Study into Commercial and Industrial Waste Arisings

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Executive Summary

Introduction

The English Regions are faced with the task of planning for waste infrastructure to deal with commercial and industrial waste arisings whilst knowing relatively little about the scale and nature of such arisings.

At the meeting of the Waste Strategy Board in January 2009 on the future prospects for waste treatment infrastructure in the UK it was reported that the country is in line to overshoot its landfill diversion targets for 2020. The Board was asked to consider how to utilise any potential over-capacity from waste infrastructure in 2020 and use this to tackle C&I waste. Crucially, the issue of a lack of available data to help shape C&I waste policy was highlighted

Surveys have been the method of choice to provide estimates of the commercial and industrial (C&I) waste resource but these are very difficult to undertake and expensive. The most recent of these was conducted in the North West Region in 2006/07 and it is these estimates that have been used to provide a snapshot of similar arisings in the other English Regions.

From the NW survey data to regional estimates

From the NW data it is possible to estimate C&I waste arisings on the basis of the number of companies in each standard industrial classification (SIC) sector for each Region:

- Waste arisings by sector and company size
- Material type by sector

The NW survey estimates are compared to the 2002/03 Environment Agency estimates and the reasons for differences described and the rationale for adjustments to the NW data made. The translation of the NW data to other Regions (and subsequently to counties and unitary authorities) are presented in section 3. There are two tables for each region showing arisings by standard industrial classification (SIC) against employee sizeband and by SIC against substance oriented classification (SOC). The estimates provided here suggest a drop of around 15% from the 2002/03 survey. Some regions show only a modest drop – 5% for London and the South East) – whilst others show significant drops that are the result of methodological differences between the two surveys.

In addition, forecasts of future arisings that link to the expected make-up of the future economy have been made for the East of England. This requires input from Regional Economic Models and only the East of England was able to provide output from such a model. Rudimentary forecasts for the other Regions have been made to illustrate the potential for this approach. However, the spreadsheets that accompany this report allow alternative growth scenarios to be applied using information that may become available in the future.

Of note here is the different estimates such a method provides as compared to the usual simplistic growth scenarios that show waste arisings growth of, say, 1%, 2% and so on. The method utilised here accounts for specific sector growth, whereby those sectors with high rates of waste production per employee are in relative decline as compared to those with lower rates. Thus, whilst overall employment is increasing, this will not necessarily mean increases in waste arisings.

Using the data

This project has generated a large amount of data. A simple spreadsheet tool has been developed that allows the user to produce estimates of future arisings by altering assumptions on the amount of waste produced by employee at the regional level. Data from the ONS is provided to allow county/unitary and district estimates to be made but these should be treated with caution since the further into sub-sector and sub-regional data estimates delve, the greater the degree of uncertainty.

Conclusions & recommendations

Whilst the degree of precision of the estimates is unclear, producing these figures provides the third estimate of regional C&I arisings. The scarcity of such estimates clearly illustrates the problems with gathering such data. The results here reflect the details of the NW survey methodology (with some adjustments) plus the PPC arisings in each region. As such, any skew in the NW survey will be reflected elsewhere. However, this has been examined by the project team in conjunction with the Environment Agency and deemed to be acceptable.

Utilising surveys is one of the few methods open to obtaining C&I data on a consistent basis. Urban Mines are undertaking a survey very similar to the NW survey currently for Wales and it would be a worthwhile exercise in including that new data set in the comparison with the 2002/03 survey results.

Given the costs of conducting large scale surveys, rolling regional surveys could be undertaken. They would provide smaller samples than the prior Environment Agency surveys but would ensure consistency in methodology and produce time series data. If all the regions pooled resources to conduct such work, and given the costs of the NW survey and the current Welsh survey, this might be achieved at a cost of around £20,000 per region per survey.

Further work is also needed to understand better the arisings and fate of waste produced by small firms employing 5 or fewer people. Such firms make up approximately 70% of companies in most counties and it is not clear how much waste from these organisations makes its way into the municipal waste stream.

Linking future business waste arisings to regional economic models requires further work. Forecasts of waste arisings that use employee numbers do not take account of changes in productivity. However, it is likely that the relationship between waste per employee and productivity is not straightforward as such gains in productivity could mean less waste is produced per unit of production but also more units per employee, resulting in an unknown net effect. The same problem would occur using other outputs from regional models such as changes in GVA (gross added value). Additional research might seek to assess the nature of the relationship between the typical outputs of regional forecast models (such as the number of employees or GVA).and waste arisings per unit (employee or GVA). This would allow for the provision of more robust forecasts with future arisings reflecting both the predicted shape of the economy and the impact of productivity changes.

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1. The project

The objectives of the project were to:

- Provide estimates of C&I arisings for each English region using the survey results from the 2006/07 North West study
- Provide forecasts by region through 2031

1.1 Need for the data

At the meeting of the Waste Strategy Board in January 2009 on the future prospects for waste treatment infrastructure in the UK it was reported that the country is in line to overshoot its landfill diversion targets for 2020. The Board was asked to consider how to utilise any potential over-capacity from waste infrastructure in 2020 and use this to tackle C&I waste. Crucially, the issue of a lack of available data to help shape C&I waste policy was highlighted.

The role of the Regional Technical Advisory Bodies (RTABs) is to assemble relevant waste data and provide advice on options for the management of waste in the region. The recently issued PPS10 and accompanying guidance places a significantly increased burden on the RTAB to collect, collate, and publish data and information on waste management within the region. This information will be crucial for the development of strategic plans and local development frameworks and also to provide the necessary numeric context to individual planning applications and appeals.

In the development of its annual monitoring reports the RTAB had highlighted major deficiencies in the available information for C&I waste arisings and management methods. The available data was from surveys carried out by the Environment Agency for 1998/99 and 2002/3 respectively. Whilst these surveys achieved a precision of +/- 5% at a 90% confidence level for total industrial and commercial waste, users are advised to treat the information provided as the best estimate from a range and should not, for example, read too much into small differences between sectors or detailed comparisons with results from the previous (1998-9) survey.

The 2002/3 survey shows a reduction in the total C&I waste for the 4 year period. However, the survey had insufficient detail and the categorisation used did not readily translate into the type and scale of new waste management facilities needed. In the North West, the level of information that was currently available to the RTAB from was deemed inadequate to make reasonable projections for what type and capacity of waste management facilities will be required for C&I waste in the future. This information gap could only be filled by the commissioning a North West regional survey of these waste types and this was undertaken in 2007 by Urban Mines.

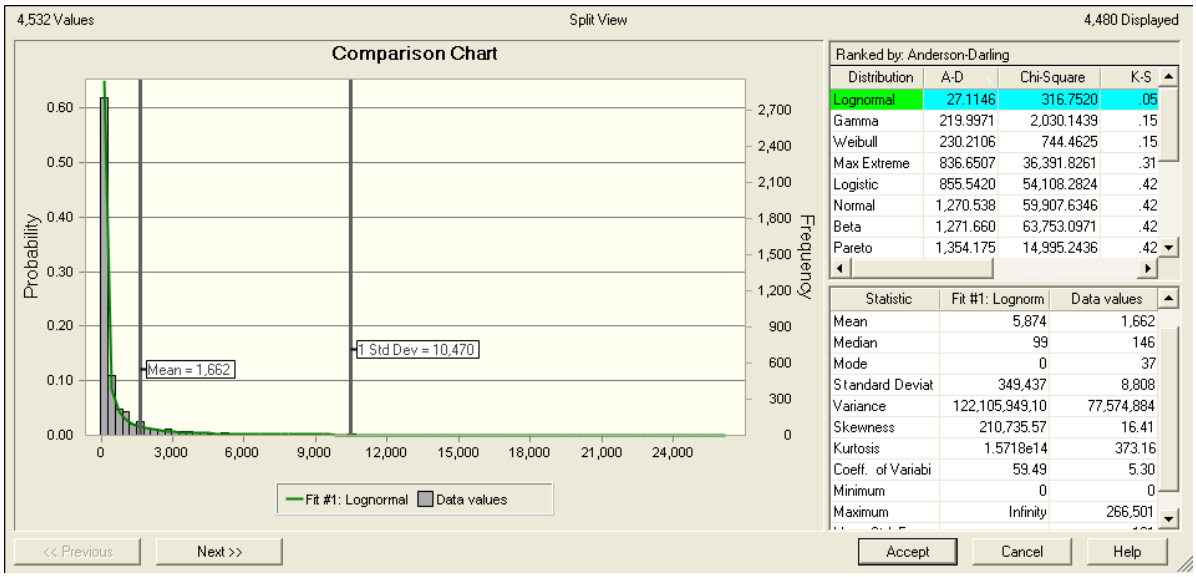
1.2 The North West survey

A survey conducted by Urban Mines and partners in 2006/07 for the North West Regional Technical Advisory Board provides the basis of the estimates for other English regions presented in this report. The NW survey conducted over 800 face-to-face interviews by trained surveyors to gauge waste arisings. This survey data was augmented by returns from over 100 companies as part of their Pollution Prevention and Control obligations.

Figure 1 below shows the distribution of the NW survey and PPC data by individual waste streams. The lognormal distribution shows that most of the returns are

clustered close to the origin but that there are significant outliers. This is further evidenced by the mean being 1,662 tonnes per waste stream versus a median of 146 tonnes. This high degree of variability illustrates the problems associated with collecting and analysing C&I data.

Figure 1: Distribution of NW Survey Data



A detailed description of the NW survey is provided in some detail in the methodology section (The NW Survey methodology p3) since the methodological issues raised and overcome in that project provides the context for the regional estimates presented in section 2.

1.3 Confidence Levels

An understanding of the confidence that can be placed in the estimates provided here depends to a large degree on the confidence in the original survey data. Prior Environment Agency surveys addressed issues of data quality through in depth examination of experience from the previous surveys in England and Wales, by the design of the survey requirements, by the use of experienced resource efficiency surveyors, training and survey quality monitoring and by timely screening and follow up for outliers and anomalies and cross checking with PPC returned data. The combination of these factors contributes to obtaining a high qualitative confidence level in the base survey data.

The prior Environment Agency National Waste Production Surveys were designed to produce a high level of precision for national estimates (a confidence level of 95% and an interval of +/- 3%) based upon the assumption of normality. However, the Environment Agency methodology also states that *"the standard errors and confidence intervals only give some comfort or otherwise about the representativeness of the sample assuming it is truly random"*. The Agency methodology explicitly states that the standard errors and confidence intervals do not provide an estimate of the sources of error such as those listed below in the section on the methodology.

A survey of around 1,000 companies tends to provide an overall level of confidence of 95% +/- 3%. This is for the entire universe and the level of confidence will decline as more sectoral or sub-regional detail is sought. The NW survey and this project both

utilise all the PPC companies in the region and thus in this respect the survey sample is non-random. The inclusion of the PPC data for anomalous non scalable waste producers has allowed extreme outliers to be included in a manner that does not obviously skew the data and in fact increases the accuracy of the survey although this methodology cannot be described through standard statistical analysis.

2. Method

2.1 The NW Survey methodology

The NW survey, tendered by Cheshire County Council on behalf of the North West Regional Technical Advisory Board (NWRTAB), was intended to provide detailed information on the production of waste by commercial and industrial companies within the region, to help make reasonable projections for what type and capacity of waste management facilities will be required to meet the Region's need for dealing with such waste in the future.

The NW survey objectives were to:

- Gather information on current (2005-6) industrial and commercial (C&I) waste arisings from a representative sample of waste producers
- Provide information of the current C&I waste arisings such that this information can be further used to project the requirements for future waste management capacity provision within the NW region

Direction was provided as to the type of data required from each company survey, including waste classification, quantity and current disposal method, with some measure of wastes leaving the region for treatment or disposal. The project allowed for inclusion of PPC[1] data from the Environment Agency to augment that collected by the face-to-face survey.

The survey of North West based C&I companies, took place between September 2006 and January 2007. A total of 981 companies were surveyed, selected at random (at a regional and sub-regional level) depending upon their size, sector and location. Of these, 827 were surveyed directly by face-to-face interview by a trained surveyor, collecting data electronically. Data on the remaining companies was sourced from 2005-6 PPC submissions, supplied by the Environment Agency.

Fifty percent of the survey returns were based upon company records, 48% on company estimates, and only 2 % on surveyor estimates.

What was surveyed:

- 981 Commercial and Industrial companies within the North West, including retail, representatively distributed by company size, industrial sector and location
- All wastes produced on a company's site and sent off site for treatment, disposal or recycling, recorded by waste type and annual tonnage produced
- Hazardous and non-hazardous wastes

[1] Data submitted under conditions of a Permit issued under the requirements of the Pollution Prevention and Control (PPC) Regulations 2000

- The waste management method used for each waste e.g. landfill, recycling etc, and contractor used.
- The possibility of the waste to be recycled or energy recovered
- Waste which was exported from the Region for treatment, disposal or recycling

What was <u>not</u> surveyed:

- Companies with less than 5 employees
- Agricultural, construction and demolition (C&D) waste
- One-off wastes e.g. refurbishments or site clearances
- Waste which would not have an impact on external treatment or recycling facilities e.g. waste landfilled on site, or waste recycled or re-used on site.

Companies with less than 5 employees were not included in the NW survey as it was viewed that much of this waste stream would be captured in municipal waste statistics. The previous Environment Agency survey included estimates for the 0-3 employee band through projections. Analysis of this business grouping indicated the statistical sampling for this scale and diversity of business of activity would be inherently unreliable.

The NW survey did provide a very basic estimate for the 0-5 sizeband by simply applying the average tonnage per employee of the 5-9 band (using the middle of the band width as the average number of employees per company). The result was particularly sensitive to the tonnes per employee figure used given the large number of employees.

Sub-regional Estimates

Data from the Office of National Statistics (ONS) used to calculate sub-regional estimates provides data for each sector and sizeband information on the number of companies to the nearest 5. This means that some cells are rounded down to zero when just one or two companies are present, resulting in an estimate of zero waste when some may be present. Using such data requires local knowledge to assess such data gaps. Further, the ONS process of no-disclosure means that the sum of the sub-regional estimates may differ from the regional estimates. This is also the case for this project and becomes even more problematical at the District level.

For those PPC companies with disproportionately large waste arisings that were added in the regional estimation method were also added to the appropriate sub-region.

Data quality

A variety of steps were taken to ensure the quality of the data collected. For the face-to-face interviews, surveyors were given tools to estimate waste tonnages from containers or other storage media they saw, but were encouraged to either take quantities from the company's written records (invoices, transfer notes etc) or if not available, to take estimates provided by the company themselves, and agreed with the surveyor. The final data set showed that 99% of the data came from written records or company estimates i.e. only 1% from surveyor estimates.

All data received was reviewed electronically to identify "outliers" i.e. those data which lay outside of the expected ranges, which could be re-confirmed and changed, if need be, by the surveyor concerned. This screen was designed to pick up entry errors and calculation errors, as well as incorrect classifications. The data was viewed for each sector in terms of the distributions of tonnages and tonnes/employee and then checked to see which returns might be outliers.

The NW survey utilised both the data generated from the survey as well as returns made by companies as part of their PPC obligations. The two data sources were amalgamated to produce a regional estimate of C&I waste arisings. PPC manages emissions to air**,** land and water from certain business processes. Companies operating a process covered by this regime must have a PPC authorisation from the Environment Agency. As part of the regulations each authorised company must provide a range of data including all waste materials generated.

The PPC data (for the NW survey and this extrapolation exercise) is a self selected sub set of the C&I universe in that it captures certain types of regulated business such as those carrying out manufacturing and other industrial activities and activities involving solvents**.** It is included in the estimation of waste arisings since these companies do potentially produce large amounts of waste and are, in general, larger companies. The NW survey had difficulties in recruiting larger companies to participate and thus the PPC data was useful in filling this gap.

Sources of error

As with all surveys, there are several areas of potential error in both collecting the data, and in grossing up and other calculations. The NW survey identified the following potential sources of error:

- **Survey data (incorrect data and recording errors)**: In the vast majority of cases either the data was taken directly from company records, or the company representative estimated tonnages. Some of the errors arose from simple input mistakes as well as one example where the waste was recorded for the whole of a managed building when the company accounted for only a small proportion of this.
- **ONS data:** A number of companies appeared to have been allocated in the wrong cell but confirmation of SIC codes and numbers employed during booking of appointments, and review during the survey visit, was aimed to correct these.
- **Conversion factors:** The conversion factors for the Substance Oriented Classification were derived from those used in the 2002/03 Environment Agency Survey for each of the European Waste Classification codes. As such the several hundred codes for the EWC were distilled to the SOC groups and sub groups.
- **Waste (SOC) coding:** The more simple SOC codes (as compared to EWC coding) made this a less likely source of error compared to prior surveys.
- **Non-randomness of the sample:** Randomness of selection was a goal of the survey but the inclusion of the PPC data gives a degree of non-randomness to the overall results. However, as inclusion of this data identified some large scale producers that may not have been included under random sampling, this trade off was believed to improve the overall quality of the survey data and grossed up results, as compared to previous surveys.

- **Sub-regional estimates:** Differences between the sub-regions in terms of the underlying waste per cell can lead to errors given the method used

2.2 Comparison of the 2006/07 and 2002/03 surveys

Table 1 compares the results from the 2006/07 survey carried out by Urban Mines and the Environment Agency's 2002/03 survey. It should be noted that the 2002/03 results include companies with 0-4 employees whereas the 2006/07 survey does not. The 2002/03 survey suggests that these companies in the commercial sector (where the vast majority of these companies are) generate around 2 tonnes of waste per annum. Discussions with the Agency highlighted the following areas where there were significant differences:

Chemical sector

The 2006 survey produced a significantly lower estimate of waste from this sector.

Possible reason for difference: The 2006/07 survey only covered waste going off site. The difference seems likely to stem from the fact that the 2006/07 survey would not have taken account of waste disposed in lagoons and boreholes.

Implications for regional extrapolation: Given the heavy nature of the chemical sector in the NW and the difference in method with respect to waste moving offsite it is reasonable to take the 2006/07 figures forward for the extrapolation exercise.

Animal and vegetable wastes

This high priority waste stream was much reduced in the 2006/07 survey.

Possible reason for difference:

a) For the food and drink sector there are three elements that explain the difference

- The NW universe for the 2007 survey shows over 150 fewer companies in the sector than those used for the EA surveys
- The UM survey would not have taken account of effluent tankered off site
- The EA survey included 2 large re-users of waste. This would not have been picked up by the 2007 survey

Implications for regional extrapolation:

The second two points are not necessarily an issue for LAs as these have designated end markets. The universe data used to extrapolate is consistent with that used for the NW survey and so no adjustments to the 2007 data need to be made.

b) A second issue with respect to animal and vegetable waste relates to the retail SIC sample. The tonnage of animal and vegetable waste for this sector was very low in the 2006/07 survey. That survey focussed on industrial waste and the estimates of food waste from the retail sector was based on a very small sample, a sufficiently small sample to generate very wide confidence intervals. The 2002/3 Agency survey covered a much larger sample and estimated much high levels of food waste than the NW survey from the retail sector.

Implications for regional extrapolation:

It is probable that the NW 2006/07 survey underestimates animal and vegetable wastes from the retail sector and this would therefore be extrapolated to the other regions if left unadjusted. Therefore, the amount of food waste from the retail sector has been adjusted to reflect the tonnages per company and proportions of waste type as reported in the EA 2002/03 survey.

Metal sector

The 2006 survey produced a much higher estimate for this sector

Possible reason for the difference: the majority of the high estimate was due to a single PPC company

Implications for regional extrapolation: Given that it is a PPC company, it will be stripped out of the NW data before that data set is used for extrapolation. Therefore there is no implication.

Mineral waste

East Midlands and the North East had vastly reduced mineral waste tonnages when extrapolating from the NW 2006/07 survey data.

Possible reason for the difference: This was down to the "specials" that were added to the EA 2002 estimates. For the North East the 2002 results had one steel plant included that has since closed that explains all the difference. For the East Midlands the difference seems to be related to power station ash where there may have been some closures.

Mixed ordinary waste

This waste category was approaching 40% lower in the 2006/07 survey.

Possible reason for the difference: Similar reasoning to the small retail sector sample and its impact of specific stream tonnages but this time due to the other services sector.

Implications for the regional extrapolation: The 2006/07 other services data has been adjusted to reflect the proportions in the 2002/03 survey.

Other considerations/validation of the NW data

This report does not extrapolate data by waste management method although this is a key feature of the 2006/07 survey. In practice it is likely that food waste from the retail sector and mixed ordinary waste are preferentially disposed of to landfill. Work undertaken through the NW RTAB has shown that (personal communication, Peter Greifenberg, April 2009) there is a reasonably good correlation between estimated C&I landfilled in 2006 and Environment Agency data on deposits of non hazardous non inert wastes at landfill sites in the NW (taking into account known exports of municipal waste from the NW region and PPC arisings and deposits at restricted user sites).

Table 1: Comparison of C&I estimates ('000 tonnes)

SICDescription	Animal & vegetable waste		Chemical wastes		Common sludges		Discarded equipment		Health care		Mettallic wastes		Mineral wastes		Mixed (ordinary) wastes		Non-metallic wastes		Total	
	UM	EA	UM	EA	UM	EA	UM	EA	UM	EA	UM	EA	UM	EA	UM	EA	UM	EA	UM	EA
Food, drink and tobacco	362	633	20	23	34	64	0	0	0		7	9	2	82	70	200	52	83	547	1,093
Textiles/wood/paper/publishing	0	0	423	185	62	55	0	0	0		21	14	1	11	205	322	386	469	1,099	1,056
Power & Utilities	-	0	50	32	197	14	0	1	0		1	5	25	331	4	18	1	3	279	404
Chemical/non-metallic minerals r	1	4	527	609	3	1	0	2	0		15	38	131	277	98	195	63	88	838	1,214
Metal manufacturing	0	0	66	13	1	0	2	0	0		110	19	388	57	28	12	13	2	608	103
Machinery & equipment (other m	11	2	49	62	2	0	9	9	0		63	239	1	51	104	182	116	86	354	632
Retail & wholesale	37	213	81	51	0	9	25	20	0		201	50	1	21	478	640	530	663	1,353	1,668
Other services	24	44	202	150	49	8	7	12	1		302	25	3	80	513	1,031	746	367	1,849	1,716
Public sector	42	18	0	47	-	1	9	2	83		1	3	0	18	336	293	136	67	606	448
Total	477	914	1,419	1,172	348	154	52	45	85		721	402	552	927	1,836	2,892	2,042	1,829	7,532	8,335

UM – results from the 2006/07 survey (excludes those companies with 0-4 employees)

EA – results from the 2002/03 survey (includes those companies with 0-4 employees)

2.3 Regional extrapolation

The adjusted results of the North West survey were extrapolated to the other English Regions. This makes the assumption that the results of the North West can be applied to the other Regions on the basis that companies that are in the same sectors and are in the same employee sizeband, produce similar quantities and types of waste.

Following the NW methodology, this project has received the 2005/06 Pollution Prevention and Control (PPC) returns from the Environment Agency. Some of these were scaled up in the same manner as the survey returns. However, some particularly large waste producers were simply added to the total as their inclusion in the grossing up process would have led to significantly skewed results. These large producers have been identified as those being more than 3 interquartile ranges from the mean. They PPC data in the NW results were stripped out before proceeding with the extrapolation.

The NW survey results were scaled up based upon the total number of VAT and/or PAYE based Local Units for each county and unitary authority (the region's "universe"). The data from the Office of National Statistics was in the following form:

Table 2: Sector by sizeband "universe"

	Employee Sizebands						
SIC Sector	5-9	10-19	20-49	50-99	100-249	250+	Total
Food, drink and tobacco							
Textiles/wood/paper/publishing							
Power & Utilities							
Chemical/non-metallic minerals							
Metal manufacturing							
Machinery & equipment							
Retail & wholesale							
Other services							
Public sector							
Total							

The results from the 1,000 or so surveyed companies (selected as a stratified sample of the "universe") were scaled up to the NW "universe". The main tabular outputs for the NW survey were:

- SIC by employee sizeband
- SIC by Substance Oriented Classification (SOC)
- SIC by waste destination (fate)
- SOC by destination

To extrapolate the NW data to the other English Regions, the same "universe" data was obtained for each Region from the Office of National Statistics (and Counties and Unitary Authorities for disaggregation of the Regional figures). This allows the NW data to be applied to each Regions "universe".

The total arisings figure in each of the above cells for the NW scaled up results was applied pro rata to the other Regions "universe". In other words, if a region has twice as many companies as the NW in the Food and Drink 10-19 employee sizeband cell, the estimated waste arisings for that Region would also be twice as much that of the

NW (excluding the impact of atypical PPC companies). Filling all the cells in this way provides an estimate of total waste arisings by SIC and employee sizeband. To summarise this approach:

For each cell:

$$\text{NW survey results – tonnages by SIC and sizeband} \times \left(\frac{\text{Other regions “universe” of companies – no. of companies by SIC and sizeband}}{\text{NW region “universe” of companies – no. of companies by SIC and sizeband}} \right)$$

These estimates of Regional arisings were then used to estimate sectoral arisings by waste type (SIC by SOC) in a similar pro rata method with the NW survey results and taking account of the SOC profile of the atypical PPC companies. In other words, if 70% of the Food and Drinks sectors waste in the NW was defined as “Animal and Vegetable Wastes”, then this will be the case for all the other regions.

It is not sensible to extrapolate the NW destination data. For the NW, the scale of material flowing to particular destinations reflects the infrastructure of that Region. This infrastructure will be very different between Regions and using the NW profile would give meaningless estimates. For example, the NW has relatively little energy-from-waste (EfW) capacity but a simple pro rata transfer of the NW results would reduce the amount sent to this destination in regions with much larger EfW capacity. Because of this, no estimates are provided on destination.

Details for Counties and Unitary Authorities and Districts are not presented in this report. The major reason is the desire not to produce an enormous document full of numbers. However, there are serious statistical reasons to be somewhat wary of such estimates. In some cases this may not be possible to produce them as the Office of National Statistics have disclosure rules that mean that some cells in the “universe” for an individual County or UA may be empty if there are less than three companies in that cell. This problem will be much greater for District level data with many more cells being empty for disclosure reasons. In addition, the level of confidence will reduce as the geographic unit reduces. Crude estimates of sub-regional areas can be calculated in the accompanying spreadsheets.

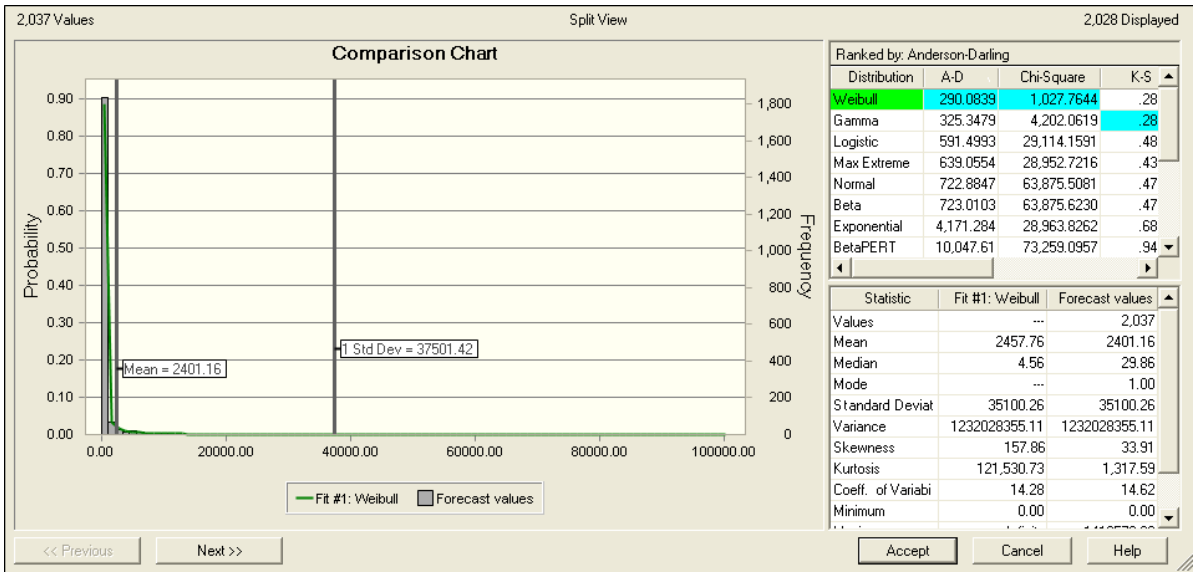
With respect to the results presented in section 2, none of the Regions responded initially negatively to the method or the estimates. One response from Kent was encouraging in that the estimates provided here were very close to a modelling exercise they had recently undertaken that had appeared at odds with the 2003 Environment Agency data. Differences between the estimates produced here and the 2003 survey are discussed in section 2.

The NW survey did not produce an estimate of the accuracy of the findings. The sample size was chosen with a specific degree of accuracy in mind but there are many potential sources of error. Likewise, it will not be possible to estimate confidence levels from the extrapolation of the NW data to the other regions.

Distribution of PPC data

The importance of analysing the PPC data in some detail is illustrated below in Figure 2. The average tonnage per waste stream is over 2,400 tonnes (50% greater than the NW survey mean) compared to a median of only 30 (around one fifth of the NW survey median).

Figure 2: Yorkshire & Humber PPC data distribution



2.4 Forecasting

Given that there have been only three C&I surveys, analysis of trends from these datasets may not be particularly informative. Some of the figures below show the three point datasets for some aspects of the NW survey and additional trend analysis that was undertaken as part of the Greater Manchester Needs Assessment project that forecast C&I arisings through to 2025. However, a more robust forecasting methodology will be required for this task that reflects anticipated changes to the regional economies.

It can be expected that C&I waste arisings in the future will reflect the base of companies operating in the Region. Any forecasting should reflect the changes that will occur in this base over time. For the Greater Manchester Needs Assessment, the Oxford Economics Greater Manchester Forecasting Model (GMFM) was utilised. The GMFM forecasts the number of jobs by industrial sector and it was decided to apply the waste per employee figures from the NW survey to these employment forecasts by each sector.

There are two conflicting forces that might be expected to be in operation over time with respect to the amount of waste that is produced by each employee – each unit produced by an employee can be expected to create less waste but at the same time more units will be produced by each employee. For the Greater Manchester project it was decided that these forces cancel each other out and that the waste per employee estimates from the NW survey could be used multiplied by the forecast number of employees. Figure 3 and Figure 4 illustrate the data used for the Greater Manchester Needs Assessment as well as the trends in C&I waste arisings and waste per employee.

Figure 3: Total C&I Waste in Greater Manchester from Prior Surveys

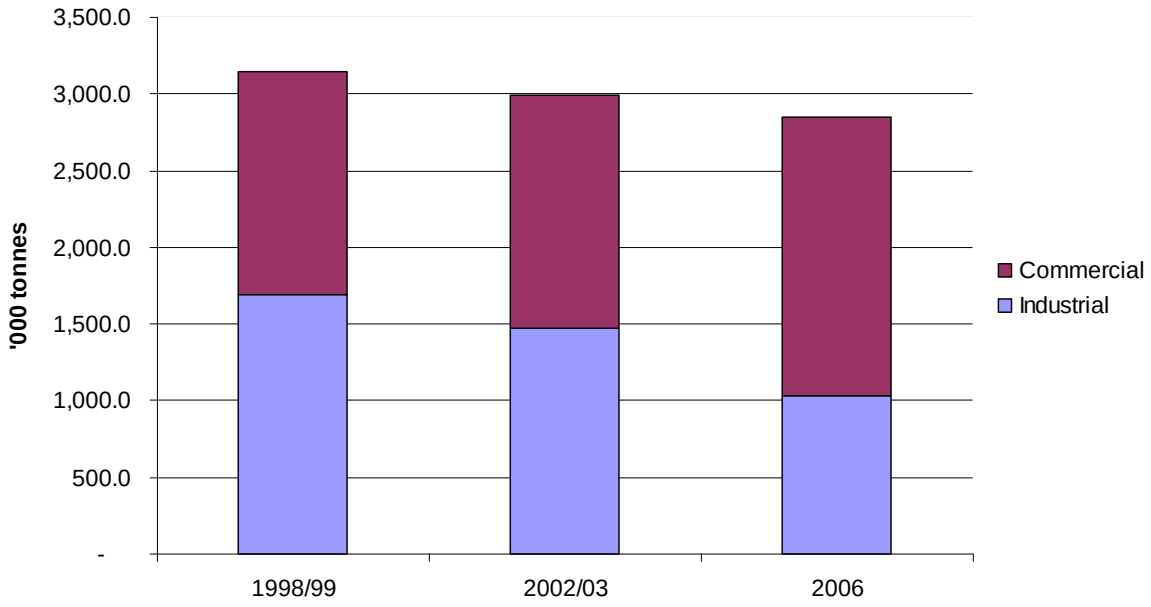
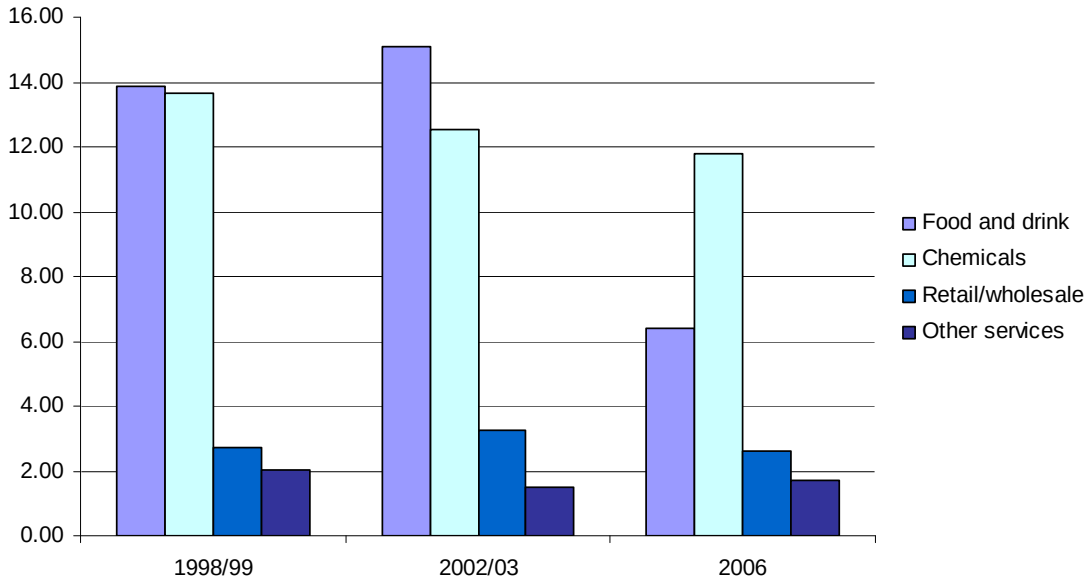


Figure 4: Waste/Employee for Selected Sectors from the Prior Surveys



The figures show the declining trend in total arisings but a less clear picture with respect to reductions in waste per employee.

The method to provide forecasts relied on models equivalent to the GMFM being available. However, as reported in section 3 this has not been the case. It does seem likely that such models exist for most of the regions and the spreadsheets are set up for this information to be added to produce instant forecasts. The forecasting could be attached to metrics other than future employees by sector such as estimates of future Gross Value Added by sector.

If such models are not available assumptions would need to be made on the growth of the number of businesses in each sector that reflect regional economic strategies e.g. the assumption might be that the number of companies in the chemical sector will shrink by 1% per annum with consolidation into larger companies. This may not be such a problem as many of the forecasts from the models of the likes of Oxford Economics and Cambridge Econometrics tend to follow linear trends which can be estimated using local knowledge.

Figure 5 and Figure 6 shows the output from the GMFM in terms of forecasts for employment in the retail and the food and drink sectors as well as the relevant waste per employee data from the previous C&I surveys. The linear forecast for future jobs is clearly illustrated.

Figure 5: Retail Employment Forecasts (GMFM 2007) and Waste/Employee

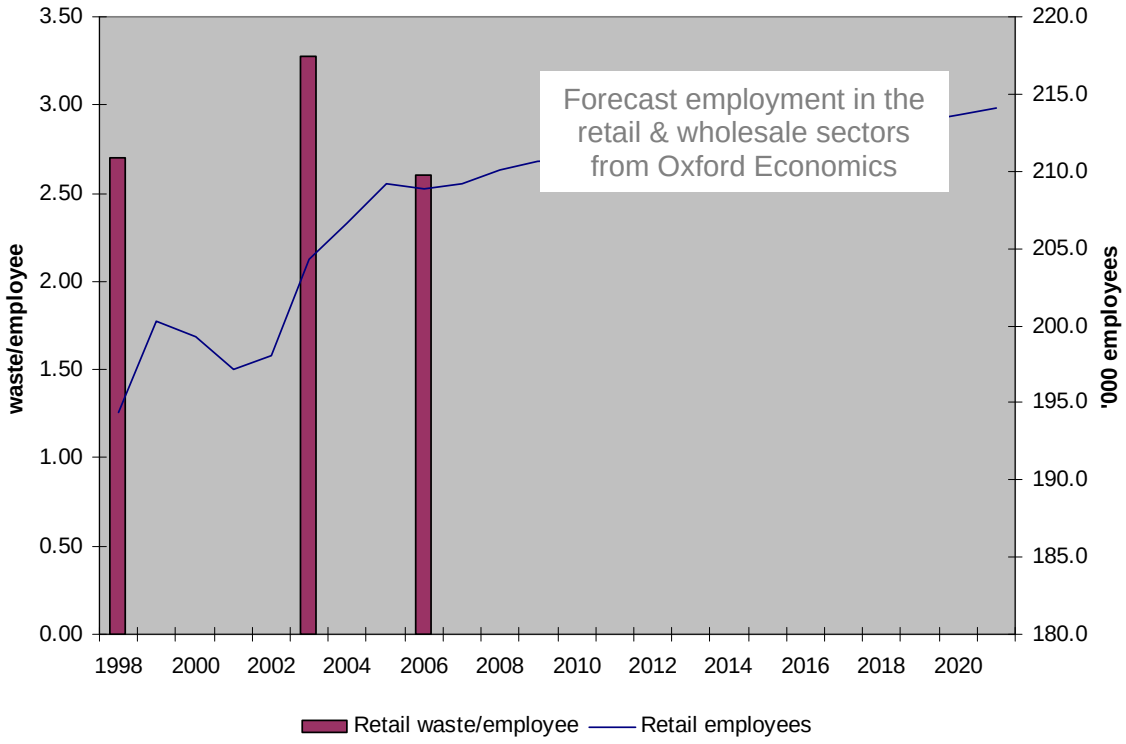
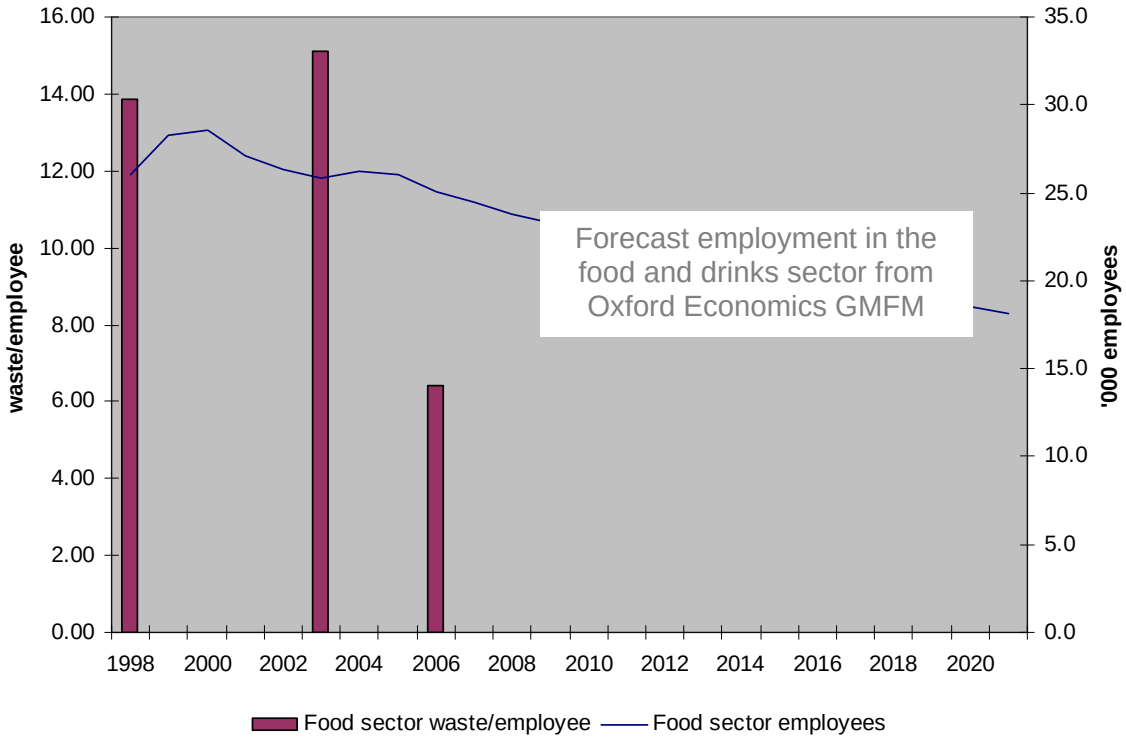


Figure 6: Food and Drink Sector Employment Forecasts (GMFM 2007) and Waste/Employee



3. Results

The scope of the project has resulted in a large amount of data tables being created. To make this report sufficiently concise, this section just reports the regional level estimates of C&I arisings with the sub regional estimates consigned to the spreadsheets. For each region the following data is presented:

- Total arisings by SIC code and employee sizeband
- Total arisings by SIC code and SOC type

It should be noted that there are slight differences between the totals between the tables since some of the PPC returns have been presented without a waste code.

3.1 Results by region

Estimates for each Region are presented below without commentary.

The tables below show the industrial groupings and substance oriented classification used for the NW survey and for this project.

Table 3: Standard Industrial Classifications

Sector	**Description**
Food, drink and tobacco	Food, drink and tobacco manufacturers
Textiles/wood/ paper/publishing	Includes manufactures of textiles, wearing apparel, luggage, handbags and footwear; also wood and wood products, pulp, paper and paper products, publishing and printing.
Power & Utilities	Production of gas, electricity, oil and water
Chemical/non-metallic minerals manufacturing	Manufacture of chemicals and chemical products, cleaning products, manmade fibres, rubber and plastic products, and non-metallic mineral products
Metal manufacturing	Manufacture of basic metals and fabricated metal products
Machinery & equipment (other manufacturing)	Manufacturing of machinery and equipment, of computers, electrical and communication equipment, including medical and optical instruments. Also manufacturers of motor vehicles, and of furniture and other manufacturing.
Retail & wholesale	Retail and wholesale including of motor vehicles and fuel
Other services	Includes hotels, catering, transport, storage, communications, travel agents, finance, estate agents, IT related activities, and other business.
Public sector	Includes public administration, social work, and education.

Table 4: The Substance Orientated Classification used for waste classification

Waste Group	**Included Wastes**
Chemical Wastes	Solvents, acids/alkalis, used oil, catalysts, wastes from chemical preparation, residues and sludges
Healthcare	Healthcare wastes
Metallic Wastes	Metallic wastes
Non-Metallic Wastes	Glass, paper & card, rubber, plastic, wood, textiles
Discarded equipment	End of life vehicles (ELV) , batteries, waste electronics (WEEE) other discarded equipment
Animal & Vegetable Wastes	Food, manure, other animal and vegetable wastes
Mixed (ordinary) wastes	Household, undifferentiated wastes and sorting residues
Common Sludges	Sludges (common) and dredgings
Mineral Wastes	Combustion residues, contaminated soils, solidified mineral wastes, other mineral wastes

3.1.1 The East of England (2006/07)

Table 5: The East of England – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	3,841	4,585	13,331	63,138	61,364	557,065	703,323
Textiles/ wood/ paper/ publishing	42,423	10,599	41,354	80,887	104,973	85,071	365,306
Power & Utilities	2	30,742	29,851	45,205	8,812	146,837	261,450
Chemical/ non-metallic minerals	26,534	17,283	126,376	79,031	112,316	131,651	493,191
Metal manufacturing	18,814	20,035	31,787	67,471	56,172	12,554	206,833
Machinery & equipment	11,580	46,106	51,113	40,465	50,342	131,307	330,913
Retail & wholesale	107,725	150,397	307,840	169,169	225,335	401,943	1,362,409
Other services	116,320	158,938	208,078	856,740	94,658	98,362	1,533,095
Public sector	12,879	35,712	164,520	51,004	40,055	128,168	432,337
Total	340,117	474,396	974,250	1,453,109	754,026	1,692,958	5,688,858

Table 6: The East of England – tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	276,680	17,991	289,710	35	15	6,411	2,053	64,486	45,943	703,323
Textiles/wood/paper/publishing	187	7,255	8,673	56	-	13,150	589	116,321	219,077	365,306
Power & Utilities	-	189,613	4,845	543	8	5,281	42,038	15,898	3,225	261,450
Chemical/non-metallic minerals	364	315,768	1,602	225	69	8,324	74,704	56,009	36,086	493,149
Metal manufacturing	0	39,325	519	1,261	2	65,596	75,641	16,958	7,435	206,739
Machinery & equipment	4,676	47,015	964	8,577	8	60,527	600	99,128	109,420	330,913
Retail & wholesale	174,388	40,872	166	25,425	482	69,502	859	517,715	532,998	1,362,409
Other services	20,088	167,298	40,226	5,472	1,042	23,150	2,879	961,637	311,305	1,533,096
Public sector	29,820	179	-	6,152	59,468	362	5	239,260	97,092	432,337
Total	506,202	825,316	346,704	47,747	61,094	252,303	199,367	2,087,410	1,362,580	5,688,723

3.1.2 The East Midlands (2006/07)

Table 7: The East Midlands – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	4,008	2,515	79,169	28,281	130,897	449,304	694,175
Textiles/ wood/ paper/ publishing	43,532	13,766	55,403	149,744	103,663	122,398	488,506
Power & Utilities	2	15,371	1,975	5,411	299,371	1,050,540	1,372,670
Chemical/ non-metallic minerals	24,944	15,634	138,369	95,662	184,490	107,857	566,956
Metal manufacturing	17,059	19,900	33,137	63,388	114,058	43,127	290,669
Machinery & equipment	9,314	71,091	39,353	36,520	56,741	153,764	366,784
Retail & wholesale	80,100	107,994	226,799	123,032	179,126	278,269	995,319
Other services	74,657	111,689	145,590	574,831	59,857	68,551	1,035,176
Public sector	10,985	33,921	135,913	36,883	28,426	102,534	348,661
Total	264,600	391,882	855,709	1,113,753	1,156,630	2,376,344	6,158,917

Table 8: The East Midlands– tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	262,008	16,440	169,018	38	14	6,328	1,876	190,840	45,213	691,775
Textiles/wood/paper/publishing	236	33,809	10,972	71	-	16,636	745	147,175	278,862	488,506
Power & Utilities	-	45,059	1,443	765	2	3,749	1,315,718	5,101	833	1,372,670
Chemical/non-metallic minerals	431	356,719	1,901	264	82	9,833	88,630	66,399	42,697	566,956
Metal manufacturing	1	60,200	795	1,931	3	100,231	90,204	25,961	11,344	290,669
Machinery & equipment	47,810	38,563	15,088	7,034	7	49,636	37,268	81,593	89,786	366,784
Retail & wholesale	127,401	29,860	121	18,575	352	50,775	627	378,221	389,387	995,319
Other services	13,564	112,963	27,162	3,695	703	15,631	1,944	649,316	210,199	1,035,177
Public sector	24,048	144	-	4,961	47,958	292	4	192,953	78,300	348,661
Total	475,500	693,757	226,498	37,334	49,122	253,111	1,537,016	1,737,558	1,146,622	6,156,518

3.1.3 London (2006/07)

Table 9: London – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	5,678	3,255	5,705	23,554	38,970	95,569	172,731
Textiles/ wood/ paper/ publishing	80,409	19,857	59,805	125,007	108,356	237,534	630,968
Power & Utilities	2	30,742	1,975	10,822	9,290	1,121	53,951
Chemical/ non-metallic minerals	17,547	10,019	71,750	28,805	40,724	38,064	206,908
Metal manufacturing	12,095	10,017	13,402	19,687	11,485	0	66,686
Machinery & equipment	7,930	33,253	22,164	18,330	18,172	108,979	208,828
Retail & wholesale	139,844	182,033	378,329	210,573	348,113	474,087	1,732,980
Other services	229,931	342,108	430,729	1,928,576	241,752	318,764	3,491,860
Public sector	19,258	44,843	193,115	74,188	56,852	253,487	641,742
Total	512,693	676,127	1,176,974	2,439,541	873,714	1,527,606	7,206,655

Table 10: London – tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	87,208	9,249	15,775	16	8	3,234	1,052	32,219	23,969	172,731
Textiles/wood/paper/publishing	323	12,530	14,980	97	-	22,712	1,016	200,912	378,397	630,968
Power & Utilities	-	39,127	1,000	112	2	1,090	8,675	3,281	665	53,951
Chemical/non-metallic minerals	149	131,163	655	91	28	3,388	33,639	22,878	14,917	206,908
Metal manufacturing	0	13,811	182	443	1	22,995	20,695	5,956	2,603	66,686
Machinery & equipment	1,683	16,924	347	3,088	3	26,138	79,398	39,535	41,712	208,828
Retail & wholesale	221,821	51,989	211	32,341	614	88,406	1,092	658,532	677,973	1,732,980
Other services	44,119	369,106	88,349	12,018	2,288	60,031	120,193	2,112,040	683,718	3,491,862
Public sector	44,263	265	-	9,131	88,271	538	8	355,147	144,119	641,742
Total	399,566	644,166	121,499	57,338	91,214	228,533	265,769	3,430,500	1,968,073	7,206,656

3.1.4 The North East (2006/07)

Table 11: The North East – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	3,841	1,480	20,613	9,443	20,495	80,484	136,355
Textiles/ wood/ paper/ publishing	10,258	2,680	10,811	29,413	37,049	65,618	155,830
Power & Utilities	1	25,618	988	10,822	4,941	18,759	61,129
Chemical/ non-metallic minerals	14,480	6,550	58,788	47,583	98,183	237,214	462,797
Metal manufacturing	6,911	8,300	18,950	33,720	85,938	28,903	182,723
Machinery & equipment	3,147	12,849	15,816	17,466	24,168	83,405	156,850
Retail & wholesale	43,288	61,616	113,071	59,150	81,114	123,675	481,914
Other services	40,850	60,109	79,773	309,525	34,050	47,986	572,293
Public sector	5,881	18,550	86,032	25,502	20,673	74,052	230,691
Total	128,657	197,752	404,841	542,623	406,610	760,097	2,440,580

Table 12: The North East – tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	77,260	6,391	10,901	11	5	2,234	727	22,263	16,562	136,355
Textiles/wood/paper/publishing	80	3,095	3,699	24	-	5,609	251	49,619	93,452	155,830
Power & Utilities	-	44,333	1,133	127	2	1,235	9,829	3,717	754	61,129
Chemical/non-metallic minerals	274	283,574	1,140	469	50	6,409	104,704	40,260	25,772	462,651
Metal manufacturing	0	34,591	449	1,090	2	74,345	51,050	14,717	6,462	182,707
Machinery & equipment	2,216	22,285	457	4,066	4	28,689	284	46,986	51,864	156,850
Retail & wholesale	61,685	14,457	59	8,994	171	24,584	304	183,127	188,533	481,914
Other services	7,499	62,451	15,016	2,043	389	8,642	1,075	358,972	116,208	572,293
Public sector	15,912	95	-	3,282	31,731	193	3	127,667	51,807	230,691
Total	164,925	471,272	32,853	20,106	32,353	151,940	168,227	847,328	551,415	2,440,419

3.1.5 The South East (2006/07)

Table 13: The South East – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	4,200	3,699	14,517	21,819	42,318	70,875	157,427
Textiles/ wood/ paper/ publishing	54,900	63,417	45,808	102,947	92,583	352,125	711,781
Power & Utilities	15,124	35,865	257,950	31,175	318,573	428,312	1,086,999
Chemical/ non-metallic minerals	30,757	23,332	172,404	90,865	120,282	194,359	632,000
Metal manufacturing	27,453	25,750	34,570	56,679	59,280	43,065	246,797
Machinery & equipment	15,671	64,537	63,315	64,762	82,785	194,077	485,147
Retail & wholesale	167,668	235,699	462,740	253,161	375,151	585,396	2,079,815
Other services	194,499	270,627	358,233	1,442,180	170,929	186,804	2,623,272
Public sector	19,976	55,764	251,690	76,506	60,728	213,613	678,277
Total	530,247	778,692	1,661,228	2,140,094	1,322,629	2,268,625	8,701,513

Table 14: The South East – tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	80,097	8,199	14,684	15	7	2,866	933	28,557	21,387	156,744
Textiles/wood/paper/publishing	258	102,841	22,801	78	-	18,415	57,142	207,538	302,708	711,781
Power & Utilities	-	100,819	256,617	324	5	5,351	711,735	10,150	1,998	1,086,999
Chemical/non-metallic minerals	472	393,211	2,079	297	90	10,825	104,765	73,445	46,816	632,000
Metal manufacturing	0	42,818	565	1,373	2	73,230	101,459	19,285	8,065	246,797
Machinery & equipment	6,855	68,927	1,413	12,575	12	88,737	879	145,329	160,419	485,147
Retail & wholesale	266,216	62,394	253	38,814	736	106,100	1,311	790,330	813,660	2,079,814
Other services	34,373	286,263	68,831	9,363	1,782	39,611	4,926	1,645,451	532,672	2,623,273
Public sector	46,783	280	-	9,651	93,296	568	9	375,366	152,324	678,277
Total	435,054	1,065,752	367,243	72,489	95,931	345,704	983,159	3,295,451	2,040,048	8,700,832

3.1.6 The South West (2006/07)

Table 15: The South West – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	5,511	4,234	14,245	97,536	95,337	262,355	479,219
Textiles/ wood/ paper/ publishing	34,659	8,040	29,266	80,887	89,703	63,478	306,033
Power & Utilities	4	29,862	30,303	20,561	18,580	2,241	101,551
Chemical/ non-metallic minerals	22,654	17,279	127,802	62,902	73,132	92,722	396,491
Metal manufacturing	16,126	16,305	25,653	58,702	44,758	8,576	170,121
Machinery & equipment	8,937	39,681	35,282	28,941	55,882	133,558	302,281
Retail & wholesale	107,659	146,090	287,742	141,834	202,784	288,575	1,174,684
Other services	110,840	156,230	198,245	741,845	79,676	80,548	1,367,384
Public sector	13,616	40,046	168,175	49,318	40,378	150,953	462,486
Total	320,006	457,767	916,714	1,282,527	700,228	1,083,007	4,760,250

Table 16: The South West – tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	282,175	14,302	88,659	26	12	4,991	1,624	50,418	37,013	479,219
Textiles/wood/paper/publishing	156	6,078	7,265	47	-	11,016	493	97,447	183,531	306,033
Power & Utilities	-	56,217	26,044	154	2	1,512	12,201	4,506	914	101,552
Chemical/non-metallic minerals	289	252,609	2,560	187	55	6,585	61,145	44,468	28,592	396,491
Metal manufacturing	0	35,234	465	1,130	2	58,662	52,794	15,194	6,639	170,121
Machinery & equipment	4,019	40,409	828	7,372	7	52,162	18,235	85,201	94,047	302,281
Retail & wholesale	150,360	35,241	143	21,922	416	59,925	740	446,380	459,557	1,174,684
Other services	17,917	149,215	35,878	4,881	929	20,647	2,568	857,694	277,656	1,367,384
Public sector	31,899	191	-	6,581	63,614	388	6	255,945	103,863	462,486
Total	486,815	589,496	161,843	42,299	65,038	215,890	149,807	1,857,252	1,191,812	4,760,251

3.1.7 Yorkshire & Humber (2006/07)

Table 17: Yorkshire & Humber – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	8,183	5,178	15,613	40,032	455,969	383,539	908,515
Textiles/ wood/ paper/ publishing	31,055	9,621	46,256	106,624	122,485	165,541	481,581
Power & Utilities	2	15,371	26,712	15,485	434,698	1,844,826	2,337,094
Chemical/ non-metallic minerals	22,682	15,714	144,158	99,291	165,720	609,225	1,056,790
Metal manufacturing	20,893	24,041	38,642	110,042	165,584	1,452,151	1,811,354
Machinery & equipment	8,811	37,792	40,726	36,501	50,949	109,232	284,010
Retail & wholesale	99,464	131,017	267,971	146,692	185,886	319,494	1,150,523
Other services	92,102	138,205	177,816	710,886	81,719	90,831	1,291,559
Public sector	11,682	37,273	153,074	46,156	37,148	145,257	430,589
Total	294,875	414,212	910,969	1,311,709	1,700,156	5,120,094	9,752,014

Table 18: Yorkshire & Humber – tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	302,912	23,714	63,316	41	20	15,274	76,278	364,446	62,508	908,509
Textiles/wood/paper/publishing	246	9,564	11,433	74	-	17,335	776	153,345	288,808	481,581
Power & Utilities	308	37,415	1,702	139	2	4,137	2,287,227	5,150	914	2,336,993
Chemical/non-metallic minerals	432	658,929	1,902	269	83	9,998	274,790	67,663	42,994	1,057,058
Metal manufacturing	1	98,562	1,082	2,628	4	187,129	1,462,553	43,115	16,100	1,811,174
Machinery & equipment	4,013	40,351	827	7,361	7	51,948	515	85,077	93,911	284,010
Retail & wholesale	147,267	34,516	140	21,471	407	58,693	725	437,199	450,105	1,150,523
Other services	16,923	140,941	33,889	4,610	877	19,503	2,425	810,132	262,259	1,291,560
Public sector	29,699	178	-	6,127	59,227	361	5	238,292	96,699	430,589
Total	501,801	1,044,168	114,291	42,721	60,627	364,377	4,105,294	2,204,419	1,314,297	9,751,995

3.1.8 The West Midlands (2006/07)

Table 19: The West Midlands – tonnages by employee sizeband

SIC Sector	Employee Sizebands						Total
	5-9	10-19	20-49	50-99	100-249	250+	
Food, drink & tobacco	3,674	2,515	6,578	29,017	153,899	249,560	445,243
Textiles/ wood/ paper/ publishing	36,877	10,355	38,173	62,266	58,157	64,782	270,610
Power & Utilities	4	20,494	2,469	16,233	637,110	5,826	682,135
Chemical/ non-metallic minerals	33,276	17,935	132,142	99,259	243,228	179,949	705,789
Metal manufacturing	38,204	41,991	98,872	209,702	248,326	48,834	685,928
Machinery & equipment	12,461	60,467	65,072	50,128	77,630	181,043	446,801
Retail & wholesale	106,998	138,140	294,768	169,339	226,442	318,300	1,253,987
Other services	97,358	142,174	191,052	738,097	83,762	107,968	1,360,411
Public sector	12,300	34,961	152,387	54,587	39,409	145,173	438,817
Total	341,152	469,032	981,513	1,428,627	1,767,962	1,301,435	6,289,721

Table 20: The West Midlands – tonnages by SOC

SIC Sector	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	Total
Food, drink and tobacco	177,565	17,453	143,839	37	10	5,549	1,341	60,202	39,245	445,240
Textiles/wood/paper/publishing	138	5,374	6,424	42	-	9,741	436	86,167	162,287	270,610
Power & Utilities	-	44,597	1,126	127	2	3,234	627,238	5,037	775	682,135
Chemical/non-metallic minerals	1,088	403,761	2,151	299	93	12,197	162,718	75,155	48,327	705,789
Metal manufacturing	2	150,059	1,826	4,435	7	230,195	213,729	59,623	26,053	685,928
Machinery & equipment	6,230	62,640	1,284	11,428	11	80,643	799	137,980	145,786	446,801
Retail & wholesale	160,510	37,620	153	23,402	444	63,971	790	476,515	490,582	1,253,987
Other services	17,825	148,454	35,695	4,856	924	20,542	2,555	853,320	276,240	1,360,411
Public sector	30,267	181	-	6,244	60,359	368	6	242,846	98,547	438,817
Total	393,625	870,139	192,498	50,869	61,850	426,440	1,009,611	1,996,845	1,287,842	6,289,718

3.2 Comparison with Environment Agency 2002 survey

Table 21compares the results from this project with those produced by the Environment Agency's 2002/03 survey. All the regions show a fall in estimated arisings which is expected given that the NW survey also showed a fall. However, two things stand out:

- The grouping of 6 of the regions with fall of between 5% and 16%
- The much larger falls in East Midlands and the North East

Table 21: Comparison of C&I estimates

	Environment Agency 2002/03 survey ('000 tonnes)	Estimate using NW 2006/07 survey ('000 tonnes)	Change
East Midlands	8,093	6,159	-24%
East of England	6,564	5,689	-13%
London	7,507	7,207	-4%
North East	4,599	2,441	-47%
North West	8,335	7,532	-10%
South East	8,852	8,702	-2%
South West	5,556	4,760	-14%
West Midlands	7,265	6,290	-13%
Yorkshire & Humber	11,136	9,752	-12%

The large differences in the East Midlands and the North East are due to the inclusion of power stations and a steel production site respectively that are not included in the estimates produced here.

The other differences will partly be due to the fact that the NW survey did not include estimates for the 0-4 employee sizeband but they were included in the 2002/03 survey. This could account for as much as 5 percentage points of the difference for those service intensive regions (e.g. East, South East and London) and for as little as 1-2 percentage points of more industrialised regions. Table 22 shows the comparison in more detail. Much of the difference has been described in section 2.2, Comparison of the 2006/07 and 2002/03 surveys.

Table 22: Comparison with EA 2002 survey by SOC

		Chemicals	Metallic	Non-metallic	Discarded equipment	Animal & plant	Mixed	Common sludges	Mineral wastes	Total
East Midlands	EA 2002	860	345	1,343	29	736	1,920	112	2,747	8,093
	NW 2006	694	253	1,147	37	476	1,738	226	1,537	6,107
East of England	EA 2002	634	303	1,605	40	884	2,279	120	699	6,564
	NW 2006	825	252	1,363	48	506	2,087	347	199	5,628
London	EA 2002	585	200	2,088	55	662	3,489	72	355	7,507
	NW 2006	644	229	1,968	57	400	3,430	121	266	7,115
North East	EA 2002	599	202	597	15	278	1,017	42	1,849	4,599
	NW 2006	471	152	551	20	165	847	33	168	2,408
North West	EA 2002	1,172	402	1,829	45	914	2,892	154	927	8,335
	NW 2006	1,418	721	2,042	52	477	1,836	347	552	7,532
South East	EA 2002	907	376	2,127	59	765	3,413	98	1,108	8,852
	NW 2006	1,066	346	2,040	72	435	3,295	367	983	8,605
South West	EA 2002	585	382	1,339	34	670	2,091	72	384	5,556
	NW 2006	589	216	1,192	42	487	1,857	162	150	4,695
West Midlands	EA 2002	741	696	1,442	39	609	2,328	86	1,324	7,265
	NW 2006	870	426	1,288	51	394	1,997	192	1,010	6,228
Yorkshire & Humber	EA 2002	1,551	425	1,463	34	776	2,196	159	4,533	11,136
	NW 2006	1,044	364	1,314	43	502	2,204	114	4,105	9,691
Totals	EA 2002	7,634	3,330	13,833	350	6,295	21,625	915	13,926	67,907
	NW 2006	7,622	2,959	12,905	423	3,840	19,293	1,910	8,970	58,612

3.3 Regional forecasts

The proposed methodology for providing forecasts is laid out in the next section. The major issue with respect to providing forecasts is the lack of underlying economic forecasts that the Regions were able to provide. A project for Greater Manchester utilised a regional econometric model that forecast employment by the same industrial sectors as used in the NW survey. The proposal was to use similar forecasts. We have only managed to gather similarly based forecasts for the East of England.

A further issue is the current economic downturn. This means that any forecasts from as little as only one year ago will be significantly out of date. The forecasts for the East of England do however include the "crunch" and we concentrate the discussion here on them. The spreadsheets provided with the project allow for updated regional economic forecasts to be incorporated producing C&I waste arisings forecasts.

3.3.1 East of England forecasts

The economic forecasts provided by Oxford Economics for the East of England do not break the sectors into precisely the same as used in the surveys. We have therefore had to combine some of the sectors.

Table 23: Survey and model categories

Survey categories	East of England model categories
Food, drink & tobacco	Food, drink and tobacco
Textiles/ wood/ paper/ publishing	Other low tech
Power & Utilities	Utilities
Chemical/ non-metallic minerals	Chemicals and process industries
Metal manufacturing	Metals and engineering
Machinery & equipment	
Retail & wholesale	Wholesale, distribution and sale and maintenance of motor vehicles, retailing
Other services	Hotels and catering, air transport, communications, land and other transport, water transport, finance, business services (computer related, labour recruitment, security and cleaning, other including call centres, research and development, technical testing, real estate and renting, other tradeable)
Public sector	Public admin, health, education

The Oxford Economics model produces a number of forecasts for the number of employees in each of these sectors. Figure 7 shows a fairly typical pattern of commercial sector employment dominating industrial employment in terms of numbers as well as being forecast to grow as compared to a decline in all the industrial sectors bar power and utilities.

For the forecast arisings, these employment forecasts are combined with the average waste arisings per employee estimated from the extrapolated NW survey and the regional PPC data. These figures for the East of England are shown in Table 24.

Figure 7: Forecast employment by selected sector for the East of England

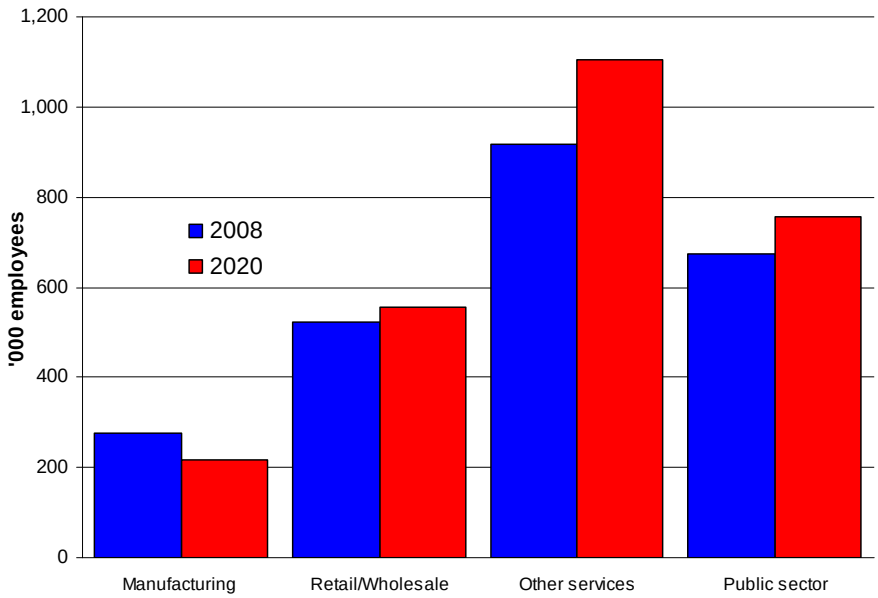
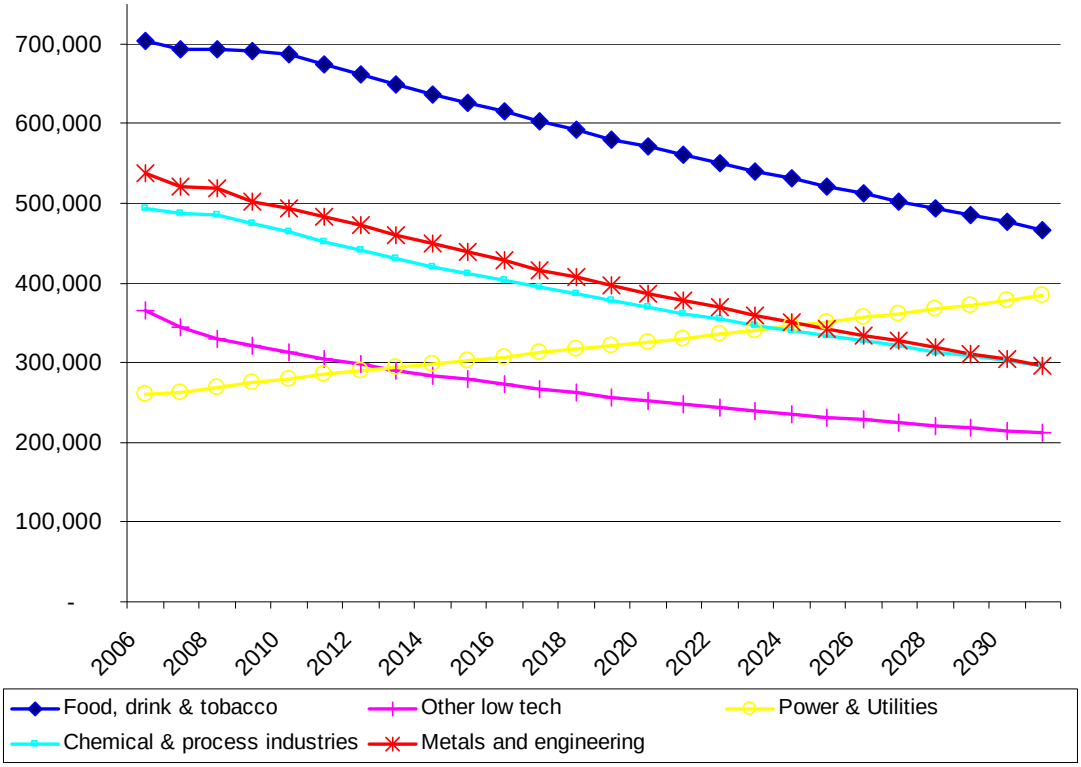


Table 24: Baseline waste per employee data for East of England forecasts

	2006		
	Total C&I waste	Employees (000's)	Waste per employee
Food, drink & tobacco	703,323	37.8	18.61
Other low tech	365,306	56.6	6.45
Power & Utilities	261,450	7.3	35.82
Chemical & process industries	493,149	48.3	10.21
Metals & engineering	537,652	125.3	4.29
Retail & wholesale	1,362,409	512.5	2.66
Other services	1,533,096	1,062.6	1.44
Public sector	432,337	662.5	0.65

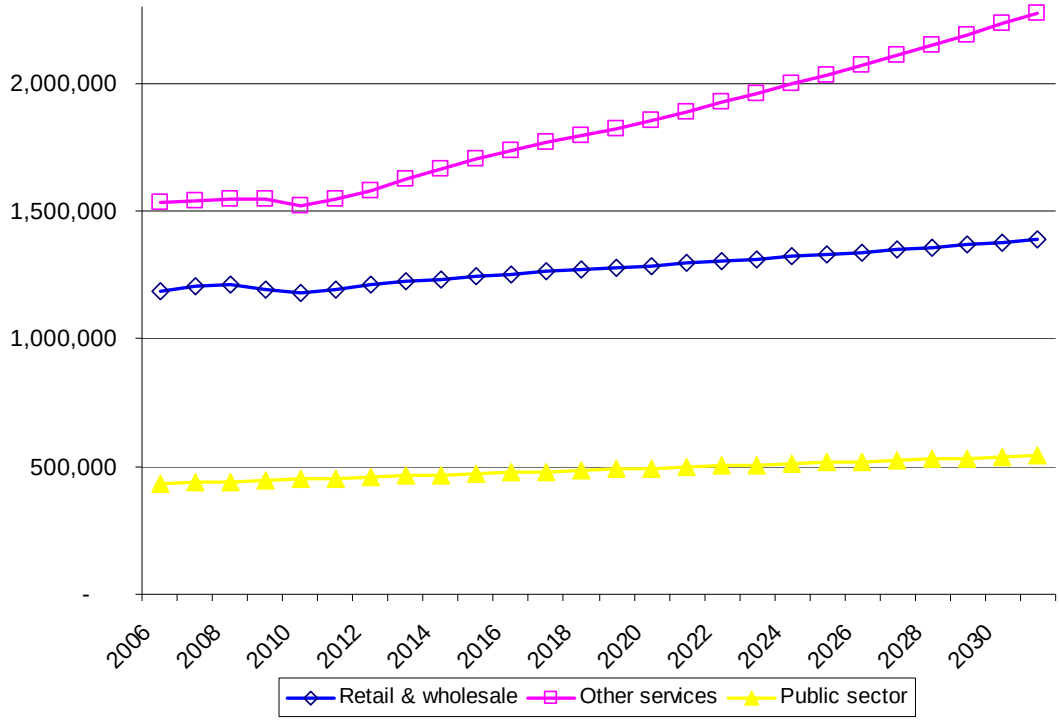
Combined, the above produce forecasts for the waste arisings from the specified sectors as illustrated in the following charts. Because of scale issues we have separated the industrial and commercial sectors. All the industrial sector bar utilities show fairly steep declines in arisings. Excluding utilities, the industrial sector shows a decline in tonnage from 2006 to 2020 of over half a million tonnes, with a further reduction of over 300,000 tonnes by 2031. These forecasts will be sensitive to growth forecasts and cumulative impacts in particular (a 1% per annum difference in growth over a 25 year time period can make an almost 30% difference in the end quantity).

Figure 8: East of England forecast industrial waste arisings



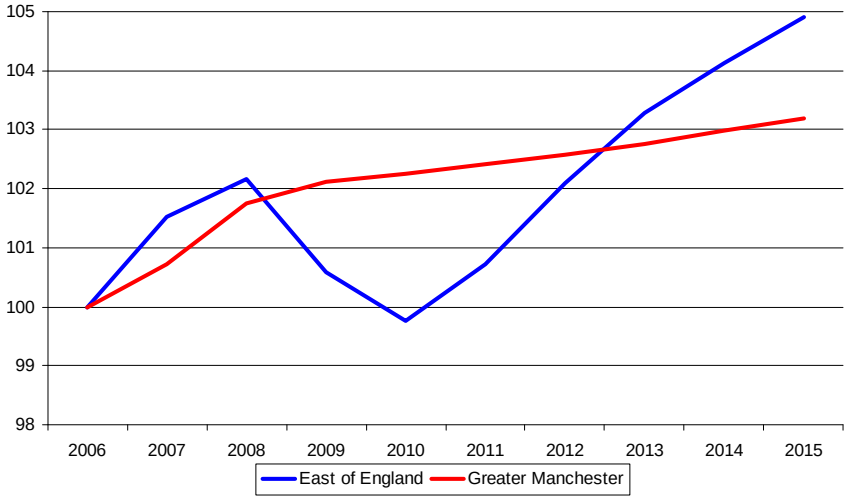
As might be expected the forecast for commercial waste arisings paints a very different picture.

Figure 9: East of England commercial waste arisings



The impact of the ongoing credit "crunch" is included in the forecasts for the East of England. The differences can be seen in the Figure 10 that shows the forecast employment for the retail and wholesale sectors for the pre-crunch Greater Manchester forecasts and the post-crunch East of England, both provided by Oxford Economics with 2006 as the base year.

Figure 10: Effect of the crunch on retail sector employment



The steep drop in employment in this sector between 2008 and 2010 equates to around 28,000 tonnes (assuming waste per employee remains static at 2.3 tonnes). For all of the sectors the crunch related economic forecasts with static waste per employee estimates leads to a reduction of over 100,000 tonnes between 2008 and 2010, a fall of around 2%.

We do not have the pre-crunch economic forecasts to gauge the long term impact of the economic downturn.

Forecasts by substance

The forecast arisings can further be considered in terms of the substance make-up by assuming that the proportions as shown in the tables in section 3. The outlying PPC data is added to the appropriate cell. Rather than simply showing the same tables for different years the tables below summarise the changes taking place from 2006 to 2010, 2020, and 2030.

Table 25: East of England forecast changes in substance arisings

Change from 2006	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes
to 2010	-7,520	-16,107	-2,954	-667	2,558	-15,818	-6,937	-26,586	-48,355
to 2020	-57,070	-23,232	-5,989	1,368	8,529	26,720	-26,486	58,717	60,347
to 2030	-94,630	-293	-5,104	3,814	15,140	81,358	-38,062	172,668	204,660

Table 25 shows potentially significant declines in animal and vegetable wastes, chemical wastes and mineral wastes reflecting the forecast decline in employment in the food and drink sector, the principal producer of such arisings. Table 26 shows the 2006 to 2020 substance arisings changes by sector

Table 26: East of England substance change by sector (2006-2020)

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes
Food, drink & tobacco	-88,011	-4,847	-8,240	-8	-4	-1,695	-550	-17,005	-12,523
Other low tech	-31	-43,443	-6,401	-9	-0	-2,140	-116	-21,003	-39,638
Power & Utilities	0	11,612	45,656	33	1	323	5,693	974	197
Chemical & process industries	-94	-77,798	-414	-58	-18	-2,145	-19,330	-14,481	-9,312
Metals and engineering	-1,713	-17,978	-409	-1,734	-2	-27,079	-60,905	-20,744	-20,079
Retail & wholesale	3,142	6,914	14	2,160	41	17,211	73	40,819	45,271
Other services	4,232	35,247	8,475	1,153	219	52,720	607	89,552	130,187
Public sector	4,159	25	0	858	8,294	50	1	33,370	13,542
Total	-78,316	-90,268	38,682	2,394	8,531	37,246	-74,527	91,481	107,645

3.3.2 Other regions

The primary difficulty in providing forecasts for the other Regions is the lack of regional forecasts with respect to either employment or gross value added. As an alternative we have used the Office of National Statistics information on the size of the Regions universe of companies to estimate the number of employees and utilised the East of England forecasts on employment growth to provide 2020 forecasts for illustrative purposes i.e. the regional forecasts will reflect the employment changes as shown in Figure 7. These are presented by Substance Oriented Classification, there is little point in showing waste growth forecasts as these would reflect the East of England patterns. However, an accompanying spreadsheet will allow alternative growth paths to be input by each region that reflect information that was not available to this project.

Table 27: East Midlands 2020 SOC forecast

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	
Food, drink & tobacco	213,243	13,380	137,560	31	11	5,150	1,527	155,321	36,798	
Other low tech	163	23,371	7,585	49	-	11,500	515	101,738	192,770	
Power & Utilities	-	56,173	1,799	953	2	4,673	1,640,250	6,359	1,039	
Chemical & process industries	323	267,285	1,424	198	62	7,368	66,409	49,752	31,992	
Metals and engineering	34,417	71,096	11,433	6,454	7	107,883	91,762	77,424	72,799	
Retail & wholesale	138,215	32,394	132	20,151	382	55,085	680	410,326	422,439	
Other services	16,416	136,718	32,873	4,472	851	18,918	2,353	785,859	254,401	
Public sector	27,402	164	-	5,653	54,647	333	5	219,864	89,221	
Total	430,180	600,582	192,805	37,961	55,963	210,911	1,803,501	1,806,642	1,101,459	**6,240,004**

Table 28: London 2020 SOC forecast

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	
Food, drink & tobacco	70,731	7,502	12,795	13	6	2,623	853	26,132	19,440	
Other low tech	223	8,662	10,355	67	-	15,700	703	138,885	261,575	
Power & Utilities	-	48,778	1,246	140	2	1,359	10,814	4,090	830	
Chemical & process industries	111	98,279	491	68	21	2,539	25,205	17,142	11,177	
Metals and engineering	1,212	22,125	381	2,542	3	35,369	72,053	32,747	31,900	
Retail & wholesale	240,650	56,402	229	35,086	666	95,910	1,185	714,430	735,521	
Other services	53,397	446,725	106,927	14,546	2,769	72,655	145,468	2,556,175	827,495	
Public sector	50,436	302	-	10,405	100,582	613	9	404,679	164,219	
Total	416,761	688,775	132,424	62,866	104,049	226,768	256,291	3,894,280	2,052,158	**7,834,372**

Table 29: North East 2020 SOC forecast

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	
Food, drink & tobacco	62,662	5,183	8,841	9	4	1,812	590	18,057	13,433	
Other low tech	55	2,139	2,557	17	-	3,878	174	34,300	64,601	
Power & Utilities	-	55,268	1,412	158	2	1,539	12,253	4,634	940	
Chemical & process industries	205	212,479	854	352	37	4,802	78,454	30,166	19,311	
Metals and engineering	1,596	40,943	652	3,712	4	74,170	36,954	44,418	41,987	
Retail & wholesale	66,921	15,685	64	9,757	185	26,671	329	198,672	204,536	
Other services	9,076	75,584	18,174	2,472	471	10,459	1,301	434,459	140,645	
Public sector	18,131	109	-	3,740	36,157	220	3	145,472	59,033	
Total	158,646	407,389	32,554	20,217	36,860	123,551	130,057	910,178	544,485	**2,363,937**

Table 30: South East 2020 SOC forecast

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	
Food, drink & tobacco	92,373	9,455	16,935	18	8	3,305	1,076	32,934	24,665	
Other low tech	114	45,617	10,114	35	-	8,169	25,346	92,057	134,272	
Power & Utilities	-	85,622	217,933	275	4	4,544	604,446	8,620	1,697	
Chemical & process industries	214	178,210	942	135	41	4,906	47,482	33,287	21,218	
Metals and engineering	3,463	56,443	999	7,045	7	81,811	51,692	83,148	85,102	
Retail & wholesale	164,411	38,534	156	23,971	455	65,526	809	488,096	502,504	
Other services	21,132	175,996	42,318	5,757	1,096	24,353	3,029	1,011,633	327,490	
Public sector	36,128	217	-	7,453	72,048	439	7	289,875	117,632	
Total	317,836	590,094	289,398	44,687	73,658	193,053	733,886	2,039,649	1,214,579	**5,496,839**

Table 31: South West 2020 SOC forecast

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	
Food, drink & tobacco	228,862	11,600	71,908	21	10	4,048	1,317	40,892	30,020	
Other low tech	108	4,201	5,022	33	-	7,615	341	67,362	126,870	
Power & Utilities	-	70,083	32,468	192	3	1,886	15,211	5,618	1,140	
Chemical & process industries	216	189,277	1,918	140	41	4,934	45,815	33,319	21,424	
Metals and engineering	2,893	54,453	931	6,120	6	79,778	51,131	72,271	72,480	
Retail & wholesale	163,122	38,232	155	23,783	451	65,012	803	484,270	498,566	
Other services	21,684	180,593	43,423	5,907	1,124	24,989	3,108	1,038,056	336,043	
Public sector	36,348	218	-	7,498	72,487	442	7	291,641	118,348	
Total	453,235	548,657	155,826	43,694	74,123	188,704	117,733	2,033,429	1,204,891	**4,820,290**

Table 32: West Midlands 2020 SOC forecast

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	
Food, drink & tobacco	144,017	14,156	116,663	30	8	4,501	1,087	48,828	31,830	
Other low tech	96	3,715	4,441	29	-	6,734	301	59,565	112,184	
Power & Utilities	-	55,597	1,403	159	2	4,032	781,951	6,279	966	
Chemical & process industries	815	302,533	1,612	224	70	9,139	121,923	56,313	36,211	
Metals and engineering	4,486	153,114	2,239	11,419	13	223,760	154,430	142,246	123,700	
Retail & wholesale	174,135	40,813	166	25,388	482	69,401	857	516,963	532,224	
Other services	21,574	179,672	43,201	5,877	1,119	24,862	3,092	1,032,762	334,330	
Public sector	34,488	207	-	7,115	68,777	419	6	276,716	112,291	
Total	379,611	749,806	169,725	50,241	70,470	342,847	1,063,648	2,139,672	1,283,737	**6,249,758**

Table 33: Yorkshire & Humber 2020 SOC forecast

SICDescription	Animal & vegetable waste	Chemical wastes	Common sludges	Discarded equipment	Health care	Metallic wastes	Mineral wastes	Mixed (ordinary) wastes	Non-metallic wastes	
Food, drink & tobacco	245,683	19,234	51,354	34	16	12,388	61,867	295,591	50,698	
Other low tech	170	6,611	7,903	51	-	11,983	536	106,003	199,645	
Power & Utilities	384	46,645	2,122	173	2	5,158	2,851,512	6,421	1,139	
Chemical & process industries	323	493,602	1,425	201	62	7,490	205,844	50,686	32,207	
Metals and engineering	2,890	100,007	1,375	7,192	8	172,117	1,053,296	92,288	79,199	
Retail & wholesale	159,767	37,445	152	23,294	442	63,675	787	474,309	488,311	
Other services	20,482	170,579	41,015	5,579	1,062	23,604	2,936	980,493	317,409	
Public sector	33,841	203	-	6,981	67,487	411	6	271,527	110,186	
Total	463,541	874,326	105,345	43,505	69,079	296,825	4,176,784	2,277,318	1,278,794	**9,585,518**