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## **Final Report**

prepared for

**Department of Trade and Industry**

## **Evaluation of the Costs and Benefits of Collecting Metal Packaging in Multi-material Kerbside Collections**

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**December 2004**

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## 1 Introduction

In the last few years there has been a step change in the number of authorities introducing kerbside collections, with some research suggesting that almost all Waste Collection Authorities (WCAs) are now operating some form of kerbside collection, albeit on a pilot scale in some<sup>1</sup>. The increase has been primarily driven by legislation and, most importantly, by the Landfill Directive<sup>2</sup> that requires substantial levels of biodegradable waste to be diverted from landfill in all EU Member States. In response to this, and also due to the very slow progress in overall household recycling rates, defra has set local authorities individual recycling targets (statutory in England under the Best Value regime)<sup>3</sup>. Following the Cabinet Office Strategy Unit review of waste management<sup>4</sup>, funds from the landfill tax have also been made available to local authorities via the 'Waste Minimisation and Recycling fund' to cover the costs of establishing kerbside collections. Since 2002/03 this source of funding alone has made £275 million available to authorities in England for additional recycling.

In recognition that simply collecting recyclable materials is insufficient to close the recycling loop, WRAP was established in 2000 to assist in the creation of stable markets for recyclables. Six material streams were identified as the focus for its work: glass, organics, wood, aggregates, plastic and paper. In 2003 WRAP's remit was expanded to include waste reduction, providing an advisory service to local authorities to improve their collection of recyclables, in particular green waste (ROTATE), and to engage the public by raising the awareness for the need to recycle and compost household waste.

Metal packaging is not biodegradable, it comprises less than 5% of household waste and markets exist to recycle it. Thus the focus on the diversion of biodegradable waste from landfill (and not into incineration!), the weight based recycling targets and WRAP's remit to concentrate on materials for which recycling markets are difficult, has meant that metal packaging has fallen outside all the current initiatives and drivers promoting increased post consumer recycling. However, an increase in the collection of post consumer metal packaging is considered essential by the metal 'producers' in order to meet their recycling obligations under the revised Packaging Directive and UK Producer Responsibility Packaging Regulations.

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<sup>1</sup> Aylesford Newsprint, Recycling Atlas England and Wales, 2004

<sup>2</sup> Directive 1991/31/EC

<sup>3</sup> Statutory Instrument 2001 No. 724

<sup>4</sup> Waste Not, Want Not, November 2002

The targets set for obligated businesses in the UK are summarised below together with the overall packaging recycling it is anticipated meeting these will achieve. The 2008 target set by the Packaging Directive for the UK to achieve is also provided.

|                  | 2004 (UK) |       | 2005 (UK) |       | 2006 (UK) |       | 2007 (UK) |       | 2008 (UK) |       | 2008 (EU) |
|------------------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
|                  | bus.      | ant.  | bus.      | ant.  | bus.      | ant.  | bus.      | ant.  | bus.      | ant.  |           |
| <b>Aluminium</b> | 26%       | 23.5% | 28%       | 25.3% | 30.5%     | 27.6% | 33%       | 29.8% | 35.5%     | 32.1% | 50%       |
| <b>Steel</b>     | 52.5%     | 46%   | 55%       | 48%   | 58%       | 50%   | 60%       | 52%   | 61.5%     | 54%   |           |

bus. = obligated business recycling target      ant. UK = anticipated UK packaging recycling if business target met

The need to increase the recycling of metal packaging by collecting more post consumer material is well recognised as the biggest barrier to recycling more of these materials. For example, in 1999 DETR cited this as the obstacle to increased reprocessing of the materials in 'A Way With Waste' (the draft waste strategy for England and Wales)<sup>5</sup>. However, with the regulatory pressure to collect metal packaging resting on the 'producers' rather than the local authorities it is up to the 'producers' to persuade the authorities to include the materials in their kerbside collections.

It is currently perceived amongst many authorities that collecting metal packaging will not to any great extent assist them in the achieving their recycling targets, and neither will it contribute to the diversion of biodegradable materials. Therefore, the benefits of collecting metal packaging together with the other recyclables materials must be identified in order to convince authorities, and their waste management contractors, to include it in their kerbside collections.

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<sup>5</sup> 'A Way With Waste' DETR Part 2 Chapter 6 para 6.39

## **2 Objectives**

The purpose of this report is to provide an objective evaluation of the impacts of including metal packaging (steel and aluminium, food and drink cans, and foil) in multi-material kerbside collections of household recyclables and to assess the additional costs and benefits for example in the materials value, enhanced recycling of other materials and overall efficiency, of doing so. The intention is to use the findings to enable informed dialogue between the producers, local authorities and defra, with the ultimate aim of promoting the inclusion of metal packaging in kerbside collections.

### 3 Methodology

The study has been undertaken in two stages.

Stage 1 comprised an evaluation of the impacts of including metals in multi-material kerbside collections, with a particular focus on the financial costs. The impact on the total costs as well as the unit costs (i.e. cost per tonne and cost per household) have been assessed and evaluated with regard to the likely overall efficiency of systems excluding/including metal packaging.

Stage 2 considers how the findings from Stage 1 can be presented to local authorities, their contractors, defra and other stakeholders to promote the inclusion of metal cans in multi-material kerbside collections.

A more detailed description of each of the stages is provided below.

#### Stage 1

Evaluation of the impacts of including metals in multi-material kerbside collections focuses on the **additional** financial costs in both collection and MRF sorting (where required post collection). The recently completed Kerbside Analysis Tool (KAT) has been used to examine the sensitivities to the costs of kerbside collection of the different factors influencing the operation, including overall recycling performance. A detailed description of KAT is in Appendix 1.

The impact of including metals in the collections will be influenced by the operating environment of the collection e.g. the housing density of the WCA, the quantity of waste put out for collection. Research has shown that there is a wide range in average cost to collect refuse from different WCAs and the same has been demonstrated for kerbside collections<sup>6</sup>. Furthermore, those with a mid-point average collection cost per tonne are not necessarily the same as those with a mid-point average cost per household. For this reason KAT has been designed to make projections that are local authority specific and the results for a single 'generic' authority would not provide a sound basis for this evaluation.

In order to provide a comprehensive understanding of the impacts on the costs of including metals an evaluation has been carried out for specific, but anonymous WCAs, whose refuse

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<sup>6</sup> Hummel J, The Financial Cost of Collecting Household Packaging to meet the targets set in the Packaging Directive 94/62/EC, PhD Thesis 2002

collections are at the low end, the high end and at the mid-point of the cost range, for both collection cost per tonne and per household. These can be described as 'reference WCAs'. The selection of the six reference WCAs is described in the next chapter.

### *Collection systems*

Following the identification of the six reference WCAs KAT was set up for these WCAs for 3 types of collection:

- **'kerbside sorted'** i.e. in which the materials are set out mixed by the householders but are sorted into the different categories by the collection crew and placed into separate compartments on the collection vehicle. The materials are sent directly to reprocessors after collection and further sorting at a Materials Recycling Facility (MRF) is not required;
- **'2-stream'** i.e. in which the materials are set out mixed by the householders and the collection crew separates them into 2 categories, in this case papers and containers, and places these into separate compartments on the collection vehicle. Sorting of the containers takes place after collection at a MRF; and
- **'co-mingled'** i.e. in which the materials are set out mixed by the householders and are simply placed into a single compartment of the collection vehicle by the crew. Sorting of all the materials takes place after collection at a MRF.

The cost of the collection will depend on the type of collection container the household is provided with and currently, for all the collections, a range of different containers are used by WCAs. It was agreed that for the purposes of this study the materials would be collected in boxes in the kerbside sorted and 2-stream collection and in wheeled bins or sacks for the co-mingled collection.

### *Materials targeted*

Currently, WCAs collect a range of different materials at kerbside, for example, some will not include glass preferring to collect this in bring banks, some will collect a wide range of papers while others will target specifically newspapers and magazines and some will collect plastic bottles while others believe this is impractical or too expensive. For the purposes of this study it was agreed that the same materials should be targeted in all three collection types as this would enable direct comparisons between the impacts of adding metals to the different collections. An initial evaluation was carried out to establish the extent to which the inclusion of other materials, in particular plastic bottles, influenced the cost differences of the collections with and without metals. This evaluation showed that the impact on the cost difference of the other materials was very small. Thus, the non-metal materials included in the collections are newspapers, magazines, other paper, glass bottles and jars, and plastic bottles.

### Scenarios

The cost impacts for four scenarios have been evaluated. The scenarios have been selected to address specific aspects of including metals in multi-material collections and these are summarised in Table 3.1.

**Table 3.1: Scenarios evaluated**

| Scenario | Description   | Reason for selection  |
|----------|---|---|
| 1        | Addition of metal cans and foil at current average levels of expected participation   | To evaluate the minimum impact of adding metals to a multi-material collection  |
| 2        | Increase the capture of all the targeted materials to the levels currently achieved for paper and glass   | In most multi-material collections paper and glass are the materials most householders separate out for collection even when other materials are targeted. There is evidence that targeting more materials will lead to an increase in the collection of all materials.   |
| 3        | Include all metal packaging in the collections, at the same high levels of capture as in Scenario 1.  | Typically only metal food and drinks cans are collected at present in kerbside collections, but these only represent 60% of metal packaging. Targeting all metal packaging will increase the quantity collected at the kerbside and further assist towards meeting the requirements of the Packaging Regulations. |
| 4        | Increase the capture of all targeted materials to very high levels that may be possible in the future as householder awareness for recycling increases. | There are very few multi-material collections currently operating that can claim to be collected all the targeted materials out of the waste stream. However, over time and for a number of reasons it may be possible to achieve higher rates of recycling.  |

The results of the projections for Scenarios 1, 2 and 3 are compared to the results for a base scenario (Base low) identical to Scenario 1 but excluding metal cans and foil. The results from Scenario 4 are compared to a second base scenario (Base high) identical to Scenario 4 but excluding all metal packaging.

### Assumptions

In carrying out the projections most of the assumptions embedded in KAT have been used. The exceptions to this are:

1. **Waste composition.** The composition used in KAT has been taken from that used for the Cabinet Office study 'Waste Not, Want Not'. However, experience of using this composition suggests that for some materials, notably paper, the composition is unrepresentative for most WCAs. As the composition is presented in percentages an inaccurate value for one material will impact on the values for all the other materials.

Therefore, a composition based on materials put onto the market has been developed and introduced into KAT. Details of how the composition has been derived are provided in Appendix 2.

2. **Rounding of collection infrastructure.** KAT automatically rounds up the number of vehicles and crew when it projects the standard collection costs. This is because it is primarily aimed at WCAs planning the implementation of kerbside collections. However, it was felt that this could distort the results of this analysis, with possibly no additional costs being identified to collect metals in some circumstances where existing vehicle capacity is sufficient to collect the materials while, in other circumstances a large increase in costs might result if KAT estimates an extra vehicle is required. Although these subtleties are important for an individual WCA examining the impact of including metals in its collections the study is aimed at a broader level where this level of detail can only lead to misleading observations.
  
3. **Householder participation.** The scenarios assume that there is currently room for large improvement in the number of households who participate (participation rate) and some improvement possible in the quantity of targeted materials participating households separate out (capture rates) (see Appendix 3 for more detail). i.e. participating householders either do or don't separate out the materials for collection, and if they decide to it is only occasionally that they place targeted materials with the refuse. The participation and capture rates assumed for each scenario are summarised in Table 3.2. The difference in these rates are responsible for the increases in the quantities of materials collected across the Scenarios.

**Table 3.2: Participation and capture rates assumed for the Scenarios**

|                       | Capture      | Participation |     |     | Capture | Participation |
|-----------------------|--------------|---------------|-----|-----|---------|---------------|
|                       | 1, 2 & 3     | 1             | 2   | 3   | 4       | 4             |
| N&P                   | 80%          | 55%           | 55% | 55% | 95%     | 90%           |
| other paper           | 80%          | 55%           | 55% | 55% | 95%     | 90%           |
| glass                 | 80%          | 55%           | 55% | 55% | 95%     | 90%           |
| plastic bottles       | 80%          | 30%           | 55% | 55% | 95%     | 90%           |
| Al cans               | 80%          | 25%           | 55% | 55% | 95%     | 90%           |
| Fe cans               | 80%          | 15%           | 55% | 55% | 95%     | 90%           |
| Al foil               | 80%          | 10%           | 55% | 55% | 95%     | 90%           |
| Other metal packaging | 80% (2 only) | -             | -   | 55% | 95%     | 90%           |

4. **Other operational variables.** The collections in Scenarios 1, 2 and 3 are assumed to operate fortnightly while those in Scenario 4 are assumed to operate weekly. It is likely that weekly collections will be necessary to encourage higher participation and to provide the capacity necessary for the additional materials that will be generated.

The set-out rate i.e. the number of participating householders placing materials out ready for collection on a particular collection opportunity, is assumed as 50% in Scenarios 1, 2 and 3 and 80% in Scenario 4.

5. **Sorting/processing at a Materials Recycling Facility (MRF).** As the analysis is of relative costs/benefits i.e. only additional costs are reported, processing costs for metals only have been included, but this is an average for the mix of materials entering the MRF:

- Kerbside sorted £20/T
- 2-stream £40/T
- Co-mingled £55/T

6. **Materials revenues.** The following revenues have been included for the metals. These represent current average values for materials delivered to a regional centre.

- Steel cans £60/T
- Aluminium cans £700/T
- Aluminium foil £425/T

7. **Transfer and disposal costs.** The following unit costs have been included for transfer of all materials and for refuse disposal.

- Transfer £5/T
- Landfill disposal £25/T + £15/T landfill tax

## Stage 2

Stage 2 considers how the findings from Stage 1 can be presented to local authorities, their contractors, defra and other stakeholders to promote the inclusion of metal cans in multi-material kerbside collections.

Using the conclusions from Stage 1 messages have been developed to convey the key findings from the study relevant to the different stakeholders. This was carried out during a

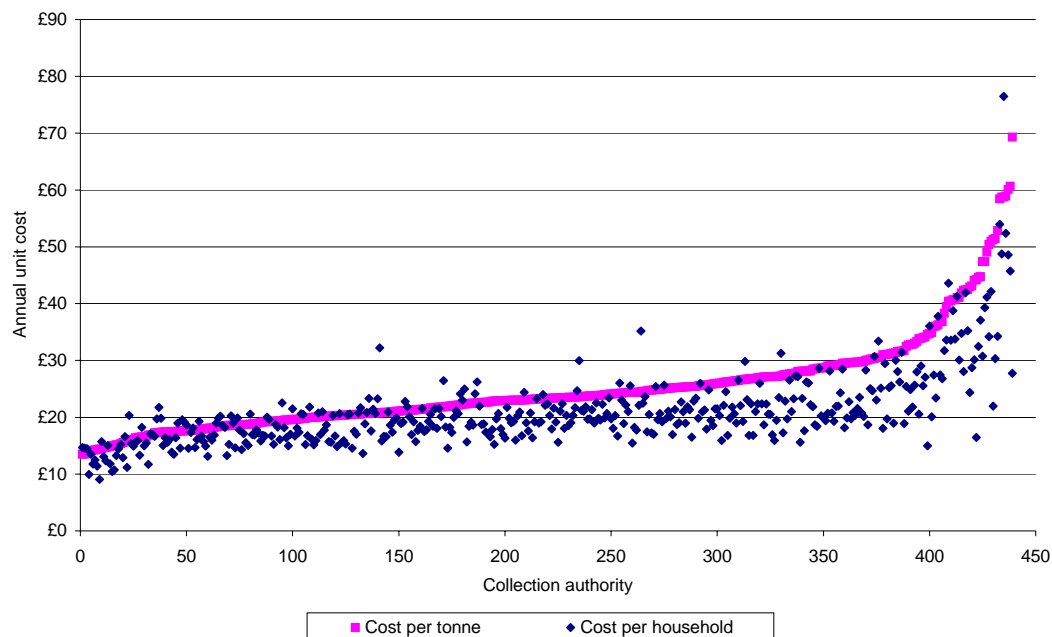
workshop with representatives from DTi, Corus, Alcan and Alupro and further consultation with a wider group of stakeholders by the workshop participants.

## 4 Selection of reference WCAs

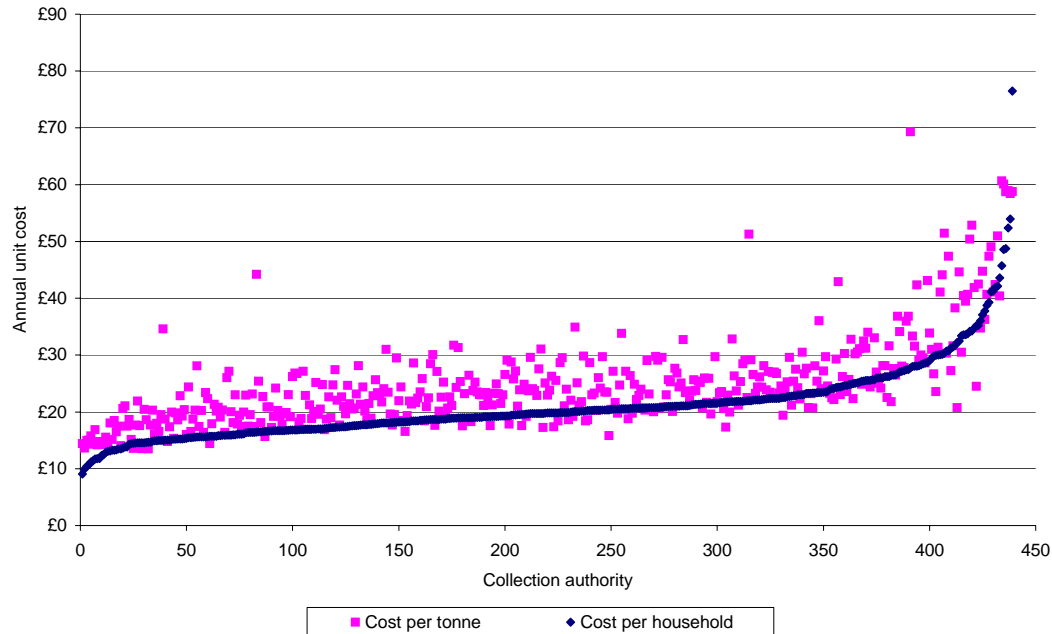
The elements contributing to collection costs are well defined and include the capital cost of collection vehicles and bins, the operating costs of labour, fuel, maintenance, insurance, and overhead costs. KAT uses the unit costs for each of these elements to calculate the total cost of a specific collection system. However, first KAT must project the collection infrastructure requirements for each system. This is determined by the type and quantity of materials collected and the time taken to serve each household, and these in turn will be influenced by socio demographic factors, such as the type and density of housing, and the willingness of householders to participate in the collection. Some of these factors are independent of the type of collection, for example the type and density of housing, while other factors vary according to the collection type. KAT uses data on the existing **refuse** collection infrastructure to take account of the factors that are dependant on the local operating environment to project the infrastructure required to serve a particular collection authority.

Using data reported to the Audit Commission on the unit costs of refuse collection in England it is clear that few authorities have the same unit costs. Figure 4.1 presents the costs sorted with increasing cost per tonne and Figure 4.2 presents the same data but sorted by increasing cost per household.

**Figure 4.1: Projected standard refuse collection costs for UK collection authorities – sorted by increasing cost per tonne collected**



**Figure 4.2: Projected standard refuse collection costs for UK collection authorities – sorted by increasing cost per household**

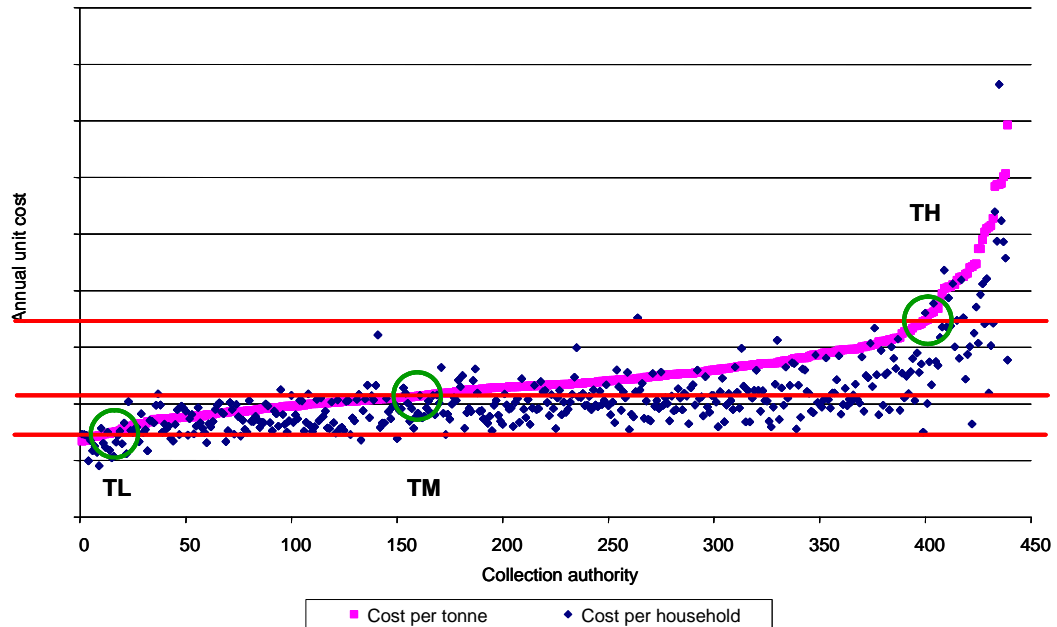


The scatters of the associated unit cost per household in Figure 4.1 and cost per tonne in Figure 4.2 show that a low cost per tonne is not necessarily correlated to a low cost per household. This is because the quantity of waste generated by householders is not constant and the same tonnage of refuse collected from a few households will have a different (generally lower) cost than that collected from a large number of households.

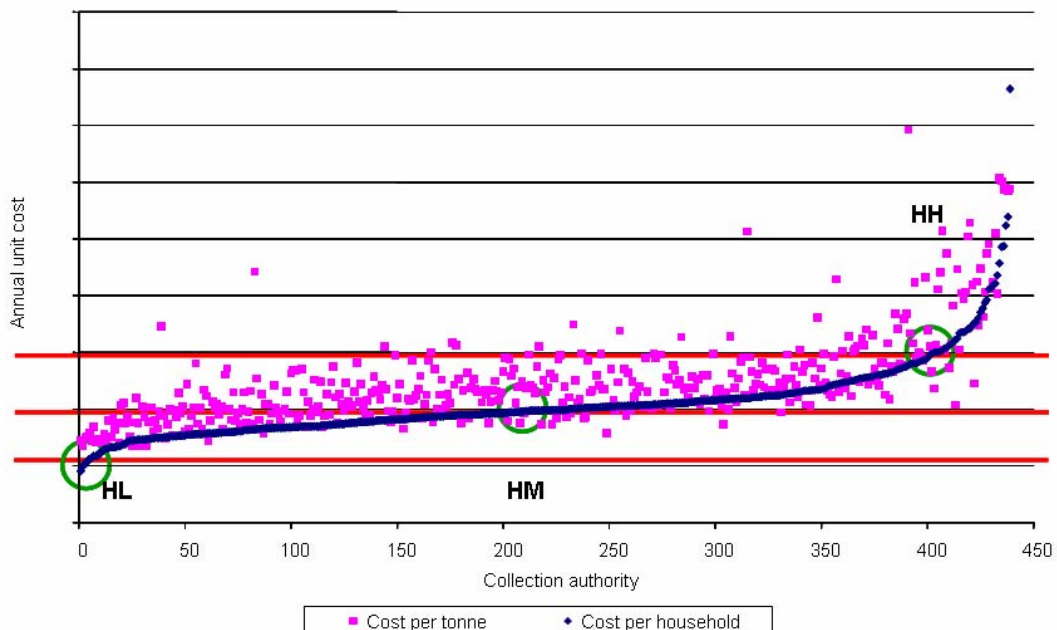
A low cost per tonne is generally considered to be an indication of a cost effective collection. However, this can be misleading. A collection authority that experiences a high cost per tonne for refuse collection could be one in which waste minimisation or diversion practices have successfully been implemented so that small amounts of waste are collected per household. It could equally be one that operates inefficient collection rounds. The unit cost per household can also be misleading, particularly for collections of recyclables. The cost per household of an efficient system capturing a large quantity of recyclables could have a similar cost per household as an identical system that only achieves a high participation of householders without capturing many of the recyclable materials. Therefore, only by considering costs per household *as well as* costs per tonne, and the total cost for the collection system can a true impression of the cost efficiency and impact of the collection be gained.

For the purposes of this study kerbside collection costs will be projected for six authorities. The first 3 WCAs have been selected to represent WCAs with high, medium and low refuse collection costs with respect to cost per tonne. The next 3 WCAs have been selected to represent WCAs with high, medium and low refuse collection costs with respect to cost per household. This is illustrated in Figures 4.3.and 4.4.

**Figure 4.3: Selection of WCAs with respect to cost per tonne**



**Figure 4.4: Selection of WCAs with respect to cost per household**



The actual identity of the WCAs has been kept confidential and they are simply referred to as:

- TH, TM and TL for those selected with respect to cost per tonne (H = high, M = medium and L = low); and
- HH, HM and HL for those selected with respect to cost per household.

When interpreting the results of the analysis it is important to appreciate that the unit costs for these WCAs are not intended to represent an absolute range of costs or overall average costs. However, by using these WCAs it is possible to get an appreciation of the possible difference in costs and impacts of including metals in different types of authority.

The base data required by KAT for these reference authorities is presented in Table 4.1 together with the **KAT projected standard** refuse collection costs. Note that these are projected standard costs and while they are representative of the actual cost they are not necessarily as the contract price the authorities are paying for the refuse collection service. However, they are comparable to the KAT standard costs that will be projected for kerbside collections.

**Table 4.1: Base data for the reference WCAs**

| WCA | Annual tonnes collected | Number of households | Number of vehicles | Refuse collection type | Projected refuse collection cost £/Hhld | Projected refuse collection cost £/T |
|-----|-------------------------|----------------------|--------------------|------------------------|---|--------------------------------------|
| HL  | 55,563                  | 78,400               | 8                  | Sack                   | 17                                      | 24                                   |
| HM  | 46,186                  | 50,000               | 9                  | Wheeled bin            | 25                                      | 27                                   |
| HH  | 45,258                  | 39,500               | 12                 | Wheeled bin            | 39                                      | 34                                   |
| TL  | 57,763                  | 60,620               | 8                  | Wheeled bin            | 19                                      | 20                                   |
| TM  | 41,214                  | 41,000               | 8                  | Wheeled bin            | 27                                      | 27                                   |
| TH  | 29,153                  | 39,051               | 10                 | Sack                   | 40                                      | 54                                   |

## 5 Recycling and packaging recycling rates

The quantity of material collected at the kerbside for recycling can be represented as a percentage of the total household collected waste. For the purposes of this study this is defined as the **kerbside recycling rate**. This differs from the recycling rate as defined for the Best Value Performance Indicators as it only considers kerbside collected materials and not those collected from other sources, for example bring collections or at Civic Amenity (CA) sites. The kerbside recycling rate can be calculated using the relationship:

$$\begin{array}{ccccccc}
 \text{Total waste} & & \text{Materials} & & \text{Proportion of} & & \text{Participation of} & & \text{Capture}^7 \text{ by the} & & \text{Quantity} \\
 \text{arising} & \times & \text{targeted for} & \times & \text{households} & \times & \text{of the served} & \times & \text{served} & = & \text{collected for} \\
 & & \text{collection} & & \text{served by the} & & \text{householders} & & \text{householders} & & \text{recycling} \\
 & & & & \text{collection} & & & & & & \\
 & & & & & & \textit{Participation} & & \textit{Capture rate} & & \textit{Kerbside} \\
 & & & & & & \textit{rate} & & & & \textit{recycling} \\
 & & & & & & & & & & \textit{rate}
 \end{array}$$

Separate recycling targets exist for the collection and recycling of packaging materials. It is possible to extrapolate the quantity of metal packaging that would be collected for recycling in the UK if every WCA targeted the materials as described in the scenarios and achieved the assumed level of performance.

The quantities of materials targeted and recycled in each scenario are presented in Table 5.1.

**Table 5.1: Kerbside and packaging recycling rates for each scenario**

|             | <b>Kerbside recycling rate (all targeted materials)</b> | <b>Tonnes of metal packaging collected UK wide (000'sT)</b> | <b>Percentage of household metal packaging recycled</b> | <b>Percentage of total metal packaging recycled</b> |
|-------------|---|---|---|---|
| Base (low)  | 13.5%   | 0   | 0%  | 0%  |
| Scenario 1  | 13.7%   | 49  | 8%  | 6%  |
| Scenario 2  | 14.3%   | 159   | 27%   | 19%   |
| Scenario 3  | 14.7%   | 252   | 43%   | 30%   |
| Base (high) | 27.1%   | 0   | 0%  | 0%  |
| Scenario 4  | 29.5%   | 499   | 85%   | 60%   |

<sup>7</sup> Capture is also known as Recognition as defined in the DETR Monitoring the Performance of Recycling and Composting Programmes (1999)

Comparing the kerbside recycling rate for the Base scenarios with the scenarios in which metals are collected demonstrates the small quantity of metals arising in the household waste stream relative to the other materials. This is important because it illustrates why some WCAs may not be interested in targeting metals as their collection will not assist the WCA in achieving their weight based recycling performance targets. As metals do not need to be diverted from landfill to meet the objectives of the Landfill Directive there is no legislative or policy driver encouraging WCAs to collect the materials. It is only to meet the requirements of the Packaging Regulations that metals need to be collected from household waste and the obligations under this legislation fall onto the metal producers and not the WCAs.

## 6 Results of the analysis

The objective of the study is to evaluate the impact on the costs of including metals in multi-material collections. Therefore, the results of the analyses will be presented as cost differences between Scenarios 1 to 4 and their Base scenario costs. Clearly, even these differences are dependant on the accounting practices employed (e.g. in the case of KAT simple straight line depreciation has been used for capital items) and in practice would also be influenced on the financing methods for the collections, for example if equipment is leased rather than purchased. However, as there is consistency in the methods used to project the costs for the Base scenarios as well as the scenarios with metals, it is likely that the resulting cost differences represent the right order of magnitude of the cost differences if not the precise difference.

Separate analyses of **gross collection** costs (i.e. without any sales revenues considered), **net collection and MRF processing costs** and **net total system costs** will be presented.

Unfortunately it is impossible to present the costs broken down between WCAs and Waste Disposal Authorities (WDAs) because the receipt of sales revenues and the distribution of recycling credits is inconsistent, often depending on local agreements. Furthermore, the MRF is sometimes operated by the WCA and sometimes the WDA. However, the analyses can broadly be considered to represent the following:

- **gross collection cost:** this analysis represents the **worst** case scenario for a WCA that implements a multi-material kerbside collection but receives no sales revenues or recycling credits for the materials.
- **net collection and MRF processing costs:** this analysis presents the net cost to the WCA and WDA of the collection and sorting of kerbside recyclables. Revenues from the metals sales are taken into account (less any transport costs to reprocessors). Recycling credits are not included as these represent a payment from the WDA to the WCA giving a net zero result. This analysis represents a **realistic minimum** of possible benefits for the WCA and WDA combined.
- **net total system costs:** this analysis represents the **best** case scenario for the WCA and WDA combined. It takes into account possible savings in refuse collection due to the reduced quantities being collected and also the avoided landfill costs.

Expected trends in these analyses are described below together with a description of how to interpret the results.

Detailed tables of the results are presented in the Appendices for all the reference WCAs. In the main part of the report only the reference WCAs with the greatest and least benefit will be presented for the sake of clarity. However, it is important to remember that these **do not** represent an absolute maximum and minimum range that might be expected across **all** WCAs. However, due to the method used to select the reference WCAs the ranges represent 'upper' and 'lower' order of magnitudes of possible benefits.

## **Trends in gross kerbside collection costs**

There are two causes of a possible increase in collection cost:

1. Additional time required to collect the materials will reduce the number of households each vehicle and crew can collect from during the day; and
2. Additional weight/volume of materials will reduce the number of households it is possible to serve before the vehicle requires unloading.

For kerbside sorted collections both factors are likely to be important but for collections in which the metals are collected co-mingled with the other containers the additional collection time required is much less important than the additional vehicle capacity required.

The time it takes to collect the materials in a kerbside sorted collections depends on the configuration of the collection vehicle, quantity of each material present, the material properties and how the householder has placed the materials in the container, e.g. are they layered or segregated using carrier bags. Observation of different kerbside collections reveals that crews develop their own practises (which they consider enable them to load each box as quickly as possible!); however, there is some consistency in their approach. For example, paper is usually loaded first as it represents the largest quantity of material and once it has been removed separation of the other materials is much easier. The sorting of the remaining material is dependant on the number of each item present. Most commonly the glass is sorted by picking out each individual item and placing them into the correct colour specific compartment in the vehicle. Then the remaining cans and/or plastic bottles are simply tipped into their compartment. If this approach is adopted the additional loading time for cans is minimised as it is already accounted for with the plastic bottles.

The gross kerbside collection cost will increase as more material is collected because additional collection capacity is required. Although, in practice, the cost increases will be in steps corresponding to the size of the vehicles, for the purpose of this analysis KAT has been adjusted to enable the costs for partial vehicles to be included to smooth the increase. As the gross collection cost increases the *cost per household* will also increase, because the number of households served will remain the same. However, the *cost per tonne* may either increase

or decrease depending on the relative change in collection cost to the increase in the quantity of material collected.

### **Net collection and MRF processing costs**

The extent of MRF sorting and processing will depend on the mix of materials entering the MRF (a function of how they have been collected) and the specification required by the reprocessors. For this study it has been assumed that by the time the materials leave the MRF they will be of the same specification regardless of the collection method. This enables a direct comparison between the kerbside systems.

Clearly the MRF processing will be an additional cost; however, these costs, together with some or all of the collection costs may be off-set by the revenues received from the sale of the recyclables.

If the additional costs are not fully off-set by the sales revenues the results under this part of the analysis will show an increase in the total costs reflected in an increase in the cost per household. However, even if there is an increase in the total costs there may be a reduction in the average cost per tonne if the relative increase in costs is smaller than the relative increase in tonnes collected.

In interpreting the results for this part of the analysis it must be remembered that although additional quantities of non-metals are collected in Scenarios 2 and 3, and the additional collection and MRF processing costs are included for these materials, sales revenues have only been included for the metals. This has been done on purpose so the results are not distorted favourably in favour of including metals due to the benefits of collecting the other materials. However, this treatment will have an adverse effect on the magnitude of any benefits of collecting metals for these scenarios.

The base scenarios only differs from Scenarios 1 and 4 in respect to the inclusion of metal so for these scenarios, the calculated results reflect the only net costs and benefits of including metals.

### **Net total system costs**

In principle, as more recyclables are collected separately it should mean that less refuse is collected and therefore there should be a reduction in the refuse collection costs. The potential to reduce the refuse collection costs, however, will depend on the capacity of the refuse collection vehicles and their efficiency. It also depends on the ability to reorganise the

collection rounds if necessary and finally, if the avoided costs can be recovered from the collection contractor.

The potential to save on refuse disposal costs is more likely than saving on collection costs because, in principle, the disposal costs are directly linked to the tonnes sent for disposal. In practice, many disposal contracts specify minimum guaranteed tonnages and the WDA is charged for the disposal of this quantity even if it does not physically send the minimum quantity to disposal. In these cases the only saving would be on the landfill tax.

Because of the issues surrounding the actual ability for WCAs and WDAs to realise all these savings although they have been quantified for the analysis they must be interpreted very much as being the best case. However, in evaluating the impact of implementing kerbside collections for recyclables it is reasonable to consider the benefits to disposal costs because even if they are not realisable in the short term, in the longer term as new contracts are negotiated, collection rounds are reconfigured and new vehicles purchased, it should be possible to realise the savings. Where savings are identified to the net collection and MRF processing costs for recyclables there is the possibility that these could be further enhanced by refuse collection savings and disposal.

Due to the complex number of factors by this stage in the analysis it is impossible to predict if there is likely to be an overall increase or decrease in the total system costs. If the total net costs increase this will be reflected in the results by an increase in cost per household and, unlike in the other analyses, an increase in the cost per tonne. This is because the number of households and the number of tonnes in the base scenarios and in the scenarios including metals are the same.

## 7 Kerbside sorted collections

### Gross kerbside collection cost

Kerbside sorted collections require all the materials to be sorted at the kerbside so the addition of an extra material is likely to result in an increase in collection cost. The change in the multi-material kerbside collection costs as a result of including metals in the kerbside sorted collections are presented in Table 6.1.

**Table 6.1: Change in kerbside sorted collection costs with the addition of metals**

|            | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -0.08            | 2.68          | 0.15             | 0.47          |
| Scenario 2 | -2.38            | 0.73          | 0.38             | 0.56          |
| Scenario 3 | -5.16            | -0.38         | 0.38             | 0.88          |
| Scenario 4 | -4.21            | 0.05          | 1.21             | 1.49          |

As expected, the results for the cost per household show that the total costs have indeed increased for all the reference authorities.

The cost per tonne results show that for some of the reference authorities the addition of the metals has reduced the overall cost per tonne. i.e. the collection has become more efficient. For some other authorities, the collection has become less efficient.

The reason for the difference in the efficiencies is associated to the number of loads the vehicles must complete to collect all the materials and the 'free' capacity available on the vehicle before the metals are added. Those reference authorities in which the cost per tonne is less once metals are included can accommodate the additional materials on the vehicle without increasing the number of loads. The reference WCAs for which the cost per tonne is greater due to the addition of the metals is because the vehicle has to tip more often. As the vehicle loses 'collection time' when it has to tip the number of households each vehicle can serve during the day decreases and the collection thus becomes less efficient.

Overall, the quantity of materials collected increases between Scenario 1 to 3 and this is associated with a general trend of an increasing benefit. This demonstrates that the collection generally becomes more efficient as more material is collected as long as the number of loads does not increase as a result. Scenario 4 does not immediately appear

follow this trend, in that the range of costs lies between those of Scenarios 2 and 3. However, the base line is different in Scenario 4 and the collections are assumed as operating weekly rather than fortnightly. Weekly collections are likely to incur higher costs than fortnightly collections and thus it is not surprising that the cost benefits of Scenario 4 lie between those of Scenario 2 and 3. The results for Scenario 4 support the general conclusion that as the quantity of materials collected increases the efficiency of the collection will decrease.

### Net collection and MRF processing cost

The impact on the net collection and MRF processing costs as a result of adding metals to the kerbside sorted collection are presented in Table 6.2.

**Table 6.2: Change in net collection and MRF processing cost after the addition of metals to kerbside sorted collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -2.2%            | 1.2%          | -3.18            | -0.36         | -0.25            | 0.10          |
| Scenario 2 | -7.6%            | -3.6%         | -10.15           | -6.98         | -0.84            | -0.29         |
| Scenario 3 | -11.6%           | -4.3%         | -14.96           | -10.09        | -1.18            | -0.45         |
| Scenario 4 | -6.3%            | -3.0%         | -13.72           | -9.37         | -1.83            | -0.67         |

The results in Table 6.3 show that the benefits of including metals in the kerbside sorted collections outweigh the costs for all the reference authorities for all scenarios except for some reference WCAs for Scenario 1. In Scenario 1, the benefits outweigh the costs for three of the reference authorities but for the other three the total costs are higher. As soon as higher levels are achieved (moving from Scenario 1 to Scenario 2) the benefits outweigh the additional costs. This observation further demonstrates the financial benefits of collecting as much of the targeted materials as possible.

For all of the reference WCAs the average cost per tonne is lower for all the scenarios than in the base scenarios that do not include metals. This reflects an overall improved collection efficiency even in those WCAs in which the overall costs have increased.

As the quantities of metals recycled increases the potential overall benefits can become significant. In the reference WCAs the benefits of targeting all metals and achieving high but achievable household participation, can be equivalent to more than £1 per household. For a WCA comprising 50,000 households the benefits could be significant and could contribute to

the promotion and communications required to achieve these higher rates of household participation and capture (55% for both rates in Scenario 3).

### Net total system costs

The further benefits to the total system costs of a kerbside sorted collection together with the refuse collection and disposal, if savings in refuse collection and disposal can be realised, are presented in Table 6.3.

**Table 6.3: Change in net total system costs after the addition of metals to kerbside sorted collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -0.5%            | 0.0%          | -0.35            | 0.03          | -0.36            | 0.02          |
| Scenario 2 | -1.5%            | -0.9%         | -1.09            | -0.76         | -1.24            | -0.54         |
| Scenario 3 | -2.3%            | -1.3%         | -1.59            | -1.04         | -1.82            | -0.89         |
| Scenario 4 | -3.4%            | -1.8%         | -3.13            | -2.11         | -3.59            | -1.58         |

These results confirm that the revenues from the sale of the collected metals together with the savings in refuse collection and disposal further reduce the overall system costs. The potential for reducing the overall system costs increases as more metal is collected. For Scenario 1 there is an increase in cost for two of the reference WCAs but for all other WCAs and for all the reference WCAs in the other Scenarios, there is an overall benefit. The results show that for some authorities the possible reduction in total system cost is substantial even at relatively low recovery of metals.

Although the potential benefits may not be considered enormous and their size will clearly depend on the WCA, the results show that the addition of metals should, at worst, have no additional cost and could potentially offer some savings even at low recovery of metals.

### Conclusions for kerbside sorted collections

#### *Gross kerbside collection cost*

- the collection costs increase as the quantity of material collected increases;
- the collection efficiency increases as the quantity of material collected increases;

- the extent of the additional cost and improved efficiency depends if the vehicles have sufficient capacity to collect the metals without having to complete additional loads; and
- the benefits are greater for fortnightly collections rather than weekly collections but this must be weighed against the benefits associated with collecting larger quantities of material.

*Net collection and MRF processing cost*

- the sales values of the metals more than off-set the additional costs except for some WCAs with low recovery rates;
- the benefits in improved efficiency of collecting metals can be large for some WCAs at medium to high recovery rates; and
- the reduced efficiency of weekly collections compared to fortnightly collections is more than off-set if high rates of material recovery are achieved.

*Net total system costs*

- collecting metals can reduce the overall refuse and recycling collection and disposal cost even at low levels of metals recovery; and
- at high levels of metals recovery the cost benefit on the overall system can be considerable.

## 8 Single stream collections

### Gross kerbside collection cost

In single stream collections all the materials are collected together, either contained in a sack or a wheeled bin. The inclusion of metals in these collections is therefore likely to have little effect on the collection time of the materials so the most significant factor will be the need for additional vehicle capacity.

The change in the multi-material kerbside collection costs as a result of including metals in the co-mingled single stream collections are presented in Table 6.4 for sack collections and Table 6.5 for wheeled bin collections.

**Table 6.4: Change in co-mingled kerbside collection costs with the addition of metals to single stream sack collections**

|            | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -1.38            | -0.19         | 0.00             | 0.04          |
| Scenario 2 | -4.50            | -0.62         | 0.00             | 0.13          |
| Scenario 3 | -6.89            | -0.94         | 0.00             | 0.18          |
| Scenario 4 | -6.18            | -0.46         | 0.00             | 0.38          |

**Table 6.5: Change in co-mingled kerbside collection costs with the addition of metals to single stream wheeled bin collections**

|            | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -1.87            | -0.39         | 0.00             | 0.07          |
| Scenario 2 | -6.11            | -1.40         | 0.00             | 0.13          |
| Scenario 3 | -9.35            | -1.90         | 0.00             | 0.21          |
| Scenario 4 | -9.19            | -3.43         | 0.00             | 0.00          |

The results show that for some of the reference WCAs the collection can be carried out at no additional total collection cost. This is because these WCAs have sufficient capacity in the collection vehicles for the additional materials including the metals and do not have to unload more frequently. In other reference WCAs there is some additional cost because there is insufficient spare capacity in the vehicles.

The inclusion of metals has a positive effect on the collection efficiency regardless of the type of collection container and the quantity collected, although the benefits increase as the quantity of material collected increases. As in kerbside sorted collections, the benefits are greater for the fortnightly collections although these must be weighed against the increased quantities of materials it is more likely to be able to collect in the more frequent collections.

The results for the wheeled bin collections in Scenario 4 suggest that none of the reference authorities experience as increase in collection costs if metals are included in the collections. This could be because the weekly collections, by their more frequent nature, are less efficient with respect to the capacity utilisation than the fortnightly collections and thus the metals can easily be collected. A similar result might be expected for the co-mingled sack collection, and for four of the reference WCAs this is the case. These results demonstrate the danger of drawing too wide conclusions from the results for the reference WCAs in which the combination of characteristics in the base data and the scenarios selected can give results that are not reflected in other WCAs.

### Net collection and MRF processing costs

The impact on the net collection and MRF processing costs as a result of adding metals to the kerbside single stream collections are presented in Table 6.6 for kerbside sack collections and Table 6.7 for kerbside wheeled bin collections.

**Table 6.6: Change in net collection and processing costs after the addition of metals to kerbside single stream sack collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -8.0%            | -2.6%         | -3.96            | -2.71         | -0.38            | -0.20         |
| Scenario 2 | -18.4%           | -6.0%         | -10.57           | -6.49         | -0.90            | -0.43         |
| Scenario 3 | -20.9%           | -7.1%         | -14.05           | -7.81         | -1.05            | -0.47         |
| Scenario 4 | -25.7%           | -7.4%         | -13.12           | -7.11         | -2.05            | -0.88         |

**Table 6.7: Change in net collection and processing costs after the addition of metals to kerbside single stream wheeled bin collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -4.9%            | -1.9%         | -4.48            | -2.92         | -0.38            | -0.16         |
| Scenario 2 | -10.0%           | -4.5%         | -12.26           | -7.31         | -0.90            | -0.42         |
| Scenario 3 | -10.6%           | -5.3%         | -16.64           | -8.81         | -1.05            | -0.52         |
| Scenario 4 | -12.6%           | -5.1%         | -16.28           | -10.23        | -2.05            | -1.27         |

The results in Tables 6.6 and 6.7 show that the benefits of including metals in the kerbside co-mingled collections outweigh the costs for all the reference authorities for all scenarios including those with low recycling rates. The benefits for sack collections are similar to those for wheeled bin collections.

As the quantities of metals and other materials recycled increases the potential overall benefits can become considerable.

As the benefits are heavily dependant on the MRF processing costs, and these can vary widely according to level of technology and annual throughput, a sensitivity analysis has been carried out to evaluate how high MRF processing costs would have to be before no overall cost benefit is realised. The results are summarised in Table 6.8. The MRF processing cost used in the projections is £55 per tonne entering (an average for all material types).

**Table 6.8: Maximum MRF processing cost per tonne for zero net benefit of adding metals**

|                   | WCAs with greatest benefit |             | WCAs with least benefit |             |
|-------------------|----------------------------|-------------|-------------------------|-------------|
|                   | Sack                       | Wheeled bin | Sack                    | Wheeled bin |
| <b>Scenario 1</b> | £190                       | £190        | £170                    | £145        |
| <b>Scenario 2</b> | £141                       | £141        | £120                    | £117        |
| <b>Scenario 3</b> | £121                       | £121        | £100                    | £106        |
| <b>Scenario 4</b> | £121                       | £121        | £100                    | £121        |

The results in Table 6.8 show that MRF processing costs would have to be higher than those currently experienced to reduce the benefit of adding metals to zero in the reference WCAs.

## Net total system costs

The further benefits to the total system costs of a kerbside single stream collection together with the refuse collection and disposal, if savings in refuse collection and disposal can be realised, are presented in Tables 6.9 and 6.10.

**Table 6.9: Change in net total system costs after the addition of metals to kerbside single stream sack collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -0.7%            | -0.4%         | -0.44            | -0.39         | -0.50            | -0.27         |
| Scenario 2 | -1.8%            | -1.1%         | -1.15            | -0.97         | -1.31            | -0.69         |
| Scenario 3 | -2.3%            | -1.4%         | -1.49            | -1.24         | -1.71            | -0.88         |
| Scenario 4 | -7.7%            | -2.7%         | -5.47            | -2.69         | -5.05            | -2.13         |

**Table 6.10: Change in net total system costs after the addition of metals to kerbside single stream wheeled bin collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -0.7%            | -0.4%         | -0.44            | -0.33         | -0.50            | -0.24         |
| Scenario 2 | -1.7%            | -1.1%         | -1.15            | -0.96         | -1.31            | -0.68         |
| Scenario 3 | -2.1%            | -1.4%         | -1.49            | -1.28         | -1.71            | -0.93         |
| Scenario 4 | -4.8%            | -2.4%         | -3.75            | -2.90         | -4.30            | -2.17         |

These results confirm that the revenues from the sale of the collected metals together with the savings in refuse collection and disposal further reduce the overall system costs. The potential for reducing the overall system costs increases as more metal is collected. The results show that for some authorities the possible reduction in total system cost is substantial even with a medium recovery of metals.

Although the potential benefits may not be considered enormous and their size will clearly depend on the WCA, the results show that the addition of metals should, at worst, have no additional cost and could potentially offer some savings even at low recovery of metals.

## Conclusions for kerbside single stream collections

### *Gross kerbside collection cost*

- the collection costs do not always increase as the quantity of material collected increases;
- the collection efficiency increases as the quantity of material collected increases;
- the extent of the additional cost and improved efficiency depends if the vehicles have sufficient capacity to collect the metals without having to complete additional loads and this must be considered WCA by WCA; and
- the benefits are greater for fortnightly collections rather than weekly collections but this must be weighed against the benefits associated with collecting larger quantities of material.

### *Net collection and MRF processing cost*

- the sales values of the metals more than off-set the additional costs even at low recovery rates;
- the benefits in improved efficiency can be large for some WCAs at medium to high recovery rates;
- MRF processing costs would need to more than double for no benefits to be observed at higher recovery levels, and could almost quadruple for scenarios with lower metals recovery; and
- the reduced efficiency of weekly collections compared to fortnightly collections is not necessarily compensated by the higher rates of material recovery.

### *Net total system costs*

- collecting metals can reduce the overall refuse and recycling collection and disposal cost even at low levels of metals recovery; and
- at high levels of metals recovery the cost benefit on the overall system can be considerable.

## 9 2-stream collections

### Gross kerbside collection cost

In 2-stream collections the metals are collected together with the other containers. For the purposes of this analysis it has been assumed that the materials will be collected together in a box. The inclusion of metals in these collections is therefore likely to have a negligible effect on the collection time of the materials so the most significant factor will be the need for additional vehicle capacity. As most vehicles with a 2 way split have a fixed partition the collections will be more sensitive to the collection of additional materials than single stream collection vehicles.

The change in the multi-material kerbside collection costs as a result of including metals in the 2-stream collections are presented in Table 6.11.

**Table 6.11: Change in 2-stream kerbside collection costs with the addition of metals**

|            | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -1.40            | -0.54         | 0.00             | 0.00          |
| Scenario 2 | -4.55            | -1.36         | 0.00             | 0.26          |
| Scenario 3 | -6.96            | -2.33         | 0.00             | 0.26          |
| Scenario 4 | -7.14            | 5.10          | 0.00             | 3.04          |

The results show that for some reference WCAs there is no increase in collection cost but for others there is an increase in cost. This is because these authorities do not have the spare capacity available on the vehicles so they need to tip more often, thereby reducing the collection time available and the number of households each vehicle can collect from. As already mentioned for the single stream wheeled bin collections, the combination of local factors comprised in the base data generate this result. This further illustrates the dangers of interpreting too widely the results from this analysis.

The inclusion of metals has a positive effect on the collection efficiency for all the lower recovery scenarios. The results for Scenario 4 show that efficiencies can be realised but not in all the reference WCAs. This result is also linked to the spare capacity on the collection vehicles and is WCA specific.

## Net collection and MRF processing costs

The impact on the net collection and MRF processing costs as a result of adding metals to the kerbside 2-stream collections are presented in Table 6.12.

**Table 6.12: Change in net collection and processing costs after the addition of metals to kerbside 2-stream collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -5.8%            | -2.6%         | -4.30            | -3.35         | -0.41            | -0.25         |
| Scenario 2 | -13.3%           | -6.3%         | -11.65           | -8.15         | -1.01            | -0.62         |
| Scenario 3 | -16.5%           | -7.7%         | -15.71           | -10.61        | -1.23            | -0.76         |
| Scenario 4 | -8.5%            | 5.1%          | -15.69           | -2.22         | -2.39            | 0.94          |

For most of the reference WCAs the additional collection and MRF processing costs are more than off-set by the sale revenues of the metals. The sales revenues, however, are insufficient to off-set the much higher collection costs for two of the reference WCAs (see above analysis). However, the collection efficiency is better even in these reference WCAs than in the base scenarios without metals.

As the quantities of metals and other materials recycled increases the potential overall benefits can become considerable.

As the benefits are heavily dependant on the MRF processing costs, and these can vary widely according to level of technology and annual throughput, a sensitivity analysis has been carried out to evaluate how high MRF processing costs would have to be before no overall cost benefit is realised. The results are summarised in Table 6.13. The MRF processing cost used in the projections is £40 per tonne entering (an average for all material types).

**Table 6.13: Maximum MRF processing cost per tonne for zero net benefit of adding metals**

|                   | WCAs with greatest benefit | WCAs with least benefit |
|-------------------|----------------------------|-------------------------|
| <b>Scenario 1</b> | 190                        | 190                     |
| <b>Scenario 2</b> | 140                        | 105                     |
| <b>Scenario 3</b> | 120                        | 120                     |
| <b>Scenario 4</b> | 120                        | -                       |

The results in Table 6.13 show that MRF processing costs would have to be higher than those usually incurred to reduce the benefit of adding metals to zero in the reference WCAs.

### Net total system costs

The further benefits to the total system costs of a kerbside single stream collection together with the refuse collection and disposal, if savings in refuse collection and disposal can be realised, are presented in Table 6.14.

**Table 6.14: Change in net total system costs after the addition of metals to kerbside 2-stream collections**

|            | % of total cost  |               | £/T              |               | £/hhld           |               |
|------------|------------------|---------------|------------------|---------------|------------------|---------------|
|            | Greatest benefit | Least benefit | Greatest benefit | Least benefit | Greatest benefit | Least benefit |
| Scenario 1 | -0.6%            | -0.4%         | -0.56            | -0.56         | -0.64            | -0.40         |
| Scenario 2 | -1.6%            | -1.1%         | -1.57            | -1.31         | -1.80            | -1.11         |
| Scenario 3 | -2.2%            | -1.5%         | -2.16            | -1.91         | -2.48            | -1.53         |
| Scenario 4 | -4.5%            | -1.1%         | -5.35            | -1.18         | -6.13            | -1.12         |

These results confirm that the revenues from the sale of the collected metals together with the savings in refuse collection and disposal further reduce the overall system costs. They are sufficient to fully off-set the high additional collection costs that result in some of the reference WCAs. The potential for reducing the overall system costs increases as more metal is collected. The results show that for some authorities the possible reduction in total system cost is substantial even with a medium recovery of metals.

Although the potential benefits may not be considered enormous and their size will clearly depend on the WCA, the results show that the addition of metals should, at worst, have no additional cost and could potentially offer some savings even at low recovery of metals.

### Conclusions for kerbside 2-stream collections

#### *Gross kerbside collection cost*

- the collection costs do not always increase as the quantity of material collected increases;
- the collection efficiency increases as the quantity of material collected increases;

- the extent of the additional cost and improved efficiency depends if the vehicles have sufficient capacity to collect the metals without having to complete additional loads and this must be considered WCA by WCA; and
- the benefits are greater for fortnightly collections rather than weekly collections but this must be weighed against the benefits or possible step change in additional costs associated with collecting larger quantities of material.

*Net collection and MRF processing cost*

- the sales values of the metals can more than off-set the additional costs even at low recovery rates;
- the benefits in improved efficiency can be large for some WCAs at medium to high recovery rates;
- MRF processing costs could more than double before no benefits are observed at higher recovery levels for some reference WCAs, and could almost quadruple for scenarios with lower metals recovery; and
- the reduced efficiency of weekly collections compared to fortnightly collections is not necessarily compensated by the higher rates of material recovery.

*Net total system costs*

- collecting metals can reduce the overall refuse and recycling collection and disposal cost even at low levels of metals recovery; and
- at high levels of metals recovery the cost benefit on the overall system can be considerable.

## 10 Overall conclusions

In the preceding chapters the cost impacts have been analysed with respect to the type of collection. A comparison of the findings reveals that many of the conclusions are independent of the type of collection system. It is also possible to draw some further conclusions by drawing the results of the analyses together.

Overall, it is possible to conclude from the results of this study that:

- the collection of metals, even at low recovery levels, can have a positive net benefit on the cost of the kerbside collection and MRF processing system;
- the cost benefit can be realised for kerbside sorted, co-mingled and 2-stream collections;
- the benefits can be further enhanced if refuse rounds can be reconfigured to reduce refuse collection costs, and if disposal savings for the diverted metals are also taken into account;
- the addition of metals to an existing collection does not always result in a cost benefit as it depends on the spare capacity available in the collection vehicle;
- if, as a consequence of adding metals, the quantities of material collected exceed the spare capacity thereby increasing the number of times the vehicle needs to tip each day, cost benefits are harder to realise;
- the actual benefit of adding metals to a collection needs to be evaluated specifically for each WCA and WDA;
- for as long as there is spare capacity in the vehicle, the more metals and other targeted materials that are collected, the greater the benefit;
- the benefits for a particular WCA will be different for weekly and fortnightly collections and will depend on the spare capacity on the vehicle;
- the greatest benefits will be realised if refuse collection and disposal contracts do not have restrictive clauses that limit the savings in refuse handling;
- the benefits in net collection and MRF processing costs are in the same order of magnitude for kerbside sorted collections and the collections requiring MRF processing;
- it is a complex combination of factors that will determine if there is a benefit to a WCA and WDA of collecting metals making it impossible to quantify the potential benefits without examining the specific conditions in each authority.

## 11 Qualitative aspects of adding metals

Kerbside collections have evolved over the recent years and many WCAs that initially targeted only a limited range of materials have started to target a wider range of materials. Monitoring of these collections has provided some evidence of two aspects of householder behaviour. The first is that not all householders will separate out all the targeted materials, but will be selective and more frequently only separate out paper and glass. Despite this, the second observation is that expanding the range of materials targeted can result in an increase in the capture of all the materials, even those that have been collected for some time previously. Thus, either participating households are becoming more conscientious in their sorting or more households are starting to participate.

Unfortunately, most of the evidence is anecdotal, the trial in Leicester being the exception, and has not been consolidated or analysed in such a way to enable firm conclusions to be drawn on the impacts and possible causes. In this chapter some of the findings from third party research are drawn together and combined with discussions with operators.

### Pilot research in Leicester

During 1999 and 2000 a project funded by the Landfill Tax credit scheme was undertaken in Leicester by Environ in association with SITA Environmental trust to investigate the impact of including glass in their kerbside collection<sup>8</sup>. One trial and one control area were selected from the borough. The weekly box collection including glass was operated in the trial area for 12 weeks while the control area maintained its fortnightly bag collection. In both instances the collections were promoted at the beginning of the trial period with similar written information describing the schemes, the materials that could be collected and the frequency of collection.

For two weeks before the trial, and then during the trial between October 1999 and January 2000, set-out, participation and tonnage of each material collected were monitored.

The trial results showed that the introduction of the box scheme led to an increase in householder participation and set-out and an increase in the quantity of material collected. Of the increase just over 50% was due to additional paper, plastic and cans being collected with the balance being the glass, which had not been targeted previously. Participation and set-out rates also initially increased in the control area after the promotion campaign but not to the same extent as in the trial area and by the end of the trial period they had dropped back to levels similar to those before the promotion campaigns.

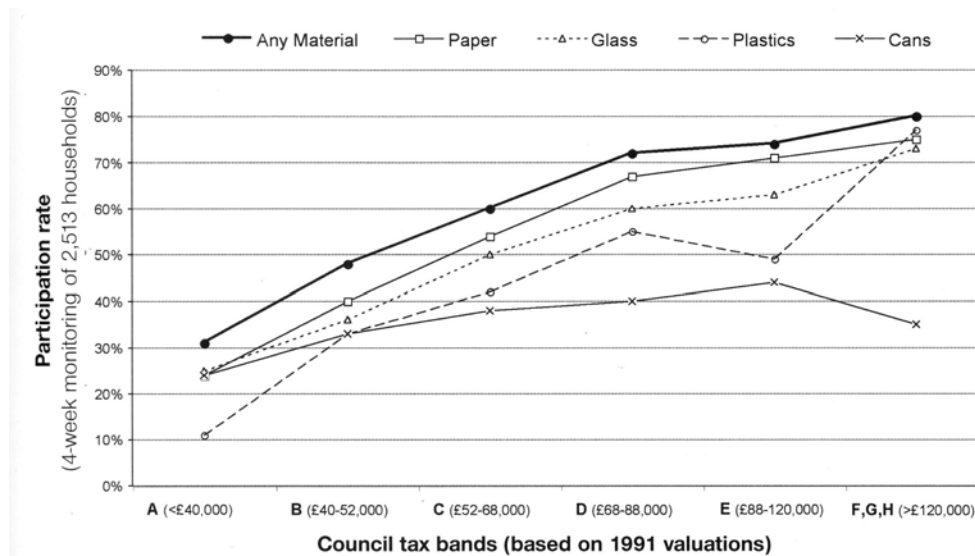
The researchers concluded that the introduction of the new collection receptacle, increasing the frequency of collection and introducing the glass had the combined positive effect on the levels of householder recycling. Furthermore, the trial reinforced previous research that promotion of an existing scheme can also have a positive effect on the householder participation.

## Results from other participation and householder surveys

Participation surveys carried out in other WCAs have been carried out to investigate the difference in participation with respect to material types. Across the board these surveys show that not all participating households separate the full range of targeted materials, and the separation of metal cans is generally lower than the separation of paper and glass (is targeted). Some examples of these results are provided below.

The participation in the kerbside recycling collection in Bristol was monitored in a number of different areas of the city during 2000<sup>8</sup>. The results are illustrated in Figure 11.1.

**Figure 11.1: Results of participation monitoring in Bristol**



The survey showed that not all households that participate separate out all the targeted materials, the overall participation being higher than that for any single material. Participation

<sup>8</sup> From Bags to Boxes: Research into effective kerbside recycling in Oadby and Wigston borough, Leicester. Environ, 2001

<sup>9</sup> CRN, Maximising Recycling Rates: tackling residuals, 2002

for cans was poorest for all housing types except A and paper and glass are the most consistently recycled materials.

The results of another participation survey<sup>10</sup> of a multi-material collection of paper, glass and cans in an un-named authority show the average set-out by residents of their boxes to be approximately 24% with an overall participation of 40%. i.e. approximately 60% of participating residents set their boxes out on a collection day. However, examination of the materials set out for collection on 3 of the rounds shows that only between 50% and 60% of residents on 2 rounds, and less than 20% on the other round, are setting out all of the targeted materials. Analysis of the materials collected shows that the percentage of residents setting out materials is summarised in Tables 11.2 and 11.3.

**Table 11.2: Type of materials set-out by residents**

|                | <b>Paper</b> | <b>Glass</b> | <b>Cans</b> |
|----------------|--------------|--------------|-------------|
| <b>Round 1</b> | 88%          | 28%          | 63%         |
| <b>Round 2</b> | 79%          | 85%          | 56%         |
| <b>Round 3</b> | 81%          | 89%          | 66%         |

**Table 11.3: Number of materials set-out by residents**

|                | <b>3 materials</b> | <b>2 materials</b> | <b>1 material</b> |
|----------------|--------------------|--------------------|-------------------|
| <b>Round 1</b> | 18%                | 44%                | 38%               |
| <b>Round 2</b> | 51%                | 32%                | 18%               |
| <b>Round 3</b> | 63%                | 24%                | 13%               |

Further evidence for the lower capture rates for metals compared to paper and glass are found in an attitude survey carried out in London<sup>11</sup> that reports that the majority of Londoners equated recycling to mean separating paper and glass. Table 11.4 summarises responses on which materials are separated according to collection type and these show that fewer householders separate metal cans and foil for recycling than other materials. (Clearly the response to such a survey will be somewhat skewed by the recycling facilities available to the householders and this factor is not commented on in the report. Despite this, it is clear that a step change in the recycling of metal cans and foil is possible).

<sup>10</sup> Meeting statutory Recycling Targets through Cost Effective Kerbside Expansion, Hummel J for the Open University, 2004

<sup>11</sup> Household Waste Behaviour in London, Brook Lyndhurst Ltd for Resource Recovery Forum 2002

**Table 11.4: Materials claimed to be recycled according to collection option (Brook Lyndhurst pg40)**

| Households saying item is 'always' recycled (%) | High recyclers | Medium recyclers | Kerbside | No kerbside |
|---|----------------|------------------|----------|-------------|
| Newspapers                                      | 70             | 56               | 60       | 25          |
| Magazines etc.                                  | 63             | 47               | 53       | 21          |
| Glass bottles                                   | 55             | 46               | 46       | 19          |
| Cereal boxes                                    | 28             | 12               | 18       | 6           |
| Tin cans  | 27             | 10               | 20       | 4           |
| Cardboard                                       | 26             | 16               | 19       | 7           |
| Garden rubbish                                  | 25             | 12               | 19       | 8           |
| Soft drink cans                                 | 24             | 15               | 21       | 4           |
| Plastic bottles                                 | 19             | 6                | 11       | 5           |
| Tin foil  | 11             | 3                | 7        | 2           |
| Plastic food wrappers                           | 8              | 2                | 5        | 2           |

The same survey also reports that 30 to 50% of regular recycling households don't consistently recycle even paper or glass and that less than a quarter of committed recyclers separate out metal cans (pgvii).

The survey revealed that householders considered that an increase in the range of materials targeted in their collections would be a popular route to increasing the effectiveness of high participating households (pg 49).

Focus groups revealed that lack of information on what to do was a common reason given for not recycling, with less than 50% of keen recyclers admitting it is easy to know what can and can't be recycled (pg47). Clearly this will impact on their willingness and ability to separate out all the targeted materials.

This finding is supported by a survey carried out in Somerset County New Jersey that found that people who were confident of their knowledge of what and how to recycle were more likely to recycle than those who were less confident, even if they were environmentally motivated<sup>12</sup>.

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<sup>12</sup> Motivations and barriers to recycling. The journal of environmental education 22 (1) 13-18), Simmons and Widmar 1990

This finding perhaps provides the key to understand the phenomenon that increasing the range of materials targeted by a kerbside collection results in an overall improvement in the recycling of all the materials. When materials are added to a kerbside collection it is always accompanied by some form of communications campaign to inform householders of the changes. These campaigns will reinforce householders knowledge of what can be recycled, making them more confident in the materials they separate. They will also inform householders who perhaps in the past have been unaware of the collection or uncertain of what can be included (in the UK this is a particular problem often the materials targeted not being consistent even within a district, so the scope for confusion and uncertainty is broad. Consequently, participation will improve in all materials, not simply due to the addition of more materials but due to the increased awareness of the collections.

A final comment from the surveys could also shed light on why more of all materials are recycled if the range is expanded. Many householders surveyed expressed a desire for feedback – to know that what they were doing was valued and appreciated. Perhaps, expanding the range together with its associated communications campaign, satisfies this need and encourages an even better participation.

In another pilot carried out in Leeds, the millennium recycling scheme<sup>13</sup>, 136 households were provided with a kerbside collection and the participation in each material was monitored. For paper and glass participation rates of up to 90% were measured with associated recovery rates for these materials estimated at around 75 to 80%. However, the recovery of plastics and metals was around 30%. This increased to 40% to 45% when feedback was given saying that the containers did not need to be cleaned. However, the report states that it is impossible to say whether the increase was due to the message only or the additional promotion the feedback gave that these materials were recyclable.

The research goes on to conclude that the place in the house that the materials arise is important in determining if they are recycled – and cans being generated in the kitchen generally during busy activities are less often recycled than newspapers generated when relaxing in the living room.

These findings are backed up by the recent 'Rethink Rubbish' attitude survey carried out by Open University.

It is likely that the changes in the quantities collected will also be influenced if the collection moves from a mono-material collection e.g. of just paper to a multi-material one, or if the

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<sup>13</sup> The Millenium Recycling Scheme: Results and Analysis, John Barton, Darren Perrin and Jennifer Barton, University of Leeds, June 2001

range of materials in a multi-material collection is expanded. Research undertaken at the University of Paisley shows that a move from a paper only collection to a multi-material typically collection results in an increase in paper collected by 40%<sup>14</sup>. Unfortunately no similar data is provided to indicate the likely increases as a result of expansion of a multi-material collection.

### **Anecdotal evidence from local authorities**

Much of the local authority evidence for increases in material capture with the broadening of the range of targeted materials is anecdotal and is often unsupported by data. In the cases below information has been derived from a wide range of sources ranging from discussions with operators to internet searches. Unfortunately it has not been possible within the scope of this project to contact all the authorities and have discussions on the findings. As a result the information is not always complete, however, it has been included as it provides a picture of possible increases in overall recycling when the range of materials targeted by a collection is increased.

In Newport plastics were added to the collection and the overall recovery of all materials was noted to increase. Participation prior to the introduction was measured at between 20% and 70% and this rose to 69 to 84%. The average quantity collected by the households was 80kg/household rising to 196kg/household. However, the change also coincided with other changes to the systems and a promotion and education campaign. The extent to which all of these influenced the increased participation compared to the extension in the range of materials is impossible to assess.

In Bracknell Forest the change from a paper only collection to a multi-material one for paper and cans increased recycling rates by 50%. Again, details are unavailable but this increase cannot solely be attributed to cans because, based on national composition data, cans only represent 9% of a mix of newspapers and cans. In 2002 a survey of 4,000 properties was undertaken to assess satisfaction with the kerbside scheme and to ascertain if the residents would support the collection of plastic bottles in the green boxes. 70% of residents responded positively stating that collection of plastics would encourage them to participate in the green box scheme. Following a successful trial, the collection of plastics was introduced borough-wide in May 2003. The council provided additional capital funding to purchase machinery to sort the cans from the plastics in order to maximise income. This initiative has produced an increased kerbside tonnage of recyclables of 21% in the first six months of this year. Again, it is unclear how much of this increase is due to the plastics and how much to

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<sup>14</sup> Model forecasts of recycling participation rates and material capture rates for possible future recycling scenarios. Report to the cabinet office 2002, Peter Tucker and David Spiers, University of Paisley

other materials, but based on national composition data plastic represents only 10% of the mix.

In Epsom and Ewell approx 15 tonnes a week was collected in their paper only collection. With the introduction of a multi-material collection (glass, cans, textiles as well as paper) the quantity increased to over 60 tonnes per week. Based on national composition data an additional 12 tonnes per week would have been expected as a result of collected the new materials. Instead an additional 45 tonnes per week was collected that suggest that additional paper was also being collected.

Informal discussion with crews in Bath suggest that there had been noticeable increases in the quantities of all materials collected when plastic was introduced. However, on the face of it the overall tonnage figures<sup>15</sup> do not support this – with the quantity of glass collected even falling, and that for other materials being comparable to previous years. (Note that detailed examination of the data available has not been undertaken nor have discussions been held with managers of the collection so other explanations could be possible).

In Worthing the participation rate increased from 10% to 36% with the relaunch of the collection and the introduction of green waste. (April to October 2003)

## Conclusions

The evidence from the surveys and the anecdotal examples all suggest that expanding the range of materials targeted by a kerbside collection has a positive impact on the recycling of all the materials. Furthermore, there is substantial evidence that householders are more reluctant to recycle metal cans and foil than paper and glass. However, the results are not clear cut and it is unlikely that the addition of more materials will, per se, result in an increase in recycling of all materials. More probable is that the impact is a combined result of adding materials, possibly the low starting performance of some collections, the change in collection system (e.g. frequency, container, etc.) and, perhaps most importantly, the accompanying communications programme. Thus, there is currently insufficient information to provide a basis for reliable predictions of the likely increases the addition of a specific material will have on the overall performance for the collection.

With regard to the scenarios modelled as part of this report, the findings support the participation and capture levels used in Scenario 1 and demonstrate the potential to improve

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<sup>15</sup> <http://www.bathnes.gov.uk/BathNES/environment/wasteandrecycling/recycling.htm>

the capture of all materials (moving from Scenario 1 through to Scenario 3, and possibly over time to Scenario 4).

Finally, in Barnet, although an increase in the quantity of paper collected was noted with the introduction of the multi-material scheme, the operator believes that the highest levels of recovery of all materials are achieved if all the materials are targeted at the outset rather than being added piecemeal to the collection. Clearly, for many authorities this is no longer an option as some level of kerbside provision is already in place. However, it should provide a warning that despite the evidence presented above incremental changes to a multi-material collection should not be relied upon to provide the highest recycling performance possible.

## 12 Stage 2: Presentation of findings

Stage 2 considers how the findings from Stage 1 can be presented to local authorities, their contractors, defra and other stakeholders to promote the inclusion of metal cans in multi-material kerbside collections.

Using the conclusions from Stage 1 messages have been developed to convey the key findings from the study relevant to the different stakeholders. This was carried out during a workshop with representatives from DTi, Corus, Alcan and Alupro and further consultation with a wider group of stakeholders by the workshop participants.

The resulting presentation is presented below.

### Broad Messages

- The inclusion of metals will reduce the overall collection cost of most multi material collections even at low levels of recovery thereby improving BVPI 86
- The inclusion of cans should increase the recovery of the other targeted materials, contributing to an improvement of BVPI 82a
- Revenues from the sales of the metals alone will more than off-set the additional collection and sorting costs of collecting more recyclables, contributing to an improvement in BVPI 86
- Metals can be included in some multi-material collections at no additional cost (depending on efficiency of collection and assuming sales revenues are received)
- The benefit of including metals increases as the recovery increases
- Benefits of including metals can be realised in both kerbside sorted and co-mingled collections
- Any benefits of including metals are dependant on the demographics of the WCA and the type of collections it operates

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### Adding metals to an existing multi-material collection

Worse case scenario – low recovery of metals (13% of food & drink + foil)

- Less than 0.5% increase in BVPI 82a (good)
  - Some increase in BVPI 86 possible (bad)
- but
- In some WCAs a decrease in BVPI 86 is possible
    - up to 40p per household per year is possible
  - If an increase in BVPI 86 results it is likely to be small
    - usually no more 10p per household per year
  - A positive impact on BVPI 86 is possible for kerbside sorted as well as co-mingled collections
  - The size of the impact depends on the local environment and the efficiency of the collection without metals

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### Adding metals to an existing multi-material collection

More likely scenario – an increase in the recovery in other targeted materials (approx. 44% for all inc. metal food & drink + foil)

- Increase of more than 0.5% in BVPI 82a
  - Decrease in BVPI 86 likely
- because
- the sales revenues from the metals alone are likely to more than cover the additional collection and sorting costs
    - a reduction of over 90p per household per year is possible
    - a reduction of approx. 50p to 70p per household per year is more likely
    - for 50,000 households this results in possible savings of between £25,000 to £45,000 per year
    - and additional net revenues from the other materials will further enhance these benefits
  - A positive impact is possible for kerbside sorted as well as co-mingled collections
  - The size of the impact depends on the local environment and the efficiency of the collection without metals

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### And if even more metal is targeted.....(still approx 44% for all materials but inc. all metal packaging)

- Further increases in BVPI 82a
  - Greater reductions in BVPI 86
- because
- the maximum value for BVPI 82a increases as more materials are targeted
    - targeting all metals raises the possible value of BVPI 82a by approx 2.5%
    - the wider the range of materials targeted the greater the recovery of all materials
  - the collection and sorting of other metal packaging isn't more complicated than collecting food and drink cans and foil and the material value is equally high
    - a reduction of over £1 per household per year is possible
    - a reduction of approx. 50p to 90p per household per year is more likely
    - for 50,000 households this results in possible savings of between £25,000 to £50,000 per year
    - and additional net revenues from the other materials will further enhance these benefits
  - A positive impact is possible for kerbside sorted as well as co-mingled collections
  - The size of the impact depends on the local environment and the efficiency of the collection without metals

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### ...and when everyone becomes a keen recycler (approx. 85% recovery all materials)

- Very large increases in BVPI 82a
  - Greater possible reductions in BVPI 86, but less predictable
- because
- almost doubling the quantity of material collected is likely to require reconfiguration of both kerbside and refuse rounds
  - the kerbside collection infrastructure demands will be higher but this should be off-set by savings in refuse collection (as long as the contracts allow this)
  - to achieve high recovery rates it is likely that the collection frequency will have to be weekly (both to motivate the householder and due to the volume of materials that will be accumulated making storage difficult)
  - With the necessary reconfiguration of the kerbside collections
    - a reduction of over £2.00 per household per year is possible
    - a reduction of approx. £1.30 to £1.60 per household per year is more likely
    - for 50,000 households this results in possible savings of between £65,000 and £100,000 per year
    - and additional net revenues from the other materials will further enhance these benefits
  - Taking account of savings in refuse collection and disposal
    - a reduction of over £5.00 per household per year is possible
    - a reduction of approx. £2.50 per household per year is more likely
    - for 50,000 households this results in possible savings of between £125,000 and £250,000 per year
    - and additional net revenues from the other materials will further enhance these benefits
  - A positive impact is possible for kerbside sorted as well as co-mingled collections
  - The size of the impact depends on the local environment and the efficiency of the collection without metals
  - Limitations of the infrastructure may result in possible increases in BVPI 86

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## Appendix I     KAT

KAT has been developed under the landfill tax credit scheme with funding from Biffaward and third party funding from Aylesford Newsprint, Valpak, Bifpak, Lancashire CC and London Remade. The project steering group comprised representatives from these organisations and also from defra, LGA, LARAC, BVWN, RAGS and WRAP. Subsequent to its launch KAT has been piloted by WRAP to evaluate if it is a suitable tool for its ROTATE team to use in working with local authorities to improve their performance in kerbside collections and also to evaluate the robustness of the kerbside projections. Preliminary findings from this evaluation suggest that the projections are generally robust.

KAT can be used to make projections for three broad types of collection: fully kerbside sorted; two stream; and single stream (co-mingled or mono material). The impacts the type of household container used e.g. wheeled bin, plastic sack, box, the materials targeted and the overall performance have on the infrastructure projections and cost estimates can be considered to be 'sensitivities' within these broad collection types.

The variables included in KAT include those relating to household behaviour, material characteristics, technical operation of the system, system costs and material revenues. Simply, KAT projects infrastructure requirements for a kerbside collection defined by the user. Standard costs are calculated based these projections. The costs are calculated using units e.g. capital costs for vehicles, salary costs for operators etc. As such, they do not represent the actual price a contractor may charge to operate the system; however, they enable evaluation of the change in costs of a system resulting from changes in the operation e.g. targeting different materials, or in householder behaviour e.g. numbers participating.

KAT can only project standard costs for the kerbside systems and as the objective of this project is to examine the impact of including metals in kerbside collections the results of the cost projections will be presented in the report as additional costs i.e. the total standard cost projected by KAT will not be reported but the difference in costs between the kerbside collection with, and without, metals will be calculated. This will be presented in the report as cost per tonne, cost per household and/or percentage difference in cost, whichever is most appropriate to the particular analysis. Presenting the standard costs could be misleading in the report because they are unrepresentative of the actual price paid for the services and they do not represent 'typical' kerbside costs as they have been projected for specific WCAs. Additional costs will enable a better evaluation of the impact of including metals.



## Appendix II Waste Composition

Defining an average national waste composition is difficult. A composition has been developed for this study primarily based on the quantities of the various materials placed on the market and cross referenced with the quantities used to develop the composition used in 'Waste Not, Want Not'. The derivation of values for each of the materials or material categories is described below.

To be able to convert quantities of material put onto the market into percentage it is necessary to establish the tonnes of household waste arising in the UK. Although headline figures from the most recent Municipal Waste Survey 2002/03 had just been released at the beginning of this study these could not be broken down into waste arising as collected household waste and that arising at CA sites. Thus data from 2001/02 was used.

In 2001/02 a total of 17.7 million tonnes of waste (including recyclables) was collected from households in England. ONS population estimates<sup>16</sup> for 2002 are 49.561 million for England and 59.231 for the UK. Thus, using this to extrapolate the total collected waste arising in the UK gives an estimate of 21.2 million tonnes.

### Packaging

Packaging, together with newspapers and magazines, represent the majority of dry recyclables targeted by local authority collection schemes. As a consequence of the requirements to recycle packaging under the Packaging Directive, detailed data have been collected on the quantities of packaging considered to be available from the household waste stream in the UK. These are presented in Table All.1 together with the data sources and, for purposes of comparison, the estimated tonnages used to compile the composition for 'Waste Not, Want Not'.

For the broad material categories the overall quantities do not differ greatly between the different sources, except for glass and foil. For foil we have taken the estimate provided by the industry believing this likely to be more accurate. Further data on the glass figures were discussed with representatives from the glass industry.

The problem with this material is establishing an accurate breakdown between glass bottles that end up in commercial waste streams and those in household waste. The estimated total (commercial and household) quantity of glass put onto the market in the UK is approximately

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<sup>16</sup> [www.statistics.gov.uk](http://www.statistics.gov.uk)

2.3 million tonnes per annum. This compares to the estimated total of 2.2 million in 1999<sup>8</sup>. Thus, the higher figure has been used in compiling the composition rather than the figure estimated in 'Waste Not, Want Not'. (It is interesting to note that for the other most commonly recycled material, newspapers and magazines, the quantity estimated from composition analyses is also significantly lower than compared to the quantities placed on the market. This could be because some composition analyses only examine collected materials and almost all exclude bring banks and third party recycling. It is also known that some composition analyses have also excluded kerbside collected recyclables.)

As most packaging will be collected from the kerbside, either separated or together with refuse, it has been assumed in compiling the composition that all household packaging waste is available for collection from the kerbside.

Combining the data on materials placed on the market together with the total household collected waste enables the percentage of each packaging material in the collected household waste stream to be calculated. The results are presented in Table AII.1.

**Table AII.1: Estimated packaging composition of household collected waste**

| Material                                    | Quantity put on the market | Quantity estimated for 'Waste Not, Want Not' | Percentage of household collected waste |
|---|----------------------------|--|---|
| Steel food and drinks cans <sup>17</sup>    | 300,000                    | 596,676                                      | 1.4%                                    |
| Aluminium food and drinks cans <sup>8</sup> | 54,000                     |  | 0.3%                                    |
| Other steel packaging <sup>8</sup>          | 200,000                    |  | 0.94%                                   |
| Other aluminium packaging <sup>8</sup>      | 12,000                     |  | 0.06%                                   |
| Aluminium foil <sup>8</sup>                 | 13,000                     | 25,029                                       | 0.06%                                   |
| Glass containers <sup>18</sup>              | 1,850,000                  | 1,557,911                                    | 8.7%                                    |
| Plastic bottles <sup>19</sup>               | 500,000                    | 387,574                                      | 2.3%                                    |

#### Newspapers and magazines

A similar method has been used to estimate the percentage of newspapers and magazines in the collected household waste stream as that described above for packaging. Data on the quantity of these materials available has been drawn from a recent report published by

<sup>17</sup> Data from discussion with representatives from Corus, Alcan and Alupro

<sup>18</sup> DETR, A Forward Look For Planning Purposes, 1999

<sup>19</sup> www.recoup.org.uk

Aylesford Newsprint<sup>20</sup>. In this report the quantity of these materials is given as 3.6 million tonnes for Britain. Extrapolating this for the UK using ONS population statistics suggests 3.7 million tonnes would be available UK wide. This compares to the tonnage used in 'Waste Not, Want Not' of 1.4 million. As has already been mentioned, analysis using this lower figure has shown it to be grossly inaccurate, so, for the purposes of developing this composition 3.7 million tonnes has been used. Thus an estimated 17.5% of collected household waste is newspapers and magazines.

The report also identifies a further 'other paper' category of material similar to newspapers and magazines, at approximately 30 kg per person per year. Extrapolating this figure based on the UK population gives a total of 0.7 million tonnes, equivalent to 3.3% of the collected household waste stream.

#### Remaining materials

As the remaining material streams will be collected in the refuse in all scenarios no attempt has been made to define more precisely the quantities arising in household collected waste. Simply the percentages as stated in 'Waste Not, Want Not' have been used. Finally, as the above projections will have altered the overall percentages the balance has been calculated to make the composition up to 100%.

The composition that results from these assumptions is presented in Table AII.2.

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<sup>20</sup> Aylesford Newsprint Recycling Atlas England & Wales

**Table AII.2: Average estimated composition of collected household waste**

| <b>Material</b>                     | <b>Percentage in collected household waste</b> |
|-------------------------------------|--|
| Newspapers and magazines            | 17.5%  |
| Other paper                         | 3.3%   |
| Steel food and drink cans           | 1.4%   |
| Aluminium food and drink cans       | 0.3%   |
| Other steel and aluminium packaging | 1.0%   |
| Aluminium foil                      | 0.06%  |
| Glass containers                    | 8.7%   |
| Plastic bottles                     | 2.2%   |
| Plastic film                        | 2.7%   |
| Other dense plastic                 | 2.8%   |
| Corrugated cardboard                | 3.5%   |
| Non-corrugated cardboard            | 1.4%   |
| Textiles                            | 3.2%   |
| Compostable kitchen waste           | 12.1%  |
| Non-compostable kitchen waste       | 10.1   |
| Garden waste                        | 15.3%  |
| Soil and other organic              | 1.1%   |
| Balance                             | 13.3%  |

## **Appendix III Participation, capture and set-out**

A number of different terms are commonly used to describe how householders served by kerbside collections join in. Unfortunately the terms are not always used to mean precisely the same outcome, so for clarification the following definitions have been used in this study. These definitions correspond to those used by WRAP for these terms.

**Participation rate:** *the number of households served by the collection setting targeted materials out at least once in a four week period.*

**Capture rate:** *the quantity of the targeted materials successfully identified and separated out by the participating households*

**Set-out rate:** *the number of households served by the collection setting targeted materials out on a specific opportunity. It represents the number of containers that need to be collected on average each week (assuming each household only sets out 1 container).*