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THE DIFFICULTIES SURROUNDING LOCAL AUTHORITY KITCHEN WASTE COLLECTION

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ABSTRACT

The Cardiff School of Engineering has examined numerous aspects with regard to increasing the diversion of household waste through kerbside recycling and composting schemes. Research has shown that there is a need to target and collect the kitchen/food waste stream to meet the 2010 Welsh Assembly Government (WAG) target of 40% recycling and/or composting. The WAG 2003 analysis of household waste showed that green waste made up 28% of a Welsh municipal solid waste, of which 12% was garden waste and 16% was kitchen waste. Therefore, the 15% minimum source-separated composting target by the year 2010 cannot be met by targeting garden waste alone. A case study authority is used as an example to show Rhondda Cynon Taf County Borough Council's current biodegradable municipal waste (BMW) diversion through traditional diversion routes. The BMW diversion deficit in meeting the Landfill Allowance Scheme Regulations is quantified and the potential fine for the case study authority is highlighted. This paper examines numerous aspects associated with the way other local authorities collect kitchen waste in England and Wales. The best practice of kitchen waste collection is identified in UK local authorities and the potential additional diversion attributed to this is then transferred to the case study authority. Subsequent predictions are made about the implementation of a full kitchen waste collection scheme. A distinct lack of data relating to kitchen waste collection in the UK has been identified.

Keywords: biodegradable waste, BMW, collection, kerbside, kitchen waste, Wales.

1 INTRODUCTION

Wales faces challenging diversion targets for municipal solid waste (MSW) and subsequently household waste. There are concerns about Wales's present and future recycling and composting rate, in particular the amount of biodegradable municipal waste (BMW) being diverted away from landfill. Wales has a legal order distinctly different from that of England, due to the Welsh Assembly Government's (WAG) ability to implement secondary legislation. Welsh legislation has taken many steps recently to commit to EU legislation and policy. The most demanding piece of supranational legislation from the EU for the diversion of household waste away from landfill is the Landfill Directive. The WAG has implemented separate pieces of legislation in an attempt to meet the BMW diversion requirements stated in the EU Landfill Directive. The 'Wise About Waste' Welsh strategy target for MSW recycling and / or composting of 40% with a minimum of 15% of each category by 2010 will be a major driving force in household waste diversion, along with the introduction of the Landfill Allowance Scheme (LAS). The LAS presents a more serious incentive for local authorities to divert BMW away from landfills, as non-compliance will come at the cost of a £200 per tonne fine (for every tonne of BMW landfilled over the allowance).

Importantly, the WAG states that only source-segregated compost will count towards the strategy target, meaning that only green waste collected at Household Waste Recycling Centres (HWRCs) or at kerbsides will qualify. However, the inclusion of any green waste diversion at kerbsides or HWRCs towards the strategy target is complicated by the Animal By-Product Regulations (ABPR) 2003 which requires specialist treatment if potentially contaminated by meat waste (as most could potentially be).

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2 THE CASE STUDY AREA

After Cardiff, Rhondda Cynon Taf County Borough Council (RCTCBC) is the second largest unitary authority in Wales in terms of population. RCTCBC has a range of socio-economic and cultural characteristics. High levels of socio-economic deprivation are observed, particularly in the northern part of the authority which has some of the highest deprivation indicators in the UK. In 2004/05, the municipal solid waste (MSW) recycling rate in the case study area was 14.6% [1] and the average Welsh recycling rate for the same year was 19.4% [1].

3 WASTE ARISINGS

Waste by its very nature is a heterogeneous material, and its composition varies depending on a number of factors such as:

- location – waste varies on a number of scales, i.e. internationally, nationally and on a local scale;
- socio-economic status – i.e. affluent areas produce high levels of glass and paper wastes compared to less affluent areas; and
- seasonality.

Therefore, it is vital that waste classification is undertaken to determine the suitability and effectiveness of various waste management options. A number of studies have been carried out to analyse MSW composition. Table 1 presents a summary of the various waste composition studies that have been conducted and highlights the variation between the stated categories. The results obtained from WAG indicate that 64% of MSW has a potential to be recycled or composted [2].

The data in Table 1 shows the average household biodegradable content (kitchen, garden, paper and cardboard wastes) in the different areas covered by the classification study. The lowest percentage is that for the UK at 53% and the highest is 62% for Cheshire. The biodegradable content of household waste in Wales was 61% [2] compared to 55% for RCTCBC reported in the Cardiff University analysis

Table 1: Household waste composition and waste arisings per household per week [2–4].

Category	Wales* (%)	RCTCBC (%)	UK (%)	England (%)	Cheshire (%)	Wirrel (%)	EU (%)
Paper Cardboard	41	25	32	23	25 12	20	23
Garden waste Kitchen waste	28	11 19	21	37	14 11	17 22	34
Glass	4	7	9	8	6	8	7
Textiles	1	4	2	3	6	7	4
Ferrous metal	5	4	6	6	3	3	5
Non-ferrous metal		1	2		1	1	
Plastics	10	10	11	9	14	8	12
Fines	1	6	7	14	8	7	15
Miscellaneous	10	13	10			7	
Total	100	100	100	100	100	100	100
Waste arisings (kg/hh/wk)		19.4	15.3	16.8		17.4	

*Corresponds to the percentage breakdown of MSW composition in Wales.

a few years earlier [3]. (It should be noted that the figures for Wales in Table 1 are based on MSW, not household waste.)

Assuming that there are 115 kilotonnes of MSW in RCTCBC, then according to the latest WAG 2003 analysis [2], which states food/kitchen waste makes up around 16% and garden waste around 12% of MSW [2], there are potentially 32.2 kilotonnes of organic waste available in RCTCBC, equal to a predicted 18.4 kilotonnes of kitchen waste and 13.8 kilotonnes of garden waste.

4 CALCULATING COMPLIANCE WITH DIVERSION TARGETS

The LAS Regulations 2004 are a WAG stimulus to ensure that EU Landfill Directive requirements are met. The WAG has allocated each waste disposal authority in Wales a maximum quantity that it may landfill in each year from 2004 to 2020; Table 2 lists the BMW tonnages up to 2010. In all scheme years, whether target (2010, 2013 and 2020) or non-target (2011, 2012, 2014–19), waste disposal authorities may not landfill more BMW than their allowance permits.

4.1 Meeting 2010 targets

The target year 2010 was chosen as it allows sufficient time to modify recycling and composting strategies within the authority. Figure 1 shows the BMW landfill allowance of MSW in RCTCBC. The figures are based on the fixed EU Landfill Directive and WAG targets. Figure 1 highlights the required BMW diversion from landfill (values have been rounded to simplify the analysis) and assumes a 2% annual growth in MSW within the case study authority. As illustrated in Fig. 1, if it is assumed that the case study authority's total MSW in 2009/10 is 125,000 tonnes, then to meet the EU Landfill Directive (2010) requirements, only 47,500 tonnes of BMW will be allowed to be landfilled. This is the equivalent of 78,000 tonnes of MSW (based on 61% as the percentage of BMW in MSW). The additional BMW diversion required by 2009/10 is 28,500 tonnes.

The 2009/10 WAG MSW recycling target of 40% (an estimated 50,100 tonnes in RCTCBC) includes a minimum of 15% composting (an estimated 18,800 tonnes for RCTCBC) and 15% dry recycling (an estimated 18,800 tonnes for RCTCBC). It has been calculated that complying with the WAG target (tonnages as noted above) will also facilitate compliance with the 2010 LAS diversion target. The required diversion of BMW of 28,500 tonnes can be met in theory with large-scale composting and the kerbside recycling scheme. However, this theoretical prediction is based on potential material in the RCTCBC waste stream, not on what is actually being diverted though the traditional voluntary diversion systems of the kerbside recycling scheme, HWRCs and bring sites.

Table 2: Landfill allowance for BMW disposal for RCTCBC and Wales.

	2004–05 (tonnes)	2005–06 (tonnes)	2006–07 (tonnes)	2007–08 (tonnes)	2008–09 (tonnes)	2009–10 (tonnes)
Total landfill allowance for Wales	550,000*	1,022,000	944,000	866,000	788,000	710,000
RCTCBC	37,942	70,200	64,515	58,830	53,145	47,461

*Only half year allowance as regulations started in June 2004.

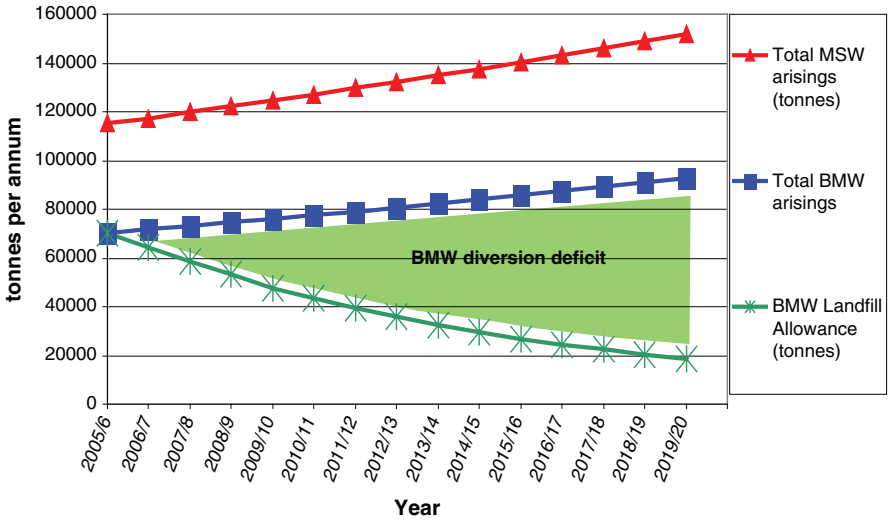

Figure 1: The BMW landfill allowance of MSW in RCTCBC.

Table 3: The factors and relevant units that comprise actual observed kerbside recycling scheme diversion.

Factor	Unit	Observed	Equation letter
Number of households served by scheme	Households	94,553	a
Household set out rate	%	40	b
Material recovery facility efficiency	%	90	c
Material capture in kerbside recycling scheme per participating household	kg/household/week	6	d
Number of collections per year	weeks/year	52	e

4.2 Predicted MSW diversion

Actual kerbside recycling diversion is considered to comprise the factors and relevant units shown in Table 3. Table 3 assumes that all households in RCTCBC have access to the kerbside recycling scheme. The calculation of the actual kerbside diversion, which comprises all the components shown in Table 3, is expressed by the following equation:

$$[(a) \times (b) \times (d) \times (e)] \times (c)/1000,$$

which in RCTCBC 2003/04 was calculated to be:

$$94{,}553 \times 0.4 \times 6 \times 52 \times (0.90)/1000 = 10{,}620 \text{ tonnes of compost and dry recyclables.}$$

Table 4: Observed diversion of MSW from non-kerbside recycling scheme sources 2003/04 in RCTCBC.

Diversion route	Tonnes	% diversion of waste received in 2003/04
HWRC	1335	8
Bring sites	700	100
Non-household waste	1060	10
	3095	

Kerbside performance alone (10,620 tonnes) would not meet any of the 2010 diversion targets. However, recycling and composting at the kerbside alone does not make up all the constituent parts of MSW. Other MSW diversion (non-kerbside) in the case study authority 2003/04 is shown in Table 4.

The addition of the diversions in Tables 3 and 4 gives the total MSW diversion. The total MSW diversion predicted in RCTCBC when all have access to the kerbside scheme is: non-kerbside diversion (3095 tonnes) + kerbside (10,620 tonnes) = 13,715 tonnes. Therefore, simply expanding the kerbside recycling scheme to all households and assuming that households continue to behave in the same way as 2003/04, will result in a MSW recycling rate of roughly 12% (13,715 tonnes/115,080 tonnes). Importantly, 13,715 tonnes of diverted MSW correspond to 8229 tonnes of BMW; 8229 tonnes of BMW diverted minus 28,524 tonnes required to be diverted (by the LAS target) equals a 20,295 tonne BMW shortfall in meeting the LAS 2010 target.

It is clear that in the case study authority current BMW diversion levels are insufficient to meet all MSW related targets. In theory, the full kitchen waste fraction will have to be targeted for collection by the case study authority in an attempt to make up this deficit. A 15% minimum source-separated composting target of 18,800 tonnes by the year 2010 will not be met without capturing at least some of the kitchen waste stream. While kitchen waste diversion will reduce the BMW diversion requirements, alternative technologies could also contribute significantly towards the LAS target; e.g. energy derived from a waste (energy from waste) facility may reduce the need for landfilling by up to 90%.

5 KITCHEN/FOOD WASTE DIVERSION IN WALES

To further highlight the problem, in 2003/04 food/kitchen waste was one of the least recovered materials by local authorities in Wales. The full kitchen waste fraction was only collected by Welsh local authorities on a small trial scale. WAG has calculated that there is a potential 278,278 tonnes of kitchen waste available in the Welsh MSW stream as shown in Fig. 2.

6 FAILING TO MEET MSW DIVERSION TARGETS

Clearly, the current state of recycling/composting practices in the case study authority needs considerable motivation and investment to meet the demands laid down by the WAG. Although there is considerable debate about the LAS (e.g. the BMW percentage of MSW), it is prudent to assume that large financial penalties will be used to enforce diversion targets. Action is thus required to ensure that procedures, processes and resources are in place to meet future demands and challenges. Based on the predicted lower limit of 10,668 tonnes and an upper limit of 20,295 tonnes of BMW that will not be diverted away from landfill [5, 6], fines incurred by RCTCBC in 2010 are estimated to be between £2.1 and £4.06 million.

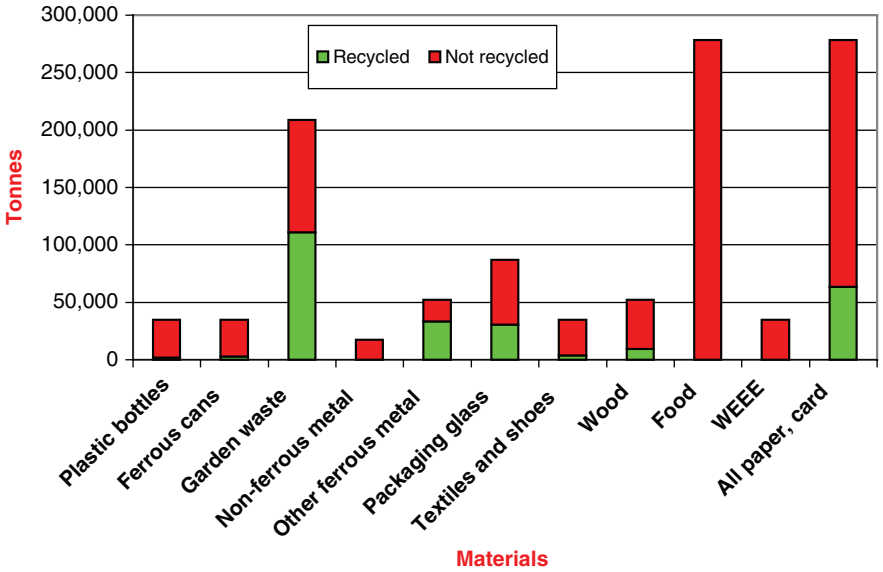

Figure 2: 2003/04 Welsh local authority arisings of different MSW material categories. WEEE, waste electrical and electronic equipment.

7 SURVEY OF LOCAL AUTHORITIES

As a key component of BMW, the need to divert the kitchen waste stream has been identified in the above sections. Subsequent sections will explore how local authorities currently collect the full kitchen waste fraction from the household waste bin.

In the summer of 2005, contact with all local authorities was attempted in some way. A data collection exercise was undertaken through telephone interviews, a postal survey and web searches. A representative sample was not necessary as all local authorities were investigated in someway.

The different survey methods asked the same questions:

- Does the local authority collect the full kitchen waste fraction? With any other material?
- In what receptacle?
- How often is the material collected from households?
- In what type of vehicles?
- How many households do they collect from?
- Is the kitchen waste collection scheme successful?
- What are the set out rates and material diversion per household in the scheme?

8 RESULTS OF LOCAL AUTHORITY SURVEY

As of November 2005, 28 local authorities of the 418 in England and Wales had household collection of the full kitchen waste fraction; in other words, they accepted both vegetable and animal matter, e.g. bones, carcasses and plate scrapings. All 28 waste authority respondents collected the full kitchen waste fraction and delivered it to an in-vessel composting system as required by the ABPR. Most local authorities had a green waste collection of sorts, but only collected garden waste. It should be noted that many of the remaining authorities were planning to start a full kitchen waste collection system as soon as an in-vessel composting system became operational and ABPR compliant. Current full kitchen waste collections varied in size, from large, 78,000 households (Borough of Bexley), 57,000

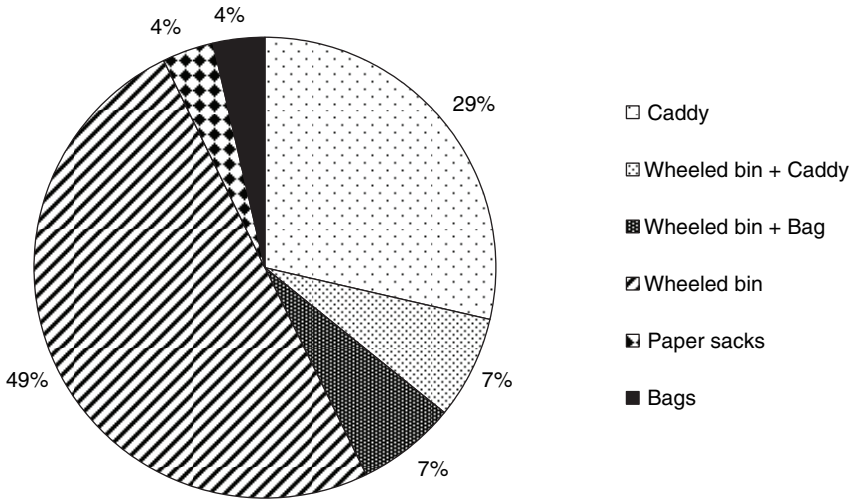

Figure 3: The breakdown of receptacle type used in the collection of kitchen waste.

households (South Cambridgeshire District Council) and 54,400 (Teignbridge Borough Council) to small trials of just a few thousand households, such as that run by Newport City Council, Wales.

8.1 How are UK local authorities collecting kitchen waste?

The size and nature of containment is expected to depend partly on the material coverage, and also on the frequency of collection of the material. It is also thought that it may depend upon the frequency of collection of the residual waste stream [7].

Local authorities have given their residents different types of receptacles for containing food waste, and some use a combination of receptacles as highlighted in Fig. 3. Of those where it could be established or those that answered, 63% collect the kitchen waste fraction in a wheeled bin, an example of which is shown in Fig. 4a [7]. Of this 63%, cumulatively 7% ask residents to put out the kitchen waste in separate bio-bags within the wheeled bin, 29% collect kitchen waste from a specially designed kitchen waste caddy (see an example in Fig. 4b) and 49% collect kitchen waste directly form a wheeled bin. A small percentage of the total surveyed (8%) collect the kitchen waste in bags – plastic bags, bio-bags (see an example in Fig. 4c) or paper bags.

8.2 With what materials are UK local authorities collecting kitchen waste?

Almost three-quarters of the respondent local authorities (72%) collect kitchen waste with another material (see Fig. 5). The most popular material for co-collection with kitchen waste is garden waste, but many of the respondent local authorities additionally co-collect it with cardboard. About 4% of the respondent local authorities co-collect kitchen waste with just cardboard. More than a quarter (28%) collect only the full kitchen waste fraction.

8.3 Collection frequency

Around 50% of the respondent local authorities collect kitchen waste from residents weekly, while the other 50% collect it fortnightly. Interestingly, 30% of the respondent local authorities have an alternate weekly collection of residual waste.

(a) (b) (c)

Figure 4: (a) The wheeled bin with bags; (b) the kitchen waste caddy; (c) bio-degradable bags.

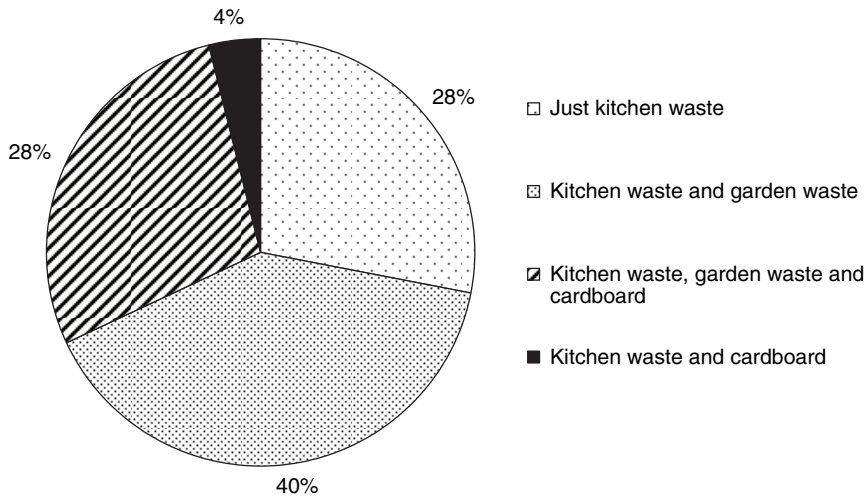

Figure 5: Is the kitchen waste collected on its own or with another material?

8.4 Type of collection vehicles

Where kitchen waste is collected with another material, usually garden waste, sometimes cardboard or both, the majority of the respondent authorities prefer to use the same type of refuse collection vehicle that they use for refuse. They claim that they collect green waste from 500 to 1500 households per day. Some local authorities use a Rotapress vehicle specifically for green waste collection and collect waste from 1500 to 1750 households per day using these vehicles. Where only kitchen waste is collected, stillage vehicles are used. Authorities using stillage vehicles claim to collect waste from 600 to 1000 households per day.

8.5 Success of local authorities' collection of kitchen waste

Research questions were asked to try to understand the quantitative effect of implementing a full kitchen waste collection scheme. Despite all efforts to obtain data, such as the household set out rate

and material capture per participating household in such a scheme, only in a very few cases was this data available. As regards local authorities that co-collect kitchen waste with another material, it is difficult to disassociate the weights of the two material types and, therefore, impossible to assess the added contribution of the full kitchen waste fraction to the green waste diversion.

In 2003, a recyclable waste analysis was conducted by Cardiff University in RCTCBC [8]. At that time, the local authority was already asking for uncooked fruit, vegetable, peelings, egg shells, tea leaves and coffee granules to be put out together with garden waste. Garden waste was found to be the second most abundant waste category by mass in the kerbside recycling scheme, although prone to large fluctuations due to changing weather conditions and seasonal effects. In November 2003, 2 kg of recyclable material per participating household per week was attributed to garden waste alone. Kitchen waste weights were unexpectedly low, averaging about 0.4 kg per participating household per week. The corresponding potential kitchen waste weight estimated from the full waste analysis [3] was about 3.8 kg per household per week. Even though the Council did not ask for all components that comprise kitchen waste, this category still had a correspondingly low capture rate. The results may indicate that kitchen waste was viewed as an undesirable category to separate in the household and subsequently store before being collected.

The most detailed data were provided by Somerset County Council and Chiltern District Council. In Somerset, kitchen waste is collected separately from garden waste on a weekly basis, and the County Council claims to be diverting between 1.6 and 2 kg per participating household [9]. Fortnightly collections of just kitchen waste have taken place in a trial in Chiltern District Council where 4 kg per participating household is claimed.

The UK best practice of diverting the full kitchen waste stream is therefore found to be around 2 kg per participating household.

9 PREDICTED DIVERSION INCREASE AFTER IMPLEMENTATION OF 'BEST PRACTICE' KITCHEN WASTE COLLECTION IN RCTCBC

Table 5 highlights the predicted impact if the case study authority was to implement the collection of the full kitchen waste fraction and the households in RCTCBC were to divert as much as in the best practice authorities: the 40,000 households that regularly set out in the current kerbside recycling scheme would set out an additional 2 kg per household per week of kitchen waste, equal to an extra 3438 tonnes. All the 3438 additional tonnes would be BMW and therefore reduces the case study's non-compliance fine under LAS Regulations by £687,636 (3438 × £200). This would reduce the predicted BMW deficit to between 7230 and 16,857 tonnes in 2010. Accordingly, even with the current best practice of kitchen waste diversion being superimposed on RCTCBC's current diversion, none of the 2010 MSW related targets would be met.

10 CONCLUSION

It is predicted that implementing a full kitchen waste collection scheme in the case study authority (based on the observed best practice of local authorities in the UK) will not provide the diversion required to meet the 2010 MSW diversion targets. The research findings have wider connotations for the waste industry. Local authorities that implement kerbside recycling and green waste collection schemes, and still have significant tonnage to divert to meet the 2010 Wales Waste Strategy targets and reach the required BMW diversion set in the LAS, might not be able to do so by including the full kitchen waste fraction for collection, due to a low predicted household capture (2 kg/household/week) and a low predicted set out rate of the full kitchen waste fraction.

Table 5: Predicted diversion increase after implementation of 'best practice' kitchen waste collection in RCTCBC.

	Average household 2003	Diversion after implementation of 'best practice' kitchen waste collection
Total diversion per household per week (kg)	6	8
Set out rate (%)	40	40
Contamination* (%)	12.6	12.6
Number of households in RCTCBC**	94,553	
Current assumed dry recyclate diversion from all participating households in RCTCBC	10,313 tonnes $(94{,}553 \times 6 \times 0.4\,\text{x} \times 52/1000) \times 0.874$	
Best possible diversion from households after full kitchen waste collection in RCTCBC	13,751 tonnes $(94{,}553 \times 8 \times 0.5 \times 52/1000) \times 0.874$	
Best potential increase in dry recyclable diversion after waste awareness campaign	3438 tonnes	
Best potential increase in diversion of Bio-degradable Municipal Waste (BMW)***	3438 tonnes	

*The material recovery facility inefficiency at sorting is different to the sample contamination level.
**The 2001 Census claimed there were 231,946 people living in 94,553 households, which equals 2.45 people per home (National Statistics, 2005).
***The additional diversion is solely due to the kitchen waste which has a 100% BMW content.

Methods designed to increase the number of households that take part, and the amount of material captured (diverted) in kerbside collection schemes that accept the full kitchen waste fraction, need further investigation.

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