

Appendix A

Commercial and Industrial Waste Arisings Survey Extrapolation Methodology

Extrapolation of waste arisings estimates from published survey data is based on deriving a waste arisings unit for each business sector and business size by employee number. The Defra National Survey has published national and regional totals by business sector and company size. Also published in the report is the number of business under the same business sectors and company sizes. It is therefore possible to produce an estimate of the average quantity of waste produced by a business by size and sector. Table A1 below shows the estimated waste produced by a single company in each of the business sector and company sizes.

Table A1 Average Annual Waste Production by Business Sector (Data from Defra National C&I Waste Survey)

Business sector	1 - 4	4 - 9	10 - 19	20-49	50-99	100-249	250+
Food, drink & tobacco	0.60331825	9.395973154	60.96256684	401.3245033	1455	2298.630137	8696.969697
Textiles / wood / paper /publishing	1.103955842	12.89640592	74.87684729	126.2376238	644.295302	2768.674699	11923.80952
Power & utilities	0.657894737	85.41666667	46.34146341	137.6623377	551.5151515	10073.33333	38123.80952
Chemicals / non-metallic minerals manufacture	1.014492754	41.51785714	99.21671018	407.2625698	356.9767442	2694.017094	3941.666667
Metal manufacturing	6.463414634	24.8447205	48.10126582	108.4233261	795	2025.352113	22720
Machinery & equipment (other manufacture)	1.902985075	7.843137255	38.07439825	61.58113731	163.3217993	484.3137255	1876
Retail & wholesale	3.547558777	23.60265078	31.82926829	68.18600368	157.6284585	344.5742905	973.0205279
Other Services	1.437595295	11.00281568	24.97698681	52.66050462	88.54282536	113.6393019	569.210174
Public Sector	0.900964313	6.065468549	25.2155523	24.85944385	47.17198923	126.6028003	381.884058

If the number of business in each sector and the quantity of waste produced by sector and company size is known then the total quantity of waste produced by sector and business size can also be estimated. Table A2 give the number of businesses in Bradford.

Table A2 Bradford Number of Businesses (ONS data 2008)

Business sector	1 - 4	4 - 9	10 - 19	20-49	50-99	100-249	250+	Totals
Food, drink and tobacco	20	15	10	10	5	5	0	65
Textiles/wood/paper/publishing	210	60	45	55	10	10	0	390
Power & Utilities	10	0	0	5	0	0	1	15

Business sector	1 - 4	4 - 9	10 - 19	20-49	50-99	100-249	250+	Totals
Chemical/non-metallic minerals manufacturing	75	20	30	20	15	5	5	170
Metal manufacturing	150	40	30	20	5	5	0	250
Machinery & equipment (other manufacturing)	230	60	50	30	20	10	10	410
Retail & wholesale	2680	605	350	185	60	15	25	3920
Other services	4260	780	485	270	80	55	20	5950
Public sector	580	240	305	260	155	60	30	1630

Table A3 shows the total quantities of estimated waste arisings for Bradford by multiplying the factors in Table A1 and the business numbers in Table A2.

Table A3 Waste Arisings Tonnes Bradford (data in Tonnes) based on the Defra Nation C&I Survey.

Business sector	1 - 4	4 - 9	10 - 19	20-49	50-99	100-249	250+	Totals
Food, drink and tobacco	12	141	610	4,013	7,275	11,493	-	23,544
Textiles/wood/paper/publishing	232	774	3,369	6,943	6,443	27,687	-	45,448
Power & Utilities	7	-	-	688	-	-	38,124	38,819
Chemical/non-metallic minerals manufacturing	76	830	2,977	8,145	5,355	13,470	19,708	50,561
Metal manufacturing	970	994	1,443	2,168	3,975	10,127	-	19,677
Machinery & equipment (other manufacturing)	438	471	1,904	1,847	3,266	4,843	18,760	31,529
Retail & wholesale	9,507	14,280	11,140	12,614	9,458	5,169	24,326	86,494
Other services	6,124	8,582	12,114	14,218	7,083	6,250	11,384	65,756
Public sector	523	1,456	7,691	6,463	7,312	7,596	11,457	42,497
Totals	17,888	27,527	41,247	57,102	50,167	86,635	123,758	404,324

Although the aim in the Defra National C&I survey was for an overall error on the total tonnage of C&I waste across the eight English regions surveyed of within +/-5% at a 95% confidence interval, the actual precision for the total waste arisings figure was 7.29% at a 95% confidence interval and at regional level the arisings were of a similar precision. The error is reported as “higher than that targeted due to the optimal sample being unachievable in reality within a voluntary survey”. The effect of this on the total C&I arisings projected using the methodology described above is a projected total C&I arisings of 404,324 tonnes within a range from 374,444 tonnes to 433,799 tonnes (variance of 59,355 tonnes). In practice the precision and confidence level of any such projections will be reduced by deriving estimates at smaller geographical units such as sub-regions and county and unitary/district levels as the survey sampling at national level cannot reflect increasing local variations in characteristics.

Exactly the same methodology is used for extrapolation of the data from the NW Survey with the estimated average quantity of waste produced by a business by size and sector multiplied by the number of businesses in each sector and size classification.

Comparisons for C&I Waste Arisings by Material Type

The Defra National C&I survey data has published waste arisings by both material type and management method at regional level including Yorkshire and Humberside. The distribution of business numbers by SIC classification and business size for material type and management method has not been made available within the published data. It is not possible therefore to derive estimates of waste materials by type and management method as a factor of business classification and size.

However, some indication of materials type and management method can be calculated from the proportions of waste materials and methods of waste management shown in the national survey. Thus if it is shown in the Defra survey for the Yorkshire and Humberside that “Animal & Vegetable Wastes” make up 7% of the total arisings then an assumption can be made that “Animal & Vegetable Wastes” arisings are in the same proportion i.e. 7% for Bradford. Therefore if the projected C&I arisings for the North Yorkshire Sub-region are 404,324 tonnes “Animal & Vegetable Wastes” arisings would be 28,302 tonnes. These projections can only be valued as indications given that at a Yorkshire and Humberside regional level the C&I waste arisings may be significantly influenced by other metropolitan areas which have different characteristics to Bradford.

The same methodology can be used taking the total waste C&I arisings estimates from the extrapolated NW Survey estimates and this has been carried out and figures shown in the report (Tables A6-A9).

If it is assumed that waste materials and management methods are of the same proportions of waste arisings for Bradford as for Yorkshire and Humberside, arisings by waste type and management method can be compared.

Table A6 Comparisons for C&I Waste Arisings by Material Type

Estimated Arising by Waste Types	Yorkshire and Humber National Survey	% of Total	Bradford Proportional to National Survey
Animal & vegetable wastes	493,000	7	28,303
Chemical wastes	750,000	11	44,476
Common sludges	91,000	1	4,043
Discarded equipment	76,000	1	4,043
Healthcare wastes	190,000	3	12,130
Metallic wastes	347,000	5	20,216

Mineral wastes	2,648,000	38	153,643
Mixed wastes	1,220,000	18	72,778
Non metallic wastes	1,129,000	16	64,692
Total	6,944,000	100	404,324

Table A7 Comparisons for C&I Waste Arisings by Management Method

Estimated Waste Arising by Management Method	Yorkshire and Humber National Survey	% of Total	Bradford Proportional to National Survey	NW Survey Extrapolated To Bradford
Land disposal (Landfill)	1,997,000	29	117,254	93,823
land recovery	238,000	3	12,130	6,412
Thermal Energy recovery	107,000	2	8,086	11,519
Incineration	205,000	3	12,130	8,089
Non Thermal treatment	332,000	5	20,216	11,992
Transfer Station	78,000	1	4,043	9,305
Recycling	3,143,000	45	181,946	302,718
Composting	92,000	1	4,043	5,272
reuse	213,000	3	12,130	Reuse included in recycling for this survey
Unknown	539,000	8	32,346	22,247
Total	6,944,000	100	404,324	471,376