

The nature and scale of waste produced by schools in England



A report presenting the indicative findings of compositional analyses of waste produced in schools and the consequent implications for those planning to collect waste for recycling from schools.

WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.

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Front cover photography: Recycling at school

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Executive summary

To better understand the nature and scale of waste produced by schools in England, WRAP commissioned WastesWork to analyse the waste produced over a week in 12 primary and 12 secondary schools (three of each in four different local authority areas). This report presents the indicative findings of these analyses.

On average, primary schools generated 45kg of waste per pupil per academic year (40 weeks) and secondary schools 22kg per pupil per academic year. Food waste and paper and card were found to be the dominant fractions of the waste streams for both primary and secondary schools, accounting for more than 75% of the waste (by weight) from primary schools and 70% of waste (by weight) from secondary schools.

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1.0 Introduction

This report presents the findings of a piece of research conducted in December 2007, examining the quantity and composition of waste produced in schools in England; intended to improve upon existing knowledge of this area of waste arisings. This first section of the report presents background information on schools waste (examining firstly the existing knowledge of schools waste, and secondly the factors that may influence the quantity and quality of schools waste before outlining the specific objectives of this study). The methods used to measure waste from schools are detailed in Section 2; the findings of the research are presented in Section 3 and then discussed in Section 4.

1.1 Existing knowledge of waste in schools

This study aims to improve upon estimates generated from previous studies into the composition and quantity of waste produced in schools. Two main studies are considered here - Waste Watch (2005) and Eunomia Research & Consulting *et al.* (2007). Both were reviewed before initiating this work to determine whether they could be used as the basis of estimates of the types and quantities of waste generated by schools. Neither study was considered suitable for use for WRAP's purposes. The issues are summarised – for information – in this section. It should be noted that this should not be taken as criticism of the reports *per se* but simply that the methods used were not appropriate to WRAP's intended use of them – providing generalised advice on planning collection and recycling services.

1.1.1 Use of volume to weight (density) conversion factors

The Waste Watch study of 2005 (funded by the Biffaward Mass Balance programme) presented a figure of 26.5kg of waste, on average, being generated each year by every primary school pupil and 15.95kg by every secondary school pupil. This figure was based on waste audits that recorded volume of waste and used a conversion factor to estimate the kg of waste per pupil per day. A second report (Eunomia Research & Consulting *et al.*, 2007) criticised the conversion factors that had been used in the Waste Watch report (40kg/m³) and cited what they considered to be a more appropriate conversion factor (230kg/m³) based on their own research, which would give rise to an estimated 126kg of waste per student per annum. The Environment Agency has in the past used a factor of 139kg/m³ for mixed commercial waste and 174kg/m³ for mixed household waste. Without additional research, it is not clear which of these very different factors is more appropriate for use by those planning collection services for schools. Due to the inevitable inaccuracies of estimating an appropriate conversion to translate volumes to weight, WRAP commissioned research based on actual measurements of the weight of waste collected from schools, the results of which are presented in this report. The composition of the waste presented in the Waste Watch (2005) report (see Table 1.1) is unaffected by any possible inaccuracies in conversion factors, but should nevertheless be interpreted with caution if intending to use the information for service planning.

1.1.2 The nature of the sample

Schools contributing data to the Waste Watch (2005) work were schools that volunteered to participate in an audit exercise. A self-selected group of schools is unlikely to be representative of all schools because participants are more likely to have elevated awareness of environmental issues and consequently better waste management practices than the average school, factors that could influence estimates of both the overall tonnage and the composition of waste. This is an issue that Waste Watch itself acknowledges in its report.

1.1.3 A systematic approach

Whilst a large number of schools (51 primary and 23 secondary) contributed data, it is not clear that each data set was collected in the same way, at the same time of year. In some instances the waste audits were used as educational opportunities rather than objective data collection exercises and this may influence the extent to which the results can be generalised.

1.1.4 Coverage of school activities

For a compositional analysis to be useful for service planning purposes, it is essential that it includes waste from all areas of the school and this is what WRAP's research sets out to achieve. In the previous studies it is not evident that waste was collected from all areas of the school (to include the canteen, bathrooms, administration and staff areas, playgrounds etc.).

Although the Waste Watch and Eunomia reports provide useful insights into schools waste, WRAP felt that the issues identified above meant that a bespoke study was required. Consequently the data gathered in this study is based on systematically collecting, sorting, weighing and recording a full weeks worth of waste generated in *all* areas of a diverse group of schools. This is believed to give a more reliable estimate of the average composition

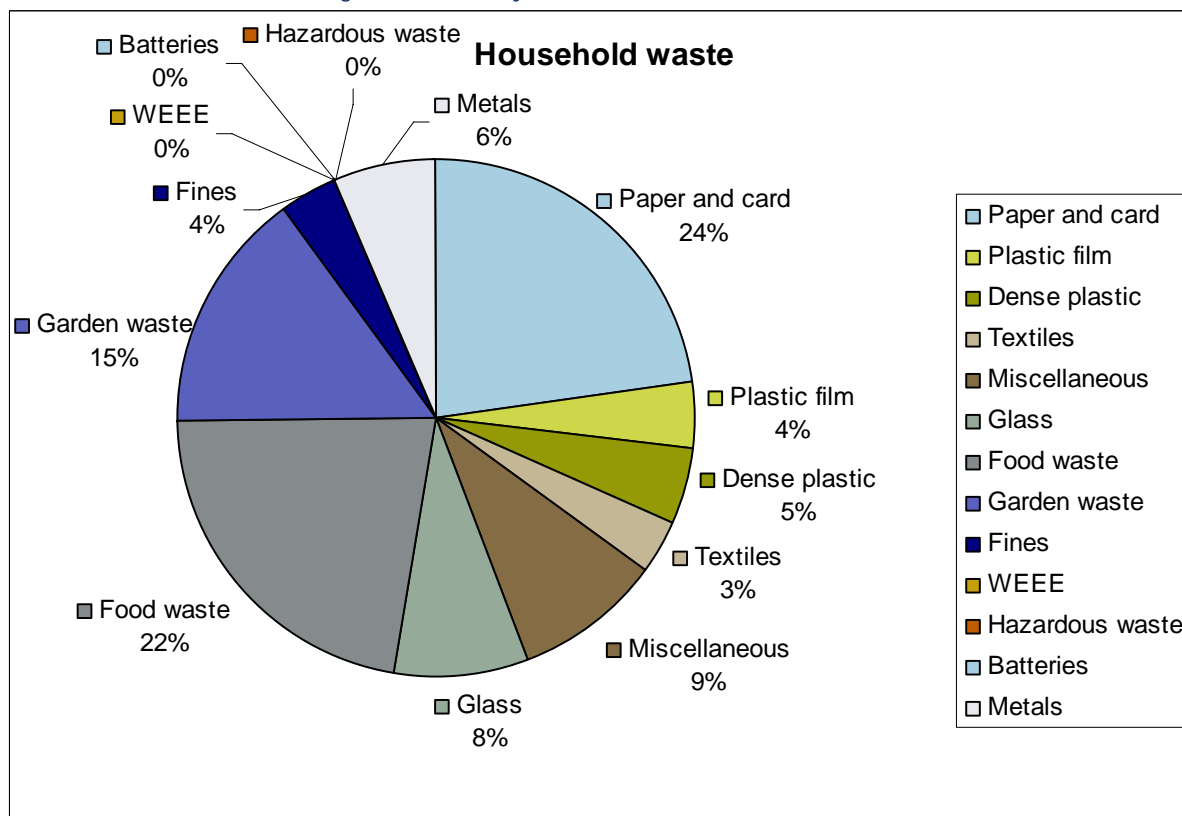
of schools waste despite being based upon just 24 schools. In an ideal world we would have included more schools but resources did not permit it.

Table 1.1: Composition of waste in primary and secondary schools reported in Resource Management in the Education Sector (Waste Watch, 2005)

Material	% of waste stream from primary schools	% of waste stream from secondary schools
Paper and card	59	53
Food and green waste	13	20
Plastic	12	14
Glass	3	2
Metal	3	3
Other	10	8

For comparative purposes Figure 1.1 (overleaf) details the average composition of waste collected from households in England, according to a compositional study of waste conducted in 2002 (Parfitt 2002). Full tabulation of the quantities of household waste reported by Parfitt (2002) can be found in Table A.1 appended to this report. The household waste figures presented here exclude any household waste arising at civic amenity sites.

Figure 1.1: Composition of household waste in England (Parfitt, 2002). Data includes bring site recycling but excludes household waste arising at civic amenity sites.



1.2 Factors potentially influencing the quantity and composition of waste

There are a large number of factors that can influence both the magnitude and make-up of the waste that may be expected from schools. It is intuitive that the number of pupils and teaching staff will influence the quantity of waste generated in schools and Waste Watch (2005) reported that the quantity of waste increased with increasing pupil and staff numbers, as anticipated.

The same research also highlighted varying amounts of waste from schools in different geographical regions and reported that, on average, urban schools produced more waste than rural ones. It was also noted that schools placing more emphasis on other waste related issues such as litter, produced less waste overall (as education in this related area, may raise overall awareness of waste issues). Waste Watch suggest that the variable measuring "emphasis on litter" may be compounded by whether or not the schools were urban or rural; evidently rural schools felt that litter was one of their more significant environmental impacts in contrast to urban schools. Taking actions to reduce litter (and therefore raising awareness of waste management) may therefore explain the decreased levels of waste associated with rural schools.

It is also probable that a school's engagement with waste issues will impact on the quantity and composition of waste; composting, waste minimization activities and reuse policies for example can all lead to potential decreases in the overall quantity of waste generated and can decrease the contribution of specific material streams. Other policies, such as those relating to purchasing within the school may impact on the waste composition as well; the scale at which consumables are purchased can influence the quantity of packaging generated for example.

The nature of catering facilities on site may also have an impact on the quantity of waste generated in a school. A small number of schools with non-production kitchens have been included in this research to further explore the hypothesis that there will be lower levels of food waste where production takes place off site.

1.3 Objectives of this research

The objective of this research was to accurately document the waste produced in 12 secondary and 12 primary schools over a one week period, to improve existing estimates of typical quantities and composition of waste generated in schools. Although the scale of the study is such that it does not claim to document a truly representative sample of all schools (in terms of size, geography, specialism, waste education initiatives etc.) it is anticipated that the results presented here will be a useful indicator of the scale and nature of waste from schools and therefore useful in planning the management of waste from schools.

2.0 Methods

This section describes the approach used to examine the waste produced by schools with details of the schools used in the study presented in Section 2.1 and the method of analysing the waste presented in Section 2.2 below.

2.1 Sample of schools studied

A sample comprising 24 schools was selected for this study; 12 primary and 12 secondary from four different local authority areas in England. A summary of the selected schools is presented in Table 2.1. The four local authority areas were selected to include a mix of unitary and waste collection authorities and covered a range of socio-demographics to ensure a diverse group of schools were included in the study, representing both rural and urban areas. Using schools from four different local authorities also ensured that schools with a range of different waste collection and waste education services (which may impact on the quantity and composition of waste generated in schools) were included in the research.

Within each of the chosen local authority areas, three primary schools (one “small”, one “medium” and one “large” sized) and three secondary schools (one “small”, one “medium” and one “large” sized) were selected to take part in this research. The “small”, “medium” and “large” sized school classifications were based on pupil numbers, though schools qualifying in each category were defined by the participating authorities, being relative to typical school sizes in a given area. The pupil numbers in each of the selected schools are listed in Table 2.1. In addition to school size, local authorities were asked to select schools from both rural and urban areas, from different socio-demographic areas (based on local knowledge of housing type in the catchment area) and with both production and non-production kitchens - all factors that could potentially influence the type and scale of waste produced in schools (see Section 1.2). Ultimately, however, only three schools with non-production kitchens were able to be incorporated into the research.

Table 2.1: Summary of schools used in this study

School type	Local authority area	Number of pupils	Production kitchen?	Materials actively recycled
Primary	Epping Forest	146	Yes	Paper, card, cans, plastic bottles
		190	Yes	Paper, card, cans, plastic bottles
		287	Yes	Paper, card, cans, plastic bottles
	Leeds	111	Yes	Paper and card
		318	No	Paper and card
		361	Yes	Paper and card
	Plymouth	126	No	Paper, card, cans, plastic bottles
		170	Yes	Paper, card, cans, plastic bottles
		214	Yes	Paper, card, cans, plastic bottles
	Shropshire	70	Yes	None
		135	Yes	Paper, cans, PET
		374	Yes	Paper
Secondary	Epping Forest	1105	Yes	Paper, card, cans, plastic bottles
		1233	Yes	Paper, card, cans, plastic bottles
		1258	Yes	Paper, card, cans, plastic bottles
	Leeds	889	Yes	Paper and card
		1168	Yes	None
		1394	Yes	Paper and card
	Plymouth	1041	Yes	Paper, card, cans, plastic bottles
		1278	Yes	Paper, card, cans, plastic bottles
		1600	Yes	Paper, card, cans, plastic bottles
	Shropshire	564	No	None
		717	Yes	Paper
		1324	Yes	Paper

2.2 Analysis of schools waste

The analysis of waste from schools was undertaken by WastesWork, a company specialising in the analysis of domestic waste. A full week's worth of waste (Monday through to Friday) produced by each school was collected and analysed and the waste from all areas of the school was included; i.e. waste from classrooms, staffrooms, bathrooms, canteens, playgrounds and administration areas. The collection of waste took place between 26 November and 7 December 2007 with all schools in a local authority area being surveyed in the same week.

Each day, schools bagged all of the waste they generated and WastesWork collected and transported the bagged waste to a sorting area provided by local authorities. Waste streams that would otherwise have been sent for recycling were similarly bagged and collected, but segregated from the residual waste to enable separate reporting.

Materials were hand sorted (by a consistent team of WastesWork staff across schools) into standard categories used in the composition of household waste, with some additional level of detail for materials such as paper; known to be a large component of the school waste stream it was deemed valuable to fully understand the nature of paper materials arising, in order to assess the full potential for recycling collections. Full details of the categories used to sort the waste are tabulated in the appendix of this report (Table A.2). The quantity of material in each sub-category was recorded (in kg) for each school, each day for both the waste destined for landfill, and that which would otherwise have been collected for recycling. In order to generate useful comparators, the kg of waste is presented per pupil and per pupil per academic year, based on the assumption that an academic year is 40 weeks long and that all weeks of the year are represented by the average weekly results found in this survey. The results of the waste analysis are presented in the following section of this report.

Bulky waste and waste from end of term clear outs were not captured; this research was intended to examine waste typically produced day to day.

3.0 Results

The following section presents the findings of the research, detailing the quantity and composition of waste from primary and secondary schools. Section 3.1 presents the quantities of waste produced, Section 3.2 the composition of the waste with Sections 3.3 and 3.4 covering the rate of capture and contamination respectively. The final section of the results, Section 3.5, presents the difference in waste generated in schools with and without production kitchens.

3.1 Quantity of waste produced

On average, the quantity of waste produced by each primary school pupil in a school year (assumed to be 40 weeks) was 45kg and the quantity produced on average by each secondary school pupil in a year was 22kg. Full details of the quantity of each material produced each week in both primary and secondary schools can be found appended to this report in tables A.3 and A.4 respectively.

Based on estimates of there being 4,148,950 primary school pupils in England and 3,306,780 secondary school pupils (National Statistics, 2006) the total quantity of waste generated in primary schools is an estimated 186,500 tonnes and the total generated in secondary schools is an estimated 71,800 tonnes (to the nearest hundred tonnes) in England. This 258,300 tonnes of waste from primary and secondary schools excludes all end of term and bulky waste, which was not captured as part of this report, so the true yearly total of waste from schools would be in excess of this amount.

Within the schools sampled for this research, the average recycling rate (the quantity of targeted materials captured, as a proportion of the total waste arising) for primary schools was 13% and the average rate for secondary schools was 20%.

3.2 Composition of waste produced

The composition of the waste from primary and secondary schools is illustrated in Figure 3.1 and Figure 3.2 overleaf. Food waste makes up the largest proportion of the waste stream in primary schools (46% of the total) followed by Paper and card (30%). Secondary schools have similarly large quantities of both food waste (31%) and paper or card (39%). Plastics form 9% of the waste from primary schools and 17% of the waste in secondary schools.

Figure 3.1: Composition of waste in primary schools (percentage by weight)

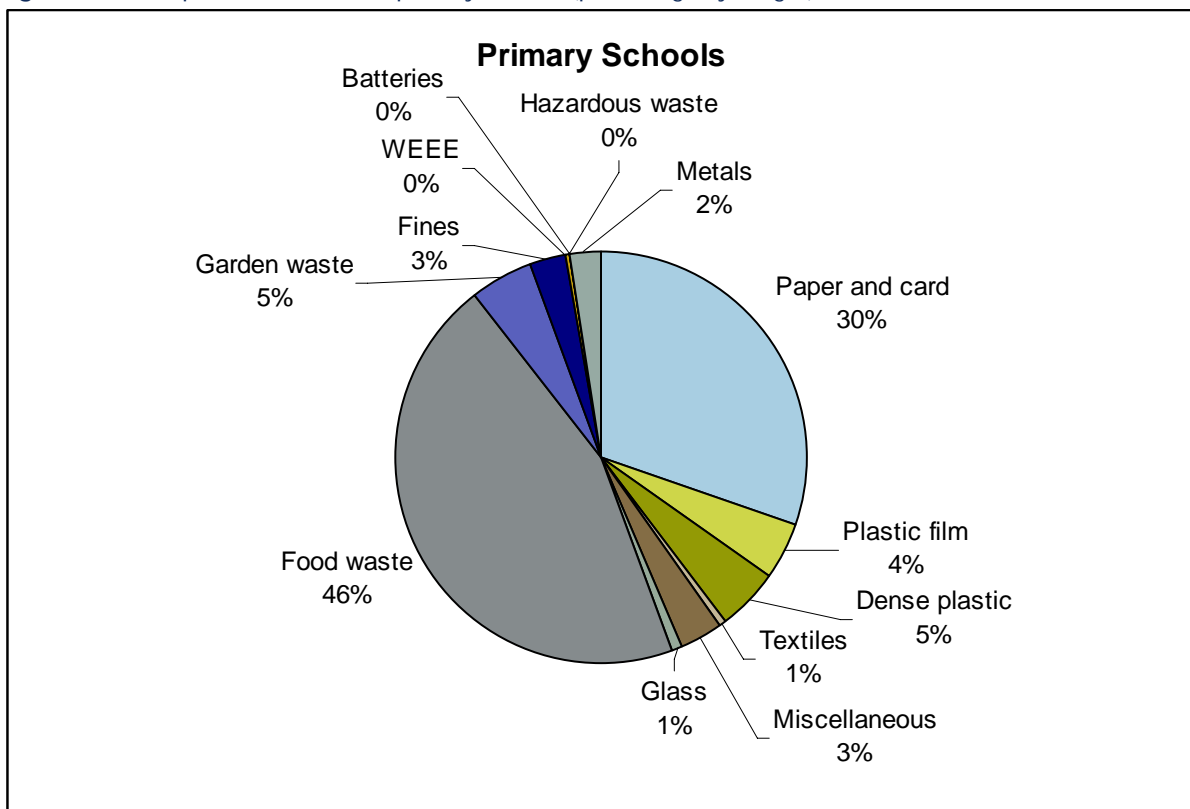
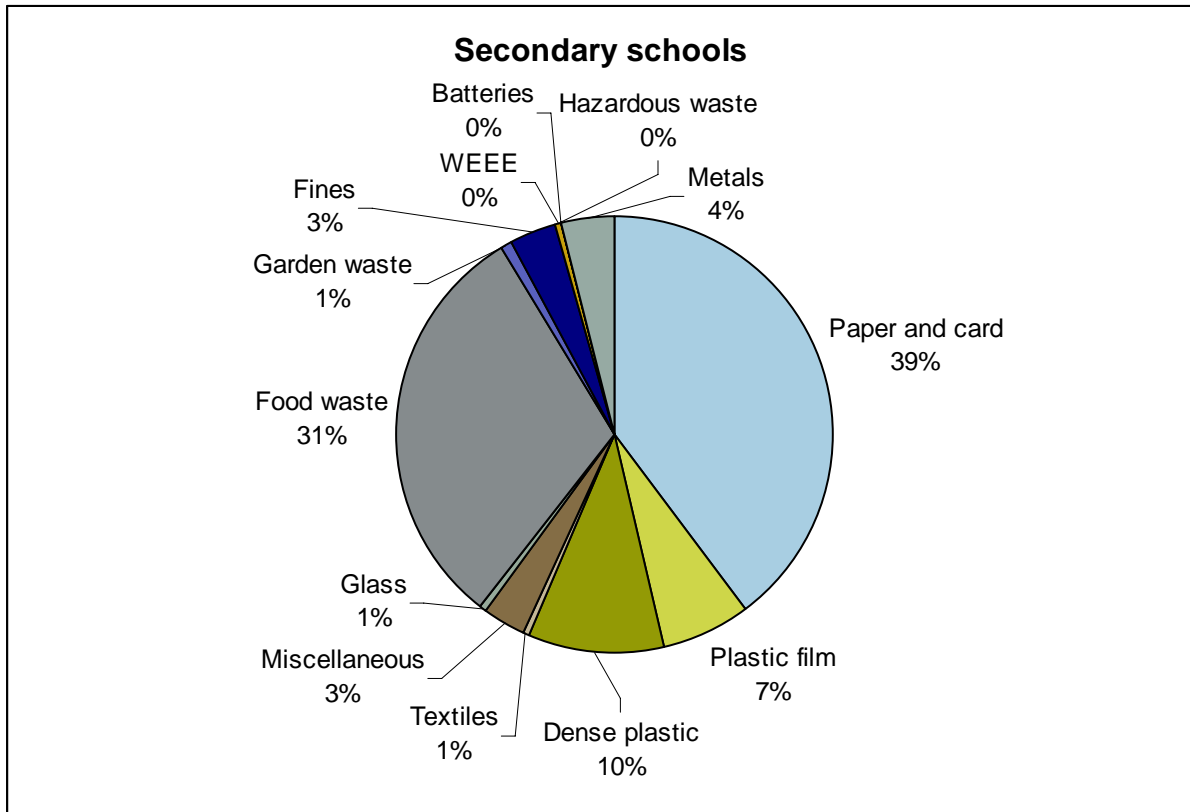


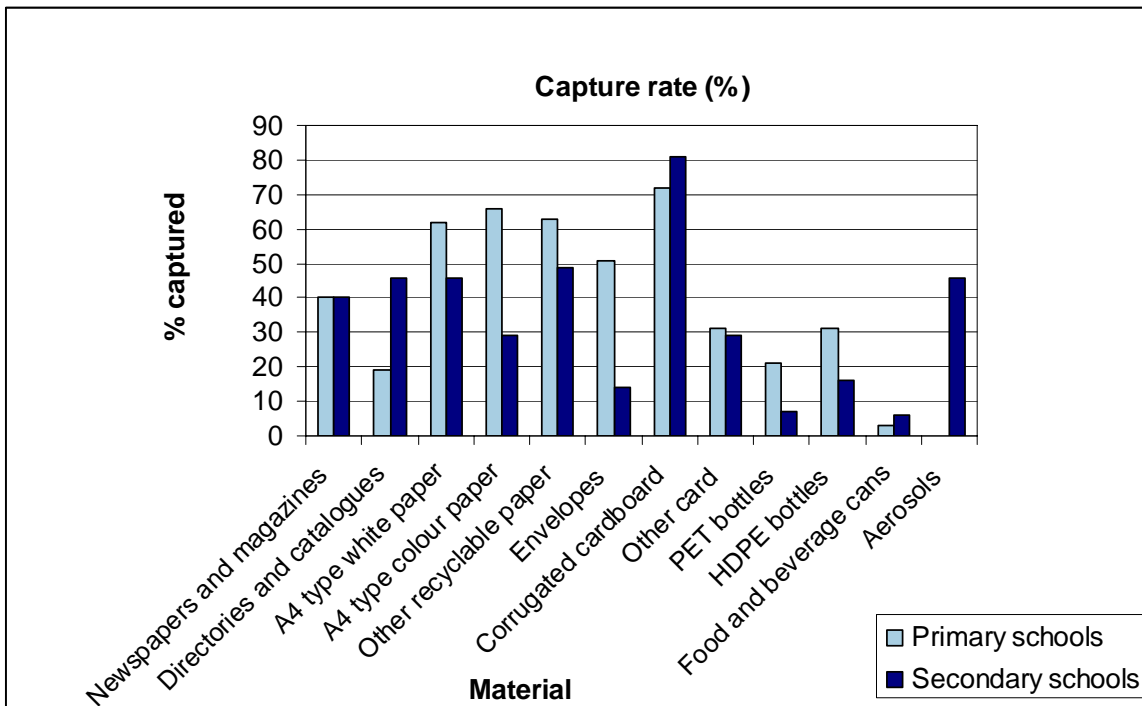
Figure 3.2: Composition of waste in secondary schools (percentage by weight)



3.3 Capture rate of materials collected for recycling

Overall, 56% of paper arising in primary schools with paper recycling facilities was captured for recycling. Similarly, in schools where facilities for recycling were in place the capture rate of cardboard was 64%, plastic bottles 26% and food and drink cans just 3%. In secondary schools offering recycling facilities, the capture rates were 45% for paper, 75% for card, 9% for plastic bottles and 6% for food and drink cans (illustrated in Figure 3.3 below). Additional details by sub-categories are appended in Table A.5 and Table A.6.

Figure 3.3: Capture rate for different materials in primary and secondary schools



The rates of capture of different materials across different local authority areas are tabulated in Table 3.1 below to highlight the range of capture rates. Reasons for these differences are discussed in Section 4 of this report.

Table 3.1: Capture rates by local authority groupings; nc denotes a material stream that is not being collected by a particular authority and na denotes where no arisings occur

Material	Local Authority	kg per pupil per year captured for recycling	kg per pupil per year not captured	% captured
Newspapers and magazines	Epping Forest	0.30	0.48	39
	Leeds	0.12	0.57	17
	Plymouth	0.60	0.28	68
	Shropshire	0.21	0.51	29
Directories and catalogues	Epping Forest	0.07	0.08	48
	Leeds	0.00	0.05	0
	Plymouth	0.15	0.03	83
	Shropshire	0.00	0.11	0
A4 type white paper	Epping Forest	0.45	0.41	52
	Leeds	0.60	0.53	53
	Plymouth	0.82	0.41	66
	Shropshire	0.32	0.56	36
A4 type colour paper	Epping Forest	0.07	0.10	43
	Leeds	0.02	0.11	16
	Plymouth	0.08	0.11	42
	Shropshire	0.07	0.09	44
Other recyclable paper	Epping Forest	0.42	0.72	37
	Leeds	0.30	1.13	21
	Plymouth	2.27	0.61	79
	Shropshire	0.34	0.74	32
Envelopes	Epping Forest	0.03	0.10	24
	Leeds	0.04	0.09	28
	Plymouth	0.04	0.05	48
	Shropshire	0.02	0.12	16
Corrugated cardboard	Epping Forest	1.59	0.23	87
	Leeds	2.18	1.58	58
	Plymouth	2.62	0.13	95
	Shropshire	nc	nc	nc
Other card	Epping Forest	0.19	0.25	44
	Leeds	0.05	0.56	8
	Plymouth	0.13	0.20	39
	Shropshire	nc	nc	nc
PET bottles	Epping Forest	0.04	0.48	7
	Leeds	nc	nc	nc
	Plymouth	0.07	0.62	10
	Shropshire	0.17	0.00	100
HDPE bottles	Epping Forest	0.04	0.22	15
	Leeds	nc	nc	nc
	Plymouth	0.05	0.14	28
	Shropshire	0.02	0.00	100
Food and beverage cans	Epping Forest	0.14	0.36	28
	Leeds	nc	nc	nc
	Plymouth	0.22	0.18	55
	Shropshire	0.27	0.04	87
Aerosols	Epping Forest	0.00	0.02	0
	Leeds	nc	nc	nc
	Plymouth	0.00	0.01	35
	Shropshire	0.00	0.00	na

3.4 Contamination rates

Table 3.2 below presents the levels of contamination of non-recyclable materials collected in the waste for recycling by local authority area and also for primary and secondary schools as a whole. On average 23% of the waste collected for recycling in primary schools was not recyclable but contamination in secondary schools was much lower at just 4%. The source of contaminants is detailed in Table A.7, appended to this report.

Table 3.2: Contamination rates of waste collected for recycling in schools

Grouping	Total kg per pupil in recycling bins	Recyclable kg per pupil in recycle bins	% recyclable	% contamination
Epping Forest primary schools	0.20	0.14	71	29
Leeds primary schools	0.17	0.14	81	19
Plymouth primary schools	0.23	0.17	76	24
Shropshire primary schools	0.05	0.04	84	16
Epping Forest secondary schools	0.08	0.07	93	7
Leeds secondary schools	0.04	0.04	100	0
Plymouth secondary schools	0.18	0.18	96	4
Shropshire secondary schools	0.02	0.02	92	8
Epping Forest schools	0.10	0.08	86	14
Leeds schools	0.07	0.06	91	9
Plymouth schools	0.19	0.18	93	7
Shropshire schools	0.02	0.02	89	11
All primary	0.16	0.13	77	23
All secondary	0.09	0.08	96	4
Average all schools	0.10	0.09	91	9

3.5 Schools with production and non-production kitchens

Full details of the differences in waste arising from schools with production kitchens and a small number of those without production kitchens are presented in Tables A.8 to A.11 appended to this report. There were some notable differences in the quantity of food waste generated in schools with and without production kitchens as tabulated in Table 3.3 below.

Table 3.3: Food waste produced in schools with and without production kitchens

School type	Kitchen type	Sub-category	Kg per pupil per week	Kg per pupil per year	Mean % by weight
primary	Production	Raw fruit and vegetable matter	0.25	9.89	20.82
		Cooked food	0.33	13.17	27.72
		Unidentified	0	0.08	0.17
	Non-production	Raw fruit and vegetable matter	0.11	4.55	13.76
		Cooked food	0.07	2.66	8.06
		Unidentified	0	0	0
secondary	Production	Raw fruit and vegetable matter	0.06	2.24	10.45
		Cooked food	0.11	4.5	20.94
		Unidentified	0	0.04	0.2
	Non-production	Raw fruit and vegetable matter	0.06	2.51	10.42
		Cooked food	0.07	2.87	11.92
		Unidentified	0	0	0

4.0 Discussion

As with waste arising from households, there may be significant variations in the quantities and types of waste generated by individual schools. Purchasing policies, school dinner systems, IT resources and school engagement in sustainability initiatives may all impact on the quantity and the composition of the waste streams of individual schools, even those with similar sized school rolls.

However, the robust methodology employed in this research means that the data presented in Section 3 above provides a good starting point for those wishing to estimate the types and quantities of waste produced by schools in a local authority area, regionally or nationally. A detailed discussion of the types and quantities of waste found in this research can be found in this section of the report.

4.1 The composition of waste from schools

Figures 3.1 and 3.2 in the previous section show the typical composition of waste produced by primary and secondary schools.

Food waste and paper or card are the dominant elements of the waste stream for both school types. The high proportion of biodegradable waste (defined as paper, card, food and garden waste in this context) present in waste produced by schools differs from the composition of waste produced by households (shown in Figure 1.1). 82% of the waste from primary schools was found to be biodegradable, compared to 60% of the waste from households. The comparable figure for secondary schools was 71%. The Landfill Allowance Trading Scheme (LATS) provides a significant incentive for the diversion of all biodegradable municipal waste (including that generated in schools) from landfill. The elevated proportion of biodegradable materials in waste from schools provides an additional incentive to manage this waste appropriately, to divert it from landfill.

The proportion of food waste found in waste from primary schools was found to be more than twice as high as the proportion of food waste found in waste from households (46% compared to 22%). The proportion of food waste found in secondary schools was approximately a third higher than the proportion of food waste found in waste from households (31% compared to 22%).

The larger percentage of food waste as a portion of total waste in primary schools compared to secondary schools can partly be accounted for by the higher amounts of raw food making up food waste in primary schools. The ratio of cooked to raw food in the food waste from secondary schools was found to be approximately 2 : 1 on average, compared to approximately 1.25 cooked : 1 raw food waste in primary schools. The higher ratio of raw food waste in primary schools may, in part, be a by-product of the free pieces of fruit or vegetables given to four to six year old children in LEA maintained infant, primary and special schools as part of the national School Fruit and Vegetable Scheme. The raw food waste was found to include a significant number of whole, or nearly whole, pieces of fruit. Although the research did not record fruit distribution activity, the staff sorting the waste anecdotally noted a positive correlation between the type of fruit offered at break time each day and the quantity of this fruit waste produced.

The sample size of schools without production kitchens included in this research was small; but of the schools sampled, those with production kitchens were producing significantly more food waste, especially cooked food waste, than those without production kitchens. This difference may be worth noting for those planning to collect food waste from schools. However, it is unlikely that more food waste is generated in total if food is prepared on-site; but simply that the waste is entering the waste stream somewhere other than from the schools.

One secondary school disposed of all of plate scrapings from their canteen directly into a sink waste disposal unit; in this instance the quantity of cooked food waste may have been significantly underestimated leading to an underestimate in the quantity of cooked waste in secondary schools as a whole.

The proportion of paper and card was also significantly higher in waste from both primary and secondary schools than in waste from households (39% from secondary Schools and 30% from primary schools compared to 18% from households). Whilst this result is not surprising, it does highlight the potential “easy-win” of collecting large quantities of readily recyclable materials from schools. In secondary schools, more than 40% of this paper and card portion of the waste stream was found to be made up of paper that is readily recyclable (e.g. A4 type paper, other recyclable paper and newspaper and magazines). Just over a third (35%) of this portion of the waste

stream was made up of card and less than 10% was made up of paper that would not be readily recyclable (e.g. hand towels, sugar paper, paper plates and cups and paper covered in glue, sequins etc.).

At least a third of this paper and card portion of the waste stream in primary schools was found to be made up of paper that is readily recyclable (e.g. A4 type paper, other recyclable paper and newspaper and magazines) and approximately 30% of this portion of the waste stream was made up of card. A higher portion of paper waste that would not be readily recyclable was found in primary schools, where hand towels, sugar paper, paper plates and cups and paper covered in glue, sequins etc. made up 16% of this portion of this waste stream.

The other recyclable materials found in waste from schools also provided some interesting points for discussion. The research found that there is not much glass in waste from schools: only 1% was found in waste from both primary and secondary schools compared to 7% found in waste from households. Textiles waste is also less prevalent in waste from schools than in waste from households, making up 1% of waste from schools compared with 3% of waste from households. There is twice as much metal waste in the waste from secondary schools as in the waste from primary schools: 4% in secondary schools compared to 2% from primary schools. This may be because drinks cans are not allowed by many primary schools as part of healthy eating initiatives. Plastics make up a significantly higher proportion of the waste from secondary schools than from primary schools and households: 17% of waste from secondary schools compared to 9% from primary schools and 7% from households. These differences should be considered when examining resources and possible approaches to collecting waste for recycling from schools.

4.2 The quantity of waste from schools

Primary schools were found to produce twice as much waste per pupil per year as secondary schools on average: 45kg per pupil per year in primary schools compared to 22 kg per pupil per year in secondary schools. Some of this difference can be accounted for by the higher tonnage of raw food waste found in primary schools plus the slightly higher paper waste per pupil in primary schools. As the number of pupils in an average secondary school would be substantially higher than the number of pupils in an average primary school, the findings of this report might suggest an inverse relationship between school size and the amount of waste per pupil head. However, the practices of individual schools, including purchasing policies and waste reduction initiatives may over-ride any such relationship.

Based in the findings of this research an estimated 258,300 tonnes of day to day waste are produced by primary and secondary schools in England in a year. Of this waste, an estimated 201,439 tonnes could be readily recycled or composted; this represents 78% of the waste generated in schools.

The key differences between the findings of this research and those of the Waste Watch report into resource management in the education sector produced as part of a Biffaward project (Waste Watch, 2005), are the higher kilograms of waste produced per pupil per year and the higher proportion of kitchen waste for both primary and secondary schools. This difference can be attributed to the more comprehensive nature of this (WRAP's) research which sampled all waste produced in primary and secondary schools, including waste from the school kitchen; not just waste from classrooms, staffrooms and offices. The kg per pupil per year waste figures presented in Eunomia Research & Consulting *et al.* (2007) was higher than that found in WRAP's research. The figures were, however, based on those of Waste Watch (2005) but employing a different conversion rate to translate the volume of waste recorded into weights; the conversion rate was based on typical compositions of waste from households which this research shows is not the same as waste from schools.

4.3 Implications for the management of waste from schools

Average recycling rates for the schools participating in this study were 13% for primary and 20% for secondary schools.

Of the waste targeted for recycling in the schools in this study, cardboard was the material with the highest capture rate across school type and local authority area. Exploration of the reasons behind the excellent capture rate for cardboard were beyond the scope of this study but may be attributed to the fact that much of the cardboard is generated in a small number of locations within the schools (such as the canteen and areas receiving deliveries of consumables) where it is more convenient to store it for recycling than to add it to residual waste bins. The capture rate for cans was the lowest of all material streams targeted for recycling, which may be

because collection containers for cans are often located in a position intended to capture students' drinks cans whilst food cans originating in the canteen may be overlooked.

Contamination rates were found to be higher on average in waste from primary schools than in waste from secondary schools. In primary schools this contamination consisted primarily of paper not targeted for recycling, e.g. sugar paper and paper towels. In secondary schools plastic film was a more significant source of contamination. Research carried out with school teaching staff and senior management on behalf of WRAP in March 2007 found that advice on what can be recycled in their school's recycling scheme would encourage schools to recycle more. Providing schools with effective communication materials to make sure users of the school's recycling scheme understand exactly what types of paper, for example, are targeted for recycling in the scheme and which are not could therefore be an effective way of improving capture rates and reducing contamination rates.

The data collected illustrates how recycling collections can work effectively; schools in the Plymouth area are good examples, capturing large quantities of the targeted recyclable materials with low levels of contamination. In Plymouth, the materials targeted for recycling are collected co-mingled from 1100 litre bins as part of a dedicated school collection round which operates weekly. Indoor recycling containers are provided in the form of reusable Hessian style bags. A recycling officer visits the school before recycling containers are delivered to make sure the lead teacher understands how the scheme operates. Schools are provided with supporting materials, including posters detailing items that can and cannot be included in the school's recycling scheme, to help raise awareness and ensure everyone knows how to use the scheme. A member of the local authority's operations team liaises with the school's caretaker to discuss location of outdoor bins, access requirements, contracts etc. The capture rate from Plymouth schools was consistently high across all materials and contamination rates from all Plymouth schools were lower than from other areas.

The largest portion of the waste stream not currently targeted for recycling in the areas where this research was carried out is food waste. The management of this portion of waste from schools presents a number of challenges. The viability of food waste collections from schools is dependent on a number of factors, including the availability of bulking or treatment facilities locally, the capacity of existing food waste collection vehicles and the cost implications of adding food waste tonnage from schools.

The overall composition of waste from schools makes getting the right mix to compost effectively the large quantities of food waste at school more challenging than when composting at home. To compost effectively a 50 : 50 mix of "brown" and "green" waste is advised (greens such as fruit and vegetable waste are quick to rot and they provide important nitrogen and moisture, browns such as woody vegetation and card are slower to rot; they provide fibre and carbon and also allow important air pockets to form in the mixture). Whilst the mix of materials typically found in waste from households offers proportions of greens and browns that are well suited for composting at home, the high proportion of food waste in waste from schools means that the proportion of easily recyclable "greens" is likely to outweigh the proportion of easily recyclable "browns" in the waste stream. The absence of "woody" materials occurring in waste from schools, needed to absorb moisture and provide structure to the compost, means that composting just a portion of the food waste produced on site and using a compost bin more as an educational tool than a waste management option may be the best option for some schools. Importing bark chippings, sawdust etc. may also be an option for schools committed to managing more of their food waste on site. The volume of food waste produced by schools however will also mean that using receptacles designed to manage waste from households to compost at school is unlikely to be ideal for managing the organic portion of the waste stream.

Finding effective ways of reducing the amount of food waste produced by schools would be the optimal solution; but there are a number of obvious challenges to reducing the amount of food waste from schools, including the lead times on menu planning which limits opportunities for using leftovers, food procurement policies and storage of leftover food. Organisations (including WRAP) will need to work together to explore solutions to the food waste issues highlighted in this report.

4.4 Recommendations

The findings in this report suggest that action may be required from local education, waste disposal and waste collection authorities, other organisations working with schools and from schools themselves. WRAP will be looking at how we can help these bodies to manage schools waste more effectively in future.

4.4.1 Initial recommendations for local waste collection and disposal authorities:

Defra has clarified that waste from schools is classified under the Controlled Waste Regulations 1992 as *household waste for which a charge for collection can be made*. Waste produced by schools which is collected by a local authority, or its contractor, will be included in tonnages of household waste sent for disposal (e.g. landfill). Waste from schools which is recycled or composted will count towards an authority's household waste recycling targets. Preventing biodegradable materials from schools from entering the residual waste stream could also help local authorities to meet their LATS allowances.

Recycling waste from schools where possible can therefore benefit both waste collection and waste disposal authorities. In light of this we recommend that local authorities consider:

- Using the indicative data from this report to get an understanding of the types and quantities of waste likely to be available from schools and develop effective recycling schemes for schools in their area.
- Communicating the benefits and logistics of the recycling scheme effectively to school staff who will be responsible for embedding recycling into the school routine.
- Monitoring the quantity and quality of recyclables being collected through the scheme– this can be a simple estimation from the crew - and provide feedback to participating schools.

A training course directed at encouraging a practical approach to planning, implementing and maintaining recycling schemes for schools has been developed by WRAP for individuals with a responsibility for developing or delivering recycling collections to schools. WRAP also offers local authorities technical and communications advice and support on recycling services for schools.

4.4.2 Initial recommendations for Local Education Authorities and schools

- Ensure that recycling containers are located in appropriate places and that school maintenance staff are trained in how to manage the waste at “back of school”.
- Recycle as much as possible and make sure school staff and pupils understand what can be recycled in their school's recycling scheme and the benefits which will result from recycling.
- Review purchasing policies and look at ways to reduce and prevent waste from schools.
- LEAs should facilitate the sharing of experience and recycling rates achieved between schools

Information, advice and activities to guide primary and secondary schools through the process of setting up and maintaining effective recycling schemes and taking a whole school approach to recycling are available in the Recycle Now Action Pack for schools;

www.recyclenowpartners.org.uk/schools

4.4.3 Recommendations for the future:

- Research into schools' current purchasing policies, how these impact on waste arisings and what effect local authority sustainable purchasing strategies are having on waste from schools.
- Waste prevention is a better environmental option and usually cheaper than either recycling or waste disposal. Consideration should be given to whether any of the waste that schools are producing can be prevented and research conducted into what waste prevention measures would be most effective in schools.
- Research into what impact recycling infrastructure and effective communications have on reducing waste for disposal from schools.
- Research to establish options for collecting food waste separately from school premises to establish the costs and benefits of food waste collections to schools and to promote the sharing of experience and learning between authorities involved in, or considering establishing, food waste collections for schools.
- Given the proportion of food waste in the total schools waste arisings, research into the types of food waste produced in schools, the reasons for wastage and barriers to reducing this waste. This report has not looked at schools' procurement of food, menu planning or children's consumption of food; only the total waste produced.

5.0 References

Economia Research & Consulting, The Environment Council, Öko-Institut, TNO & Atlantic Consulting (2007). Household Waste Prevention Policy, Side Research Programme. Final Report for Defra

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Parfitt, J.P. (2002). Analysis of household waste composition and factors driving waste increases. WRAP, Banbury, UK.

Waste Watch (2005). Resource Management in the Education Sector. Report for Biffaward mass balance programme on sustainable resource use.

6.0 Appendix

A series of tables are presented in this section as supporting materials to the main report.

Table A.1: Quantity and composition of household waste in England (Parfitt, 2002). Data includes bring site recycling but excludes household waste arising at civic amenity sites.

Category	kg per household per year	% by weight
Newspapers & magazines	71	8.1
Other recyclable paper	51	5.8
Liquid cartons	4	0.4
Board packaging	11	1.2
Card & paper packaging	31	3.5
Other card	1	0.2
Non-recyclable paper	30	3.5
Plastic bottles	18	2.1
Other dense plastic packaging	19	2.1
Other dense plastic	5	0.6
Plastic film	35	4.0
Textiles	28	3.2
Glass bottles and jars	69	7.9
Other glass	4	0.5
Metal cans & foil	29	3.4
Batteries	<0.5	<0.5
Garden waste	134	15.3
Kitchen waste	106	12.1
Non-home compostable kitchen waste	88	10.1
Fines	32	3.7
Wood	24	2.7
Furniture	2	0.3
Disposable nappies	21	2.4
Other miscellaneous combustibles	5	0.6
Miscellaneous non-combustibles	18	2.1
Other non-ferrous metals	<0.5	<0.5
Scrap metal/white goods	26	2.9
Soil & other organic waste	10	1.0
TOTAL	872	100

Table A.2: Categories into which waste from schools was sorted for weighing

Primary category	Sub-category
Paper and card	Newspapers and magazines
	Directories and catalogues
	A4 type white paper
	A4 type colour paper
	Other recyclable paper
	All sugar paper
	Paper covered in glue, sequins etc.
	Envelopes
	Hand towels
	Paper plates and cups
	Other non recyclable paper
	Liquid cartons
	Corrugated cardboard
	Other card
Books	
Plastic film	Refuse sacks
	Carrier bags
	Other film
Dense plastic	PET bottles
	HDPE bottles
	Other bottles
	Polystyrene including cups
	Other packaging
	Other dense plastic
Textiles	Fabrics
	Shoes
Miscellaneous combustible	Board pens
	Mop heads
	Rubber
	Sanitary products
	Wood
	Carpet
	Unclassified
	Ceramics
Miscellaneous non-combustible	Materials for the art department
	Hardcore
	Unclassified
Glass	Clear bottles and jars
	Green bottles and jars
	Brown bottles and jars
	Other glass
Ferrous Metal	Food and beverage cans
	Aerosols
	Batteries
	Other ferrous packaging
	Other ferrous non-packaging
Non-ferrous metal	Food and beverage cans
	Aerosols
	Aluminium foil
	Other non-ferrous packaging
	Other non-ferrous
Garden waste	Garden waste
Food waste	Raw fruit and vegetable matter
	Cooked food
	Unidentified
Fines	Particles passing a 10mm screen
WEEE	WEEE
Hazardous waste	Hazardous waste

Table A.3: Average quantity and composition of waste produced in **primary** schools (a year is 40 weeks)

Primary category	Sub-category	Kg per pupil per week	Kg per pupil per year	Mean % by weight
Paper and card	Newspapers and magazines	0.03	1.12	2.50
	Directories and catalogues	0.00	0.08	0.18
	A4 type white paper	0.04	1.41	3.15
	A4 type colour paper	0.00	0.17	0.37
	Other recyclable paper	0.05	1.84	4.10
	All sugar paper	0.01	0.48	1.06
	Paper covered in glue, sequins etc.	0.00	0.07	0.17
	Envelopes	0.01	0.25	0.56
	Hand towels	0.04	1.56	3.47
	Paper plates and cups	0.00	0.08	0.17
	Other non recyclable paper	0.03	1.30	2.89
	Liquid cartons	0.02	0.96	2.14
	Corrugated cardboard	0.08	3.23	7.18
	Other card	0.02	0.82	1.82
Books	0.01	0.28	0.63	
Plastic film	Refuse sacks	0.02	0.72	1.61
	Carrier bags	0.00	0.17	0.39
	Other film	0.03	1.01	2.25
Dense plastic	PET bottles	0.01	0.39	0.87
	HDPE bottles	0.01	0.33	0.73
	Other bottles	0.00	0.06	0.13
	Polystyrene including cups	0.00	0.13	0.29
	Other packaging	0.02	0.70	1.55
Textiles	Fabrics	0.00	0.17	0.37
	Shoes	0.00	0.07	0.15
Miscellaneous combustible	Board pens	0.00	0.06	0.14
	Mop heads	0.01	0.41	0.90
	Rubber	0.00	0.01	0.02
	Sanitary products	0.00	0.03	0.07
	Wood	0.01	0.21	0.46
	Carpet	0.01	0.59	1.31
	Unclassified	0.00	0.09	0.21
Miscellaneous non-combustible	Ceramics	0.00	0.14	0.30
	Materials for the art department	0.00	0.00	0.00
	Hardcore	0.00	0.00	0.00
Glass	Unclassified	0.00	0.03	0.06
	Clear bottles and jars	0.01	0.21	0.48
	Green bottles and jars	0.00	0.03	0.07
	Brown bottles and jars	0.00	0.01	0.02
Ferrous Metal	Other glass	0.00	0.03	0.07
	Food and beverage cans	0.02	0.68	1.52
	Aerosols	0.00	0.01	0.03
	Batteries	0.00	0.03	0.06
	Other ferrous packaging	0.00	0.01	0.03
Non-ferrous metal	Other ferrous non-packaging	0.00	0.08	0.17
	Food and beverage cans	0.00	0.10	0.22
	Aerosols	0.00	0.00	0.00
	Aluminium foil	0.00	0.19	0.43
	Other non-ferrous packaging	0.00	0.00	0.00
Garden waste	Other non-ferrous	0.00	0.00	0.00
	Garden waste	0.05	2.18	4.85
Food waste	Raw fruit and vegetable matter	0.22	8.94	19.90
	Cooked food	0.28	11.30	25.15
	Unidentified	0.00	0.07	0.15
Fines	Particles passing a 10mm screen	0.03	1.33	2.96
WEEE	WEEE	0.00	0.07	0.15
Hazardous waste	Hazardous waste	0.00	0.01	0.02
TOTAL		1.12	44.95	100.00

Table A.4: Average quantity and composition of waste produced in **secondary** schools (a year is 40 weeks)

Primary category	Sub-category	Kg per pupil per week	Kg per pupil per year	Mean % by weight
Paper and card	Newspapers and magazines	0.02	0.70	3.23
	Directories and catalogues	0.00	0.14	0.66
	A4 type white paper	0.02	0.98	4.52
	A4 type colour paper	0.00	0.16	0.75
	Other recyclable paper	0.04	1.67	7.68
	All sugar paper	0.00	0.13	0.60
	Paper covered in glue, sequins etc.	0.00	0.02	0.09
	Envelopes	0.00	0.10	0.48
	Hand towels	0.01	0.60	2.76
	Paper plates and cups	0.00	0.08	0.37
	Other non recyclable paper	0.02	0.63	2.88
	Liquid cartons	0.01	0.25	1.17
	Corrugated cardboard	0.07	2.61	12.01
	Other card	0.01	0.39	1.80
Books	0.00	0.13	0.59	
Plastic film	Refuse sacks	0.01	0.52	2.39
	Carrier bags	0.00	0.10	0.48
	Other film	0.02	0.87	4.01
Dense plastic	PET bottles	0.02	0.76	3.52
	HDPE bottles	0.00	0.20	0.92
	Other bottles	0.00	0.03	0.12
	Polystyrene inc cups	0.00	0.13	0.60
	Other packaging	0.01	0.57	2.62
Textiles	Fabrics	0.00	0.09	0.43
	Shoes	0.00	0.02	0.08
Miscellaneous, combustible	Board pens	0.00	0.01	0.06
	Mop heads	0.00	0.04	0.16
	Rubber	0.00	0.00	0.02
	Sanitary products	0.00	0.04	0.16
	Wood	0.01	0.36	1.68
	Carpet	0.00	0.02	0.08
	Unclassified	0.00	0.11	0.52
Miscellaneous non-combustible	Ceramics	0.00	0.08	0.36
	Materials for the art dept.	0.00	0.03	0.16
	Hardcore	0.00	0.00	0.02
Glass	Unclassified	0.00	0.03	0.12
	Clear bottles and jars	0.00	0.07	0.32
	Green bottles and jars	0.00	0.02	0.07
	Brown bottles and jars	0.00	0.02	0.10
Ferrous metal	Other glass	0.00	0.02	0.08
	Food and beverage cans	0.01	0.43	1.99
	Aerosols	0.00	0.01	0.05
	Batteries	0.00	0.02	0.11
	Other ferrous packaging	0.00	0.02	0.07
Non-ferrous metal	Other ferrous	0.00	0.16	0.74
	Food and beverage cans	0.00	0.14	0.66
	Aerosols	0.00	0.00	0.01
	Aluminium foil	0.00	0.05	0.23
	Other non-ferrous packaging	0.00	0.00	0.01
Garden waste	Other non-ferrous	0.00	0.00	0.01
	Garden Waste	0.01	0.22	1.02
Food waste	Raw fruit and vegetable matter	0.06	2.27	10.45
	Cooked food	0.11	4.34	20.00
	Unidentified	0.00	0.04	0.18
Fines	Particles passing a 10mm screen	0.02	0.71	3.27
WEEE	WEEE	0.00	0.10	0.46
Hazardous waste	Hazardous waste	0.00	0.02	0.08
TOTAL		0.54	21.72	100

Table A.5: Capture rate of materials collected for recycling in primary schools

Material	Number of schools	Average kg per pupil per year	Capture rate (%)	Overall capture rate (%)
Newspapers and magazines	11	1.14	40	56
Directories and catalogues	11	0.08	19	
A4 type white paper	11	1.41	62	
A4 type colour paper	11	0.17	66	
Other recyclable paper	11	1.84	63	
Envelopes	11	0.25	51	
Corrugated cardboard	9	3.33	72	64
Other card	9	0.91	31	
PET bottles	7	0.40	21	26
HDPE bottles	7	0.51	31	
Food and beverage cans	7	0.10	3	3
Aerosols	7	0.00	N/A	

Table A.6: Capture rate of materials collected for recycling in secondary schools

Material	Number of schools	Average kg per pupil per year	Capture rate (%)	Overall capture rate (%)
Newspapers and magazines	10	0.79	40	45
Directories and catalogues	10	0.17	46	
A4 type white paper	10	1.11	46	
A4 type colour paper	10	0.18	29	
Other recyclable paper	10	1.87	49	
Envelopes	10	0.12	14	
Corrugated cardboard	8	2.55	81	75
Other card	8	0.36	29	
PET bottles	6	0.63	7	9
HDPE bottles	6	0.18	16	
Food and beverage cans	6	0.05	6	6
Aerosols	6	0.00	46	

Table A.7: Proportion of material streams collected for recycling (both targeted materials and contaminants)

Primary category	Sub-category	Kg of material in Schools	Kg of material in Secondary
Paper and card	Newspapers and magazines	6.76	7.86
	Directories and catalogues	0.23	1.91
	A4 type white paper	13.01	12.70
	A4 type colour paper	1.63	1.34
	Other recyclable paper	17.41	22.62
	All sugar paper	3.06	0.43
	Paper covered in glue, sequins etc.	0.43	0.10
	Envelopes	1.87	0.41
	Hand towels	2.30	0.37
	Paper plates and cups	0.03	0.05
	Other non recyclable paper	2.87	0.59
	Liquid cartons	1.74	0.08
	Corrugated cardboard	28.49	42.74
	Other card	3.40	2.17
Books	3.27	0.16	
Plastic film	Refuse sacks	1.34	0.57
	Carrier bags	0.31	0.03
	Other film	0.87	0.86
Dense plastic	PET bottles	0.69	0.77
	HDPE bottles	1.08	0.47
	Other bottles	0.07	0.08
	Polystyrene inc cups	0.08	0.07
	Other packaging	0.71	0.55
	Other dense plastic	0.14	0.01
Textiles	Fabrics	0.89	0.07
	Shoes	0.06	0.01
Miscellaneous, combustible	Board pens	0.30	0.01
	Mop heads	0.01	0.00
	Rubber	0.00	0.00
	Sanitary products	0.00	0.00
	Wood	1.13	0.01
	Carpet	0.00	0.00
	Unclassified	0.15	0.00
	Ceramics	0.36	0.00
Miscellaneous non-combustible	Materials for the art dept.	0.00	0.00
	Hardcore	0.00	0.00
	Unclassified	0.00	0.00
Glass	Clear bottles and jars	0.22	0.02
	Green bottles and jars	0.00	0.00
	Brown bottles and jars	0.09	0.00
	Other glass	0.00	0.00
Ferrous metal	Food and beverage cans	2.08	2.64
	Aerosols	0.13	0.00
	Batteries	0.00	0.00
	Other ferrous packaging	0.10	0.00
	Other ferrous	0.17	0.01
Non-ferrous metal	Food and beverage cans	0.03	0.04
	Aerosols	0.00	0.00
	Aluminium foil	0.10	0.01
	Other non-ferrous packaging	0.00	0.00
	Other non-ferrous	0.00	0.00
Garden waste	Garden Waste	0.01	0.00
Food waste	Raw fruit and vegetable matter	1.05	0.01
	Cooked food	0.58	0.15
	Unidentified	0.08	0.00
Fines	Particles passing a 10mm screen	0.46	0.09
WEEE	WEEE	0.20	0.00
Hazardous waste	Hazardous waste	0.00	0.00
TOTAL		100	100

Table A.8: Average quantity and composition of waste from **primary** schools with production kitchens

Primary category	Sub-category	Kg per pupil per week	Kg per pupil per year	Mean % by weight
Paper and card	Newspapers and magazines	0.03	1.20	2.52
	Directories and catalogues	0.00	0.10	0.21
	A4 type white paper	0.03	1.29	2.72
	A4 type colour paper	0.00	0.19	0.39
	Other recyclable paper	0.04	1.75	3.69
	All sugar paper	0.01	0.44	0.92
	Paper covered in glue, sequins etc.	0.00	0.09	0.18
	Envelopes	0.01	0.26	0.54
	Hand towels	0.04	1.50	3.15
	Paper plates and cups	0.00	0.08	0.17
	Other non recyclable paper	0.03	1.15	2.43
	Liquid cartons	0.02	0.98	2.06
	Corrugated cardboard	0.08	3.11	6.54
	Other card	0.02	0.84	1.78
Books	0.00	0.13	0.28	
Plastic film	Refuse sacks	0.02	0.71	1.49
	Carrier bags	0.00	0.17	0.36
	Other film	0.03	1.09	2.30
Dense plastic	PET bottles	0.01	0.42	0.88
	HDPE bottles	0.01	0.35	0.73
	Other bottles	0.00	0.06	0.12
	Polystyrene inc cups	0.00	0.14	0.30
	Other packaging	0.02	0.73	1.53
	Other dense plastic	0.02	0.63	1.34
Textiles	Fabrics	0.01	0.49	1.03
	Shoes	0.00	0.11	0.24
Miscellaneous, combustible	Board pens	0.00	0.06	0.13
	Mop heads	0.00	0.08	0.17
	Rubber	0.00	0.01	0.03
	Sanitary products	0.00	0.04	0.08
	Wood	0.00	0.20	0.41
	Carpet	0.02	0.71	1.50
	Unclassified	0.00	0.06	0.13
	Ceramics	0.00	0.12	0.25
Miscellaneous non-combustible	Materials for the art dept.	0.00	0.00	0.00
	Hardcore	0.00	0.00	0.00
	Unclassified	0.00	0.03	0.07
Glass	Clear bottles and jars	0.00	0.19	0.40
	Green bottles and jars	0.00	0.02	0.03
	Brown bottles and jars	0.00	0.01	0.01
	Other glass	0.00	0.04	0.08
Ferrous metal	Food and beverage cans	0.02	0.77	1.61
	Aerosols	0.00	0.02	0.03
	Batteries	0.00	0.03	0.06
	Other ferrous packaging	0.00	0.01	0.02
	Other ferrous	0.00	0.06	0.12
Non-ferrous metal	Food and beverage cans	0.00	0.11	0.23
	Aerosols	0.00	0.00	0.00
	Aluminium foil	0.01	0.22	0.46
	Other non-ferrous packaging	0.00	0.00	0.00
	Other non-ferrous	0.00	0.00	0.00
Garden waste	Garden Waste	0.05	2.18	4.59
Food waste	Raw fruit and vegetable matter	0.25	9.89	20.82
	Cooked food	0.33	13.17	27.72
	Unidentified	0.00	0.08	0.17
Fines	Particles passing a 10mm screen	0.03	1.33	2.81
WEEE	WEEE	0.00	0.06	0.14
Hazardous waste	Hazardous waste	0.00	0.01	0.03
TOTAL		1.19	47.51	100.00

Table A.9: Average quantity and composition of waste from **primary** schools with non-production kitchens

Primary category	Sub-category	Kg per pupil per week	Kg per pupil per year	Mean % by weight
Paper and card	Newspapers and magazines	0.02	0.77	2.34
	Directories and catalogues	0.00	0.00	0.00
	A4 type white paper	0.05	1.98	6.00
	A4 type colour paper	0.00	0.08	0.25
	Other recyclable paper	0.06	2.24	6.79
	All sugar paper	0.02	0.66	2.00
	Paper covered in glue, sequins etc.	0.00	0.02	0.07
	Envelopes	0.01	0.22	0.67
	Hand towels	0.05	1.85	5.58
	Paper plates and cups	0.00	0.05	0.16
	Other non recyclable paper	0.05	1.98	5.99
	Liquid cartons	0.02	0.89	2.69
	Corrugated cardboard	0.09	3.78	11.44
	Other card	0.02	0.69	2.07
Books	0.02	0.98	2.97	
Plastic film	Refuse sacks	0.02	0.79	2.40
	Carrier bags	0.00	0.19	0.56
	Other film	0.02	0.64	1.95
Dense plastic	PET bottles	0.01	0.26	0.78
	HDPE bottles	0.01	0.24	0.71
	Other bottles	0.00	0.05	0.14
	Polystyrene inc cups	0.00	0.07	0.22
	Other packaging	0.01	0.56	1.69
	Other dense plastic	0.02	0.94	2.85
Textiles	Fabrics	0.00	0.01	0.04
	Shoes	0.01	0.41	1.25
Miscellaneous, combustible	Board pens	0.00	0.06	0.17
	Mop heads	0.00	0.00	0.01
	Rubber	0.00	0.00	0.00
	Sanitary products	0.00	0.02	0.06
	Wood	0.01	0.25	0.75
	Carpet	0.00	0.01	0.02
	Unclassified	0.01	0.24	0.71
	Ceramics	0.01	0.22	0.66
Miscellaneous non-combustible	Materials for the art dept.	0.00	0.00	0.00
	Hardcore	0.00	0.00	0.00
	Unclassified	0.00	0.00	0.00
Glass	Clear bottles and jars	0.01	0.31	0.95
	Green bottles and jars	0.00	0.10	0.31
	Brown bottles and jars	0.00	0.03	0.10
	Other glass	0.00	0.00	0.00
Ferrous metal	Food and beverage cans	0.01	0.30	0.90
	Aerosols	0.00	0.01	0.02
	Batteries	0.00	0.01	0.03
	Other ferrous packaging	0.00	0.03	0.10
	Other ferrous	0.00	0.18	0.54
Non-ferrous metal	Food and beverage cans	0.00	0.05	0.15
	Aerosols	0.00	0.01	0.02
	Aluminium foil	0.00	0.07	0.22
	Other non-ferrous packaging	0.00	0.00	0.00
	Other non-ferrous	0.00	0.00	0.00
Garden waste	Garden Waste	0.05	2.19	6.63
Food waste	Raw fruit and vegetable matter	0.11	4.55	13.76
	Cooked food	0.07	2.66	8.06
	Unidentified	0.00	0.00	0.00
Fines	Particles passing a 10mm screen	0.03	1.32	3.99
WEEE	WEEE	0.00	0.08	0.24
Hazardous waste	Hazardous waste	0.00	0.00	0.00
TOTAL		0.83	33.06	100.00

Table A10: Average quantity and composition of waste from **secondary** schools with production kitchens

Primary category	Sub-category	Kg per pupil per week	Kg per pupil per year	Mean % by weight
Paper and card	Newspapers and magazines	0.02	0.67	3.13
	Directories and catalogues	0.00	0.15	0.68
	A4 type white paper	0.02	0.98	4.55
	A4 type colour paper	0.00	0.16	0.74
	Other recyclable paper	0.04	1.71	7.95
	All sugar paper	0.00	0.14	0.64
	Paper covered in glue, sequins etc.	0.00	0.02	0.10
	Envelopes	0.00	0.10	0.45
	Hand towels	0.01	0.55	2.58
	Paper plates and cups	0.00	0.06	0.29
	Other non recyclable paper	0.01	0.58	2.69
	Liquid cartons	0.01	0.23	1.07
	Corrugated cardboard	0.06	2.56	11.93
	Other card	0.01	0.38	1.75
Books	0.00	0.14	0.65	
Plastic film	Refuse sacks	0.01	0.49	2.29
	Carrier bags	0.00	0.10	0.47
	Other film	0.02	0.85	3.94
Dense plastic	PET bottles	0.02	0.75	3.51
	HDPE bottles	0.00	0.20	0.93
	Other bottles	0.00	0.03	0.13
	Polystyrene inc cups	0.00	0.12	0.56
	Other packaging	0.01	0.55	2.57
Textiles	Fabrics	0.00	0.04	0.18
	Shoes	0.00	0.08	0.39
Miscellaneous, combustible	Board pens	0.00	0.01	0.06
	Mop heads	0.00	0.02	0.08
	Rubber	0.00	0.00	0.01
	Sanitary products	0.00	0.04	0.18
	Wood	0.01	0.35	1.64
	Carpet	0.00	0.02	0.09
	Unclassified	0.00	0.10	0.48
Miscellaneous non-combustible	Ceramics	0.00	0.08	0.35
	Materials for the art dept.	0.00	0.02	0.10
	Hardcore	0.00	0.00	0.02
Glass	Unclassified	0.00	0.02	0.07
	Clear bottles and jars	0.00	0.07	0.32
	Green bottles and jars	0.00	0.02	0.08
	Brown bottles and jars	0.00	0.02	0.11
Ferrous metal	Other glass	0.00	0.02	0.08
	Food and beverage cans	0.01	0.42	1.98
	Aerosols	0.00	0.01	0.05
	Batteries	0.00	0.02	0.08
	Other ferrous packaging	0.00	0.02	0.08
Non-ferrous metal	Other ferrous	0.00	0.17	0.81
	Food and beverage cans	0.00	0.13	0.61
	Aerosols	0.00	0.00	0.01
	Aluminium foil	0.00	0.05	0.23
	Other non-ferrous packaging	0.00	0.00	0.01
Garden waste	Other non-ferrous	0.00	0.00	0.01
	Garden Waste	0.01	0.23	1.05
Food waste	Raw fruit and vegetable matter	0.06	2.24	10.45
	Cooked food	0.11	4.50	20.94
	Unidentified	0.00	0.04	0.20
Fines	Particles passing a 10mm screen	0.02	0.67	3.10
WEEE	WEEE	0.00	0.11	0.50
Hazardous waste	Hazardous waste	0.00	0.01	0.05
TOTAL		0.54	21.48	100.00

Table A11: Average quantity and composition of waste from **secondary** schools with non-production kitchens

Primary category	Sub-category	Kg per pupil per week	Kg per pupil per year	Mean % by weight
Paper and card	Newspapers and magazines	0.02	0.98	4.09
	Directories and catalogues	0.00	0.13	0.54
	A4 type white paper	0.03	1.03	4.27
	A4 type colour paper	0.01	0.21	0.88
	Other recyclable paper	0.03	1.30	5.40
	All sugar paper	0.00	0.07	0.27
	Paper covered in glue, sequins etc.	0.00	0.00	0.01
	Envelopes	0.00	0.19	0.77
	Hand towels	0.03	1.03	4.27
	Paper plates and cups	0.01	0.24	1.01
	Other non recyclable paper	0.03	1.09	4.51
	Liquid cartons	0.01	0.48	2.01
	Corrugated cardboard	0.08	3.06	12.71
	Other card	0.01	0.54	2.24
Books	0.00	0.00	0.00	
Plastic film	Refuse sacks	0.02	0.78	3.23
	Carrier bags	0.00	0.14	0.60
	Other film	0.03	1.11	4.63
Dense plastic	PET bottles	0.02	0.87	3.60
	HDPE bottles	0.01	0.20	0.83
	Other bottles	0.00	0.02	0.09
	Polystyrene inc cups	0.01	0.21	0.88
	Other packaging	0.02	0.73	3.03
	Other dense plastic	0.01	0.46	1.89
Textiles	Fabrics	0.00	0.00	0.00
	Shoes	0.01	0.20	0.84
Miscellaneous, combustible	Board pens	0.00	0.02	0.07
	Mop heads	0.00	0.03	0.11
	Rubber	0.00	0.02	0.08
	Sanitary products	0.00	0.00	0.02
	Wood	0.01	0.49	2.04
	Carpet	0.00	0.00	0.00
	Unclassified	0.01	0.22	0.93
	Ceramics	0.00	0.09	0.38
Miscellaneous non-combustible	Materials for the art dept.	0.00	0.16	0.68
	Hardcore	0.00	0.00	0.00
	Unclassified	0.00	0.11	0.48
Glass	Clear bottles and jars	0.00	0.08	0.31
	Green bottles and jars	0.00	0.01	0.04
	Brown bottles and jars	0.00	0.00	0.00
	Other glass	0.00	0.00	0.00
Ferrous metal	Food and beverage cans	0.01	0.51	2.11
	Aerosols	0.00	0.01	0.04
	Batteries	0.00	0.10	0.43
	Other ferrous packaging	0.00	0.00	0.00
	Other ferrous	0.00	0.04	0.16
Non-ferrous metal	Food and beverage cans	0.01	0.25	1.05
	Aerosols	0.00	0.00	0.00
	Aluminium foil	0.00	0.05	0.20
	Other non-ferrous packaging	0.00	0.00	0.00
	Other non-ferrous	0.00	0.00	0.00
Garden waste	Garden Waste	0.00	0.19	0.77
Food waste	Raw fruit and vegetable matter	0.06	2.51	10.42
	Cooked food	0.07	2.87	11.92
	Unidentified	0.00	0.00	0.00
Fines	Particles passing a 10mm screen	0.03	1.14	4.74
WEEE	WEEE	0.00	0.03	0.14
Hazardous waste	Hazardous waste	0.00	0.07	0.28
TOTAL		0.60	24.06	100.00

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