Determining the drivers for householder pro-environmental behaviour: waste minimisation compared to recycling

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Abstract

New mandatory household recycling targets present a serious challenge to UK Local Authorities. Public participation in Local Authority schemes is key to increasing household recycling levels, however, the most effective way to reduce waste is to deal with it at source, through waste minimisation. Understanding waste minimisation behaviour is key to achieving sustainable waste management and householder based projects which are theoretically underpinned by cognitive psychology and are promoted by carefully designed marketing/communications, over the long-term, should result in reductions in Municipal Solid Waste (MSW). Cognitive psychological modelling can provide the means to identify the driving forces behind recycling and waste minimisation behaviour, and in a given area determine the main likely success factors. Once these factors have been established, cost-effective campaigns can be designed to maximise the outcome. The Theory of Planned Behaviour provides a cognitive framework to understand and explain behaviour, and its use in this study has provided valuable insights into the factors which underpin recycling behaviour. The findings suggest that recycling attitudes are the major determinant of recycling behaviour, and that these attitudes are influenced firstly, by having the appropriate opportunities, facilities and knowledge to recycle, and secondly, by not being deterred by the issues of physically recycling (e.g. time, space and inconvenience). Previous recycling experience, and a concern for the community and the consequences of recycling, are also significant predictors of recycling behaviour. The findings also provide support for the proposition that recycling, waste minimisation through point of purchase and waste minimisation through repair or re-use represent different dimensions of waste management behaviour, and thus will require different strategies and messages. It is suggested that waste minimisation behaviour is likely to be influenced

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by a concern for the environment and the community, and is likely to be inhibited by perceptions of inconvenience and lack of time and knowledge.

1. Introduction

The management of Municipal Solid Waste (MSW) is an ongoing problem for Local Authorities within the UK. The Department of the Environment, Food and Rural Affairs (DEFRA) report that MSW arisings in the UK have been increasing, on the whole, by more than 3% per annum for the last decade, until 2001/2002 (the most recent data) when the increase was 2.4% (DEFRA, 2003). They also estimate that during the period 2001/2002, 28.8 million tonnes of MSW were produced, 21.3 million tonnes of which originated from UK households (DEFRA, 2003). Driven by legislation, the Government has set challenging, but realistic, targets to improve the management of MSW (DETR, 2000). These include:

- to recycle or compost at least 25% of household waste by 2005;
- to recycle or compost at least 30% of household waste by 2010.

In addition, the EU Landfill Directive (EU, 1999) sets targets to limit the amount of Biodegradable Municipal Waste (BMW) to be landfilled (Price, 2001). These targets include:

- by 2010 no more than 75% of total of BMW produced in 1995 to be landfilled;
- by 2013 no more than 50% of total of BMW produced in 1995 to be landfilled.

There is now a clear understanding that the present rates of householder participation and recognition lead to capture rates that are too small. The Environmental Services Association evidence to the Environmental Audit Committee (House of Commons, 2003) suggests that:

> For the UK, if 80% of waste in the household stream is recyclable in a system that is 90% efficient, with 60% of the population participating, 80% of the time then just over 33% of the waste will be returned to the productive economy—well short of the 40% target for recovery by 2005.

2. Waste minimisation

The requirement for central UK Government action to promote activity at the top end of the hierarchy, and hence waste minimisation was recognised in Less Waste More Value (DETR, 1998). It was stated:

> The simplest and most effective way of dealing with waste is to ensure that it does not arise in the first place. The Government wants waste minimisation and reuse to be an important focus of the strategy. Up until now waste minimisation has taken place within industry and commerce. The new waste strategy will address whether and how to expand

and develop such measures and will consider how waste minimisation for households can be encouraged.

Waste minimisation for industry and commerce has been a central feature of UK waste management since 1992 and there is an extensive literature outlining the substantial progress made. Waste minimisation clubs have been shown to have made a significant contribution to developing a culture of sustainable waste management in UK industry (Phillips et al., 1999) through correcting information and market failures (Pratt and Phillips, 2000a). Research has shown that it is possible to predict levels of success in such clubs (Pike et al., 2000) and that they are very cost effective (Pratt and Phillips, 2000b). By understanding the aspirations of member companies (Cheeseman et al., 2000) it is possible to design clubs (Phillips et al., 2000) that are increasingly cost effective (Clarkson et al., 2002; Phillips et al., 2001), can be used as a policy instrument (Heggensoon et al., 2002), support micro companies as well as large (Graham et al., 2002) and by designing effective Exit Strategies (Cheeseman and Phillips, 2001) stimulate extensive County wide partnerships (Phillips et al., 2003). Such has been the success of UK waste minimisation clubs that recruitment of companies has reached very significant levels (Stringer et al., 2003) and they have been used to drive holistic sustainable waste management projects where municipal waste minimisation has been an integral component of a project that has been driven by industrial waste minimisation (Phillips et al., 2002).

In contrast to the significant developments with industrial waste minimisation, municipal waste minimisation has been relatively neglected until quite recently. Waste Strategy 2000 (DETR, 2000) emphasised the need for new and dynamic partnerships to start the drive to reduce MSW at source. Part of the underlying problem has been the confusion of minimisation with recycling. Many of the UK MSW programmes have focussed upon Reduce, Re-use and Recycle messages. In essence, they have been programmes to drive recycling behaviour not minimisation. So pressing is the need to now focus on minimisation, as well as recycling, in an attempt to reduce MSW arisings that the Strategy Unit (Strategy Unit, 2002) lays stress on MSW minimisation in 10 of its 34 recommendations to the Government concerning future actions to stem waste arisings. These include, marked expansion of the Waste and Resources Action Programme to develop four new reduction projects as well as a national campaign to promote awareness in the general public.

3. Recent UK research

The focus of much of the recent UK research on MSW management has focused on household participation in recycling behaviour. Topics investigated include: the proportion of households participating in recycling schemes (Environment Agency, 2002; MORI, 2002; Tucker and Speirs, 2002); the characteristics and attitudes of recyclers (ENCAMS, 2002; Parfitt, 2002); barriers to recycling (McDonald and Oates, 2003; Read, 1999) and factors which influence recycling behaviour (Davies et al., 2002; Emery et al., 2003; Parfitt et al., 2001; Phillips et al., 2002). However, in spite of the wealth of research into recycling behaviour, comparatively less attention has been paid to waste minimisation, and there are few detailed published reports on MSW centred waste minimisation in the UK. What

has been demonstrated time and again is that such projects are rarely cost effective as significant funds have to be dedicated to obtain relatively small returns (Maycox, 2003). In a seminal paper Maycox (2003) demonstrates that understanding behaviour is the key to taking MSW minimisation forward, but that there are very significant barriers for the general public, such as lack of knowledge, motivation and influences, via social norms. The outcomes of a 3-year study with a small cohort in rural Scotland were illuminating; MSW arisings were reduced from 18 kg per household per week to 1.45 kg per household per 2 weeks. However, the costs of the support to householders was too excessive for this to be used on a large scale, and even when householders were recycling at a rate near 100%, waste minimisation activities were at a much lower level (40%). Maycox concludes that by designing a project based upon well-researched cognitive psychology and then providing prolonged awareness-raising support, significant reductions in MSW can occur.

Much of the problem associated with UK projects to encourage householders to minimise as well as recycle waste have occurred because there was very little theoretical underpinning of the project design. Barr et al. (2001) emphasise the complex link between environmental attitudes and environmental actions, and have produced a conceptual framework with three predictors as to behaviour, namely, environmental values, situational variables and psychological variables. Their research indicates that waste minimisation behaviour is fundamentally different from recycling behaviour, and is likely to be driven by different motivations. For example, they report that recycling behaviour is likely to be influenced by convenience, knowledge and access to a kerbside scheme, whereas waste minimisation behaviour is more likely to be driven by a concern about environmental issues (Barr et al., 2001). Barr et al. (2001) also suggest that waste minimisation behaviour should be considered separately from re-use behaviour. The complex relationship between waste minimisation and recycling behaviour has also been explored by Ebreo and Vining (2001). It is reported that minimisation behaviour is not strongly connected to recycling behaviour and that to stimulate minimisation a new and dynamic approach to designing projects based upon cognitive psychology is required. Thus, the aim of this study is to explore the relationship between recycling and waste minimisation behaviour, using a cognitive model from social psychology in order to understand the recycling and waste minimisation choices made by householders, and the factors which underpin these choices. It is hoped that such a framework can be used to provide guidance on designing projects to stimulate waste minimisation as well as recycling.

For the purpose of this study, waste minimisation is defined as the actions taken by householders to minimise their household waste, either at the point of purchase, or within the home by re-using or repairing products rather than replacing them.

4. The Theory of Planned Behaviour

There has been recent interest in exploring the use of models from social psychology to provide a theoretical framework for understanding householders' recycling behaviour (see, e.g. Davies et al., 2002). The literature indicates that environmental attitudes and situational and psychological variables are likely to be important predictors of recycling behaviour, however, further investigation of the influence of these factors requires a theoretical

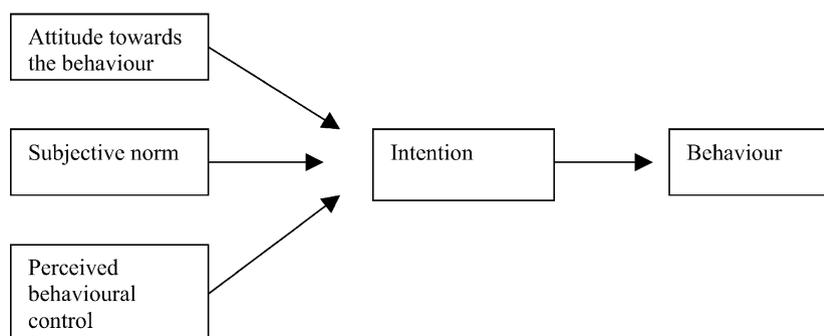The Theory of Planned Behaviour adapted from Ajzen (1991)

Fig. 1. The Theory of Planned Behaviour adapted from Ajzen (1991).

framework, such as that provided by the Theory of Planned Behaviour (TPB) (Ajzen, 1991) (Fig. 1).

The TPB (see Ajzen, 1991 for a full review of the theory and its application) provides a theoretical framework for systematically investigating the factors which influence behavioural choices, and has been widely used to investigate behaviours, such as leisure choice (Ajzen and Driver, 1992), driving violations (Parker et al., 1992), shoplifting (Tonglet, 2002) and dishonest actions (Beck and Ajzen, 1991). The theory, which was developed from the earlier Theory of Reasoned Action (Ajzen and Fishbein, 1980), assumes that people have a rational basis for their behaviour, in that they consider the implications of their actions. The TPB hypothesises that the immediate determinant of behaviour is the individual's intention to perform, or not to perform that behaviour. Intentions are, in turn, influenced by three factors:

1. Attitude, the individual's favourable or unfavourable evaluation of performing the behaviour.
2. The subjective norm, the individual's perception of social pressure to perform or not to perform the behaviour.
3. Perceived control, the individual's perception of their ability to perform the behaviour.

It is recognised that factors external to the model, for example, personality, past experience and demographic characteristics, may also influence behaviour, however, it is argued that this influence is indirect, mediated through the components of the model (Ajzen, 1991).

The TPB has been used in several studies which investigate recycling behaviour (see, e.g. Boldero, 1995; Chan, 1998; Cheung et al., 1999; Davies et al., 2002; Taylor and Todd, 1995; Terry et al., 1999). Although there is considerable support for its use, there are concerns that it does not adequately explain recycling behaviour, and that additional variables should be included within the model (Boldero, 1995; Cheung et al., 1999; Davies et al., 2002; Macey and Brown, 1983; Terry et al., 1999). The TPB allows for the incorporation of additional variables, provided that these variables make a significant contribution to the explanation of behaviour (Ajzen, 1991). Thus, this study has incorporated a number of additional variables,

including: the moral norm; past experience; situational factors; consequences of recycling and attitudes to waste minimisation.

5. Research design

The data used in this paper were collected as part of a larger study conducted in Brixworth, Northamptonshire, during the period March to July 2003. This study was conducted in three stages. *Stage 1* was an observational study to independently measure actual recycling behaviour. Some 258 Brixworth households were regularly monitored over a 16-week period between March and June 2003. Thus, recycling behaviour was not self-reported but determined by observation, making this a unique study of a mature, high participation kerbside scheme in the UK. In *Stage 2*, elicitation interviews were conducted during June 2003 with a sample of 20 randomly selected Brixworth residents participating in the kerbside recycling scheme. The elicitation schedule requested information on the resident's attitudes to recycling, the consequences of recycling, the costs and benefits of recycling and the factors which would encourage or discourage recycling behaviour. The information from the elicitation was used as the basis for the design of the questionnaire. In S*tage 3* of the study, some 258 (89% of 'old village') postal questionnaires, with return paid envelopes, were distributed in July 2003.

5.1. The test area: Brixworth

Brixworth is situated in Daventry District Council, Northamptonshire, in the East Midlands of England. Northamptonshire has a population of just over 600,000; 60% living in the urban environment. Northamptonshire generates around 330,000 t of MSW per year; this is increasing by some 3% per annum. The current recycling rate for Daventry District Council is 42.6% (the statutory target for 2005/2006 is 36%).

Daventry District Council has a population of 71,838 and is noted as the highest recycling rate WCA in England (DEFRA, 2003). In 1995, the Council launched the first wave of its programme to adopt a kerbside collection scheme based upon four receptacles (a brown wheelie bin for garden waste; a red box for paper, textiles and shoes; a blue box for glass, cans and plastic bottles; and a black wheelie bin for all other wastes). The black and brown bins are collected every other week and the boxes every week. By September 1999, some 29,000 households in the LA area were part of the kerbside scheme.

The population of Brixworth is 6033 (8.3% of the LA). Brixworth is a historic, small town that has undergone rapid expansion in the last two decades. It has a thriving industrial and commercial base. Although there is no present Deprivation Index for the town, all the indicators (Office for National Statistics, 2003) suggest that it is an area of relative affluence within the LA. The survey area within Brixworth is clustered around the 'old village' region in the north-west of the town. This is a distinct, historic, high housing cost area untypical of the rest of the town and consists of some 290 homes, the majority being detached or semi-detached dwellings built between the 17th and 20th Century. The survey area has a stable population with a very low turnover and an acknowledged excellent community spirit with a wide range of active voluntary groups. Public awareness of waste

management issues is high, the survey area is within 1.5 km of an operating landfill site and only 0.2 km from a County Council Household Waste Recycling Centre. The survey only included households that were participators in the kerbside collection scheme. Daventry District Council estimates that the participation ratio for Brixworth is around 90%. Link households and apartments were excluded, as they may not have sufficient space to store the four receptacles, as were those that were owned by 'occasional occupiers' or were empty. A preliminary survey of 20 households indicated that few (20%) were aware of all the categories of waste that could be distributed between the receptacles. This knowledge gap results in textiles, shoes, plastic bottles and cardboard being consigned to the general waste bin by some 40% of households.

5.2. Questionnaire design

The questionnaire was based on the recycling literature and previous applications of the TPB (see, e.g. Beck and Ajzen, 1991; Boldero, 1995; Davies et al., 2002; Tonglet, 2002) and information obtained from the elicitation interviews. 7-point rating scales were used throughout the questionnaire, with 1 indicating a positive view of recycling and waste minimisation issues, and 7 indicating a negative view. In addition to the components of the Theory of Planned Behaviour, the questionnaire contained questions on waste minimisation issues. The respondents were asked to indicate the extent of their agreement with a number of behaviours relating to the purchase or re-use/repair of household products.

The questionnaire contained the following sections:

- *Personal recycling behaviour*—future recycling intentions, frequency of recycling, past recycling behaviour.
- *Recycling attitudes*.
- *The subjective norm*—the individual's perception of social pressure to recycle household waste.
- *Perceived control*—the individual's perception of their ability to perform the behaviour.
- *Situational factors*—physical factors which may facilitate or inhibit recycling behaviour.
- *Consequences of recycling*—the outcomes of recycling behaviour.
- *Attitudes to waste minimisation*—the respondents were asked the extent to which they engaged in a number of waste minimisation behaviours.
- *Demographic information*—age, gender, marital status, education, occupation, household role, and number of children in household.

6. Results

The recycling behaviour of 258 Brixworth households was observed over the period March to June 2003. During the period of observation, all 258 households were recycling on a regular basis. The TPB questionnaire was distributed to these 258 households, and 191 completed questionnaires were returned, a response rate of 74%. The demographic composition of the sample is shown in Table 1. There was a bias in the sample towards females (65%), married/cohabiting couples (78%), and 40- to 64-year olds (47%). In addition, the

Table 1
The demographic composition of the sample

	n	%
Sex		
Male	67	35
Female	124	65
Total	191	100
Age		
18–24	4	2
25–39	65	34
40–64	90	47
65 and over	32	17
Total	191	100
Marital status		
Single	17	9
Married/cohabiting	148	78
Divorced/separated	10	5
Widowed	12	6
No response	4	2
Total	191	100
Education		
GCSEs	28	15
A levels	28	15
College graduate	64	33
Other	57	30
No response	14	7
Total	191	100
Occupation		
Management	60	31
Clerical	25	13
Skilled	44	23
Semi-skilled	4	2
Unskilled	1	1
Unemployed	7	4
Student	4	2
Retired	38	20
No response	8	4
Total	191	100
Household role		
Housewife/husband	61	32
Principle wage earner	46	24
Joint wage earner	77	40
No response	7	4
Total	191	100
Children in household		
None	110	58
Children under 12	40	21
Children 12–18	28	15
No response	13	6
Total	191	100

majority of the sample (63%) had received post-18 education, and 31% were in management positions. The 18–24 age group were under-represented, possibly because it was specified that the questionnaire should be completed by the person responsible for the disposal of household waste (this tends not to be the 18-year old if they are living at home), possibly because this group are less likely to own their own house, or possibly because this age group tend to be less environmentally aware than older age groups, and were not interested in completing the questionnaire.

All the respondents (apart from one) indicated that they had recycled their household waste in the past, 80% stated that they recycled on a weekly basis, and 88% agreed that it was extremely likely that they would recycle their household waste over the coming 4-week period. The overwhelming majority of respondents were, therefore, committed recyclers, suggesting that those interested in environmental issues completed the questionnaire. Although this is likely to bias the results, the purpose of this study is to test the utility of using the TPB to investigate recycling and waste minimisation in the UK, and to understand the main factors which impact on these behaviours.

6.1. The Theory of Planned Behaviour: recycling and waste minimisation

The TPB hypothesises that intentions are influenced by attitude, the subjective norm and perceived control. The theory allows for the inclusion of additional factors, and for the purpose of this study, a number of variables to assess these factors were included within the questionnaire. A factor analysis was performed to group these variables into constructs or factors which represent separate and independent underlying dimensions of recycling behaviour. The variables within each independent factor were then summed to form a measure of that factor, and reliability analysis used to test the reliability of each measure. The factor analysis grouped the variables contained within the questionnaire into 10 independent factors, these factors and their corresponding reliability coefficients are shown in Table 2. A reliability coefficient of greater than 0.7 indicates that the measure has achieved acceptable reliability.

The factor analysis grouped the variables as expected, with the exception of the variables relating to the moral norm, the consequences of recycling and attitudes to waste minimisation. The factor analysis indicated that two variables which had originally been included within the moral norm measure, *I am concerned with maintaining a good place to live* and *I have a strong interest in the health and well-being of the community in which I live*, represented a separate dimension of recycling behaviour, accordingly these two variables were grouped together and named Concern for the Community. Similarly, the factor analysis separated the variables originally identified as being related to the consequences of recycling into two separate factors. The first of these factors was named Outcomes and relates to the specific outcomes from recycling household waste. The second of these factors was named Consequences and relates to the more general consequences of recycling behaviour.

The factor analysis also classified the attitude to waste minimisation variables into two factors which represented separate underlying dimensions of waste minimisation behaviour. The first of these factors related to waste minimisation at point of purchase, and was named Buying to Reduce Waste. The second factor related to the repair or re-use of household products, and was named Repair/re-use to Reduce Waste.

Table 2
Factor analysis and factor reliability

Factor	Variables	Reliability coefficient
Attitude	Recycling good/bad	0.8986
	Recycling is useful/a waste of time	
	Recycling is rewarding/unrewarding	
	Recycling is sensible/not sensible	
	Recycling is responsible/not responsible	
	Recycling is hygienic/unhygienic	
Subjective norm	Most people think I should recycle	0.7769
	Most people would approve of me recycling	
Perceived control	I have plenty of opportunities to recycle	0.8849
	Recycling is inconvenient	
	Recycling is easy/hassle	
	The local council provides satisfactory resources for recycling	
	I know what items can be recycled	
	I know where to take my household waste for recycling	
	I know how to recycle my household waste	
Moral norm	I feel I should not waste anything if it could be used again	0.7366
	It would be wrong of me not to recycle my household waste	
	I would feel guilty if I did not recycle my household waste	
	Not recycling goes against my principles	
	Everybody should share the responsibility to recycle household waste	
Situational factors	Recycling takes up too much time	0.8671
	Recycling takes up too much room	
	Recycling is too complicated	
	Recycling programmes are a waste of money	
Outcomes	Recycling helps to protect the environment	0.7740
	Recycling reduces the amount of waste that goes into landfill	
	Recycling preserves natural resources	
	I cannot see the point in recycling	
Consequences	Recycling saves energy	0.7318
	Recycling saves money	
	Recycling creates a better environment for future generations	
Concern for the community	I am concerned with maintaining a good place to live	0.7341
	I have a strong interest in the health and well-being of the community in which I live	
Buying to reduce waste	I buy long-life light bulbs to save resources	0.8563
	I buy goods with the minimum of packaging	
	I buy goods labelled environmentally friendly	
	I buy rechargeable batteries to save resources	
	I use life-long shopping bags	
	I buy long-life goods to save resources	
	I buy goods with a returnable refund on containers	
Re-using/repairing to reduce waste	I re-use plastic containers to avoid buying new ones	0.7950
	I re-use glass containers to avoid buying new ones	
	I have objects repaired rather than buying new ones	
	I share some appliances with my neighbour rather than us all owning one	

Table 3
Multiple regression—intentions to recycle

	Theory of Planned Behaviour, adjusted R^2 0.261			Including the additional variables, adjusted R^2 0.333		
	Beta	t	Significant t	Beta	t	Significant t
Attitude	0.429	5.699	0.000	0.422	5.314	0.000
Subjective norm	0.036	0.516	0.606	0.045	0.660	0.510
Perceived control	1.929	1.929	0.055	0.143	1.829	0.069
Moral norm				−0.109	−1.547	0.124
Past behaviour				0.119	1.808	0.072
Situational factors				0.015	0.185	0.853
Outcomes				0.143	1.788	0.076
Consequences				−0.284	−3.865	0.000
Concern				0.165	2.310	0.022
Buy to reduce waste				−0.155	−1.927	0.056
Repair/re-use to reduce waste				0.070	0.855	0.394

Multiple regression calculates R^2, the proportion of the variance in the dependent variable accounted for by the independent variables. The statistical significance of this is tested by the F ratio, and the model in this study was significant at the 99% confidence level. The relative contribution of each of the independent variables to explaining the variance in the dependent variable is determined by the beta weight. The variables whose beta weight has a significant t of less than 0.05 are significant at the 95% confidence level. Any results that are statistically significant at the 95% confidence level are described as statistically significant within the text.

6.2. Multiple regression

To determine which of the 10 factors identified in the factor analysis exerted the greatest influence on recycling intentions multiple regression was used, with recycling intentions as the dependent variable. The components of the TPB (attitude, subjective norm and perceived control) were entered first. As shown in Table 3, these three components collectively explained 26.1% of the variance in recycling intentions, with attitude being the only statistically significant predictor. When the additional components to the model were entered into the multiple regression, the percentage of variance explained increased to 33.3%, with attitude, consequences of recycling and concern for the community being statistically significant.

Positive attitudes to recycling were the most significant predictors of recycling intentions for the Brixworth residents, and this was also the factor most strongly correlated with their recycling intentions, as shown in Table 4. Knowledge of the general consequences of recycling behaviour was also significant, however, the negative relationship between this measure and intentions was unexpected, and the consequences of recycling were not significantly correlated with recycling intentions. This suggests that whilst the respondents had strong and favourable views about specific aspects of recycling, they seem to be less concerned about the 'bigger' picture. In addition, concern for the community was also significant, suggesting that those respondents who were committed to their community and its well-being were more likely to indicate that they would recycle in the future. As shown in Table 4, perceived control and the situational factors were strongly correlated with recycling attitudes. This suggests: firstly, having the appropriate skills, resources and opportunities to

Table 4
Correlation between intentions, attitudes and the individual components of the model

Correlation with intentions		Correlation with attitude	
Attitude	0.507**	Subjective norm	0.433**
Subjective norm	0.259**	Perceived control	0.455**
Perceived control	0.341**	Moral norm	0.424**
Moral norm	0.185*	Situational factors	0.467**
Situational factors	0.301**	Recycling outcomes	0.353**
Recycling outcomes	0.244**	Recycling consequences	0.340**
Recycling consequences	0.033	Concern for the community	0.319**
Concern for the community	0.300**	Past recycling behaviour	0.276**
Past recycling behaviour	0.260**	Buy to reduce waste	0.049
Buy to reduce waste	0.061	Repair/re-use to reduce waste	0.111
Repair/re-use to reduce waste	0.066		

* Significant at $P < 0.05$.
** Significant at $P < 0.01$.

recycle contributes towards positive recycling attitudes; and secondly, that recyclers in this study do not feel that that recycling causes them inconvenience, takes up too much room or time, is too complicated or that recycling programmes are a waste of money, and thus they view the behaviour positively.

Neither buying to reduce waste, nor repairing/re-using to reduce waste, were significant in the multiple regression, and as shown in Table 4, neither of these two variables were significantly correlated to either recycling behaviour or recycling attitudes. This suggests that waste minimisation behaviours represent a separate dimension of waste management. In view of this, the remainder of this paper focuses on the findings relating to waste minimisation.

6.3. Waste minimisation and the recycling variables

Consistent with the research of Barr et al. (2001), the factor analysis indicated that the 11 waste minimisation variables included within the questionnaire did, in fact, represent two different dimensions of waste minimisation behaviour—buying to reduce waste and repairing/re-using to reduce waste. Therefore, these two factors are considered separately in the following analysis. Although the two waste minimisation factors were not significantly correlated with recycling intentions and recycling attitudes, as shown in Table 5, they were significantly correlated with the recycling factors of *consequences of recycling*, *outcomes of recycling*, and *concern for the community*. The individual recycling variables which correlated the most strongly with the two waste minimisation factors related to the outcomes and consequences of recycling and moral or social factors, and are shown in Tables 6 and 7. The three variables which correlated the most strongly with waste minimisation behaviour were: recycling reduces the amount of waste that goes into landfill; recycling preserves natural resources; and recycling creates a better environment for future generations. Concern for maintaining a good place to live and interest in the health and well-being of the community were also significantly correlated with both the waste minimisation factors. Thus, the respondents who were more likely to engage in waste minimisation behaviour

Table 5
Correlation between the waste minimisation factors and the recycling factors

Correlation with buying to reduce waste		Correlation with repair/re-use to reduce waste	
Attitude	0.049	Attitude	0.111
Subjective norm	0.027	Subjective norm	0.028
Perceived control	0.124	Perceived control	0.212**
Moral norm	0.082	Moral norm	0.098
Situational factors	0.137	Situational factors	0.187*
Recycling outcomes	0.233**	Recycling outcomes	0.240**
Recycling consequences	0.188*	Recycling consequences	0.218**
Concern for the community	0.201**	Concern for the community	0.222**

* Significant at $P < 0.05$.
** Significant at $P < 0.01$.

were more likely to be concerned about environmental issues and the impact of waste on the environment and their community.

This suggests that waste minimisation behaviour may contain a social element in that those who engage in it are likely to be concerned with the impact of their actions on the environment and on other people. Table 7 shows the correlations between the two waste minimisation factors and the social and moral components of the Theory of Planned Behaviour. The findings suggest that the more likely the respondents were to engage in waste minimisation behaviours, the more likely they were to agree that their neighbours and their Local Authority thought that they should recycle, and the more likely they were to state that it was important to them to comply with the views of their neighbours and Local Authority. In terms of the moral factors, unsurprisingly the respondents who were more likely to engage in waste minimisation behaviours were more likely to agree that they should not waste anything that could be re-used, however, these respondents were also more likely to feel that they did not need to recycle as enough is being done by others. Perhaps their waste minimisation behaviour results in very little waste for recycling, or alternatively

Table 6
Correlation between the waste minimisation factors and recycling outcomes and consequences

Correlation with buying to reduce waste		Correlation with repair/re-use to reduce waste	
Recycling reduces the amount of waste that goes into landfill	0.289**	Recycling reduces the amount of waste that goes into landfill	0.267**
Recycling preserves natural resources	0.283**	Recycling preserves natural resource	0.359**
Recycling creates a better environment for future generations	0.267**	Recycling creates a better environment for future generations	0.289**
I am concerned with maintaining a good place to live	0.206**	I am concerned with maintaining a good place to live	0.240**
I have a strong interest in the health and well-being of the community in which I live	0.168*	I have a strong interest in the health and well-being of the community in which I live	0.178*

* Significant at $P < 0.05$.
** Significant at $P < 0.01$.

Table 7
Correlation between the waste minimisation factors and the social and moral recycling variables

Correlation with buying to reduce waste		Correlation with repair/re-use to reduce waste	
Moral factors			
I feel that I should not waste anything if it can be used again	0.232**	I feel that I should not waste anything if it can be used again	0.261**
I do not need to recycle as enough is being done by others	0.200**	I do not need to recycle as enough is being done by others	0.220**
Social factors			
My neighbours think that I should recycle my household waste	0.189**	My neighbours think that I should recycle my household waste	0.277**
Doing what my neighbours think is important	0.320**	Doing what my neighbours think is important	0.288**
The Local Authority thinks that I should recycle my household waste	0.038	The Local Authority thinks that I should recycle my household waste	0.153*
Doing what the Local Authority thinks is important	0.160*	Doing what the Local Authority thinks is important	0.215**

* Significant at $P < 0.05$.
** Significant at $P < 0.01$.

this could provide further evidence that recycling and waste minimisation represent separate dimensions of waste management behaviour.

In terms of buying to reduce waste and repairing/re-using to reduce waste representing separate dimensions of waste minimisation behaviour, the repair/re-use factor was significantly correlated with the perceived control (0.212) and the situational factors (0.187) and the individual variables of convenience (0.242), time (0.185) and knowledge of how to recycle (0.174). Buying to reduce waste was weakly but significantly correlated with *not recycling is against my principles* (0.168). This suggests that although waste minimisation overall is likely to be influenced by a concern for the environment and the community, repair/re-use is also influenced by ability to perform the behaviour and physical or situational factors, whereas buying to reduce waste may contain a moral dimension.

6.4. Waste minimisation behaviour

The respondents were asked to indicate the extent of their agreement with a number of waste minimisation behaviours relating to the purchase of household products and the repair or re-use of household products. These behaviours are detailed in Table 2 under the factors Buying to reduce waste, and Re-using/repairing to reduce waste. Over 40% of the respondents agreed that they purchased long-life goods, long-life light bulbs, rechargeable batteries, goods with the minimum of packaging and goods labelled environmentally friendly, however, only 38% used 'life-long' shopping bags, and only 17% agreed that they bought goods with a returnable refund on the container. A substantial proportion of the respondents answered neither agree nor disagree to these questions (ranging from 20% answering neither to the purchase of long-life light bulbs to 40% answering neither to the purchase of goods with a returnable refund on the container). This suggests that these

respondents were either not aware of the measures they could personally take to reduce waste in the home, or that waste minimisation was not an important consideration when shopping for household products. Over 55% of the respondents agreed that they re-used glass and plastic containers and had objects repaired rather than buying new ones, however, only 9% agreed that they shared appliances with their neighbours. Again, approximately 20% of the respondents answered neither agree nor disagree.

As previously discussed, the respondents in this study were committed recyclers, with 80% stating that they recycled on a weekly basis, and 88% agreeing that it was extremely likely that they would recycle their household waste in the future, yet a substantially lower proportion of the same respondents engaged in waste minimisation behaviour. This suggests that whilst the Brixworth recycling scheme has been successful in encouraging householders to recycle their waste, these same householders, although concerned about environmental issues, are not as committed to waste minimisation through purchase or repair/re-use, perhaps because they are not aware of the waste minimisation measures they can personally take, or perhaps because recycling is a more convenient and less time-consuming way of helping to preserve the environment.

6.5. Waste minimisation and the demographic variables

To determine whether specific sub-groups within the sample held significantly different views about waste minimisation behaviour, one-way ANOVA was used. The mean scores for each of the 11 waste minimisation behaviours were compared by the demographic variables of age, gender, occupation, and number of children in household.

As shown in Table 8, the comparison of mean scores by age indicated significant differences on nine out of the 11 waste minimisation behaviours. The 65 and over age group were the group most likely to engage in minimising waste, either at point of purchase or

Table 8
Comparison of mean scores by age for the waste minimisation variables

	18–24	25–39	40–64	65+	*F* ratio	*P*-value of *F*
Buying long-life goods	3.50	4.05	3.11	2.23	10.838	0.000
Buying long-life light bulbs	2.75	3.51	3.28	1.84	7.403	0.000
Buying rechargeable batteries	4.25	3.91	3.53	3.35	1.216	0.305
Buying goods with minimum of packaging	4.00	3.92	3.68	2.69	4.869	0.003
Using long-life shopping bags	2.75	4.44	3.82	3.82	4.448	0.005
Buying environmentally friendly goods	3.00	3.69	3.44	3.03	1.321	0.269
Buying goods with a returnable refund	4.75	5.12	4.51	3.71	6.156	0.001
Re-using glass containers	2.50	4.38	3.06	2.50	10.883	0.000
Re-using plastic containers	1.75	4.31	3.22	2.81	7.090	0.000
Objects repaired rather than replaced	2.75	4.00	2.80	2.88	8.242	0.000
Sharing appliances with neighbours	7.00	5.88	5.30	5.17	3.672	0.013

One-way ANOVA tests the null hypothesis that two or more samples drawn from the same population will have equal means. The procedure is based on the *F*-test which compares the between-groups variance with the within-groups variance, the larger the value of *F*, the more likely that the differences between groups are statistically significant. Where the *P*-value of *F* is less than 0.05, the null hypothesis is rejected, and the alternative hypothesis, that at least one group is statistically different from the others, is accepted The lower the mean score, the more likely that group of respondents will engage in the behaviour.

Table 9
Comparison of mean scores by children in household for the waste minimisation variables

	No children	Children under 12	Children 13–18	F ratio	P-value of F
Buying long-life goods	2.98	4.36	3.50	11.450	0.000
Buying long-life light bulbs	2.89	3.65	3.54	3.422	0.035
Buying rechargeable batteries	3.43	4.08	3.82	2.540	0.082
Buying goods with minimum of packaging	3.38	3.95	4.00	2.906	0.057
Using long-life shopping bags	3.68	4.67	3.68	4.263	0.016
Buying environmentally friendly goods	3.31	3.95	3.54	2.525	0.083
Buying goods with a returnable refund	4.34	5.30	4.96	6.666	0.002
Re-using glass containers	3.05	4.50	3.43	9.148	0.000
Re-using plastic containers	3.28	4.25	3.46	3.669	0.027
Objects repaired rather than replaced	2.99	3.73	3.21	3.079	0.048
Sharing appliances with neighbours	5.20	5.98	5.75	4.317	0.015

through re-use or repair. The only exceptions to this were buying goods labelled environmentally friendly and buying rechargeable batteries (these were the two variables that were not statistically significant). This is possibly explained by the fact that the majority of people in this age group would be retired and therefore would have more time to shop and more time to sort products out for repair or re-use. The age group least likely to engage in waste minimisation behaviour was the 25–39 age group. This, again, is likely to be due to time availability. This is confirmed by the comparison of mean scores by occupation. The respondents who stated that they were retired were more likely to engage in all the waste minimisation behaviours (with the exception of buying rechargeable batteries) than all the other occupation groups.

Table 9 shows the comparison of mean scores by number of children in the household. Again, waste minimisation behaviour appears to be related to time available. Households with no children were more likely to engage in all the waste minimisation behaviours than the other two groups, whereas households with children under 12 were the group least likely to, presumably because of the demands of their family.

Analysis of the overall factors of Buying to Reduce Waste and Re-using/repairing to Reduce Waste indicates that the over 65s, the retired, and those without children, are significantly more likely than the other groups to engage in all the waste minimisation behaviours identified on the questionnaire. Conversely, the 25–39 age group, those in unskilled employment, and those with children under 12 are significantly less likely than the other groups to minimise waste. Although the only variable that was significantly different by gender was re-using plastic containers, with females being more likely to do this than males, overall females were more likely than males to repair or re-use products rather than replace them.

7. Discussion

The findings from this study suggest that the TPB provides a useful theoretical framework for investigating recycling and waste minimisation behaviour. However, it is important to

note that the findings indicate that recycling and waste minimisation represent separate dimensions of waste management behaviour, and that waste minimisation behaviour itself consists of two separate components—waste minimisation at point of purchase and waste minimisation through repair or re-use. This is consistent with the study of Barr et al. (2001) who suggest that recycling, waste minimisation and re-use should be considered separately. The findings from this study have important implications, both for the development and implementation of waste minimisation schemes and the campaigns to make householders aware of them, and for the use of the TPB in future studies of waste minimisation behaviour.

7.1. The Theory of Planned Behaviour: recycling and waste minimisation

With regard to recycling, the TPB provides a useful model for exploring the factors which influence householders' recycling decisions. The traditional TPB model of attitude, subjective norm and perceived control only explained 26.1% of the variance in recycling intentions, however, inclusion of the additional factors of the moral norm, situational factors, recycling outcomes, recycling consequences, concern for the environment and previous recycling behaviour, resulted in the percentage of variance explained increasing to 33.3%, with attitude, consequences of recycling and concern for the community being significant predictors of recycling intentions. One of the most significant findings of the explanation of recycling behaviour was the emergence of a new factor, concern for the community. This factor was composed of two variables, concern with maintaining a good place to live, and interest in the health and well-being of the community. In view of its significance in the multiple regression, future studies should explore the relevance of this factor further, perhaps by eliciting beliefs relating to this area.

Inclusion of the two waste minimisation factors within the model did not improve the percentage of variance explained, and neither of these two factors were significant in the multiple regression. This suggests that recycling and waste minimisation represent two different dimensions of waste management behaviour, and this is confirmed by the finding that neither buying to reduce waste and repair/re-use to reduce waste were significantly correlated with recycling intentions or recycling attitudes. In addition, the factor analysis indicated that waste minimisation at point of purchase and waste minimisation through repair or re-use represent separate components of waste minimisation behaviour. Examination of the frequencies also provides support for recycling, buying to reduce waste and repair/re-use to reduce waste representing separate dimensions of waste management behaviour. Of the respondents, 80% stated that they recycled on a weekly basis, compared to approximately 40% who engaged in the buying to reduce waste behaviours and approximately 55% who engaged in the repair/re-use behaviours.

This study did not specifically measure intentions, attitudes to, and beliefs about performing waste minimisation behaviour, therefore, it is difficult to theorise from the findings the antecedents of buying to reduce waste and repairing/re-using to reduce waste. However, the correlation analysis indicates significant relationships between the two waste minimisation factors and the outcomes and consequences of recycling and concern for the community. In addition, repair/re-use was significantly correlated with perceived control and situational factors. Although the findings suggest that TPB would be useful for systematically

investigating the determinants of waste minimisation behaviour, future studies should be designed to measure intentions, attitudes to, and beliefs about specific waste minimisation behaviours, for example, intentions to purchase long-life goods or intentions to repair objects rather than buying new ones. In addition, future TPB studies of waste minimisation should explore the impact of social responsibility and concern for the environment and community, in view of their relevance to this study.

7.2. Implications for waste minimisation

The findings from this study have several implications for the development and implementation of waste minimisation schemes and for the marketing/communication campaigns which advocate the use of these schemes. Although the overwhelming majority of respondents in this study were committed recyclers who had access to a well-explained and well-publicised kerbside scheme, a substantially smaller percentage engaged in waste minimisation behaviour. This suggests that whilst the Brixworth recycling scheme has been successful in encouraging householders to recycle their waste, these same householders, although concerned about environmental issues, are not as committed to waste minimisation through purchase or repair/re-use, perhaps because they are not aware of the waste minimisation measures they can personally take, or perhaps because recycling is a more convenient and less time-consuming way of helping to preserve the environment.

Barr et al. (2001) argue that waste minimisation and re-use behaviour are influenced by knowledge of environmental issues and a concern about the consequences of waste, and, as such, are value-based behaviours, whereas although recyclers are concerned about these issues, the main influence on their recycling behaviour is the logistics of recycling, the convenience of kerbside schemes and knowledge about recycling. The findings from this study provide support for this proposition. Concern about environmental issues and the community were significant predictors of recycling behaviour and were also significantly correlated with both the waste minimisation factors. Recycling attitudes were strongly and significantly correlated with perceived control and situational factors, suggesting that the recyclers positive views about recycling behaviour are strongly associated with their knowledge about, and access to, a well-publicised and convenient kerbside scheme. This suggests that a similar waste minimisation scheme, designed with convenience in mind, and based on the needs of today's households for time and space, should encourage householders to engage in waste minimisation behaviours, providing that such a scheme is well-publicised. In addition, clear instructions on how to minimise waste should be provided, emphasising that waste minimisation does not have to be inconvenient or take up too much time.

The variables which correlated the most strongly with the two waste minimisation factors related to the consequences of recycling and concern for the community. The respondents who were more likely to engage in waste minimisation behaviour were more likely to be concerned about environmental issues and the impact of waste on the environment and their community. Therefore, waste minimisation campaigns should focus on how minimising waste can help to preserve the environment and maintain a good place to live.

In terms of demographic characteristics, the respondents who were the mostly likely to engage in waste minimisation behaviours were the over 65s, the retired, and those without children. Presumably because these sectors of the population have more time available for

shopping and sorting out items for repair or re-use. Thus, promotion of waste minimisation behaviours should focus on the younger age groups, emphasising that waste minimisation need not be inconvenient and time-consuming, and providing information on how to shop and how to re-use and repair to reduce waste. It is also important to note that as recycling, waste minimisation through purchase and waste minimisation through re-use represent different types of waste behaviours, different strategies and messages for each are likely to be required, as discussed by Barr et al. (2001).

Although this study has provided useful information about the factors, which influence the behaviour of those who recycle their household waste on a regular basis, there are limitations to the approach taken. Firstly, a small sample size of participants in an LA kerbside recycling scheme, restrict the extent to which the findings can be generalised throughout the UK. A number of such surveys need to be conducted across the country before activities can be planned for the total population. Secondly, this study did not specifically measure intentions, attitudes to, and beliefs about performing waste minimisation behaviours, therefore, it is difficult to determine the factors which influence such behaviours. Although the analysis suggests that concern for the environment and the local community are likely to be important, and that time, convenience and lack of knowledge may present barriers to minimising waste, further TPB studies are required to identify the attitudes and beliefs which underpin specific waste minimisation behaviours.

8. Conclusions

New mandatory household recycling targets present a serious challenge to Local Authorities. Public participation in Local Authority schemes is key to increasing household recycling levels, however, the most effective way to reduce waste is to deal with it at source, through waste minimisation. Although waste minimisation projects have been costly in the past, it is argued that understanding waste minimisation behaviour is key to achieving success (Maycox, 2003), and that projects which are theoretically underpinned by cognitive psychology and are promoted and supported over the long-term should result in reductions in MSW (Maycox, 2003).

Cognitive psychological modelling can provide the means to identify the driving forces behind recycling and waste minimisation behaviour, and in a given area determine the main likely success factors. Once these factors have been established, cost-effective campaigns can be designed to maximise the outcome. The Theory of Planned Behaviour provides a cognitive framework to understand and explain behaviour, and its use in this study has provided valuable insights into the factors which underpin recycling behaviour. The findings suggest that recycling attitudes are the major determinant of recycling behaviour, and that these attitudes are influenced, firstly, by having the appropriate opportunities, facilities and knowledge to recycle, and secondly by not being deterred by the issues of physically recycling (e.g. time, space and inconvenience). Previous recycling experience, and a concern for the community and the consequences of recycling, are also significant predictors of recycling behaviour.

The findings also provide support for the proposition that recycling, waste minimisation through point of purchase and waste minimisation through repair or re-use represent

different dimensions of waste management behaviour as suggested by Barr et al. (2001) and Ebreo and Vining (2001), and thus will require different strategies and messages. It is tentatively suggested that waste minimisation behaviour is likely to be influenced by a concern for the environment and the community, and is likely to be inhibited by perceptions of inconvenience and lack of time and knowledge.

The value of using the TPB is that it enables the identification of the factors which are likely to encourage or discourage performance of a behaviour. This information can then be used to develop and implement recycling or waste minimisation schemes which are user friendly. Additionally, this information can be used as the basis for the marketing communication campaigns which advocate the use of such schemes. Although the Theory of Planned Behaviour has proved to have considerable utility for identifying the factors which are likely to encourage recycling behaviour and the inter-relationships between these factors, this study did not specifically address waste minimisation behaviours in terms of the TPB framework. Future studies should be designed to investigate specific waste minimisation behaviours using the TPB framework, plus the additional variables identified in this study, namely: the moral norm, past behaviour, situational factors, the outcomes and consequences of waste minimisation, concern for the community and social responsibility.

References

Ajzen I. The theory of planned behaviour. Organ Behav Hum Decision Processes 1991;50:179–211.

Ajzen I, Driver BL. Application of the theory of planned behaviour to leisure choice. J Leisure Res 1992;24(3):207–24.

Ajzen I, Fishbein M. Understanding attitudes and predicting social behaviour. Englewood Cliffs, NJ: Prentice Hall; 1980.

Barr S, Gilg AW, Ford NJ. A conceptual framework for understanding and analysing attitudes towards household-waste management. Environ Plan A 2001;33(11):2025–48.

Beck L, Ajzen I. Predicting dishonest actions using the theory of planned behaviour. J Res Personality 1991;25(3):285–301.

Boldero J. The prediction of household recycling of newspapers; the role of attitudes intentions and situational factors. J Appl Social Psychol 1995;25(5):440–62.

Chan K. Mass communication and pro-environmental behaviour: waste recycling in Hong Kong. J Environ Manage 1998;52(4):317–25.

Cheeseman K, Phillips PS. Northamptonshire Resource Efficiency Project: the Exit Strategy. Resour Conserv Recycl 2001;32:31–54.

Cheeseman K, Phillips PS, McClatchey J. The Northamptonshire Resource Efficiency Project: a critical analysis of the opinions of project champions. Environ Waste Manage 2000;3(4):175–89.

Cheung SF, Chan DK, Wong ZS. Reexamining the theory of planned behaviour in understanding waste paper recycling. Environ Behav 1999;31(5):587–617.

Clarkson P, Adams JC, Phillips PS. Third generation, low cost waste minimisation clubs: a case study from the East Midlands of England. Resour Conserv Recycl 2002;36:107–35.

Davies J, Foxall GR, Pallister J. Beyond the intention—behaviour mythology: an integrated model of recycling. Market Theory 2002;2(1):29–113.

Department for Environment, Food and Rural Affairs (DEFRA). Municipal Waste Management Statistics 2001/2002. London; 2003.

Department of the Environment, Transport and the Regions (DETR). Less Waste More Value: waste strategy consultation paper for England and Wales. London; 1998.

Department of the Environment, Transport and the Regions (DETR). Waste strategy for England and Wales (2000). London; 2000.

Ebreo A, Vining J. How similar are recycling and waste reduction? Future orientation and reasons for reducing waste as predictors of self-reported behaviour. Environ Behav 2001;33(3):424–48.

Emery AD, Griffiths AJ, Williams KP. An in-depth study of the effects of socio-economic conditions on household waste recycling practices. Waste Manage Res 2003;21(3):180–90.

ENCAMS. Waste segmentation research. 2002. Available: http://www.encams.org/publications/research.

Environment Agency. Household waste survey. London; 2002.

European Union. Landfill Directive 1999/31/EC. Off J Eur Communities, L182/1 1999.

Graham R, Hill D, Read AD, Phillips PS. Delivering resource efficiency to very small businesses: the role of Green Angels. Environ Waste Manage 2002;4(4):195–207.

Heggensoon S, Phillips PS, Pratt R, Hyde K. Waste minimisation clubs: a cost effective policy instrument. Eur Environ 2002;11(6):1–18.

House of Commons: Environmental Audit Committee. Waste—an audit. London: HMSO; 2003.

Macey SM, Brown MA. Residential energy conservation; the role of past experience in repetitive household behaviour. Environ Behav 1983;15(2):123–41.

Maycox A. The Village Initiative Project: achieving household waste minimisation in the rural locale. CIWM Sci Tech Rev 2003;4(3):10–7.

McDonald S, Oates C. Reasons for non-participation in a kerbside recycling scheme. Resour Conserv Recycl 2003;39(4):369–85.

MORI. Public attitudes towards recycling and waste management. London: Strategy Unit; 2002.

Office for National Statistics. 2003. Available: http://www.neighbourhood.statistics.gov.uk/area.

Parfitt J. Analysis of household waste composition and factors driving waste increases. London: Strategy Unit; 2002.

Parfitt JP, Lovett AA, Sunnenberg G. A classification of local authority waste collection and recycling strategies in England and Wales. Resour Conserv Recycl 2001;32:239–58.

Parker D, Manstead ASR, Strading SG, Reason JT, Baxter JS. Intentions to commit driving violations: an application of the theory of planned behaviour. J Appl Psychol 1992;77:94–101.

Phillips PS, Read AD, Green AE, Bates MP. UK waste minimisation clubs: a contribution to sustainable waste management. Resour Conserv Recycl 1999;27:217–47.

Phillips PS, Pike K, Bates MP, Read AD. Developing effective waste minimisation clubs: a case study from the East Midlands of England. J Solid Waste Technol Manage 2000;26(3):97–113.

Phillips PS, Pratt RM, Pike K. Waste minimisation clubs in the UK: key factors for cost effective future developments. Waste Manage 2001;21:389–404.

Phillips PS, Holley K, Bates MP, Freestone N. Corby waste not: an initial review of the UK's largest holistic waste minimisation project. Resour Conserv Recycl 2002;36:1–33.

Phillips PS, Clarkson P, Adams JC, Read AD, Coggins C. An UK County waste minimisation programme: sustainable development through partnership. Sustain Dev 2003;11:103–18.

Pike K, Phillips PS, Cumberpatch Z. The use of planned surveys to predict levels of success in Resource Efficiency Projects. Environ Waste Manage 2000;3(2):59–73.

Pratt RM, Phillips PS. The role and success of UK waste minimisation clubs in the correction of market and information failure. Resour Conserv Recycl 2000a;30:201–19.

Pratt RM, Phillips PS. Waste minimisation clubs in the UK: cost benefit considerations. Environ Waste Manage 2000b;3(3):1–15.

Price JL. The landfill directive and the challenge ahead: demands and pressures on the UK householder. Resour Conserv Recycl 2001;32:333–48.

Read AD. A weekly doorstep recycling collection, I had no idea we could! Overcoming the local barriers to participation. Resour Conserv Recycl 1999;26:217–49.

Strategy Unit. Waste not want not: a strategy for dealing with the waste problem in England. London; 2002.

Stringer J, Hill D, Phillips PS, Read AD. Betre: an evaluation of the UK's highest recruiting waste minimisation project. Resour Conserv Recycl 2003;38:271–99.

Taylor S, Todd P. An integrated model of waste management behaviour: a test of household recycling and composting intentions. Environ Behav 1995;27(5):603–30.

Terry DJ, Hogg MA, White KM. The Theory of Planned Behaviour: self-identity, social identity and group norms. Br J Social Psychol 1999;38(3):225–44.

Tonglet M. Consumer misbehaviour: an exploratory study of shoplifting. J Consumer Behav Int Rev 2002;1(4):336–54.

Tucker P, Speirs D. Model forecasts of recycling participation rates and material capture rates. London: Strategy Unit; 2002.