incentives: a case study *Building Research and Information*, Vol. 36, No.1, pp. 37-43.

Teo, M.M.M., Loosemore, M., Masosszeky, M. and Karim, K. (2000) 'Operatives attitudes towards waste on a construction project' In:

Proceedings of the Annual Conference – ARCOM. Vol. 2, pp. 509-517.

Teo, MMM. and Loosemore, M. (2001) Theory of waste behaviour in the construction industry *Construction Waste and Economics*, Vol. 19, pp. 1647-1651.

Trung, D. and Kumar, S. (2005) Resource use and waste management in the Vietnam hotel industry *Journal of Cleaner Production*, Vol. 13, pp. 109 – 115

Tsui, A., Zhang, Z., Wang, H., Xin, K. and Wu, J. (2005) 'Unpacking the relationship between CEO leadership behaviour and organisational culture' *The Leadership Quarterly*, Vol. 17, No. 2, pp. 113-137

Tudor, T., Barr, S. and Gilg, A. (2007) 'A tale of two locational settings: Is there a link between pro-environmental behaviour at work and at home?' *Local Environment*, Vol. 12, No. 4, pp. 1-13

Tudor, T.L., Barr, S.W. and Gilg, A.W. (2008) 'A novel conceptual framework for examining environmental behaviour in large organisations: a case study of the Cornwall National Health Service (NHS) in the UK' *Environment and Behavior*, May Vol. 40, No. 3, pp. 426-450.

Tudor, T.L. (2011) 'The role of organisations in enhanced global environmental management: perspectives on climate change and waste management strategies' *The International Journal of Environment and Waste Management*, Vol. 7, No. ¾, pp. 250 – 266.

Welford, R. (2001) 'Corporate Environmental Management. Systems and Strategies' (3nd ed.) (ed.). Earthscan Publications Ltd., Oxford, UK

Williams, A., Dobson, P. and Walters, M. (1989) 'Changing culture: new organizational approaches' *Institute of Personnel Management* London, UK

Wilson, CDH., Williams, ID. (2007) Kerbside collection: a case study from the north-west of England. *Resources, Conservation and Recycling*, Vol. 52, No. 2, pp. 381 - 394

Young, R. and Jordan, E. (2008) 'Top management support: mantra or necessity' *International Journal of Project Management*, Vol. 26, No. 7, pp. 713-725

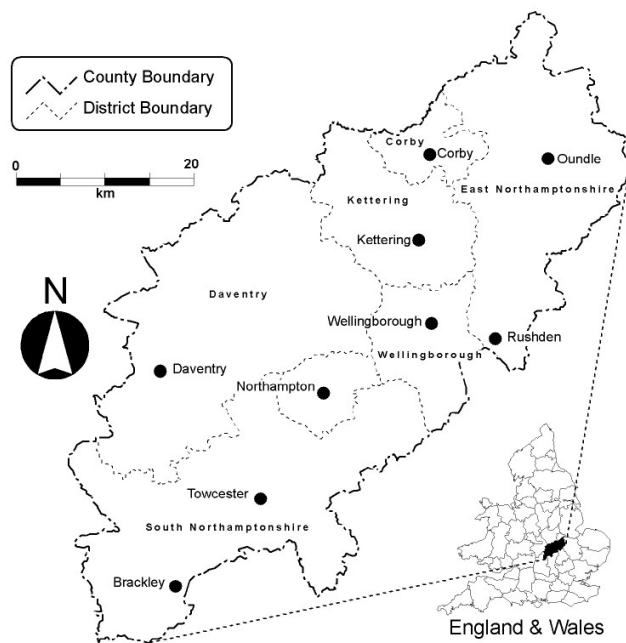


Figure 1: Map of Northamptonshire, UK

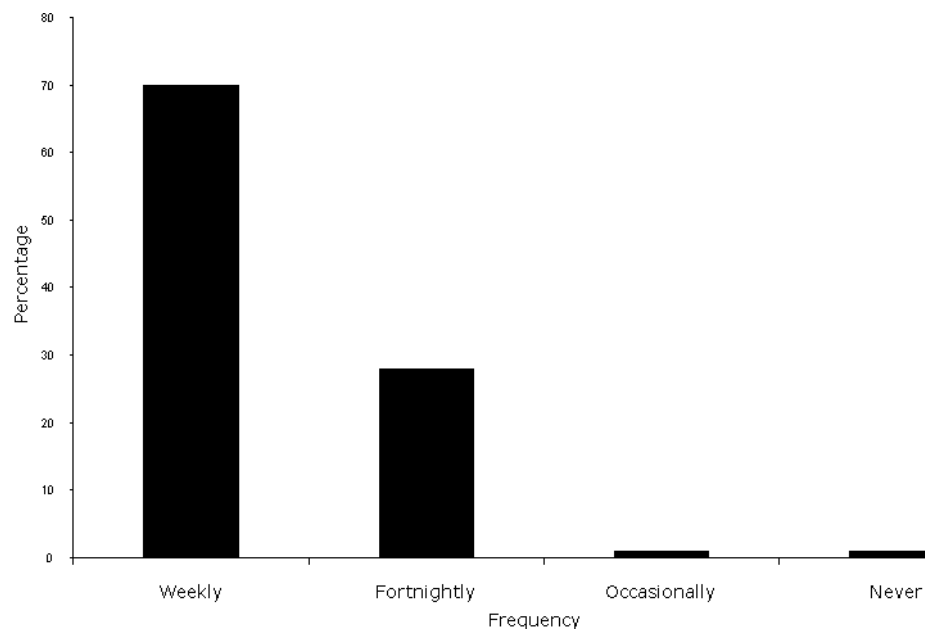


Figure 2: The frequency of staff recycling at home

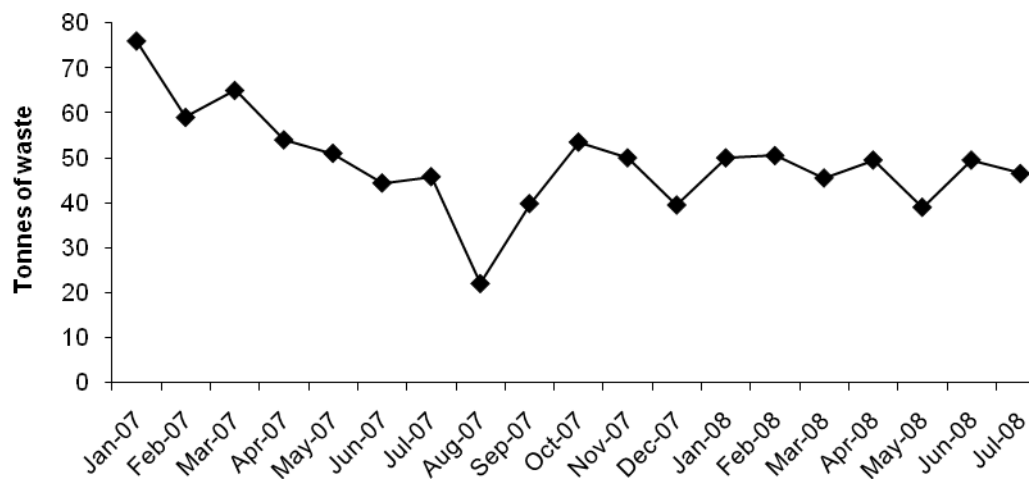


Figure 3: Monthly waste production between January 2007 and July 2008

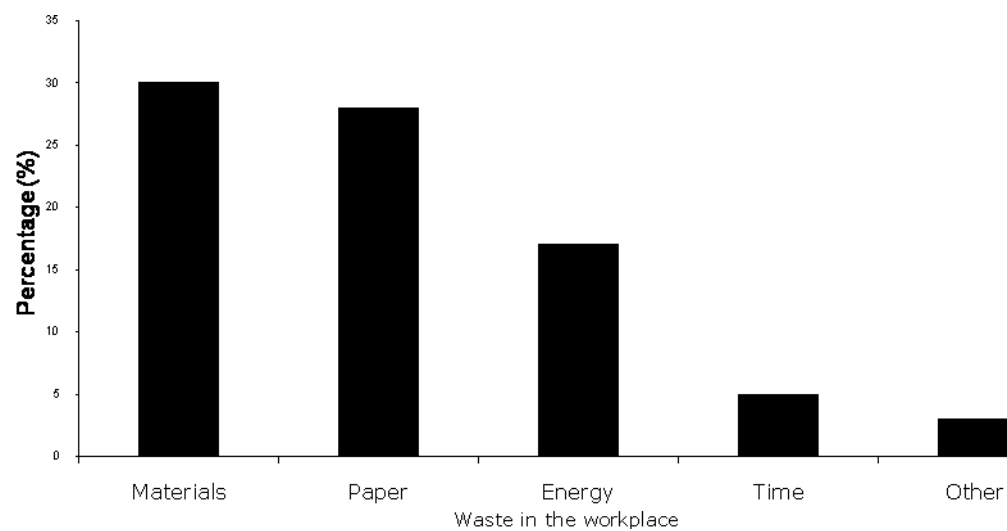


Figure 4: Employees perceptions of waste in the workplace

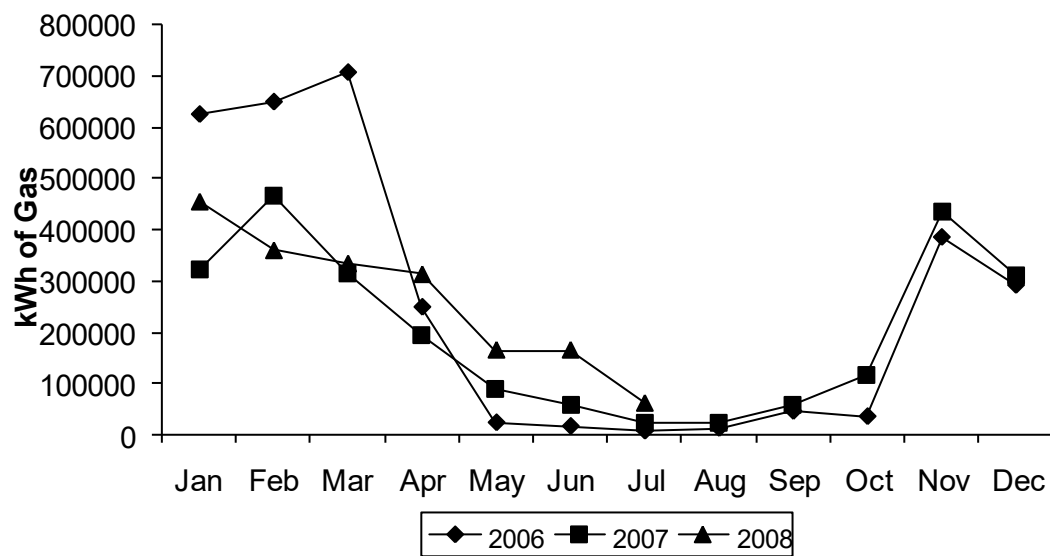


Figure 5: Gas consumption rates during January 2007 and July 2008

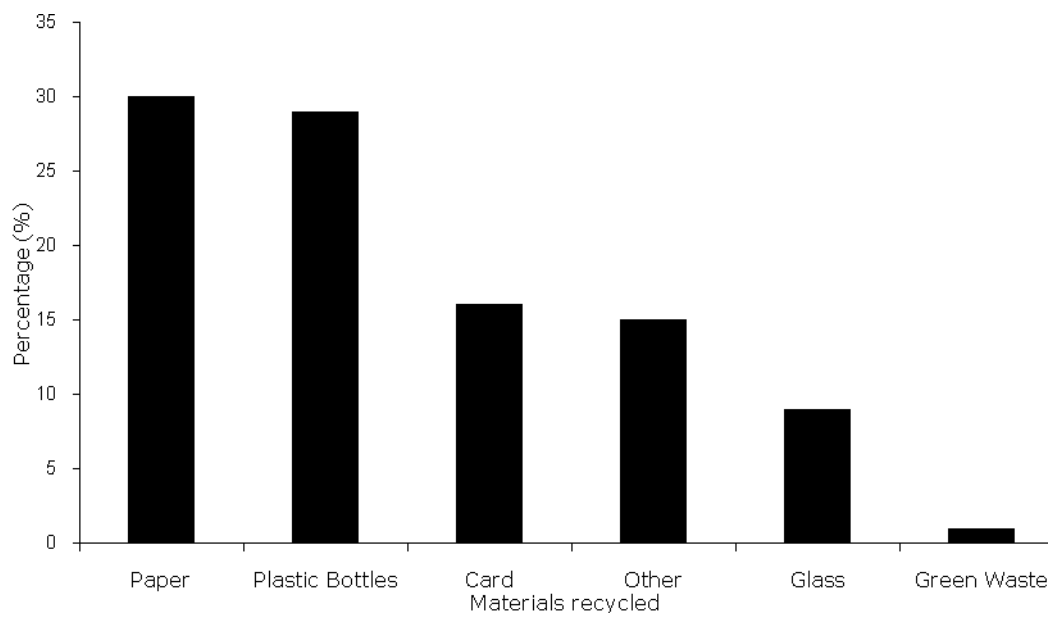


Figure 6: The main items recycled in the home by the employees