Oxfordshire County Council

Minerals & Waste Local Plan Support

Baseline, Forecasts & Targets for Commercial & Industrial Waste Generated in Oxfordshire

Final Report

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1. Introduction

There are four steps associated with the derivation of capacity requirements[1] for the management of Commercial and Industrial (C&I) Waste, as follows:

1. Defining a Credible Baseline Value
2. Forecasting Growth: Determining appropriate growth factors
3. Determining A Profile of Current Management Routes
4. Identifying Appropriate Targets for management routes in the future

This paper considers each of these steps in turn.

2. Defining a Credible Baseline Value

Estimating quantities of Commercial and Industrial (C&I) waste arisings at Plan Area level is fraught with difficulty due to the lack of comprehensive data for this sector. This paper focuses on using a 'point of production' approach comparing datasets that have been generated to identify a suitably robust baseline. This approach utilises data on the types, number and size of business within the Plan area and applies waste production factors (related to the types of business) derived from a range of sources. Several attempts have been made to establish the amount of C& I waste arisings in England as described below:

2.1. Environment Agency Surveys

The Environment Agency carried out two National surveys intended to estimate C&I waste arisings - once in 1998/9 and then in 2002/3. The results of the first National Waste Production survey were reported in regional 'Strategic Waste Management Assessments' (SWMAs)[2] and have historically been used as the basis for estimates used to inform waste planning at regional and sub-regional scales. The 1998/9 survey was the most comprehensive national study undertaken sampling 20,000 businesses using a statistically stratified sample. The 2002/3 survey was undertaken using a significantly smaller sample base of 4,500 industrial and commercial businesses in England. The 2002/3 survey also generated a 'waste managed' value (called 'measured by business sector') that was lower than the 'waste produced' value called 'waste type'.

[1] This report does not identify the capacity gap between current and future needs as that is beyond the study scope

[2] Strategic Waste Management Assessment: South East (2000) Environment Agency 2000

2.2. 'ADAS' Study

Prior to its abolition, the East of England Regional Assembly led the preparation of a nationwide C&I waste study using survey data from the North West of England for 2006/7. This study reported in 2008 and, as it was undertaken by ADAS (as the contractor), it is referred to as the 'ADAS study'[3]. As part of this study regional data was disaggregated to Waste Planning Authority (WPA) level. There are concerns over the applicability of the north west dataset to other regions with different waste management capacity and economic profiles, and the fact that the study did not include waste produced by businesses of less than 5 employees.

2.3. 2009 Defra Survey

Most recently (in 2009) DEFRA commissioned consultants (Jacobs)[4] to undertake a study that generated estimates for arisings in England down to regional level. The survey total sample size was 6,005 businesses to provide national level estimates, with 592 sample points in the South East spread across 72 sub categories. More intensive sampling was conducted in London and the South West to allow more detailed breakdowns for their waste planning purposes. [5]

The key limitations of the above C&I waste estimation exercises are summarised in Table 1 below.

[3] Study into Commercial and Industrial Waste Arisings ADAS April 2009

[4] Commercial and Industrial Waste Survey 2009 Final Report Jacobs for DEFRA May 2011

[5] For this reason the South West dataset combined with the South East dataset giving a total of 1,844 datapoints has been used in the baseline estimate generation exercise that follows.

Table 1: Data Sources for C&I Estimates

	1998/99	2002/3	2006/7	2008/09
Source	EA National survey	EA National survey	ADAS Study	DEFRA Survey
Comment & Key Limitations	Most comprehensive national study	Significantly smaller sample base	Applied NW data & excluded SMEs of 5 or fewer employees	Gathered regional data supplemented by local data for London & SW. Carried out during economic down-turn
Possible Implication of Limitation on Value obtained	Assumptions about representativeness of sample. Waste generation data now 15 years old.?	Less representative & greater focus on waste managed rather than produced	Industrial arisings may be overestimated while commercial underestimated with omission of micro businesses	Limited dataset of 592 data points for South East. If enhanced with South West values dataset becomes more representative. giving a total of 1,844 results.

3. Estimating C&I Arisings for Oxfordshire

3.1. Historical trend

To contextualise current estimates, historical values should first be considered. The Environment Agency Surveys and the ADAS study generated values for C&I waste arisings for Oxfordshire.

The initial values are plotted on Figure 1[6].

[6] The upper value given in the 2002/3 survey result has been used at it is understood the lower value related to 'waste managed' rather than 'waste produced'.

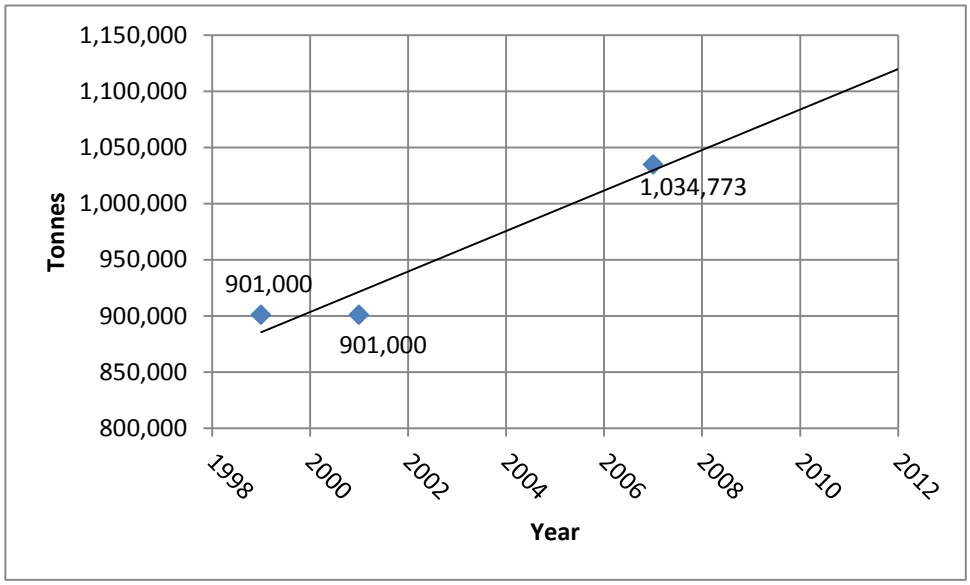

Figure 1: Historical C&I Waste Estimates & Indicative Trend

This suggests that the historical trend in C&I waste arisings was static and then grew between 2002 and 2008. Were the trend to continue it projects that over 1.1 million tonnes of waste would have been produced in 2012.

3.2. Generating More Current Values

The Oxfordshire Waste Needs Assessment used the value for 2009 of 566,800 tonnes based on apportioning the regional results generated by the 2009 DEFRA study down to WPA level. The factor used to apportion the regional results was derived from the proportion (xx%) that the Oxfordshire arisings represented of the South East region's total C&I production derived from the ADAS study. This value represents a significant drop in arisings that 'bucks the apparent historical trend' shown in Figure 2.

Recent work undertaken for the South East Waste Planning Advisory Group (SEWPAG) has generated estimates for C&I waste arisings for each WPA area by applying waste production factors derived from the DEFRA survey to population profile data. This work suggested that 567,104 & 455,174 tonnes of C&I waste was produced in Oxfordshire in 2010 and 2012 respectively. This exercise only utilised the factors generated for the South East which was a very scant dataset (592 data points over 72 categories giving a mean of 8 sampling points). It also did not account for zero entries in the ONS population data.

The recent 'top down' estimates of C&I waste arisings rely on a scant South East region dataset with estimated changes in patterns in arisings at the regional level applied down to WPA level. The method also assumes the proportion of arisings contributed by each WPA to the regional total is constant. Data gaps and anomalies are not addressed and may be magnified through the dataset. To counter this problem a 'bottom up' approach has been taken, utilising the raw survey data that underpins the DEFRA 2009 C&I waste study to enable extrapolation to Oxfordshire.

3.3. BPP Methodology

Factors for waste production by different business types derived from the combined raw survey data for the South East and South West regions were applied to business profile of the Plan Area for 2011 provided by OCC. The business population dataset cleansing and gap filling process is described in Appendix 2. This process generated a 2011 C&I waste arisings value for the Plan Area of around **710,000** tonnes**.** The methodology applied is described in Appendix 1.

For comparison the values generated from different exercises are shown in Table 2.

Table 2: Combined C&I Waste Arising Estimates for Oxfordshire

Source	Environment Agency (2000)	Environment Agency (2002/03)	ADAS	DEFRA	SEWPAG	BPP	SEWPAG
Year	1998/99	2001/02	2006/07	2009	2010	2011	2012
Value (tpa)	901,000	766,000-901,000	1,034,773	566,800	567,104	710,000	455,174

These values are plotted in Figure 2 with trend lines added.

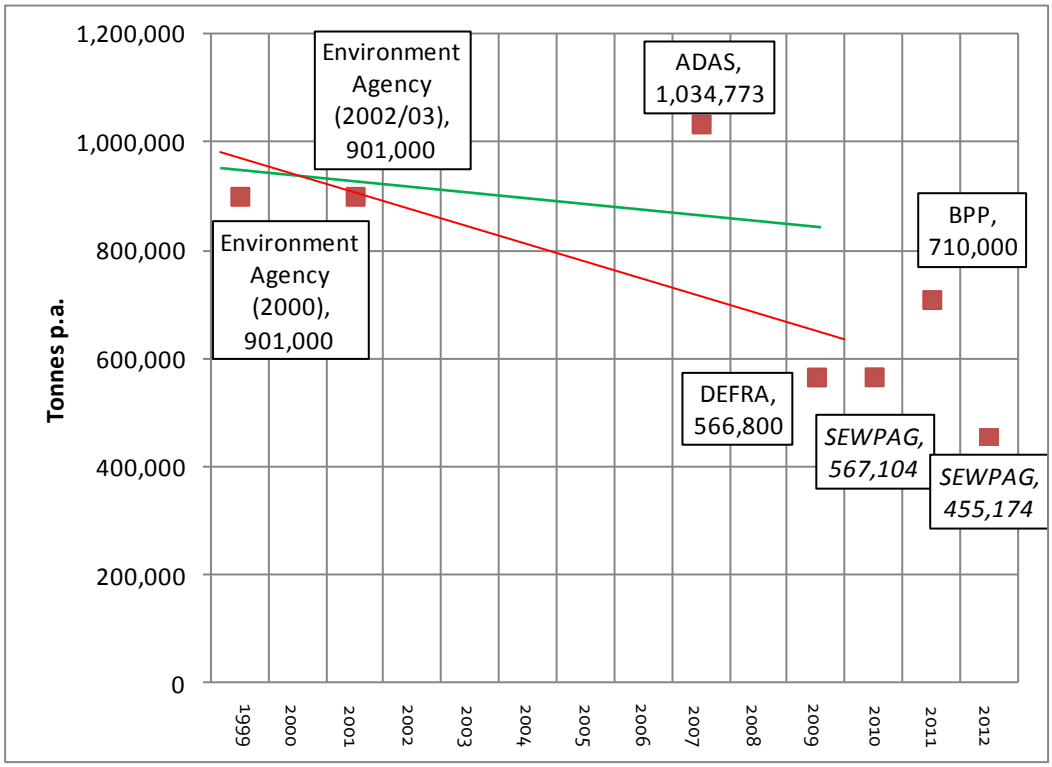

Figure 2: C&I Waste Estimates for Oxfordshire & Indicated Trends

The significant divergence in more recent values suggest two data trends - one that follows a trend line just below a million to 850,000 tonnes per annum (green line)and one that follows a trend line just below a million to less than 600,000 tonnes (red).

The gap between the trendlines can be taken to define a 'cone of uncertainty'. It is reasonable to assume that the most robust and reasonable assessment of arisings lies somewhere between these. Interestingly the BPP value falls in the centre of the cone while the SEWPAG and Defra values are outliers to the cone.

While there are four recent values, as three of these are derived directly from the same source, there are only two values to consider - the DEFRA value and the BPP value. A feel for the accuracy of the various values may be obtained by assessing the 'growth' rates implied by each in relation to the previous ADAS value and these are presented in Table 3.

Table 3: Comparison of Recent Verified C&I Waste Arising Estimates for Oxfordshire with ADAS Study Values

	Arisings	**ADAS 2007 arisings**	**Cumulative Growth Rate**
Defra 2009	566,800	1,034,773	-45%
BPP 2011	710,000	1,034,773	-31%

Didcot Power Station

At its peak production Didcot A Power Station burnt around 7 million tonnes of coal each year giving rise to up to 1.2 million tonnes of ash[7]. If an element of the ash was counted in previous surveys this will have inflated the overall arising figure. The actual proportion of this ash that was counted as waste in previous surveys of commercial and industrial waste arisings is unknown[8]. As the total amount of ash exceeds the C&I waste production value for Oxfordshire as a whole it clearly wasn't all counted. It may be that materials that had established markets were considered to be by-product and excluded from the count, leaving residues requiring disposal or going for recovery being counted as waste. This is borne out by the data obtained from RWe displayed in Figure 3 below:

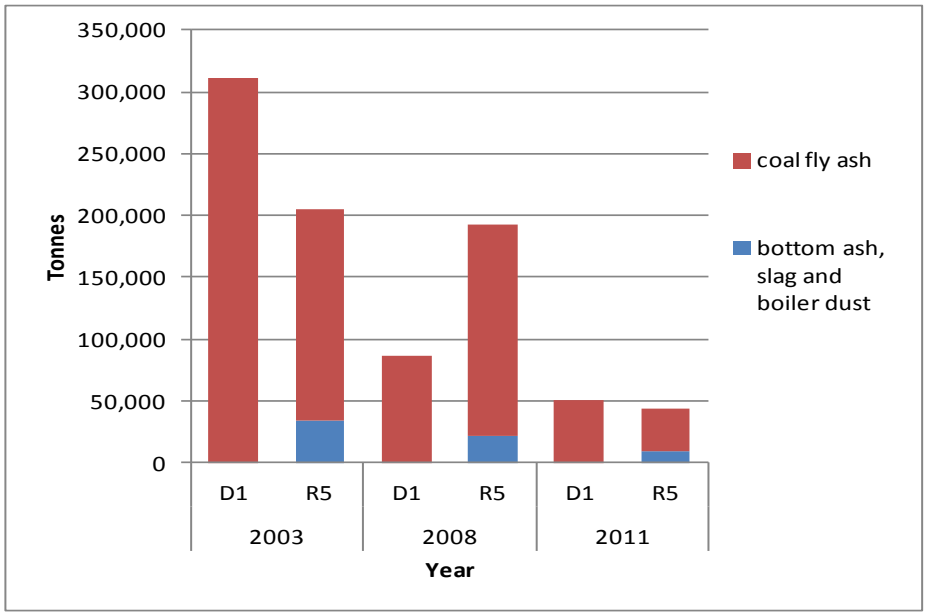

Figure 3: Arisings Classed as Waste from Didcot A Power Station
(D1=disposed; R5=recovered)

The Power Station has now ceased to operate so ash production will not be counted going forward. Therefore, the value for waste production from the single larger power sector unit was deliberately excluded from the BPP calculation to eliminate the possible confounding effect. Hence it may be that the difference between the ADAS study C&I value and the BPP C&I value is not as great as indicated and the implied growth rate indicated may be higher (i.e. less negative) than shown in Table 2.

[7] Data source Residue Utilisation At Didcot Coal-Fired Power Station Best Practice Brochure 004 DTI February 2002

[8] The data shows lower ash production than envisaged because:

1. Ash that goes for beneficial reuse directly from the station is not recorded as waste at all.
2. The operation of the station being reduced nearer the end of its life.

3.4. Comparing Trends In Waste Arisings With Trends In Number Of Businesses.

To determine if there is a basis to justify the BPP value which indicates a smaller drop in arisings in relation to the ADAS value, the trends in the number of businesses in Oxfordshire[9] over this period has been examined. While there are some issues of compatibility across 2008 due to changes in the method of measurement it gives a broad indication of the change (increase or decrease) in business activity. Figure 3 shows the change in the number of businesses between 1998 and 2012.

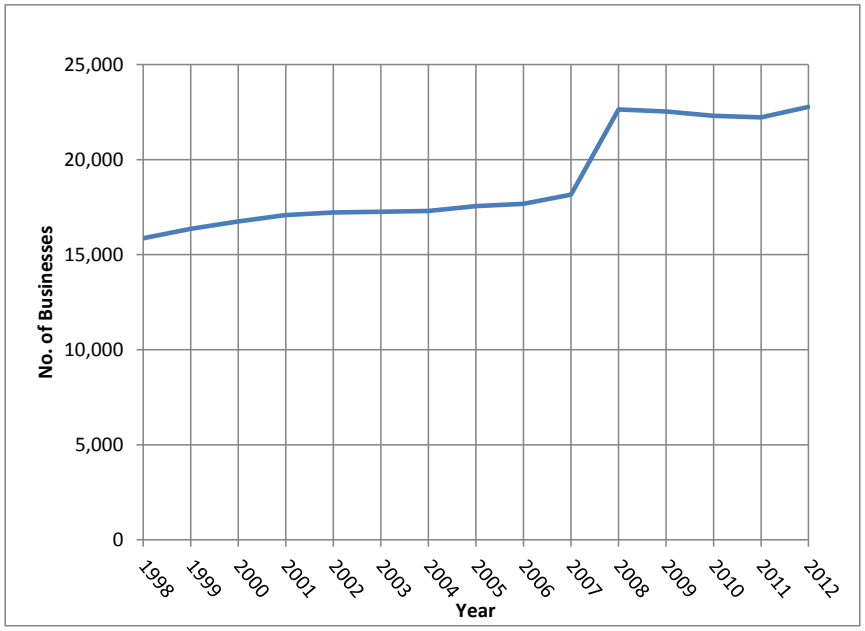

Figure 4: Number of Business Units in Oxfordshire Between 1998 and 2012
(Source ONS)

Figure 4 indicates that, since 1998, the number of businesses active in Oxfordshire has steadily risen with a 44% increase between 1998 and 2012. How closely business numbers correspond to waste growth is not clear. At national level the most recent forecasting exercise[10] uses Gross Value Added (GVA)[11] as the driver for waste arisings. GVA is considered a more complete measure of economic production and its use is therefore expected to better forecast changes in waste production. In particular this measure captures efficiency improvements in the level of waste generated for a given

[9] UK Business Activity, Size and Location data sets (ONS).

[10] Forecasting 2020 Waste Arisings and Treatment Capacity Revised February 2013 Report DEFRA October 2013

[11] Gross Value Added measures the total economic outputs of a sector net of the economic inputs it uses. This is similar to Gross Domestic Product (GDP) but can be used to measure growth in individual sectors rather than the economy as a whole.

level of GVA. Over the period 2003 to 2009 an average annual fall of 5.5% of waste per unit of GVA was observed.[12] This indicates it is entirely possible for GVA to rise while waste production falls - particularly in sectors where there is scope for significant efficiency savings such as manufacturing. Figure 5 below shows the trend in GVA by sector in Oxfordshire to 2010.

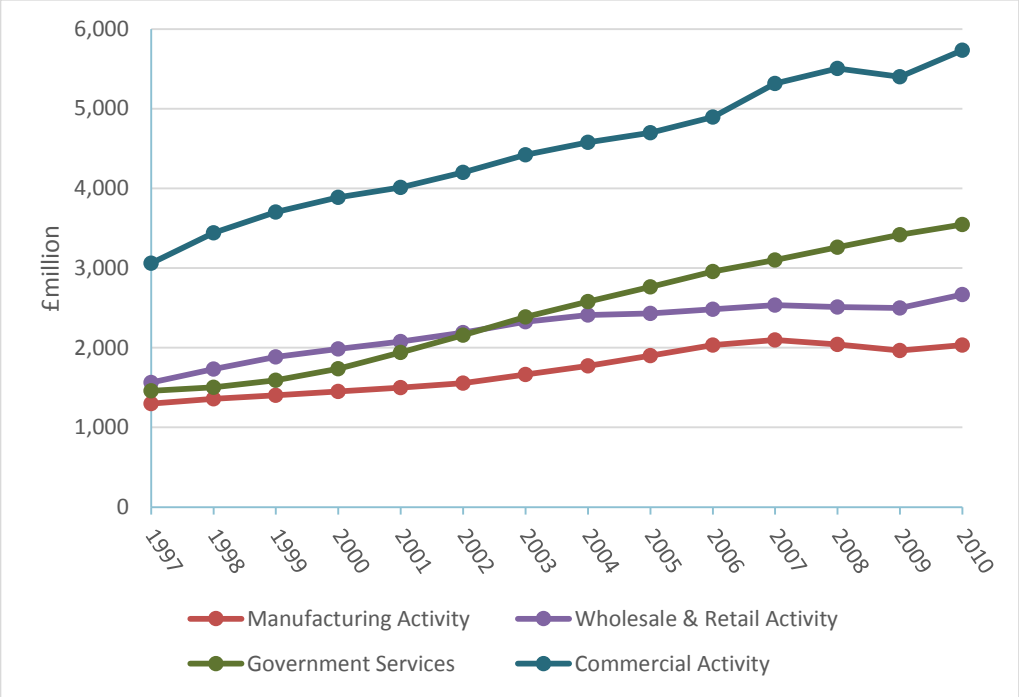

Figure 5: Gross Value Added by Combined Sector in Oxfordshire to 2010
(Source: ONS Sub-regional GVA 2013)

Figure 5 shows that the rising trend in commercial activity is not just in terms of business numbers but also GVA. This also shows some growth in GVA for manufacturing to 2007 while industrial waste production showed some growth too. See Appendix 3 for further detail.

3.5. Conclusion on Baseline

The Oxfordshire Waste Needs Assessment used the value generated by the 2009 DEFRA study based on apportioning the regional results down to WPA level. For 2009 this gave a value of 566,800 tonnes which indicates a drop of 45% on the previous dataset. Having analysed the data on business activity in Oxfordshire there is no apparent reason as to why the quantity of C&I waste

[12] This value is derived from calculating the difference in values obtained in the 2003 C&I survey and the 2009 C&I survey - which showed a significant fall in waste production while GVA has risen over the period.

generated in Oxfordshire should have halved over the 2-3 year period since the ADAS survey. Such a drop is not borne out by analysis of the trends in number of businesses or GVA in the Plan Area. The value generated through the BPP method is a closer fit to those generated in the past based on more representative survey methods. The change in business population in Oxfordshire and profile of that population (see Appendix 3) supports this. Therefore it is proposed that the value to be used as the baseline for C&I waste arisings should be approximately **710,000 tonnes per annum.**

4. Forecasting Growth

4.1. National Forecasts

The latest forecasting work by DEFRA[13] projects C&I arisings for England to 2020 using the national 2009 survey data as a baseline. Upper, lower and central forecasts were produced. These are shown in Figure 6 below

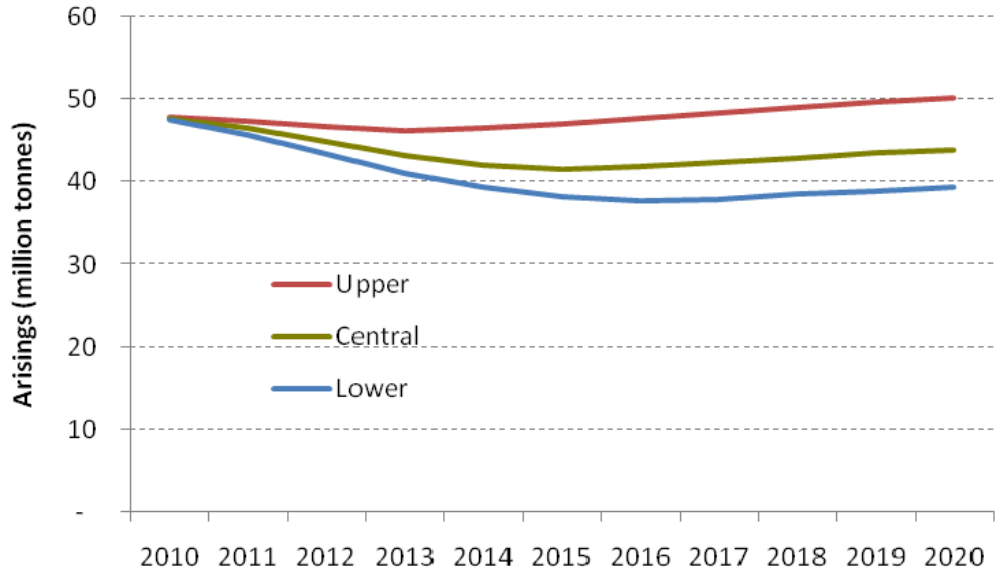

Figure 6: C&I Arising Forecasts for England to 2020
(Source: Defra Forecasting Report 2013)

4.2. Central Forecasts

The central forecast simply projects waste growth in line with predictions of economic growth taking account of the apparent fall in C&I waste per unit of economic output in recent years.[14] The forecast assumes a rate of annual efficiency savings of 4% while the landfill tax escalator continues to 2014. After 2014 the rate reduces to a lower long-run trend of 1% thereafter.[15] By 2020 the central forecast estimates C&I waste arisings to be 8% lower than 2009 levels.

[13] Forecasting 2020 Waste Arisings and Treatment Capacity Revised February 2013 Report DEFRA October 2013

[14] This fall is attributed to efficiency savings driven by the rising cost of waste management services caused by the landfill tax escalator.

[15] A lower rate has been used because the greatest efficiency gains tend to be made first, with subsequent gains tending to become increasingly difficult. i.e. the 'low hanging' fruit phenomenon.

4.3. Outer Bound Forecasts

The rates of growth selected were intended to reflect alternative levels of efficiency savings and to test the possibility that waste arising patterns could potentially change from those observed in the historical data. For example, a pronounced economic recovery could cause waste arisings to increase unexpectedly. The size of this 'shock' (20%) is based on a possible reversal of the downward shift in waste patterns that occurred between 2002-03 and 2009. Replicating this approach to Oxfordshire generates the forecasts shown in Figure 7 below:

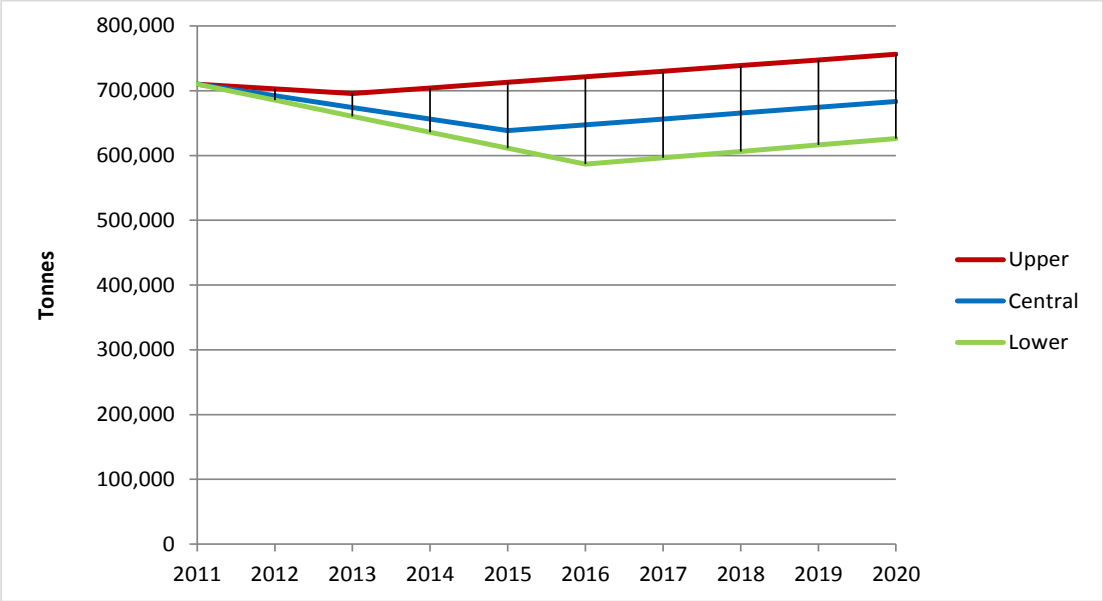

Figure 7: C&I Arising Forecasts for Oxfordshire to 2020 (tonnes per annum)
(After Defra Forecasting Report 2013)

The curves shown correspond to the following growth rates:

Table 4: C&I Arising Forecast Growth Rates for Oxfordshire to 2020
(tonnages rounded to nearest '000)

	Tonnage at 2020	Growth Rate over period	Compound Annual Growth Rate
Lower	626,000 tpa	minus 11.8%	minus 1.39%.
Central	684,000 tpa	minus 3.7%[16]	minus 0.42%
Upper	756,000 tpa	plus 6.5%	plus 0.7%.

So two out of three forecast curves indicate that C&I arisings will fall from the 2011 baseline figure. The difference between the lower and the higher estimate is 130,000 tonnes at 2020.

As the above forecasts are based on UK predictions, they do not acknowledge local economic conditions. Therefore a set of local forecasts produced by OCC for economic development in Oxfordshire have also been examined[17]. This proposed three forecasts as follows: baseline; higher population growth; and policy driven. It should be noted that economic activity is measured by employment in these studies. This is considered to be a less reliable measure than GVA when using economic data in forecasting waste arisings. GVA was used in the Defra forecasts . The projected OCC study growth rates through to 2031 have been applied on a sector by sector basis to the Oxfordshire C&I baseline data (2011) shown in Table A1.1.

This generates the results shown in Figure 8 below.

[16] The drop is significantly less than that shown by the Defra report because the baseline it has been measured from is 2 years ahead i.e. 2011 not 2009. The Defra study envisaged a substantial fall during this period which is already accounted for in setting the baseline.

[17] Economic Forecasting to Inform the Oxfordshire Strategic Economic Plan and Strategic Housing Market Assessment Final report for Vale of White Horse District Council and partners 5 December 2013 DRAFT

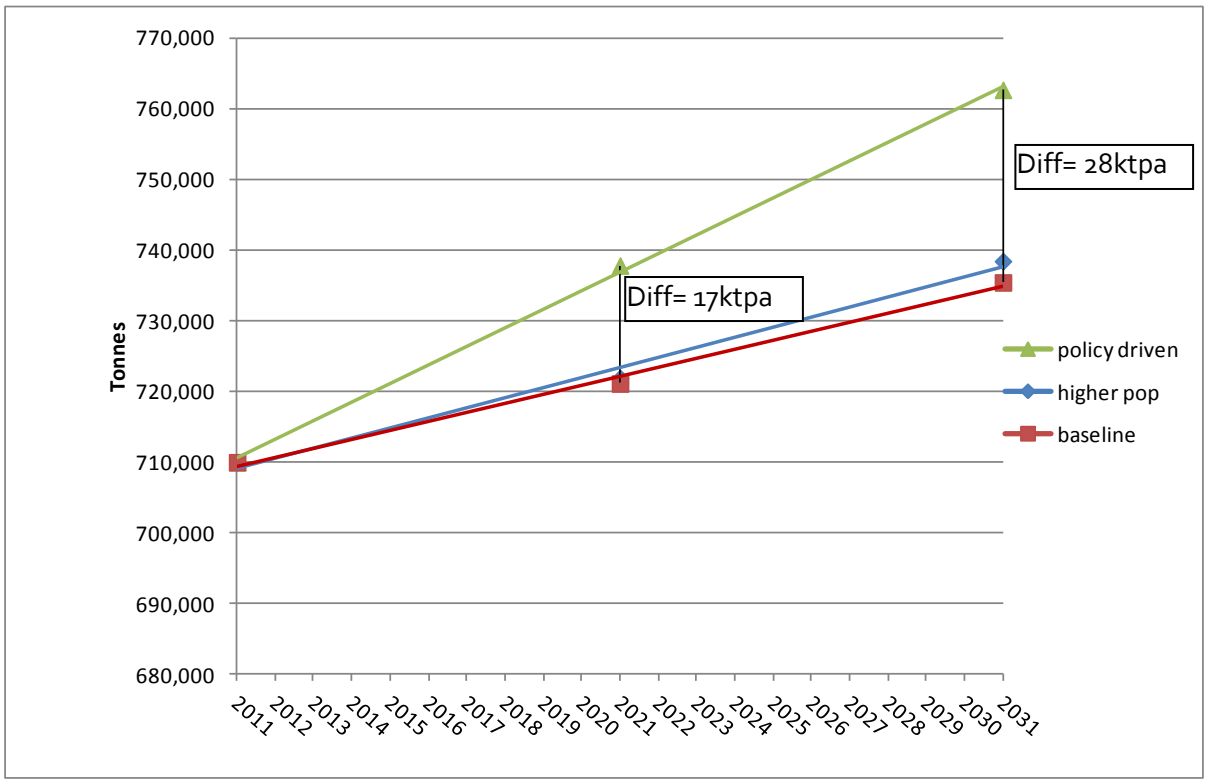

Figure 8: C&I Arising Forecasts for Oxfordshire to 2031 Applying OCC Forecast Growth Predictions
(After OCC Forecasting Report 2013) NB: y axis scale not at zero.

The curves shown correspond to the following growth rates over the initial 10 year period:

Table 5: C&I Arising Forecast Growth Rates for Oxfordshire 2011 to 2021
(tonnages rounded to nearest 'ooo)

	Tonnage at 2021	Growth Rate over period	Compound Annual Growth Rate
Baseline (Lower):	721.000tpa	plus 1.57%	0.16%.
Higher Population (Mid)	722,000 tpa	plus 1.68%	0.17%
Policy Driven (higher):	738,000 tpa	plus 3.92%	0.39%.

and the following growth rates in the subsequent decade:

Table 6: C&I Arising Forecast Growth Rates for Oxfordshire 2021 to 2031
(tonnages rounded to nearest 'ooo)

	Tonnage at 2031	Growth Rate over period	Compound Annual Growth Rate
Baseline (Lower):	735.000tpa	plus 1.98%	0.20%.
Higher Population (Mid)	738,000 tpa	plus 2.29%	0.23%
Policy Driven (higher):	763,000 tpa	plus 3.37%	0.33%.

4.4. Combining The Two Data Sets

Considering the datasets it is apparent that:

1. The Oxfordshire economic forecast-based datasets (Figure 8) offer a very limited range of growth possibilities to explore. However they do all result in a predicted trend of continued growth in arisings.
2. The Defra-based forecasts (Figure 7) result in a predicted fall in arisings in all but one of the scenarios. This seems to be an overly conservative position when considering the relative resilience shown by the Oxfordshire economy in the face of the recession illustrated by consistent growth in GVA (Figure 5).

To achieve a range of possibilities that provide flexibility to account for potential growth in Oxfordshire and therefore make provision for a greater quantity of C&I waste (rather than risk underprovison) the datasets have been considered together. The following are proposed.

Table 7: C&I Arising for Oxfordshire: Proposed Forecast Growth Rates

	Compound Annual Growth Rate to 2021	Source	Compound Annual Growth Rate 2021 to 2031	Source
Lower	0.16%.	OCC baseline	0.2%.	OCC baseline
Central	0.39%.	OCC policy driven	0.33%.	OCC policy driven
Upper	0.7%.	Defra Upper	0.2%.	Adjusted reflecting Defra Upper includes 'one-off shock'

Applying these growth rates yields the following tonnages

Table 8: C&I Arising for Oxfordshire Applying Preferred Forecast Growth Rates
(tonnages rounded to nearest 'ooo)

	Tonnage at 2021	Increase on 2011	Tonnage at 2031	Increase on 2011
Lower	721,000	10,000	735,000	25,000
Central	738,000	28,000	763,000	53,000
Upper	758,000	48,000	773,000	63,000
Diff	37,000		38,000	

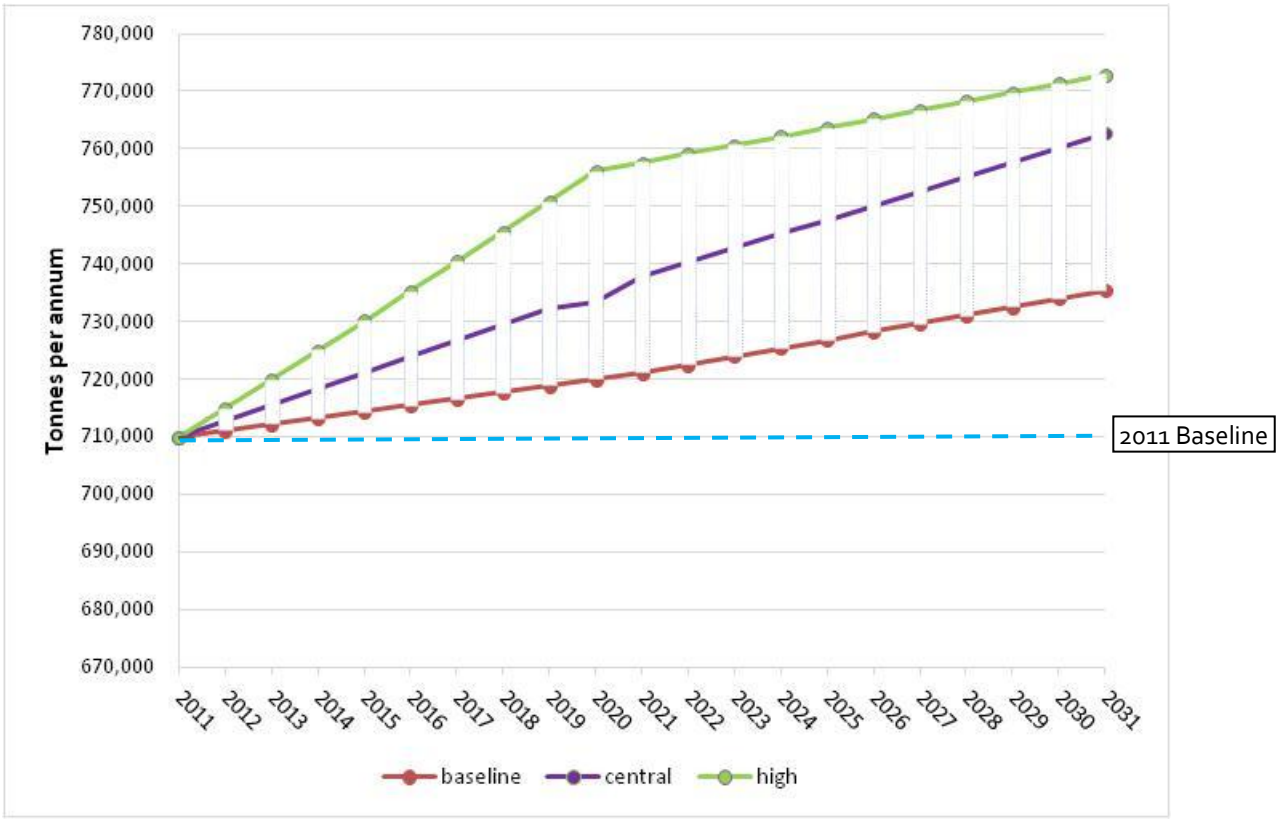

Figure 9: C&I Arising Forecasts for Oxfordshire to 2031 Applying Combined Growth Factors
NB: y axis scale not at zero.

4.5. Conclusions on Commercial & Industrial Wastes Arisings

There is considerable uncertainty in forecasting C&I waste arisings. The Government forecast described in the forecasting paper published by Defra predicts C&I arisings nationally to be lower in 2020 than the figure arrived at in the national 2009 survey which is already considered to be unrealistically low in general, and shown to be so for Oxfordshire in particular.

The economy of Oxfordshire is likely to be more resilient and grow faster than that of the UK as a whole. Therefore the expectation of the national forecasts that C&I waste arisings will fall in real terms to 2020 is considered to be overly conservative and has therefore not been applied.

To provide flexibility and help ensure that the market has sufficient opportunities to develop facilities, it is considered prudent to provide for waste management capacity other than landfill to provide for higher predicted levels of waste arisings.

The selected forecasts show moderate growth with the highest showing a final maximum figure in 2031 63,000 tonnes above the 2011 baseline. This represents capacity of one moderately sized facility or two smaller facilities.

5. Waste Management Profile

The last data point for C&I management routes is taken from the SEWPAG C&I dataset that drew on the Defra South East 2009 survey data. This indicates that of waste produced by commerce & industry in Oxfordshire:

3% was reused

49% was recycled or composted

9% was subject to other recovery including thermal destruction with energy recovery

24% was disposed either to landfill (20%) or thermal destruction without energy recovery.

15% was dealt with by methods that couldn't be classified.

The profile is illustrated in Figure 10 below:

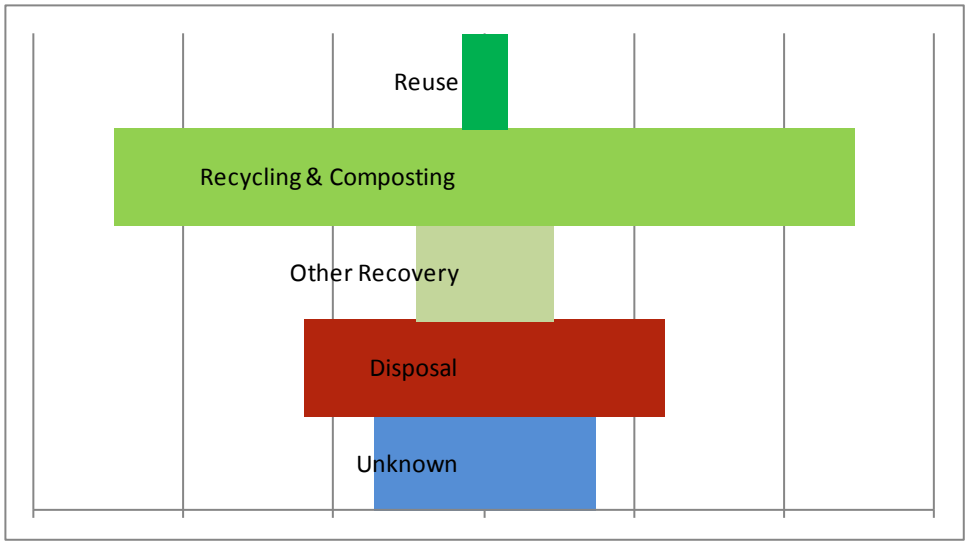

Figure 10: C&I Management Route Profile 2012
After the waste hierarchy.

Applying this profile to the arisings figure of 710,000 tonnes indicates the following management routes.

Table 9: C&I Estimate Assigned by % SEWPAG Management Profile

	Tonnes
Reuse	20,555
Recycling & Composting	350,707
Other Recovery	63,501
Disposal	170,808
Unknown	104,475

5.1. Verifying the Management Profile

Examination of the WDI for 2012 indicates that just over two million tonnes of waste (2.007 mt) attributed to Oxfordshire was managed at facilities recorded through the WDI in 2012. In addition to this 6,320 tonnes was dealt with by way of incineration. Giving a total of 2.013mt recorded as managed at permitted facilities.

5.2. Screening Out Non-C&I Waste

Step 1: Eliminating CDEW

Of the total (2.013mt), 690,000 tonnes is classed as Chapter 17 waste. This may be discounted as CDEW. This leaves 1.323 mt.

Step 2: Eliminating Local Authority Collected Municipal Waste

Examination of WasteDataFlow returns for 2012 to screen out LACMW[18] indicates that :

123,000 tonnes were sent to landfill

191,000 tonnes were sent to recycling/composting. Of the recycling/composting 157,000 tonnes went to composting sites while 35,000 tonnes went to sites for recycling.

Of the tonnage going to recycling sites around 23,500 tonnes went to sites known to be permitted with the remainder (11,500 tonnes) going to sites either 'not permitted' or 'unknown' - both assumed to be exempt. The latter value should be excluded from the discounting process as that would not appear in the WDI data.

[18] It should be noted that WDF data is normally presented by financial year whereas to draw direct comparison with the WDI data this is generated by calendar year. Hence these values may not directly reconcile with those shown in the OCC AMR.

106,012 tonnes went to their ultimate fate via transfer sites - either CA Sites, Waste Transfer Stations or MRFs.

693 tonnes is recorded as going for reuse

64 tonnes is recorded as being sent to EfW and 2 tonnes to incineration.

This combined tonnage of LACMW amounts to nearly 410,000 tonnes managed at permitted sites in 2012. If this tonnage is deducted from the dataset it gives the following total (912,505 tonnes) [19]broken down by management method for the remaining waste.

Table 10: C&I Management Routes Based on Actual Data 2012[18]

	Landfill	MRS	On/In Land	Transfer	Treatment inc Recycling & composting	Use of Waste	EfW	Incin	Grand Total
WDI 2012 + EA non WDI Totals	378,570	35,356	868	172,985	726,864	1,518	5,093	741	1,321,994
minus LACMW	*123,029*	*0*	*0*	*106,012*	*179,689*	*693*	*64*	*2*	*409,489*
Total Remaining	**255,541**	**35,356**	**868**	**66,973**	**547,175**	**824**	**5,029**	**739**	**912,505**
%	28.0%	3.9%	0.1%	7.3%	60.0%	0.1%	0.6%	0.1%	

MRS= Metal Recycling Sites; On/In Land = beneficial recovery; Use of Waste=former exempt activities producing product or putting waste to a use

Combining the values obtained to create a comparable profile gives the following:

Table 11: C&I Management Route Profile from Actual Data 2012

	Actuals 2012	%
Use of Waste	824	0.1%
Treatment inc Recycling & composting	582,532	63.9%
EfW	5,029	0.6%
Landfill + Incin	256,280	28.1%

NB: Treatment figure includes MRS value in above Table as it represents a form of treatment facility.

[19] This value may include double counting so total doesn't reconcile with arisings value.

Due to the fact that the WDI doesn't not distinguish between types of treatment sites it is not possible to establish how much of the input to the Treatment category or Transfer categories may end up going for recycling and composting. This means it is not possible to make direct comparison between the SEWPAG profile and the WDI profile. However it is possible to use the actual input data shown in Table 11 above for specific routes to test the validity of the predicted input tonnages given by the SEWPAG study as follows:

Table 12: Comparison C&I Management Routes Based on Actual Data 2012 & SEWPAG Study Predictions

	SEWPAG Prediction	Actuals 2012	Difference
Use of Waste	20,555	824	-19,731
EfW	63,501	5,029	-58,472
Landfill + Incin	170,808	256,280	85,472
Column Totals	*254,864*	*262,133*	*7,269*

.

This indicates that a greater tonnage of C&I waste than predicted through the SEWPAG method goes to landfill in Oxfordshire with a corresponding reduced tonnage going to EfW and Reuse.

This also suggests that with 262,133 tonnes going for reuse, recovery or final disposal (totals of actuals in Table 12 above) , up to 447,867 tonnes of the total tonnage of C&I waste arisings within Oxfordshire (710,000 tonnes baseline) may be subject to recycling or composting. This equates to a recycling/composting rate of 63%. However it should be noted that what actually happens to the remaining tonnage is unknown so the 63% should be regarded as a notional maximum value for recycling and composting.

5.3. Forecasting Future Management Profile

Factors likely to influence the future management of waste from commerce and industry in Oxfordshire are:

- The composition and nature of waste[20]
- Waste management service offerings & associated cost reduction opportunities

[20] The Landfill Directive landfill diversion targets relate to municipal waste with a biodegradable content. The municipal waste fraction of C&I waste is estimated by the Defra forecasting report[20] to be 84% for commercial waste and 19% for industrial waste using data from the 2009 survey. In 2020 the report assumes that the municipal waste fraction of C&I waste will fall within a range of 79% to 89% for commercial waste and 15% to 23% for industrial waste. It assumes that the municipal content is equally likely to be anywhere within these ranges.

- Availability of competitive management capacity
- Voluntary initiatives driven by government or national trade bodies
- National & Local Policy targets.

5.4. Proposed Targets

There are no local or national targets for C&I recycling, recovery or landfill diversion (apart from the indirect ones of the Landfill Directive and BMW and material specific targets such as the ELV, WEEE and Packaging Targets. However, the recycling & composting targets in the now revoked SEP (Policy W6) may be a helpful reference point. This proposed the following:

2015 55% ; 2020 60%; 2025 65%

The West Sussex Waste Local Plan proposed an accelerated version with an increase to 60% by 2015, and then by 1% per year to 65% by 2020 with that recycling rate maintained to 2031

The Welsh Strategy *Towards Zero Waste One Wales: One Planet* sets a more ambitious recycling rate of a minimum of 70% by 2025, with residual waste decreasing to a maximum of 30% by that year. In addition it proposes to reduce waste arisings by around 1.5% each year across all sectors.

The Scottish Government *Zero Waste Plan* proposes targets of 70 per cent target recycled, and maximum 5 per cent sent to landfill, both by 2025.

The OCC Waste Needs Assessment proposed that in order to divert the maximum amount of waste from landfill, in line with the waste hierarchy, it would be necessary to apply a more ambitious target than that of the South East Plan. A recycling target of 70% by 2025 was proposed. It also proposed that no more than 5% of waste be sent to landfill leading to a requirement that 25% of the waste be treated as residual waste in facilities such as energy from waste plants.

The Defra forecasting report assumes C&I recycling increases by ten percentage points by 2020 (on the 52% from the 2009 survey), reflecting factors such as landfill tax which are expected to continue to reinforce existing recycling trends going forward. However, because of the uncertainty around

the projected recycling rate a range of eight percentage points either side is used, with an assumed continuation of an upward trend.

Taking the SEWPAG study value estimate of 49% as a baseline and applying a ten percentage point rise by 2020 would get to 59% by 2020. The proposed OCC target suggests a further 11 percentage point rise over the subsequent 5 years.

However if the current baseline recycling value is nearer 63% as indicated by the actual data then a less than 0.5% rise per annum would get to the recycling target.

The actual data indicates that the 49% is a reasonable minimum baseline level so applying the Defra forecast approach of adding a range of eight percentage points suggests a range to 57% and rising. This is indicated in the Figure below.

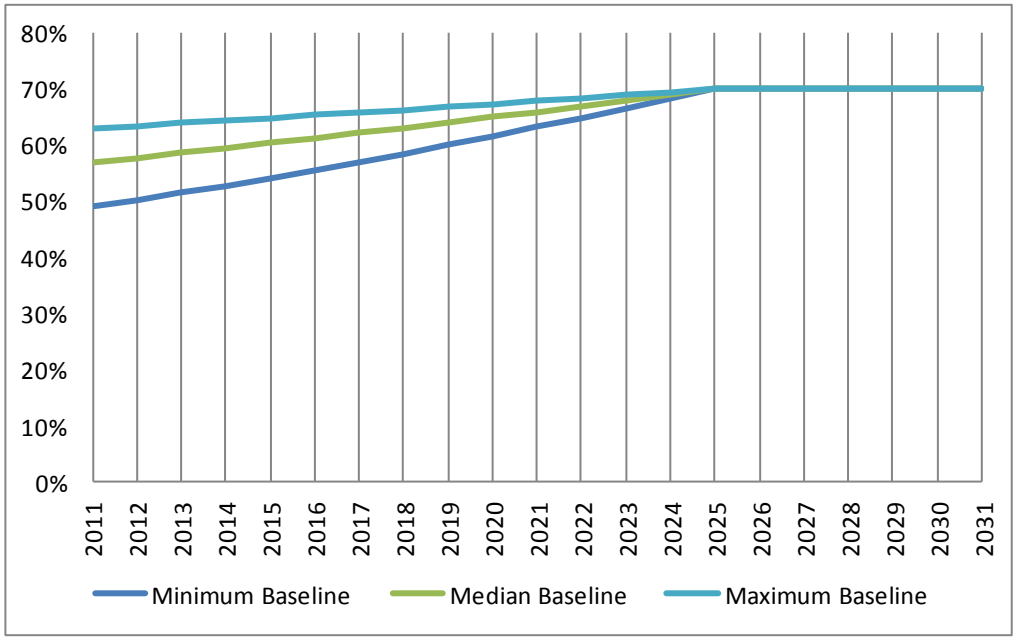

Figure 11: C&I Recycling Target Trajectories 2011-2031

5.5. Capacity Requirement

Applying the range of recycling rate trajectories depending on the assumed starting baseline, to the range of growth rates forecast in the previous section will establish the range of capacity required to meet the recycling target proposed in the Plan. This is illustrated in Figure 12 below.

This illustrates that applying the lowest baseline to the low growth rate presents a substantial challenge to get to the 70% recycling target by 2025. In particular it requires provision of an additional 167,000 tonnes of capacity by 2025 at an initial rate of 50,000 tonnes every 5 years until 2025 after which it stabilises. In contrast the highest baseline combined with the high forecast requires just less than 95,000 tonnes over the 15 year period at an initial rate of 50,000 tonnes every 8 years (circa 30,000 tonnes every 5 yrs). The central forecast combined with the central baseline requires 130,000 tonnes of capacity be in place at an initial rate of 50,000 tonnes every 7 years to 2025.

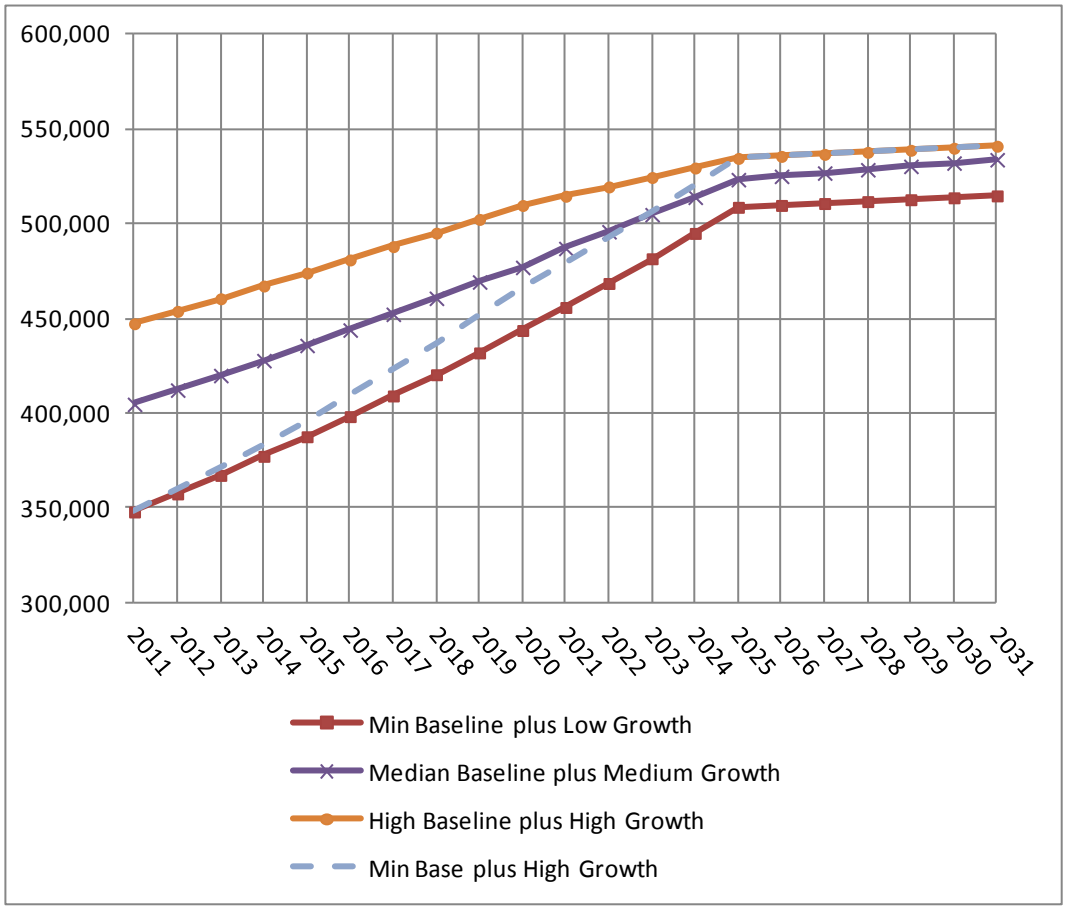

Figure 12: C&I Recycling/composting Capacity Requirement Applying Baselines, Target Trajectories & Forecast Growth Rate 2011-2031[21]

[21] It should be noted that while the above graphs indicate an annual growth rate in reality while this might reflect the development and expansion of collection schemes, for capacity provision it should be a stepped line reflecting the minimum capacity of a facility that may be provided to meet that need. i.e. when a critical mass of material is being collected that exceeds current available capacity.

5.6. Conclusion on Targets

The analysis indicates that the target of 70% recycling or composting of C&I waste by 2025 proposed in the OWNA is ambitious. Indeed if the lower baseline estimate is applied then it could be overly ambitious and it may be advisable to extend the timescale for delivery of the target to nearer the end of the Plan period.ie 2030.

The ambition of the proposed target will be more challenging were the lower baseline to be realised and combined with higher growth forecasts. This would require provision of approaching 200,000 tonnes of capacity over the period at an initial rate of 50,000 tonnes every four years to 2025. This may present a challenge in terms of availability of deliverable sites and the market ability to deliver to the Plan. Therefore we suggest the target be reviewed to align with the approach proposed in the West Sussex WLP but with a target of 65% by 2025 and the 70% target being set for the year before the end of the Plan period i.e. 2030.

Appendix 1 BPP Method of calculating C&I waste arisings utilising the 2009 DEFRA survey and Oxfordshire business profiles

The raw survey data underpinning the 2009 Defra C&I waste study was obtained from DEFRA to enable extrapolation from the latest national dataset to the Plan Area.

Data obtained was the raw survey data for the South East and South West regions combined. The South West had a more intensive sampling regime so this combined dataset gives a more representative set of results.

The raw survey waste arising values were divided by the sample population to obtain 'waste production factors' by business sector and size band. These factors were then applied to the business population profile provided by Oxfordshire County Council for 2011.

A further extrapolation was carried out to generate values for micro businesses in the 1-4 size band following the methodology applied in the 2009 DEFRA survey report. Following the 2009 DEFRA methodology this involved the use of waste production factors for micro businesses derived from the 2002/3 Environment Agency survey.

Close examination of the data revealed a number of anomalous values that distort the initial results for arisings. In particular the method adopted in the DEFRA survey means that outlying values calculated for businesses with 5-9 employees can have a significant distorting effect on the final results because the 1-4 business size band is calculated using the5-9 employee business size band values as its reference. This means any anomaly will be further amplified in the results.

Assuming that a normal distribution curve would be followed, anomalous values were adjusted by reference to adjacent waste production values. This gives rise to Table A1.1 below:

Table A1.1: Estimated Arisings of C&I waste in Oxfordshire

	ratio	Company size						Total
SIC group	**0-4**	**(5-9)**	**(10-19)**	**(20-49)**	**(50-99)**	**100-249**	**(250+)**	**inc micro**
1. Food, drink & tobacco	25	132	434	505	1,350	5,372	12,420	20,238
2. Textiles / wood / paper / publishing	262	571	1,430	1,913	280	8,623	125,237	138,315
3. Power & utilities	8	22	12	60	174	0	78,117	78,393
4. Chemicals / non-metallic minerals ma	48	1,013	162	2,500	2,582	1,762	6,298	14,365
5. Metal manufacturing	2,258	1,528	964	898	217	4,236	0	10,100
6. Machinery & equipment (other manu	872	490	2,295	8,783	138	5,419	16,393	34,390
								295,801
7. Retail & wholesale	19,669	46,387	26,266	15,807	6,269	12,343	10,384	137,125
8. Hotels & catering	2,615	13,856	9,533	7,551	1,810	207	15,503	51,076
9. Public administration & social work	2,107	6,035	5,574	5,477	7,886	627	7,977	35,685
10. Education	723	2,819	4,601	10,787	2,591	8,430	5,194	35,145
11. Transport & storage	179	717	1,943	2,351	923	14,232	3,019	23,365
12. Other services	42,255	27,009	29,586	20,868	4,649	5,539	1,946	131,850
								414,245
	71,020	**100,578**	**82,801**	**77,500**	**28,870**	**66,789**	**282,488**	**710,046**

Appendix 2 Filling in the Nil Values in Business Population Dataset

Table A2.13: Number of Businesses per Industry by Employee Size

	Employee size bands									
								x	y	z
Industry	**0 - 4**	**5 - 9**	**10 - 19**	**20 - 49**	**50 - 99**	**100 - 249**	**250+**	**Total by entry**	**Total stated**	**diff to be allocated**
Food, drink and tobacco	25	10	0	0	0	0	0	**35**	**65**	**30**
Textiles, wood, paper, publishing	230	45	25	20	0	0	0	**320**	345	**25**
Power and utilities (DEFRA def)	10	0	0	0	0	0	0	**10**	25	**15**
Chemicals/non-metallic minerals manufacturing	70	15	0	5	10	0	0	**100**	130	**30**
Metal manufacturing	150	35	10	5	0	0	0	**200**	235	**35**
Machinery & equipment - other manufacturing	345	45	35	30	0	0	0	**455**	600	**145**
Retail and wholesale	3,080	1,115	550	310	60	30	10	**5,155**	5,230	**75**
Hotels and catering	975	525	315	200	40	0	0	**2,055**	2,075	**20**
Public admin and social work (DEFRA definition inc Health)	940	435	330	275	75	30	20	**2,105**	2,130	**25**
Education	520	185	145	225	80	75	10	**1,240**	1,265	**25**
Transport and storage	475	95	65	45	15	0	0	**695**	745	**50**
Other services (DEFRA def)	11,825	1,570	770	345	85	55	5	**14,655**	14,990	**335**
Sectors not included above*	4,075	530	195	75	5	5	0	**4,885**	4,975	**90**
Total - all industries	**22,720**	**4,605**	**2,440**	**1,535**	**370**	**195**	**45**	**31,910**	32,810	**900**

The Nomis dataset provided by OCC had a substantial number of nil entries (28 out of 91 = 30%) . This is partly explained by the fact that data has been rounded to the nearest 5, meaning some results for sector groups/size bands are distorted as a result of the summing of rounded data. In addition, where the number of businesses within a sector size band is so small that the identity of any individual company might be ascertained, a process has been applied to protect commercial sensitivities such that some entries appear as zero whereas in fact a small number of businesses are active within these sectors.

The combined effect of these processes means that a significant number of businesses would be omitted from the analysis - the total number of unallocated businesses was 900 (bottom right cell of Table A2.1 above). If the businesses omitted exist within the larger size bands the methodology would result in a significant under-reporting of waste arisings for that sector. Comparison between the total of actual number (column x above) with the Total stated (column y above) indicated a difference in Column z above indicates the number of businesses eliminated by the processes for each sector.

To counter this, a method was devised to allocate the differences to the entries assigned a zero. This drew on the following sources:

1. Listing of top 100 businesses in Oxfordshire: A listing of companies with over 134 employees. This listing therefore includes all businesses in 250+ category and partially includes businesses in 100-249 size band.

2. ONS headline data for Oxfordshire by employee size band: High level data aggregated which is taken to not exclude the nil data values. [22]
3. Oxfordshire Economic Assessment: Provided indication of business population profile and growth trends

The allocation of the differences was undertaken by taking the following steps:

ONS Headline Dataset

The proportion of businesses within each size band shown in the ONS headline dataset (being the most complete dataset) were calculated.

These were applied on a sector by sector basis to generate a 'predicted' number of businesses.

The values obtained were compared with the actual values shown. Where the values derived were less than the actual values, the actual values were carried forward.

Top 100 businesses Dataset

Each of the top 100 businesses in Oxfordshire were assigned to a Sector.

The resulting number of businesses was checked against the values shown in the bands 100-249 and 250+. If the value was greater than the existing number then it was used.

The remaining difference was then allocated across all the other bands according to the proportion the remaining bands represented of the overall ONS %'s.

Where the resulting values for 100-249 size band exceeded the actual obtained from the Top 100 listing this was used and vice versa.

The results are displayed in Table A2.2. This dataset was then applied to the DEFRA production factor dataset with the resulting values shown in Table A1.1 in Appendix 1.

TableA2.2: Fully Allocated Number of Businesses per Industry by Employee Size

	Employee size bands							
Industry	**0 - 4**	**5 - 9**	**10 - 19**	**20 - 49**	**50 - 99**	**100 - 249**	**250+**	**Total by entry**
Food, drink and tobacco	47	10	3	2	1	1	2	**65**
Textiles, wood, paper, publishing	244	48	27	20	0	2	4	**345**
Power and utilities (DEFRA def)	17	1	1	1	0	1	4	**25**
Chemicals/non-metallic minerals manufacturing	88	19	2	6	10	2	2	**130**
Metal manufacturing	178	35	13	7	1	1	0	**235**
Machinery & equipment - other manufacturing	432	63	45	36	2	10	11	**600**
Retail and wholesale	3,152	1,115	550	310	62	31	10	**5,230**
Hotels and catering	991	525	315	200	40	1	4	**2,076**
Public admin and social work (DEFRA definition inc Health)	957	439	332	276	75	30	20	**2,130**
Education	537	189	147	226	80	75	10	**1,265**
Transport and storage	475	95	65	45	15	46	4	**745**
Other services (DEFRA def)	12,058	1,618	797	362	91	58	5	**14,989**
Sectors not included above*	4,137	543	202	80	6	6	1	**4,975**
Total - all industries	**23,313**	**4,700**	**2,498**	**1,572**	**383**	**265**	**78**	**32,809**

[22] The footnote to the Nomis table states "Figures may differ by small amounts from those published in ONS outputs due to the application of a different rounding methodology."

Appendix 3: Relative Contributions of Commercial & Industrial Activity to Waste Arisings.

The contribution that industry makes to arisings as compared with commerce was explored to understand the possible trends. In general industry generates greater amount (tonnes) of waste per business than commerce so a switch in emphasis between the two groupings could result in a decline in waste production while the overall count of businesses rises.

Table A3.1 Split of Oxfordshire Waste Arising Values split by Industrial & Commercial
(tonnes per annum)

	Industrial	Commercial	Total
EA Survey 1998/9	585,000	315,000	900,000
ADAS Study 2008	606,000	428,000	1,034,000
BPP Study 2013	296,000	414,000	710,000

Table A3.1 indicates that while the commercial element of C&I arisings grew between 1998 and 2008 it remained more or less constant from 2008 to 2012. In contrast growth in industrial waste between 1998 and 2008 was then offset by a significant fall in industrial waste arisings which accounted for virtually all the difference between the overall totals in the ADAS study and BPP method. Comparison of the industrial arisings figures should be treated with some caution as the contribution that Didcot A made to the pre BPP figures remains unknown. It may be in the range of 210,000 tonnes.

In light of the above the business unit dataset was split to examine whether the differences in business growth rates between industrial and commercial businesses reflects the observed change in waste production. The SIC code for 'Production' was taken to represent industrial business activity, while all other classifications, excluding construction and agriculture, were taken to represent commercial business activity. Figure 3.1 illustrates the trend in business growth between 1998 and 2010 split between industry (Production) and commercial businesses in Oxfordshire.

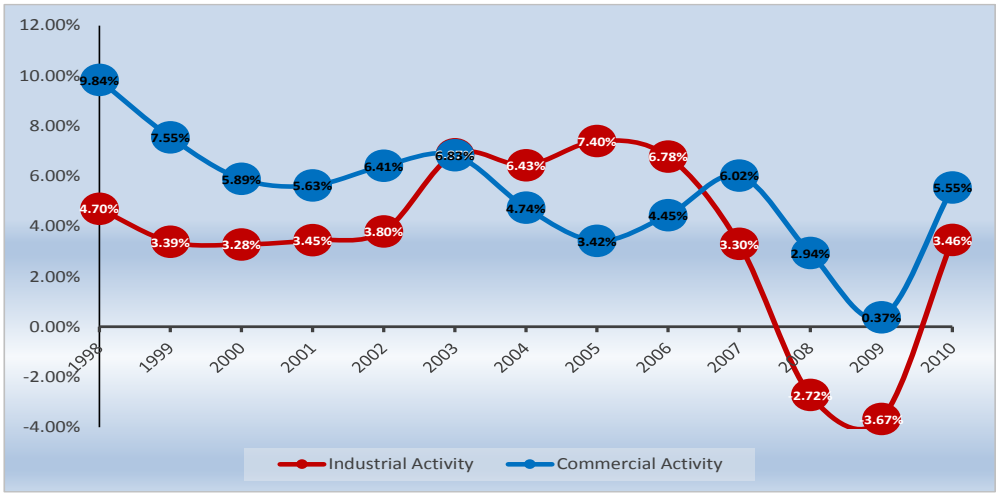

Figure A3.1 Trends in Oxfordshire Business Growth Rate- Industrial & Commercial Activity
(Source Data: ONS)

Figure A3.1 shows that business output in Oxfordshire has consistently been positive in both groupings up til 2008.

At 2008 while commercial business activity increased, industrial activity declined. Industrial activity has seen a recovery in 2010 but in absolute terms it is still at a lower level than 2007 (and only marginally above 2006). This is reflected in a fall in the contribution of industry to total waste arisings having fallen significantly over the period

The rise in GVA of 55% between 1998 and 2007 corresponds to a rise in arisings of only 3.6% (21,000 tonnes EA minus ADAS) over the same period. This supports the assertion that waste per unit of economic output within the sector has fallen significantly over the period.

Figure A3.2 shows that the fall in industrial activity has been offset by the growth in commercial activity within the economy in the recent period. But a corresponding increase in waste production has not been fully realised. This may be attributed to the reduced production of waste from commercial businesses.

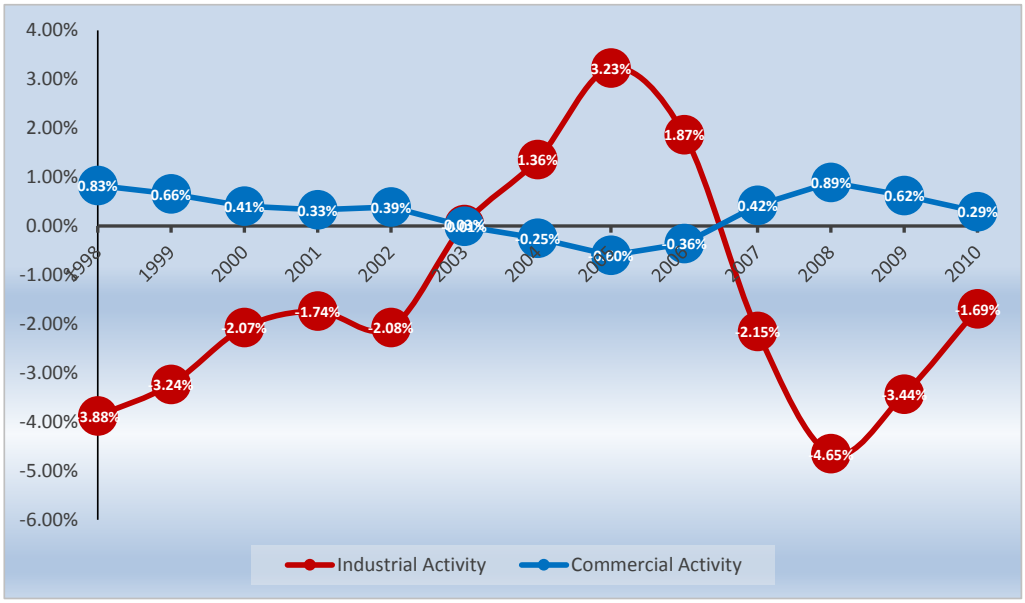

Figure A3.2 Variation in Relative contribution Industrial & Commercial Activity make to combined GVA in Oxfordshire
(source Data : ONS)