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THE EFFECT OF PUBLIC UNDERSTANDING ON KERBSIDE RECYCLING SCHEME PERFORMANCE

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SUMMARY: Kerbside recycling performance depends on a combination of factors including scheme design, operation, householder participation and the quality of that participation. The level of public understanding of what kerbside recycling schemes expect from them can have a significant effect on the quality of participation and on overall scheme performance. This is because even when participation rates are high, scheme performance can be reduced by poor separation efficiency of targeted materials and the putting out of non-targeted materials for collection.

This paper examines research conducted in two regional recycling initiatives within the UK which demonstrate the need for measurement of public understanding and awareness to be taken into account along side other aspects of scheme performance. Only when attitudinal data are fully integrated with observational measures of participation and scheme yield can scheme improvements and promotional activity be effectively planned.

1. INTRODUCTION

An increasing variety of performance indicators are now used to evaluate kerbside recycling schemes for household waste. Separately these will tell us how well a scheme is performing in particular ways but not why or how to go about improving performance. To achieve this, schemes need to be evaluated using a variety of approaches and the interplay between these measures examined. The most common measure of any scheme's effectiveness is usually the amount of material that is diverted from other forms of waste treatment to recycling, whether this be defined as diversion rate, recovery rate or recycling rate. However diversion to recycling depends on a number of factors, and can be achieved in a variety of ways. Important amongst these for source-separation schemes of all types is public participation and understanding – and not just how many people participate, but how well they do so.

Participation in kerbside schemes is most commonly measured by the number of people who put out materials for collection over a 4-week period as a percentage of the total number served by the scheme. This reflects the level of public co-operation and understanding of the scheme, as both are needed to engage participants. Another aspect of public understanding is reflected in the quality of participation of participants in a scheme, and can be measured by a term defined as separation

efficiency (ERRA, 1993). This is the percentage of targeted material correctly sorted and separated by participants in a scheme, and relates to diversion in the equation:

$$\text{Amount of material recovered} = \text{amount of targeted material in waste stream} \times \% \text{ of households participating} \times \text{separation efficiency} \quad (\text{McDougall et al., 2001})$$

Thus showing that both numbers participating and the quality of that participation are important.

This can be illustrated by considering potentially achievable recycling rates. Figure 1 was derived from the recycling performance data gathered in the authors' research. Assuming as a base line that all commonly recyclable materials (wet and dry) from household waste are recycled by a kerbside scheme and that all of this material was captured, then around 68% of household waste in this case could be potentially recycled. If such a scheme achieved a high level of participation, say 85%, then as the chart shows 57% would be the maximum that could be potentially recycled, provided all participants fully understood and complied with the scheme. However, taking into account levels of understanding amongst participants – without considering their willingness to separate all that they recognise as recyclable – shows that this has a significant effect on diversion, as now only 37% becomes potentially recyclable. Even if numbers participating are high, a kerbside scheme still needs a high level of separation efficiency to get a good recycling rate, and levels of understanding amongst participants gives a measure of separation efficiency. This shows the potential significance of understanding to performance and meeting recycling targets.

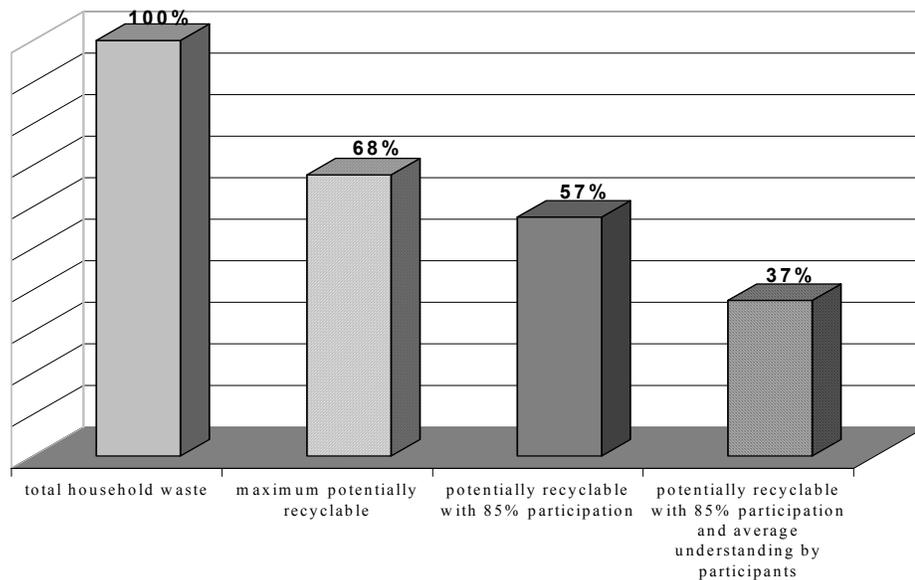


Figure 1. How much can be recycled?

The research and analysis undertaken by the authors with different local authority recycling schemes in the UK has involved a variety of different measures of monitoring performance and assessing public participation, and highlighted that they all have a place in determining effectiveness of kerbside recycling schemes. This paper describes the results of some of this research carried out in two areas of the UK which both have extensive kerbside recycling provision and adopt a regional approach to waste management.

2. PETERBOROUGH REGIONAL RECYCLING CELL

2.1 Introduction

One regional recycling initiative in the UK is the Peterborough Regional Recycling Cell, located in the east of England. Here a group of four authorities (Peterborough City Council, Wellingborough District Council, South Holland and Huntingdonshire) share a private sector operated Material Reclamation Facility (MRF) on the outskirts of the City of Peterborough. The Recycling Cell have commissioned a two year evaluation of all aspects of kerbside recycling performance and scheme costs which is being undertaken jointly by the University of East Anglia and the Open University. In most of the study area a 'green box' kerbside collection of recyclables has been introduced to collect mixed (co-mingled) recyclables. The main target materials are newspapers, magazines, cardboard, plastic bottles, juice cartons, textiles, beverage and food cans.

Part of this research programme involves the use of a geographical information system (GIS) to map the individual kerbside collection round boundaries and to integrate population data and social survey data with the key kerbside performance ratios described earlier. The use of a GIS allows spatially referenced data (such as collection round boundaries and the location of 'bring' sites) to be integrated with key performance indicators (such as household participation rate) and relevant population data (such as socio-economic groupings, mean household size and presence of young children). Understanding how mode of collection and socio-economic factors influence performance of individual collection rounds is important, as overall scheme performance can obscure important differences.

Although the research will not be fully completed until the early part of 2002, some preliminary results from the City of Peterborough kerbside rounds are presented here.

An important design feature of the research is the way in which individual kerbside rounds have been selected for detailed monitoring of participation. A cross-section of different area types have been selected along a socio-economic gradient based on the level of Council Tax that householders pay (defined in discrete bands A-H), which in turn is related to property values. This is preferable to the Census of Population, as the most recent available data is now over ten years old. Kerbside collection rounds with a high proportion of properties in the lowest Council Tax bands (A & B) tend to serve less affluent portions of the population than those with a higher proportion in the higher tax bands (C-H).

Figure 2 shows the proportion of households in higher Council Tax banding (bands C-H) across the five kerbside rounds sampled for three different monitoring exercises:

- Reject analysis: quantification of the rejection rate of green box materials arriving at the MRF from the collection rounds (completed July 2001)
- Observational study of householder set-out and participation rates and measurement of the quality of participation through the number of targeted material categories put out for collection (first wave completed October 2000)
- House-to-house questionnaire survey measuring attitude and awareness of the kerbside scheme (to be completed October 2001)

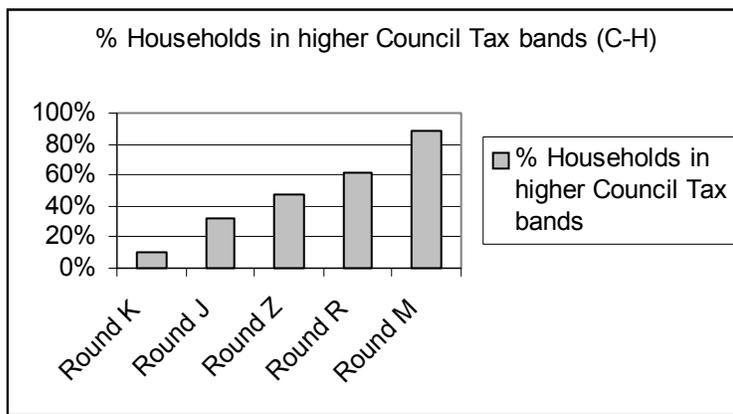


Figure 2 Socio-economic gradient across kerbside rounds sampled in Peterborough

2.2 Reject analysis

For each of the five kerbside rounds samples of 150-250 kg were obtained from the green box collection vehicles delivering to the Peterborough MRF. Each sample was sorted to separate out reject materials from uncontaminated target materials in order to determine an overall rejection rate. This exercise was conducted in July 2000 and repeated in July 2001. Reject rate can be seen as one indicator of quality of participation.

The analysis of the combined results from 2000 and 2001 in Figure 3 reveals significant variations in rejection rates between the sampled rounds. A strong negative correlation between affluence and the proportion of green box material rejected by the sorters was also established ($r=0.89$). Although contaminated target materials, such as containers with heavy paint residues, were a problem, the main rejects were materials not targeted by the scheme: such as glass bottles and rigid plastics. These findings suggest that in less affluent neighbourhoods the quality (as well as the extent) of participation is reduced. The reason why though is not clear from these results: is it lack of understanding, or lack of time or interest? As the following section demonstrates this can only be explained by further research such as public attitude surveys.

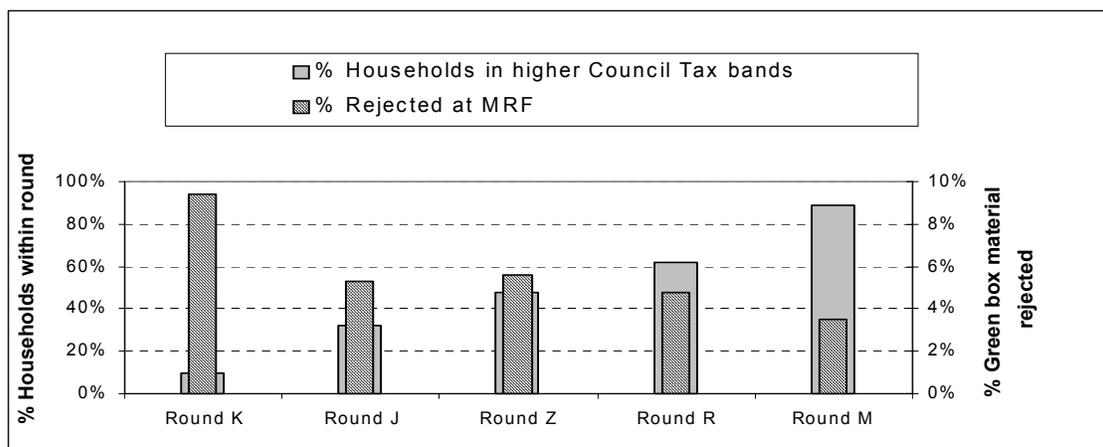


Figure 3: Kerbside monitoring in Peterborough: variation in material rejection rate across socio-economic gradient

2.3 Observational study of public participation

Participation surveys were undertaken on the same Peterborough rounds in September and October 2000 with the objective of observing the weekly set-out rates for green box kerbside collections in order to estimate overall participation rates over a four-week period.

In Peterborough participation rates ranged from less than 30% to nearly 90% (Figure 4), broadly reflecting the relative proportion of properties in bands C – H of the council tax (correlation $r=0.82$). Furthermore, households within areas of lower levels of participation were found to put out fewer of the different types of targeted materials than their counterparts in areas with higher participation.

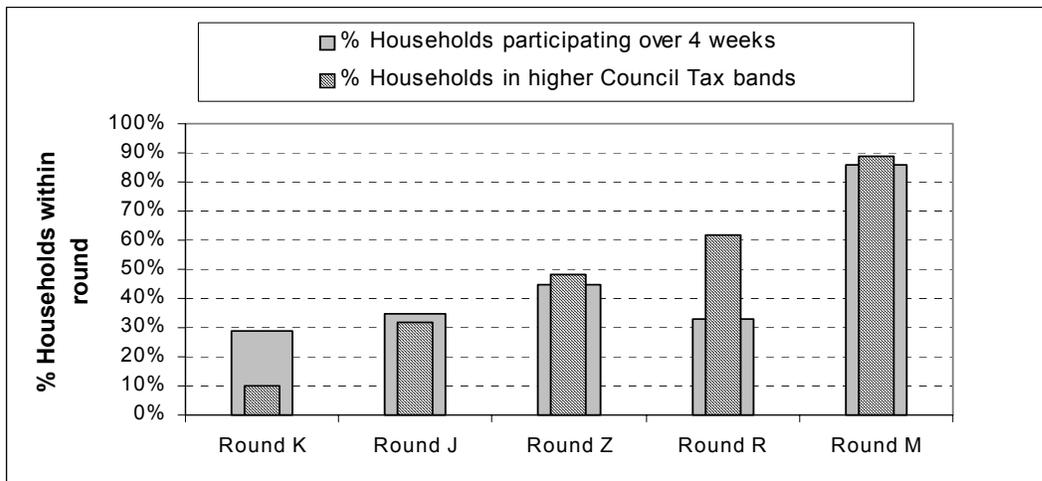


Figure 4: Kerbside monitoring in Peterborough: variation in householder participation, material rejection rate and socio-economic factors

These trends illustrate the importance of evaluating the performance of different collection rounds within a scheme, but offer no explanation for the socio-economic gradients observed. A questionnaire survey is currently being carried out with the expectation that attitudinal data will help to identify the barriers to the quality and extent of householder participation and any deficiencies in their understanding of its operation. Once completed possible interventions can then be considered that might improve participation and scheme yields and encourage those currently not participating to do so.

3. HAMPSHIRE

As shown with the research at Peterborough, measuring the amount of what is collected for recycling, the composition of the separated material, undertaking MRF sorts and calculating reject rates, can all tell us how well people are separating their waste and how much of the available recyclables are being captured, but not whether participants understand what they should do and choose not to do it because it is too much trouble, or whether they are sufficiently motivated but don't fully understand what they should be doing. Public attitude survey research of the type described here can be used to assess such levels of public understanding.

Another established regional waste management initiative in the UK is Project Integra in Hampshire County in the south of England. Project Integra is a partnership between local government, including waste collection and disposal authorities, and waste management contractors in Hampshire, set up to plan and deliver integrated waste management in the region. Analysis of the extensive public attitude and waste collection and composition data available (Project Integra, 1999a+b) was used to give insight into how effectively recyclers were participating in recycling, and examines levels of public understanding of the kerbside schemes. The research focused on the relationship between communication strategies and design variables, in the eleven kerbside schemes operating in different Districts within Hampshire County, with levels of public understanding found in each District. Public understanding was measured by use of questions in the public attitude survey to explore the respondent's recognition of the scheme's requirements. Each scheme has its own features and variations although roughly falling into five different types as defined by differences in the containment given to householders for recyclables and frequency of collection. The schemes investigated use wheeled bins, plastic boxes, bags or no containers, have weekly or fortnightly collections, take a variety of dry recyclables and in one case wet wastes as well, and each cover from between 28,000 to 60,000 properties.

The results show average levels of the public correctly recalling which materials were targeted for recycling varying from 44% to 85% in different Districts, but without showing any significant correlation with different design features such as container type or collection frequency. There was a positive correlation between recognition and diversion rates showing that improvement in understanding would bring benefits in overall performance.

Analysis of material recognition during the interview by socio-economic group gave an interesting and unexpected result. It showed little overall variation in understanding amongst participants from different socio-economic groups across Hampshire. No observational studies of the type conducted for the Peterborough Cell had been carried out to match quantities of recyclables and reject rates to these data, so it is not possible to know to what extent respondents' stated understanding translated into full compliance with each kerbside collection's requirements.

The role played by public information and education in determining levels of understanding was also examined and an assessment of the communication strategies used in each District and the impact that these had on understanding amongst participants was undertaken. This is a complex and interactive area where it is difficult to isolate individual causal relationships; however some trends emerge, such as reminders on containers appeared to increase levels of understanding (Thomas, 2001a). These regular reminders provided by either printed bags or stickers to put on boxes or lids of wheeled bins to prompt households about what materials to recycle, did show a correlation with higher levels of understanding. This was further emphasised in one District, Rushmoor (which did not provide information on the container and had the lowest average recognition levels) where respondents to the questionnaire survey reported to a lesser extent than in other districts that the council 'reminds them what to put out for recycling' (Project Integra, 1999a).

Overall the results indicated that the complexity of a scheme can affect understanding. Schemes collecting mixed paper rather than newspapers and magazines only tended to have higher levels of understanding. So increasing the range of materials targeted in some cases simplified what the householder needed to do, whereas other research carried out on a kerbside scheme in Milton Keynes in England showed that increasing the complexity and scope of the range of materials targeted led to reduced effectiveness and lower diversion overall due to achieving a lower level of understanding. (Thomas, 2001b). It is this relationship between complexity and what is demanded of participants that is important. In Hampshire, Test Valley, which collected the widest range of

recyclables in Hampshire, including compostable wastes, had lower levels of understanding than many other Districts. The Test Valley scheme is one of the more complex for residents to participate in, with its weekly collection of residual waste in a wheeled bin, and a second wheeled bin to be used on alternate weeks for wet and dry recyclables. A factor supported by the comment in the public attitude survey report that “those participating in Test Valley were significantly more likely to be confused than others” (Project Integra, 1999a).

By identifying more effective ways of raising public understanding overall, as well as where more information is needed in relation to targeting materials with poor recognition or reaching different socio-economic groups, this has potential implications for the local authority concerned in targeting future communications strategies.

4. CONCLUSION

The effective monitoring and evaluation of kerbside recycling schemes should involve the close integration of different categories of data, including questionnaire data on public understanding. Although most attention is usually given to the measurement of key scheme ratios, such as diversion and recovery rates, and the estimation of participation rates, only when performance data are analysed together with social survey data does a complete picture emerge of how public understanding influences scheme performance. Without this link, performance improvements cannot be planned with any certainty and limited resources will be used less effectively as promotional campaigns cannot be accurately targeted.

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