Joint Municipal Waste Management Strategy

Gloucestershire's Baseline Report

2004-6

Contents

1. Introduction

Gloucestershire is a two tier authority. Gloucestershire County Council is the Waste Disposal Authority and Tewkesbury Borough Council, Forest of Dean District Council, Cotswold District Council, Gloucester City Council, Stroud District Council and Cheltenham Borough Council are the six Waste Collection Authorities (or Districts). As a Waste Disposal Authority, the County Council is responsible for the treatment and disposal of municipal waste arising from the districts. The Waste Collection Authorities are responsible for the collection and recycling of municipal waste.

All seven authorities have realised the benefits of working together and in 2003 sought to strengthen the relationship between the two tiers with the formation of the Gloucestershire Waste Partnership (GWP). The Partnership is working to produce a new Joint Municipal Waste Management Strategy which will replace the Joint Authorities Municipal Waste Management Strategy published in April 2002. Whilst many of the authorities' objectives and plans are unchanged, it was felt that an updated and revised strategy was necessary to take account of recent legislative and policy developments and to help Gloucestershire meet the challenges that lie ahead.

The new Joint Municipal Waste Management Strategy will provide the framework for the development of municipal waste management services over the next twenty-five years, informing the work plans and financial planning of each of the Gloucestershire local authorities and above all, helping Gloucestershire to realise its vision for the future. The principal purpose of the Strategy, in simple terms, is to answer four questions:

1. *Where are we now?*
2. *Where do we want to go and when?*
3. *How do we get there?*
4. *How will we implement the actions?*

Before sustainable waste management solutions can be developed for Gloucestershire, a better understanding is needed of how much waste is generated and how it is currently managed. Other factors such as the socio-demographic characteristics of the area, local and regional planning policies, and statutory and legislative drivers will determine the range and suitability of waste management solutions.
The purpose of this document is to carry out a baseline assessment that addresses the first question, *'Where we are now'*. It includes a review of:

- Roles and responsibilities
- Contextual information including the socio-demographic profile
- Municipal waste arisings and trends, waste composition and capture
- Forecasts of future waste arisings
- Current waste minimisation and recycling initiatives
- Waste management arrangements
- Legislative and policy drivers
- Waste technologies.

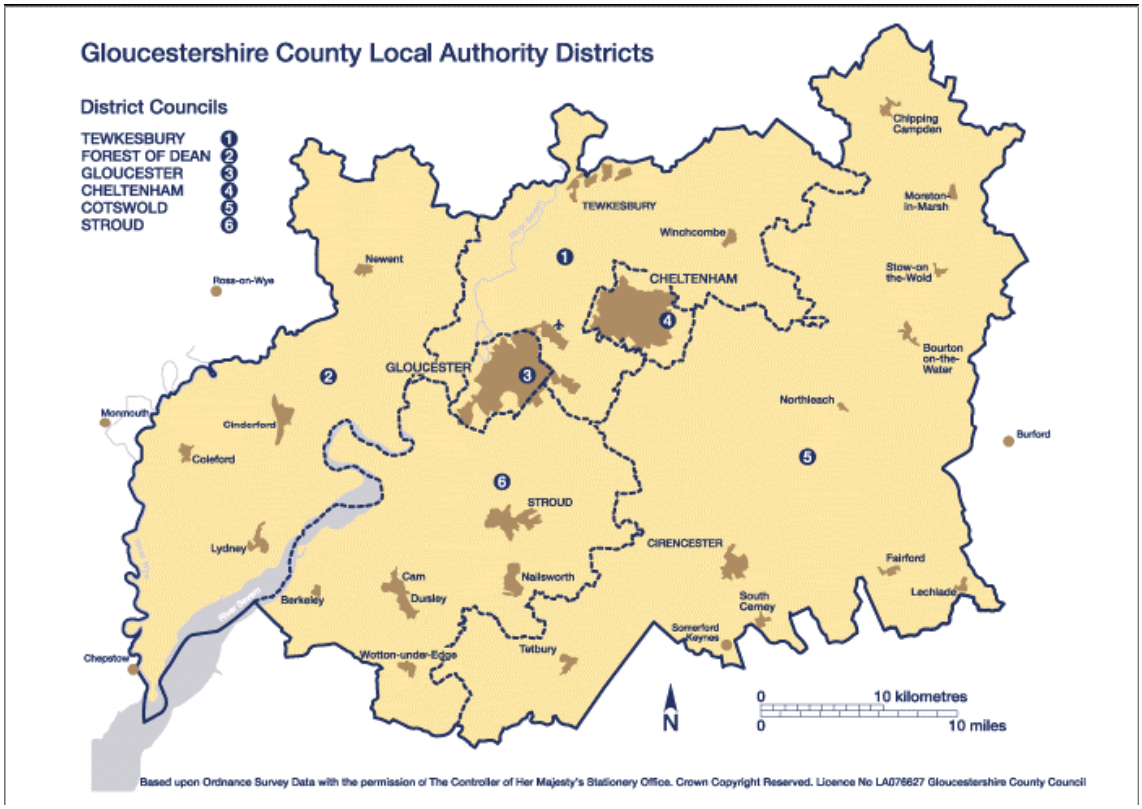
2. About Gloucestershire

2.1 Character of the County

Gloucestershire is located in the south west of England covering an area of 1,025 square miles. Geographically the county is split into three distinct areas – the Cotswolds, the Forest of Dean and the Severn Vale – each of which has its own characteristics.

The county is substantially rural in nature with the main urban focus in Gloucester and Cheltenham, although there are a number of market towns throughout the county, including Stroud, Cirencester, Lydney and Tewkesbury.

Figure 2.1 Gloucestershire County Local Authority Districts



The green and rural landscape in Gloucestershire is one of the County's key assets. Areas of Outstanding Natural Beauty account for 51 % of the County area and the Gloucester and Cheltenham Green Belt cover just over 8000 hectares. A number of other local designations protect landscape features in Gloucestershire. Protection of the Green Belt from inappropriate development remains a key priority, both for the Government and the County council.

The policies contained in the Third Alteration of the Gloucestershire Structure Plan (Unadopted) indicate that a review of green belt will take place to provide sustainable patterns of growth for the Principal Urban Area (PUA) in the County. There are currently three waste management facilities located in the Green Belt at Wingmoor

Farm. Given that Gloucestershire is, to a large extent, a rural County with a high proportion of protected landscapes, the landscape impact of proposed facilities will be a key consideration.

Gloucestershire has a rich historical and archaeological heritage and accommodates 496 Scheduled Ancient Monuments (covering 1500 hectares) and 12,860 Listed Buildings. The County also accommodates over 23,000 locally important archaeological sites. It is not anticipated that the provisions of the strategy would directly impact cultural heritage in Gloucestershire.

2.2 Transport

Gloucestershire is located within the northern extremity of the South West Region and experiences pressures and traffic through flows from the Midlands, South East and Wales. The River Severn divides the County, focusing east/west journeys to certain bridging points. The Forest of Dean District Council and parts of Tewkesbury Borough Council lie to the west of the river whilst the remainder of Tewkesbury Borough, Cheltenham Borough, Gloucester City, Stroud District and Cotswold District Councils lie to the east of the river.

There are good road connections to the southwest via the M5, to the north via the M5/M6 and M42, Wales using the A40 and the M4 west, and to London and the southeast using the A40 and M4 east. The Fosse Way runs through the county north to south from Cirencester to Stow on the Wold and Moreton in Marsh, and the Ermin Way crosses the county east to west from Cirencester to Ross.

The air quality in Gloucestershire is generally good although road traffic emissions are the major source of air pollutants and Tewksbury and Stroud districts have declared air quality monitoring areas in respect of nitrogen dioxide emissions in the vicinity of the M5. It is noted that 100% of waste in Gloucestershire is transported by road and a total of 431,600 miles is travelled during the course of internal collection rounds on an annual basis.

There are regular rail services through the county. The rail network in Gloucestershire was reduced significantly during the Beeching era (1960's) and there are now just four trunk lines. The mainline bisects Gloucestershire north to south with tracks from Gloucester running to South Wales and from Stonehouse toward the southeast. A line passes through Moreton in Marsh in the north east of the County. In recent years Gloucester Station has been under threat and consideration is currently being given to Integrated Transport at Elmbridge Court (ITEC), a Major Scheme Bid to provide a Parkway Station between Cheltenham and Gloucester.

The River Severn provides Gloucestershire with a great opportunity to develop sustainable waterborne transport. Sharpness dock lies on the River Severn towards the southern boundary of the County and is navigable to sea going vessels. The Gloucester and Sharpness canal is the only navigable canal in the county. The canal can accommodate vessels up to 1,000 tonnes. In recent years the development of the Gloucestershire Waste Local Plan has led to increasing speculation over the potential of the river and canal to move waste from the urban Vale to treatment facilities proposed at Sharpness Docks.

There is a local airport at Staverton serving flights to the Channel Isles and northern France. Major airports within easy reach just outside the county include Cardiff, Bristol and Birmingham.

2.3 Biodiversity

Gloucestershire is a highly diverse county ranging from the Wye Valley with its ancient ravine woodlands in the west, to the streams of the Cotswold plateau in the east. The county fits into three key Natural Areas. These are the acid grasslands, bogs, heaths and ancient woodlands in the Forest of Dean and Wye Valley; the Severn Vale and its floodplain habitats which are important for bird-life, especially wintering wildfowl and breeding waders; and the Cotswolds with its limestone grasslands and beech woodlands.

Gloucestershire is home to a variety of regionally important plant and animal species and habitats. There are currently three RAMSAR sites (wetlands of significant international importance) located in Gloucestershire; Walmore Common was designated in 1991 and covers an area of approximately 50 hectares. Two sites are located within the Severn Estuary covering areas of 25,000 hectares and 1400 hectares respectively. There are 124 Sites of Special Scientific Interest (SSSI's) and a substantial number of Key Wildlife Sites. One geological SSSI is situated on a closed landfill site, at Fosse Cross in the Cotswolds. The landfill is restored and there are no issues surrounding the protection of the SSSI.

2.4 Population

Gloucestershire has a population of approximately 565,000 (2001 census), a higher than average proportion of which is above 50 years old and a lower than average proportion of which is below 35. The County's population grew by 29,000 between 1991 and 2001 (5.63%), which equates to 0.5% per annum. The population growth has been boosted over the last 40 years by an inward migration of approximately 2000 people annually.

Gloucestershire's population is projected to increase to 576,700 by 2006 and to between 595,000 and 642,500 by 2026, depending on the assumptions used (Gloucestershire Population, Labour Force and Household Projections to 2026, GCC). Population projection at district level will be influenced by regional planning policy, which seeks to locate the majority of development in Gloucester and Cheltenham. However, if trends in migration and natural increase continue, Cheltenham's population is likely to decline by 6,000 people, and significant growth will take place in the Forest of Dean, Gloucester and Tewkesbury whilst there will be limited growth in Cotswold and Stroud.

Gloucestershire has a population density of 2.1 people per hectare. This is in line with the South West density, and below the UK density of 3.4 people per hectare. At District level, Cheltenham and Gloucester both stand out with densities of 23.6 and 27.1 people per hectare respectively. However, this is expected in urban areas.

An increasing population can be equated to a continual rise in waste production each year. This suggests that waste growth will steadily increase year in year out. Despite this Gloucestershire produces significantly less per head than most Shire Counties. In 2002/03 the national mean was 521kg per head, whereas the South West produced 529kg/head/annum. The per capita figure in Gloucestershire was less at 483kg/head and by 2004/05 this figure has grown to 511kg per head. Based on current quantity of waste produced per head of population (511kg) and predicted population growth, by 2026, Gloucestershire may need to deal with an extra 14,000 to 30,000 tonnes of household waste. This does not consider any other demographic factors.

2.5 Households

As shown in Table 2.1, the 2001 Census found there were just under 240,000 households in Gloucestershire. This has risen to approximately 246,800 households in 2006 and this number of households is expected to increase to between 275,000 and 295,000 by 2026 (between 286,000 and 311,000 dwellings).

Table 2.1 Population and Households in Gloucestershire

	Cheltenham	Cotswolds	Forest of Dean	Gloucester	Stroud	Tewkesbury	Total
Population	110,000	80,400	80,100	109,900	108,100	76,500	565,000
Households	48,164	43,424	32,530	45,765	44,617	32,372	**237,872**
Average household size	2.21	2.29	2.41	2.37	2.38	2.33	2.33
Dwellings	49,959	36,833	33,645	46,992	45,975	33,428	246,832

Source: Census 2001.

The number of households within Gloucestershire has increased at a faster rate than the population and mirrors the national trend of a smaller household size. The size of the average household is predicted to decrease from 2.31 persons in 2004 to 2.1 persons by 2026. The average household size is projected to decrease to, as a result of increases in the number of one-person households and smaller numbers of children. It is projected that by 2026 there will be between 96,000 and 103,000 one person households in Gloucestershire. Some areas, particularly the Cotswolds, also contain a higher than average number of second (or holiday) homes.

Housing types vary between each district. Table 2.2 contains data collected during the 2001 Census. It is the more rural districts have greater numbers of detached properties whereas urban districts have a greater number of flats and terraced housing. Housing type has an impact on the provision of collection systems and waste minimisation schemes, for example, home composting bins and wheelie bins to households with no gardens or storage space.

Table 2.2 Housing types in Gloucestershire 2001 Census

Housing Types (2001)	Cheltenham	Cotswold	Forest of Dean	Gloucester	Stroud	Tewkesbury	Gloucestershire
Detached houses or bungalows	9,103	13,885	15,379	9,478	17,312	11,630	76,787
Semi detached houses or bungalows	16,806	11,032	11,597	19,452	15,277	11,771	85,935
Terraced Houses or bungalows	11,157	7,821	4,364	10,948	8,577	5,958	48,825
Flats, maisonettes or apartments	12,501	3,755	1,972	6,859	4,516	3,300	32,903
Caravans or other temporary structures	392	340	333	255	293	769	2382

2.6 Economy and Labour Supply

Key economic indicators show Gloucestershire in a favourable light, historically with a low level of unemployment, and Gross value added per head similar to the national average. However, according to the Indices of Deprivation 2004 there are pockets of deprivation mainly in the urban areas of Gloucester and Cheltenham. The County's

Rural Economy Advisory Panel has also highlighted significant problems of isolation and low household incomes in some rural communities, particularly the Forest of Dean.

Gloucestershire's GDP per head is above average for the southwest. In the five years leading up to 2001 the demand for labour in Gloucestershire was consistently greater than the supply of labour in the County. However supply is likely to outstrip demand due to a rise in working population. Over the period 1991 – 2015 the county will see a 10.7% increase in the size of its workforce to just below 297,000 with an 11% increase in jobs to 295,000.

At a sectoral level the growth in the service sector and the decline in manufacturing over the last 10 years will continue up to 2015. Unemployment in Gloucestershire is low at 1.5% in November 2005, and the highest proportion of the labour force is employed in junior managerial or professional roles. This is lower than South West and UK figures which are 1.4 and 2.4 respectively. These figures are based on claimant counts. The average household income within Gloucestershire was £29,367 (2001 figures). Nineteen out of Gloucestershire's 140 wards have an average income above £35,000 and 26 wards have an average income of less than £25,000. The average income in Tewkesbury and Cheltenham are well above the national average whilst the Forest of Dean is well below. Both the amount and composition of household waste has been shown to vary with household wealth and this may in future necessitate different approaches to the way that we communicate with and provide services to, customers in different parts of the county.

2.7 Significance of Socio-demographic factors

Waste production throughout the County is influenced by many demographic factors. Changes and variation of key social and economic drivers can all affect waste growth patterns. Nationally household waste has increased annually at roughly the same rate as GDP (Gross Domestic Product) but economic growth and waste arisings have grown at a slower rate.

Some implications of Gloucestershire's socio-economic characteristics for developing a long-term waste management strategy are outlined below:

1. The historical trends and future projections of population growth and increases in household numbers, along with a trend towards smaller households and single occupancy, have important implications on future household waste arisings in Gloucestershire. Changes to average household size may also lead to alterations in the composition of municipal waste, with additional food packaging and food waste likely to be entering the municipal waste stream.
2. The relatively rural nature of the county impacts on the efficiency of waste collection and kerbside recycling schemes as housing density is lower making journey times and travel distances longer.
3. High car ownership rates (approximately 70% of households having one or two cars) suggest that gaining access to recycling centres and "Bring" sites should not be a significant issue.
4. The population of Gloucestershire is ageing, with a greater than average proportion of its residents above 50 years of age and a lower than average proportion of its residents below 35 years of age (20% of population are over 65 years). The ageing population will have impacts on additional services such as assisted collections, and accessibility to bring sites and waste facilities.
5. The nature of the housing stock should facilitate the promotion of home composting and the intensification of the kerbside collection system.
6. The large number of properties with gardens in the county is likely to result in a high proportion of green waste during the growing season.

3. Waste Arisings

Before options for developing Gloucestershire's strategy can be selected and evaluated, it is important to examine the key variables, which affect waste management systems. These variables include:

- The amount of waste to be managed (household and municipal waste arisings)
- The rate at which waste arisings within different sub-streams are growing (or falling)
- The composition of waste to be managed (the materials which make up the waste stream)
- The effects of existing waste management systems on quantities and composition within the waste stream.

3.1 Household Waste Arisings

Household waste includes all waste:

- collected directly from households;
- delivered by residents to Household Recycling Centres and Bring Sites;
- collected from the streets as litter and street sweepings;
- collected through recycling and composting schemes; and
- collected from schools.

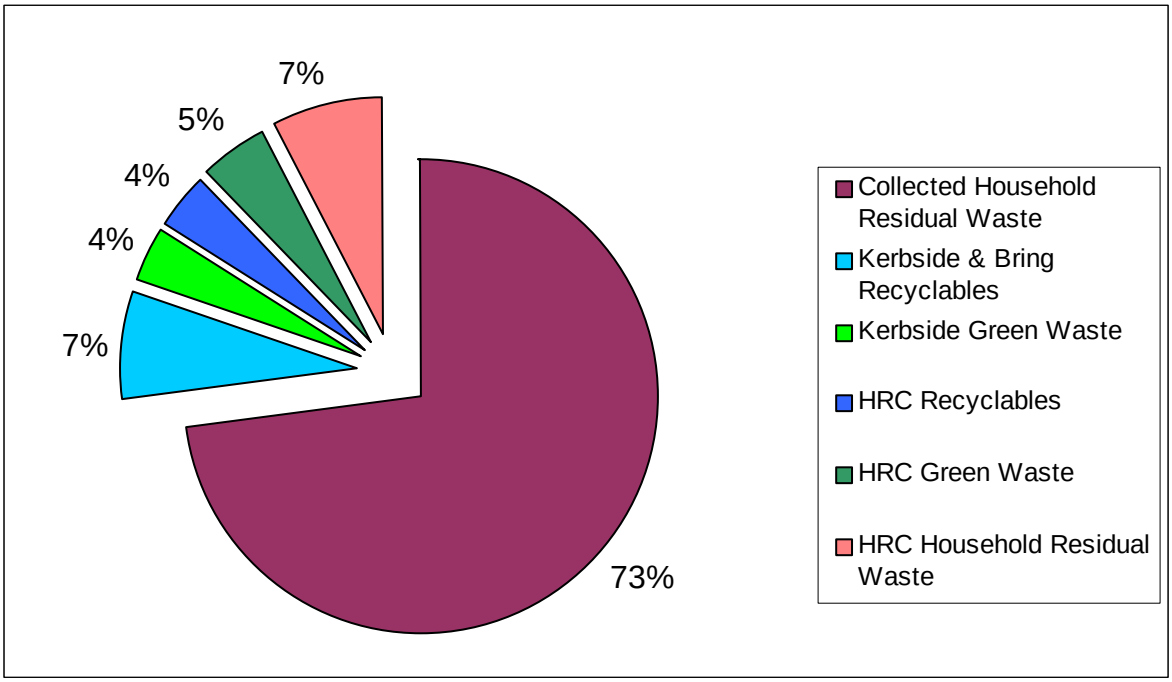
In 2004/05 Gloucestershire generated 300,380 tonnes of household waste of which 24% was recycled and composted. The kerbside recycling schemes and the network of bring banks achieved a recycling rate of 18%, and the Household Recycling Centres achieved a recycling rate of over 60% of the waste deposited at the five sites.

Table 3.1 details the Household Waste arising from the districts and the Household recycling Centres. Figure 3.1 illustrates the makeup of the household waste arising in Gloucestershire.

Table 3.1 Household Waste Arisings 2004/05

District	Recycling		Composting		Landfill		Total	Arisings per head
	tonnes	%	tonnes	%	tonnes	%	tonnes	kg/head
Cheltenham	7,070	14%	2,272	4%	41,966	82%	51,308	467
Cotswold	6,146	19%	245	1%	26,519	81%	32,910	403
Forest of Dean	4,429	12%	7,377	20%	24,356	67%	36,162	451
Gloucester	5,855	11%		0%	46,077	89%	51,932	471
Stroud	8,073	21%		0%	30,389	79%	38,462	354
Tewkesbury	5,180	15%	27	0%	30,012	85%	35,219	454
WCA Total	36,746	15%	9,921	4%	199,281	81%	245,949	433
HRCs	10,967	25%	12,853	29%	20,542	46%	44,362	78
Total	**47,713**		**22,774**		**219,823**		**290,311**	**511**

Figure 3.1 Breakdown of Gloucestershire's Household Waste 2004/05



3.2 Municipal Waste Arisings

Municipal Waste includes all:

- household waste collected by the District Councils or delivered by householders to Household Recycling Centres ("HRCs");
- recyclable materials and biodegradable wastes collected separately from households by the District Councils;
- commercial waste collected by District Councils;
- street sweepings and litter collection from the public highway or public open space carried out by District Councils;
- fly-tipped materials collected from the public highway or public open space;
- household hazardous waste either collected by District Councils or delivered to HRCs;
- clinical waste arising from home self treatment; and
- abandoned vehicles collected by District Councils from the public highway.

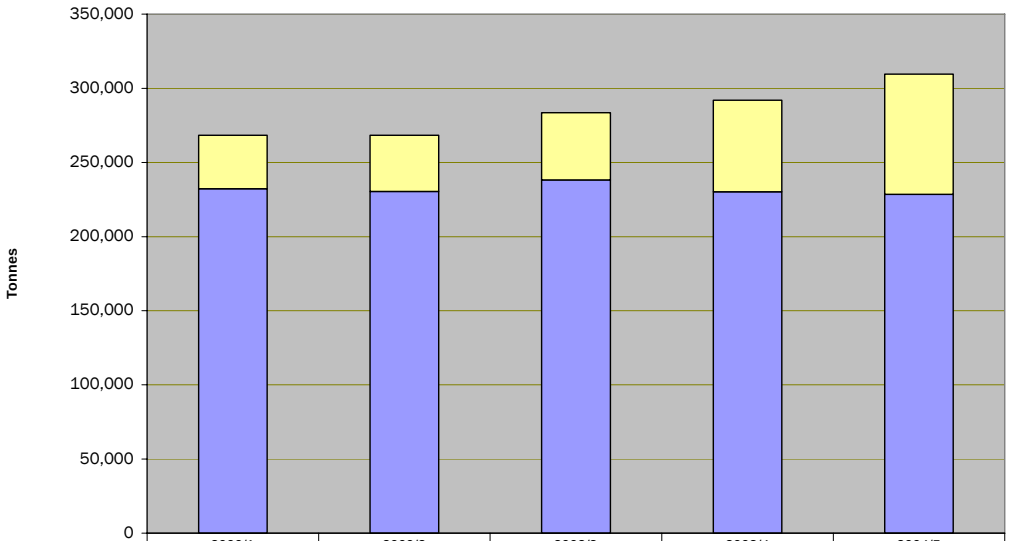
In 2004/05 Gloucestershire generated 309,500 tonnes of municipal waste. This equates to each person in Gloucestershire generating 511kg per annum which is lower that the national average of 533.5kg per person per year. Commercial waste collected by the Districts amounts to approx 8,500 tonnes per annum. This fraction does not count towards household waste arisings however the new biodegradable waste diversion targets are based on municipal waste arisings.

3.3 Historic Trends

3.3.1 Total Municipal Waste Arisings

Gloucestershire's municipal waste arisings have risen by approximately 3% per annum over the last 10 years. Recycling rates have increased steadily resulting in a reduction in the amount of municipal waste being landfilled. In 2004/5 the recycling and composting rate was 21%.

Figure 3.2 Municipal Refuse (Residual Waste) and Recycling Quantities over Time



	2000/1	2000/2	2002/3	2003/4	2004/5
Total Recycling	36,116	37,900	45,253	61,744	81,079
Total Residual	232,275	230,420	238,241	230,257	228,413

About half of the 20,000 tonnes increase in arisings between 2003/04 and 2004/05 can be attributed to growth in two waste streams: Kerbside collected green waste and recycled hardcore material, with the other half attributable to the increase in dry recycling[1].

Table 3.2 details total Municipal Waste arisings over the last five years. The table shows that total arisings have grown by some 15% (3.6% pa) over this period. This figure however masks an overall drop in residual of 4,000 tonnes (1.7% in total or 0.4% pa) and a much larger increase in recycling by some 45,000 tonnes– an increase of 124.5%.

[1] The data does not provide any indication that these streams are made up of new material not previously collected in MSW. In the case of hardcore, this material has been specifically targeted by Gloucestershire for separation from residual at the HRC sites, on the other hand with kerbside collected green waste, it is likely that much of the material that is collected was previously composted at home or left 'in situ' in peoples gardens.

Table 3.2 Gloucestershire's Total Municipal Waste Arisings (over last five years)

	2000/1	2000/2	2002/3	2003/4	2004/5	Total Growth	Average Annual Growth
Residual							
Residual Collected	205,462	193,260	199,824	194,173	195,770	-4.7%	-1.2%
Residual HRC	26,813	28,734	27,376	25,567	23,882	-10.9%	-2.9%
Trade Waste	-	8,426	8,495	8,545	8,534	1.3%	0.4%
Flytipped	-	-	-	68	54	-20.4%	-20.4%
Other	-	-	2,546	1,903	173	-93.2%	-73.9%
Total Residual	**232,275**	**230,420**	**238,241**	**230,257**	**228,413**	**-1.7%**	**-0.4%**
Recycling							
Kerbside Recycling	11,795	11,872	14,814	25,790	34,330	191.0%	30.6%
CA Recycling (incl hardcore)	13,002	14,474	18,198	24,726	37,526	188.6%	30.3%
Bring & Bulky Recycling	11,161	11,383	11,974	10,771	8,639	-22.6%	-6.2%
3rd Party Recycling	157	171	267	435	585	272.7%	38.9%
Total Recycling	**36,116**	**37,900**	**45,253**	**61,721**	**81,079**	**124.5%**	**22.4%**
Arisings							
Total CA	39,815	43,208	45,574	50,293	61,408	54.2%	11.4%
Total Collected	228,419	216,514	226,611	230,734	238,739	4.5%	1.1%
Total Arisings	**268,391**	**268,320**	**283,493**	**291,978**	**309,492**	**15.3%**	**3.6%**
Analysis							
% Recycled	13.5%	14.1%	16.0%	21.1%	26.2%		
% CA Recycling	32.7%	33.5%	39.9%	49.2%	61.1%		
% Kerb & Bring Recycling	10.1%	10.8%	11.9%	16.0%	18.2%		
Arisings Growth		0.0%	5.7%	3.0%	6.0%		
Residual Growth		-0.8%	3.4%	-3.4%	-0.8%		
Recycling Growth		4.9%	19.4%	36.4%	31.3%		

BVPI household recycling rate. This excludes DIY waste received at the HRCs and trade/commercial waste collected by WCA's.

While total HRC waste has risen by 54% over this period this rise has been accounted for solely by the material that is being recycled. The quantity of residual HRC waste has in fact declined by some 3,000 tonnes (10.9%) since 2000/01. Also there is a decline in the amount of collected refuse of approximately 10,000 tonnes (4.7%).

Collection of trade waste has remained stable over the last five years although reception of DIY waste at HRCs has increased dramatically due to proactive initiative to remove this fraction from the residual waste stream. HRC and Kerbside Recycling have increased at a similar rate with quantities of recycled materials approximately tripling in this period.

3.3.2 Trends in WCA Waste Arisings

Table 3.3 details municipal waste arisings by waste collection authority illustrating how different waste streams have increased at differing rates. Cheltenham BC's bring green waste is received at their own civic amenity site in Swindon Road, Cheltenham. A distinct increase in overall waste arisings is evident for those authorities that have implemented green waste collection schemes. This is discussed in detail later.

Table 3.3 Waste Collection Authority Municipal Waste Arisings (tonnages)

	2001/02	2002/03	2003/04	2004/05	2005/06
Cheltenham					
WCA Municipal Waste	51,163	50,032	47,937	46,418	39,034
Bring Recycling	1,372	3,348	2,997	2,405	2,487
Kerbside Recycling	1,444	1,481	2,784	4,569	5,407
Green Waste Bring		1,089	1,412	2,272	2,883
Green Waste Kerbside		726			1,974
TOTAL	**53,979**	**56,677**	**55,130**	**55,664**	**51,785**
Cotswolds					
WCA Municipal Waste	27,904	27,596	26,056	26,585	23,642
Bring Recycling	1,383	1,479	1,574	1,773	1,846
Kerbside Recycling	3,985	3,889	4,109	4,342	4,505
Green Waste Bring					
Green Waste Kerbside	161			245	8,033
TOTAL	**33,433**	**32,964**	**31,739**	**32,946**	**38,026**
Forest of Dean					
WCA Municipal Waste	24,807	25,658	24,183	24,356	23,566
Bring Recycling	1,143	1,085	1,364	4,407	4,757
Kerbside Recycling	1,418	1,720	2,330		
Green Waste Bring					
Green Waste Kerbside		565	4,989	7,377	8,302
TOTAL	**27,368**	**29,028**	**32,866**	**36,140**	**36,626**
Gloucester City					
WCA Municipal Waste	45,080	45,887	46,697	47,820	49,237
Bring Recycling	1,462	1,566	1,241	766	595
Kerbside Recycling	1,446	1,987	3,329	4,732	5,613
Green Waste Bring					
Green Waste Kerbside					
TOTAL	**47,989**	**49,440**	**51,268**	**53,318**	**55,445**
Stroud					
WCA Municipal Waste	31,689	29,478	30,397	30,669	29,766
Bring Recycling	2,478	1,801	1,457	631	301
Kerbside Recycling	3,477	5,656	6,491	7,373	7,778
Green Waste Bring					
Green Waste Kerbside					
TOTAL	**37,644**	**36,934**	**38,346**	**38,673**	**37,845**

	2001/02	2002/03	2003/04	2004/05	2005/06
Tewkesbury					
WCA Municipal Waste	33,228	33,338	31,108	32,022	32,505
Bring Recycling	1,781	1,947	1,207	887	992
Kerbside Recycling	899	1,014	3,475	4,279	4,470
Green Waste Bring	14	20	25	27	-
Green Waste Kerbside	-	-	-	-	-
TOTAL	**35,922**	**36,318**	**35,815**	**37,214**	**37,967**
Overall					
WCA Municipal Waste	213,871	211,989	206,379	207,870	197,751
Bring Recycling	9,620	11,226	9,841	10,869	10,978
Kerbside Recycling	12,669	15,746	22,518	25,295	27,773
Green Waste Bring	14	1,109	1,437	2,299	2,883
Green Waste Kerbside	161	1,292	4,989	7,622	18,309
TOTAL	**236,334**	**241,362**	**245,163**	**253,955**	**257,694**

From table 3.3 it can be seen that tonnages collected through Bring Schemes are declining whilst tonnages from kerbside recycling schemes have greatly increased. Gloucestershire has witnessed a significant growth in HRC arisings over the last 5 years and waste arisings are equivalent to a District's Recycling rates.

3.3.3 Trends in HRC arisings

Household waste received at Household Recycling Centres from 2001/2 to 2004/5 has increased from 39,182 to 54,949 tonnes. The increase in arisings has been attributed by a significant increase in the amount of DIY waste, green waste, and fridges collected at the HRCs in addition to facilities for the collection of wood waste and batteries being established. Table 3.4 demonstrates how total waste arisings have increased since 2001 and highlights the challenge of operating HRCs. DIY waste has increased by nearly 9,000 tonnes in a year (between 2003/4 and 2004/5). This has been caused by an 'acceptance policy' change at HRCs. Where previously DIY waste was limited to only 3 bags for each visit, there is now no restriction on DIY waste accepted at these sites.

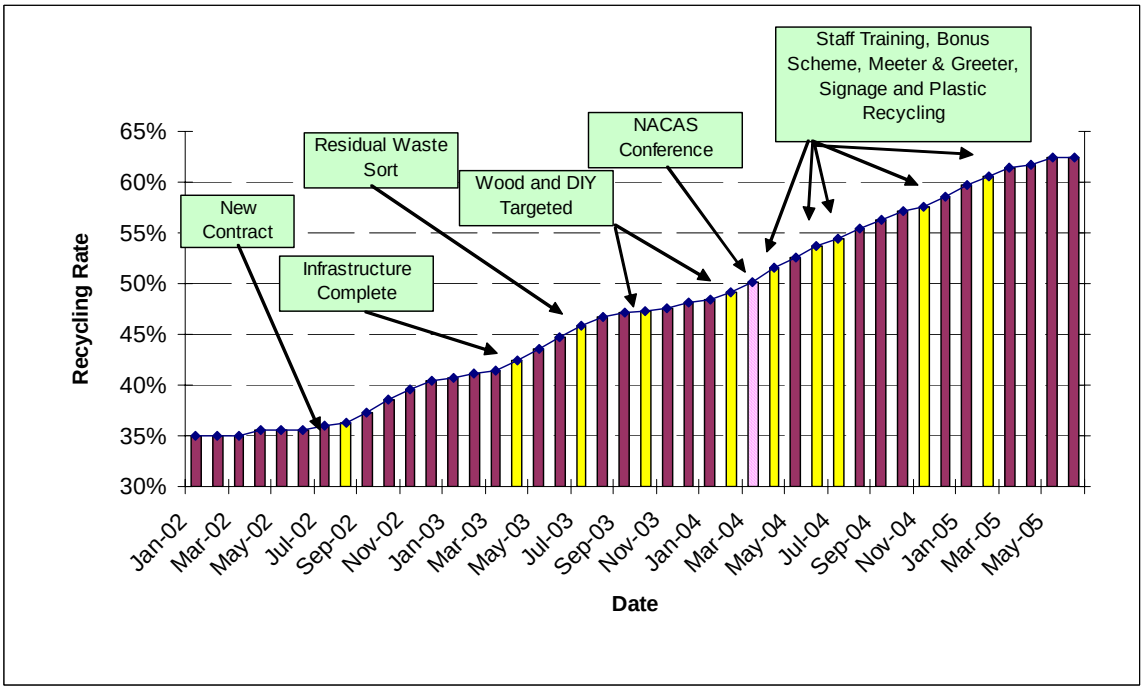
The substantial increase in the amount of DIY/hardcore wastes collected at the sites has resulted in the total recycling rate for the HRCs doubling over the last four years rising from 36.3% to 62.6%. However, as DIY wastes are not classified as household waste, the Best Value Performance Indicator (BVPI) for HRC recycling has risen by 20%.

Table 3.4 Gloucestershire's HRC Waste Arisings in tonnes (2001 – 2005)

Materials	2001/2	2002/3	2003/4	2004/5
Batteries	-	-	234	268
Cans	-	-	16	19
Cardboard	767	963	1,270	1,531
Glass	377	359	397	342
Fridges (Landfill)	-	304	71	76
Fridges (Recycledl)	190	107	439	467
Green Waste	7,312	9,995	11,030	12,853
Hardcore	1,542	2,659	1,741	10,586
Hazardous Waste	-	-	-	-
HRC Residual	24,975	23,706	22,047	20,467
HRC Residual (DIY)	-	-	-	-
Oil	68	64	81	78
Paper	670	521	547	576
Scrap Metal	3,200	3,367	3,707	4,111
Textiles	80	119	173	202
Wood	-	-	875	3,373
TOTAL	39,182	42,165	46,368	54,949
BVPI Recycling Rate	14.2%	14.4%	18.9%	24.7%
BVPI Composting Rate	19.4%	25.3%	27.0%	29.0%
TOTAL BVPI Recycling	33.6%	39.7%	45.9%	53.7%
Hardcore Recycling	2.6%	3.8%	6.4%	19.3%
TOTAL	36.3%	43.5%	52.3%	62.6%

The success of the sites to date is mainly due to more recyclable waste streams being provided, although better site layout and infrastructure and increased staff motivation have undoubtedly had beneficial effects, as has a limited amount of promotion. Figure 3.3 illustrates the rise in the HRC recycling rate correlating this with a number of reasons which may have contributed to the increase.

Figure 3.3 Total Consolidated Recycling Rate for Gloucestershire HRCs



3.3.4 Combined Residual Waste, Recycling and Composting Trends

Figure 3.4 shows the month by month trend in refuse and recycling that make up overall municipal arisings. Allowing for seasonal peaks, there has been a consistent slow increase in overall arisings, which is fuelled by increasing recycling but mitigated by a declining level of residual waste.

Figure 3.4 Combined Municipal Refuse (Residual Waste) and Recycling Quantities over Time

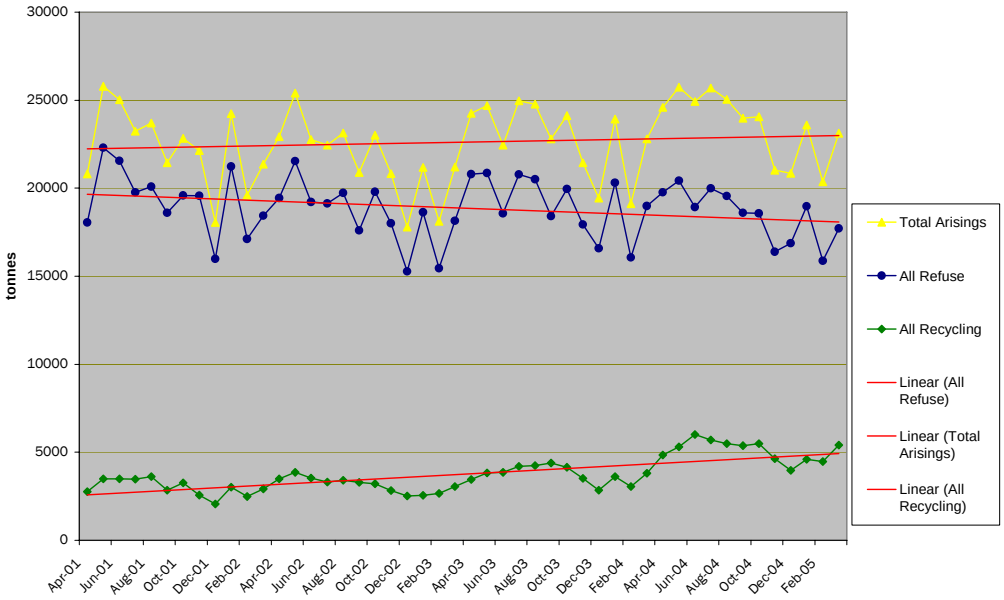
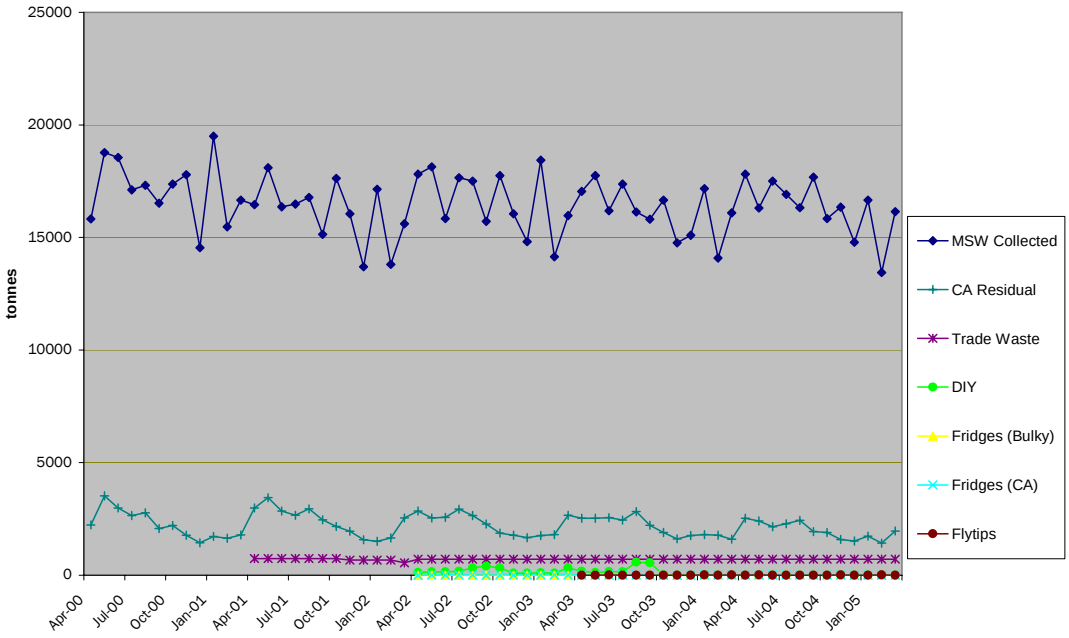


Table 3.5 BV 84 Waste Arisings Per Person Over Time[2]

Year	Kgs per person	% increase
2000/1	458	
2001/2	473	3.3%
2002/3	483	2.1%
2003/4	490	1.4%
Change	*32*	7.0%

As can be seen from the above table 3.5 the amount of waste generated by each person has grown by 7% between 2000/1 and 2003/4 (an annual average rate of 2.3%). This compares with total waste growth of approximately 10% for the same period (3.3% pa). This suggests that waste is actually growing at a slower rate than the population.

Figure 3.5 Residual Waste over Time by Source



The decline in residual waste (refuse) overall has been driven to an equal extent by a decline in kerbside collected refuse and HRC residual waste. Although there are some minor fluctuations in other streams the effect from these streams is essentially swamped by the large quantities collected from kerbside and HRC streams.

[2] http://www.bvpi.gov.uk/pages/QueryResults.asp

Figure 3.6 Recycling over Time

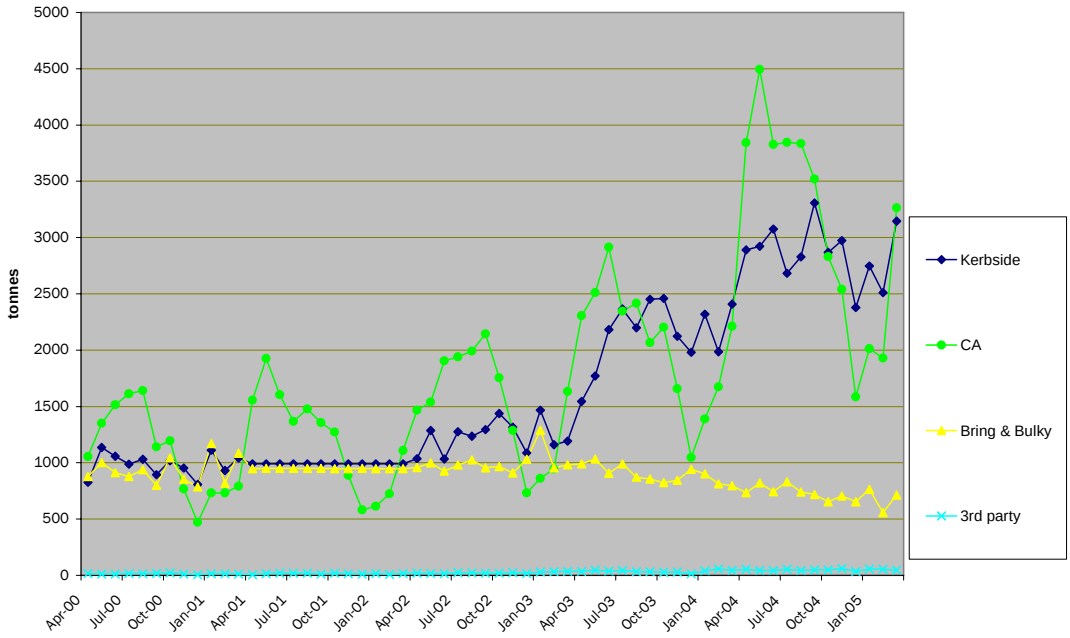
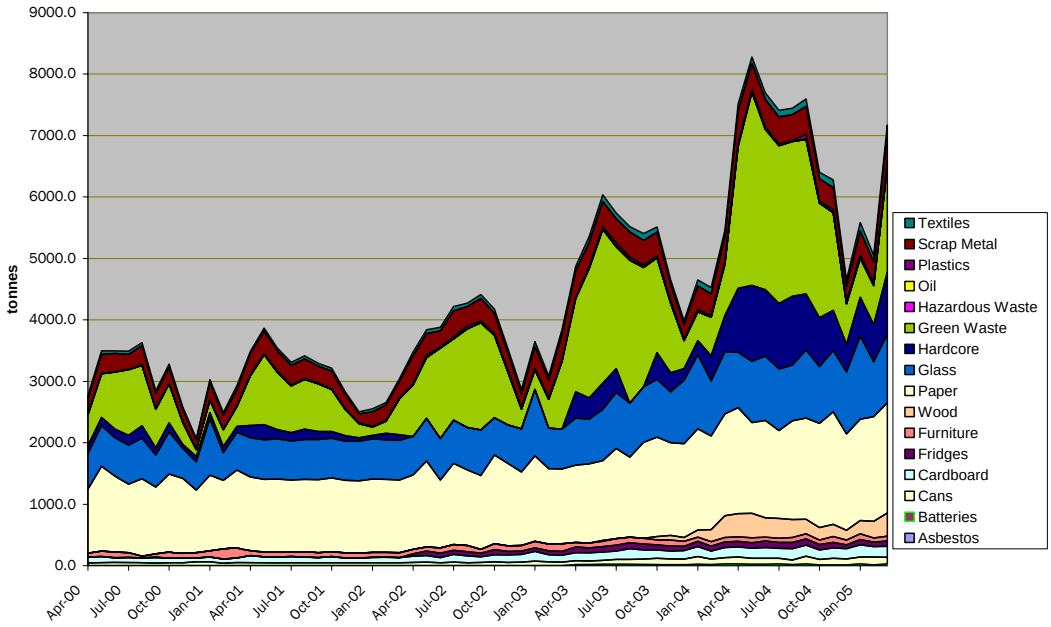


Figure 3.6 shows the pattern of household waste recycling tonnages over time from all collection infrastructure (kerbside, bring, HRC and third party). The graph shows that quantities of household waste recycled have been increasing over time and that this increase is equally attributable to growth in kerbside collected material and quantities of HRC (CA) waste. There are marked seasonal peaks in the quantities of material, for both kerbside collections and particularly for HRC recycling. The quantity of bring site material has been declining steadily since early 2003. Figure 3.7 below examines these trends further in terms of materials.

Figure 3.7 Recycling by Material Over Time



As can be seen from figure 3.7, the large seasonal peaks as well as the overall increase in recycling quantities appears to be driven largely by increases in green waste, and (in recent months) hardcore material. Small increases in paper and wood also appear to

have contributed to the increase in recycled material. Because green waste appears to be a key material in driving arisings growth it is worth examining further. Figure 3.8 shows the sources of green waste recycling over time.

Figure 3.8 Source of Green Waste Over Time

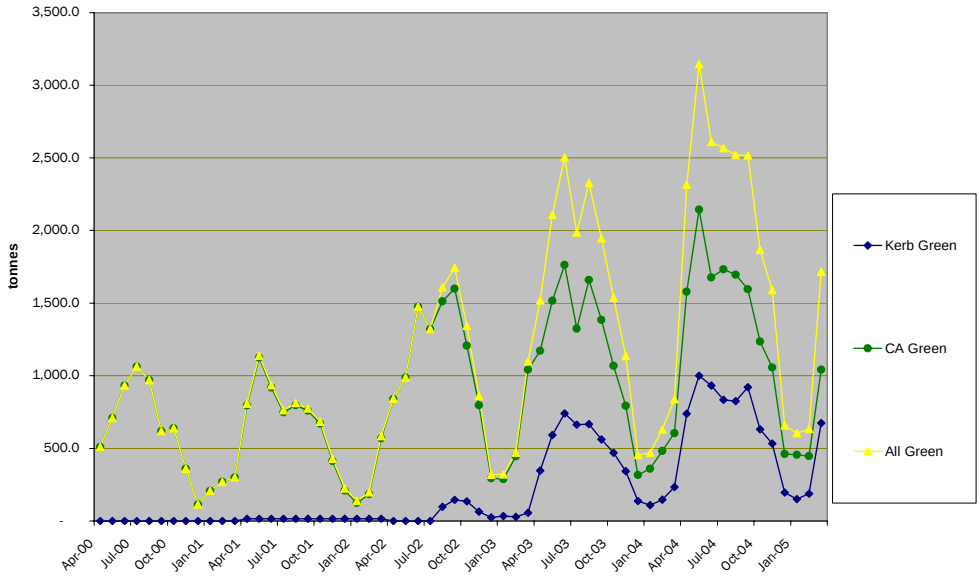


Figure 3.8 shows that quantities of green waste collected through the HRC grew significantly between 2001/02 and 2002/03 but have grown more slowly since, while quantities collected through the kerbside collections have become increasingly significant.

Green waste that is now coming through the separate kerbside collections may originate from a number of possible sources: it could be material that would have been taken to Gloucestershire's or other HRCs; material that was being placed in the wheeled refuse bins; or material that was being managed by the household (through home composting, being left 'in situ', or being taken away by a gardener). As can be seen from the chart above, HRC green waste appears to have remained essentially unaffected by the introduction of the kerbside collection. This suggests that it is therefore unlikely that any significant quantities of green waste are being diverted away from the HRC stream by the household collections. This leaves the remaining two options. The most likely scenario is that some of the material that was being disposed of in refuse bins is now being placed in the green waste collection bins, and that some additional material that was being managed by the household is also now being placed in the green waste collection. The transfer of green waste from material that was managed by the household to household collected waste will effectively lead to increases in arisings, and the data suggests that this is what is happening in Gloucestershire.

Collecting this additional garden waste will not positively contribute to the diversion of biodegradable waste material from landfill, however the tonnage that is being diverted from the refuse bin will count and have a positive impact.

Figure 3.9 Recycling by Local Authority by Month

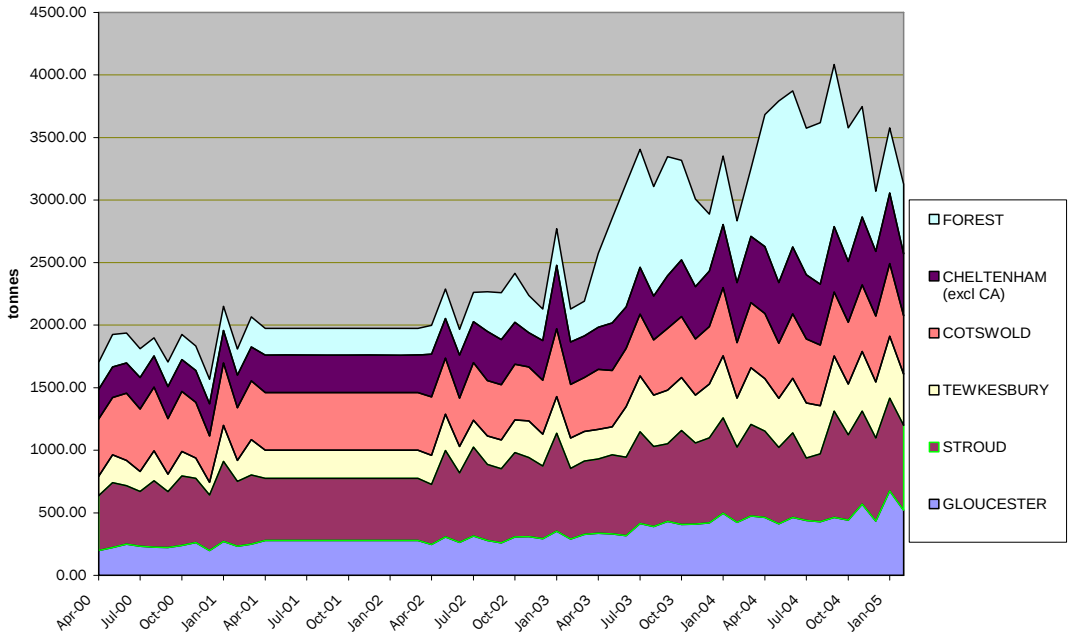
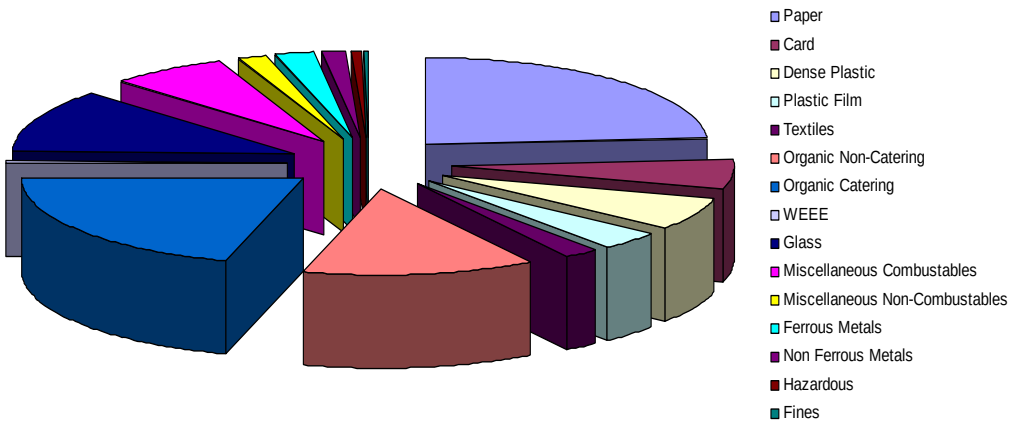


Figure 3.9 above shows how the quantity of materials (excluding HRC material) recycled by each authority have changed over time. What is notable is that all authorities apart from Forest of Dean show steady increases in recycled materials over time with little in the way of seasonal fluctuation. Forest of Dean on the other hand, which is the only authority to operate a kerbside green waste collection service in the time period examined above, shows a relatively dramatic increase in recycled material from the start of 2003, together with significant seasonal peaks.

3.4 Household Waste Composition

Entec UK Ltd. was commissioned by DEFRA's Local Authority Support Unit (LASU) on behalf of Gloucestershire County Council, to undertake a study of household waste composition across the six district councils of: Cheltenham, Cotswold, Forest of Dean, Gloucester City, Stroud and Tewkesbury. The study was to comprise analyses during winter and summer 2004/05 so as to consider the current waste composition and collection scheme performance in the context of seasonal differences. At the same time the study aimed to take into account the socio-economic profiles of each of the districts in order to build an overall picture of waste arising at the household kerbside in Gloucestershire. Figure 3.10 represents an average breakdown of the waste arising from households in Gloucestershire, taken from the two (summer and winter) studies conducted for the County Council.

Figure 3.10 Average breakdown of Household Waste arising in Gloucestershire



The study found the composition of the waste to be essentially similar to that which would be expected from previous larger scale studies in the UK. The average weight of arisings per household per week was essentially similar across the six districts in Gloucestershire once adjustments had been made to account for the different socio-economic groups in each.

Table 3.6 provides a breakdown of the composition of the average Gloucestershire householder's weekly bin, including recyclates and green waste that is set out separately for collection.

Table 3.6 Average Household Waste Composition in Gloucestershire

Primary Materials	Percentage Composition (%)	Average Weekly Bin (kg)[1]
Paper	23.97%	3.99
Card	5.57%	0.93
Dense Plastic	6.01%	1.00
Plastic Film	3.56%	0.59
Textiles	1.95%	0.32
Organic Non-Catering (Green Waste)	13.49%	2.24
Organic Catering (Kitchen Waste)	20.45%	3.40
WEEE	0.52%	0.09
Glass	11.69%	1.95
Miscellaneous Combustables	6.60%	1.10
Miscellaneous Non-Combustables	1.69%	0.28
Ferrous Metals	2.21%	0.37
Non Ferrous Metals	1.48%	0.25
Hazardous	0.57%	0.09
Fines	0.25%	0.04
TOTAL	**100.00%**	**16.64**

[1]Average includes separately collected recyclates and green wastes

The average amount of waste collected (residual and recyclate) from each Gloucestershire household was found to be 16.48 kg/hh/wk during the winter sort and 16.80kg/hh/wk during the summer. This is considered to be about average, with Best Value Performance Indicators for Local Authorities in England typically ranging from 12-18 kg/hh/wk. The overall waste arisings were not found to differ particularly between

those authorities collecting waste in black sacks (Cotswold, Forest of Dean and Stroud) and those using wheeled bins for residual waste collection.

- Tewkesbury households generated the most waste during the winter survey (average 19.25 kg/hh/wk), followed by Forest of Dean (17.5 kg/hh/wk);
- Gloucester City households produced the least waste in the winter survey (15.34 kg/hh/wk);
- Cotswold households produced the highest amount of waste in the summer survey (average 18.61kg/hh/wk);
- Stroud households produced a particularly low amount of waste during both surveys (average 14.04 kg/hh/wk).

The biodegradable fraction of the average waste bin was found to be 68% which exactly matches the figures DEFRA are using to calculate BMW diversion. A significant proportion of the waste produced by households in both winter and summer is biodegradable paper based waste with a further high percentage being represented by catering (kitchen) wastes. The most significant difference between the winter and summer was shown by the arisings of garden waste. These are streams that if targeted can contribute towards Landfill Directive (LATS) diversion targets. Garden waste was more prevalent (in total) in districts which operated a separate collection of this waste stream (Cheltenham, Cotswold and Forest of Dean), with less of this waste generally appearing in the residual bins in Gloucester, Stroud and Tewkesbury.

The study found low levels of paper and other dry recyclate remaining in the residual waste as a result of the effectiveness of the recycling schemes operating in each area. Organic catering waste remained the most prevalent category of material that is not currently being targeted by a collection system; green waste also remained prevalent in the residual bins including those in Cheltenham given that the separate collection scheme does not currently cover the full area. These organic wastes together represented around 45% of the residual waste with 75% overall being made up of material that could be considered to be biodegradable, including miscellaneous combustible materials such as wood and furniture.

3.4.1 Socio- Economic Differences

The composition of household waste is known to vary in response to a number of socio-demographic parameters. These include affluence, lifestyle, household type (including access to a garden) and methods of waste collection.

ACORN (A Classification of Residential Neighbourhoods) is a socio-demographic tool developed by CACI Limited from data obtained from sources including the UK census and is the accepted tool for use on waste compositional analysis. The tool classifies households taking into account a range of sociological, demographic and economic indicators assigning an ACORN classification code to ranges of households.

During the Waste Compositional Study in 2004/5, households in Gloucestershire were divided into socio-economic groups using information from the ACORN database. Households were categorised according to ACORN groups 1 to 5, with ACORN 1 being the most affluent and 5 being the least affluent. The small study found that:

- ACORN 3 and 4 households produced lower than expected quantities of waste during the study, with ACORN 1 being closer to the average figures at 17.08kg/hh/wk;
- Differences between ACORN groups as regards total waste arisings, were less marked during the summer survey than the winter where more affluent

households were observed to be producing marginally more waste than less affluent;

- ACORN 2 households produced the most biodegradable organic catering (kitchen) waste during the study, though in general these wastes were distributed evenly across groups.

Paper waste production was the most significant factor in the variation in total arisings across the ACORN groups with ACORN 1 households in particular producing more paper waste during the summer.

3.5 Key factors affecting waste arisings

It is generally agreed that household waste arisings in England have increased on average by 3% per annum since the mid 1990's. However, there is no concrete evidence that this 3% represents a genuine underlying trend which will continue indefinitely into the future. The key factors which seem to contribute towards genuine growth in waste arisings are increasing affluence (i.e. economic growth) and the clear trend of household population reduction (i.e. waste production being a function of both population and number of households). Key factors driving waste growth in Gloucestershire are outlined in Table 5.1

Table 3.7 Key Drivers in Waste Growth in Gloucestershire

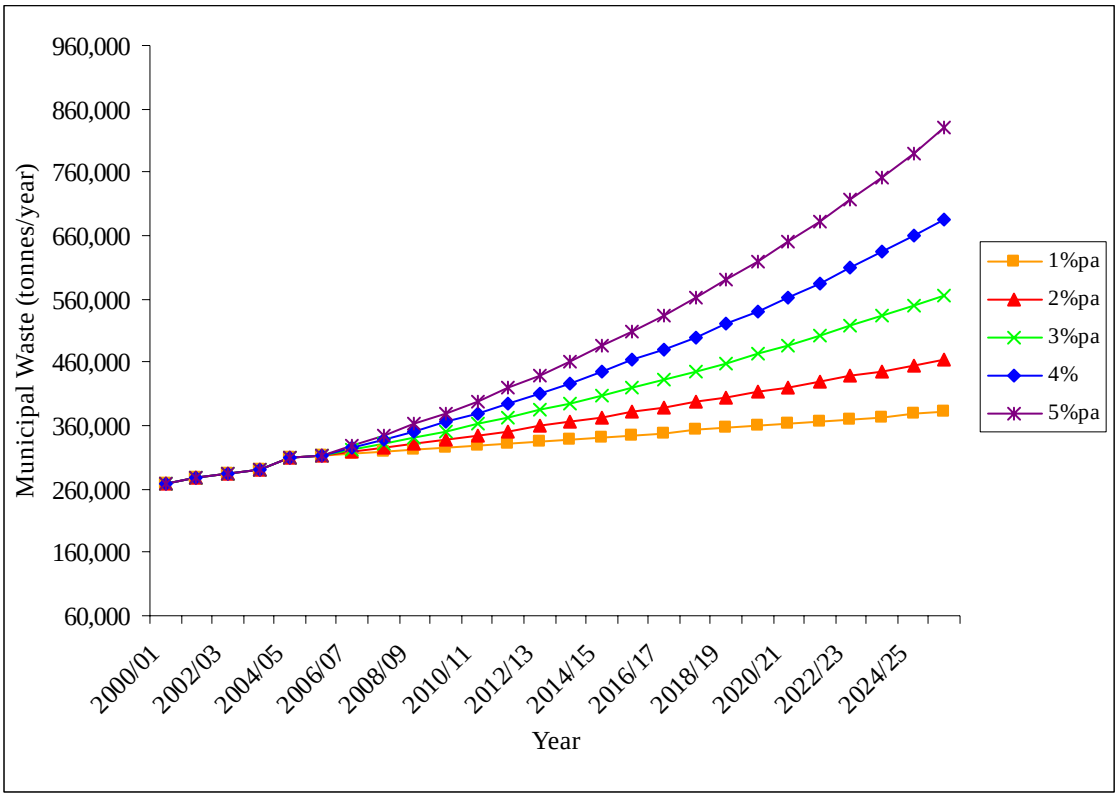
Driver	Comment	Influence on Waste Arisings Growth
Population Growth	Over the last 40 years Gloucestershire has had an inward migration of 2,000 people per year. In the past 10 years, population has grown by 0.5 % per annum.	Increasing population could be equated to greater rates of waste production. Migration implies an attractiveness of an area possibly due to enhanced economic opportunities for more affluent workers.
Urban/Rural Split	Gloucestershire's main urban areas, Gloucester and Cheltenham are distinct from the majority of Gloucestershire which is classified as an Area of Outstanding Natural Beauty.	The opportunities for waste minimisation e.g. home composting are possibly less in urban areas than in rural areas.
Distribution of Housing Stock by Type	The County has a higher proportion of larger houses with gardens (with two thirds being detached or semi detached) than the National average of half in England as a whole.	Generation of garden waste will be higher. However opportunities for home composting are enhanced.
Household/Housing Growth	The number of households has grown by one percent per annum over the last ten years. DETR forecasts to 2016 show this trend continuing at a rate faster than the English average. There are approximately 246, 800 households in 2006 and this number of households is expected to increase to between 275,000 and 295,000 by 2026.	As household numbers increase and the number of persons per house decreases, this will potentially generate more waste per head.
Number of Persons per Household	It has been suggested that there will be an increase in the number of single person households. The size of the average household is predicted to decrease from 2.31 persons in 2004 to 2.1 persons by 2026.	As above.
GDP per Capita	The County GDP is £400 above the UK average	More affluent areas are reported to have higher rates of waste generation.
Demographic Distribution	The proportion of ABC1 households in the County is higher than the national average 35%, compared with 32%	Reflects the higher affluence of households in the County

Driver	Comment	Influence on Waste Arisings Growth
Business Activity	The number of businesses in the Country grew faster than the UK average in the 1990's.	Will possibly have an impact on the rate of arisings of commercial and industrial waste.
Unemployment	In recent years County unemployment has been two thirds of the National Average.	Increased affluence leads to elevated waste generation rates

3.6 Waste Growth Scenarios

Gloucestershire's municipal waste arisings have risen by just over 3% per annum over the last 5 years. However during the period 1995/96 to 2000/01 the annual rate of waste growth ranged from 13.1% to –0.5% averaging at a rate of just under 4.0%. Some of the waste growth can be accounted for by the growing population and the increasing number of households. One of the major influential factors inhibiting the reduction in the growth rate of waste is the trend towards smaller households and single occupancy. The cumulative effect of this growth over the term of the Strategy is dramatic. Figure 5.1 illustrates waste arisings profiles under various growth scenarios.

Figure 3.11 Municipal Waste Growth Rate Scenarios



If municipal waste arisings in Gloucestershire continue to rise at the current rates of increase, by 2020 the Gloucestershire authorities will be required to manage 50% more municipal waste, and by 2030 municipal waste arisings would have doubled current arisings.

The growth rate of municipal waste arisings in Gloucestershire will have severe implications on future waste management infrastructure if recycling and composting targets and landfill diversion targets are to be met.

3.7 Data Analysis Conclusions

The key points from the data analysis include the following:

- Gloucestershire's total Municipal Waste has grown at an average of about 3.6% per annum between 2000/01 and 2004/05;
- The quantity of Municipal Waste sent for disposal however has fallen over this same period by 1.7% (0.4% pa);
- Of the residual waste streams measured only Trade Waste has grown in this period (by about 0.4% pa);
- The quantities of recycled material have risen by some 125% between 2000/01 and 2004/05 (22.4% pa);
- Although the waste being recycled continues to rise, the quantity of residual material is not falling at a corresponding rate. This means that the overall level of waste arisings continues to rise, and that Gloucestershire will have to recycle more and reduce overall waste arisings in order to have a positive impact;
- The amount of waste per person grew by 2.3% per year between 2000/01 and 2003/04[3];
- Gloucestershire has a high amount of household waste per person – 14.3% higher than the England average, although this may be due in part to the way that the household waste figures are calculated;
- The largest single waste stream is household collected residual waste which makes up nearly three quarters of the total arisings. Household collected waste is clearly the most important stream to focus on for waste prevention;
- Kerbside collected green waste appears to be a significant contributor to the overall growth in waste arisings;
- HRC residual waste makes up 7.7% of total arisings, and household items such as furniture, books and electrical goods can be prevented from entering the waste stream through reuse initiatives. Similarly there is potential to prevent garden waste being taken to HRCs by promoting home composting. HRC waste is therefore worthwhile focussing on;
- In terms of materials in the household collected waste, the largest components are organic waste, with the greatest potential for reduction in kitchen food waste, but there is also good potential for further reduction with green waste;
- Although paper waste is the most well recycled material, a lot of paper is still not being recycled, and there exists the potential to reduce the quantity of paper that is being consumed;
- All materials that are not being specifically targeted for recycling are good candidates for waste minimisation. Materials to be targeted could include:
    - Nappies;
    - Cardboard;
    - Plastic packaging;
    - Wood;
    - Furniture; and
    - Electrical and Electronic goods
- Schools waste is counted as household waste and is included in the household collected data. Although the tonnages involved are relatively small, encouraging schools to prevent waste can be important from an educational perspective, for example, promoting and providing home composting units to schools as an educational resource. It is hoped that work with schools will deliver benefits in the longer term.

[3] The average annual growth rate for waste for this period was 3.3%. The difference between this figure and the total average annual growth rate is accounted for by the fact that total waste is growing slower than the population.

4. Changing Behaviour

The Gloucestershire Waste Partnership recognises that we need to increase public awareness of waste and associated environmental and cost issues. It is vital that our waste services gain community support and buy-in. We want waste minimisation, recycling and composting to become mainstream, everyday activities that are easy to do.

It is important to monitor how successful recycling and composting schemes are and whether promotional campaigns are reaching householders and influencing the use of the recycling facilities. In order to evaluate performance of schemes, we are currently able to measure:

- Participation rate – the proportion of households having access to a recycling scheme who make use of that scheme;
- Set-out rate – the proportion of households in a given area observed to be making use of a scheme in a given time (used to describe households observed to be taking part during point surveys such as this project);
- Recognition rate – the proportion of any material targeted by a recycling scheme which is set out for recycling by those participating;
- Capture rate – the proportion of the total of a material in the waste stream that is diverted through a given recycling scheme.

The results of several studies are discussed in this section. The main market research was carried out during the roll-out of the WRAP funded campaign, “Recycle for Gloucestershire”. It is considered the most comprehensive work on participation. Other data on participation, set-out and capture rates was collated during the waste compositional study carried out in 2004/5.

4.1 Participation Rates

Participation in recycling schemes is influenced by:

- the management of the scheme by each district,
- the suitability of container types to housing type, and
- the targeting of awareness campaigns across the area.

4.1.1 WRAP study participation monitoring

During the implementation of the WRAP 'Recycle for Gloucestershire Campaign'[4] participation rate of the dry recyclable schemes was monitored to assess the impact of the campaign before, during and after the campaign. A summary of the results are summarised below and reveals an overall improvement of 7.5% in participation across the districts, rising from 61% to 68.5% from 2004 to 2006 respectively (see table 4.1).

Table 4.1 Pre-, mid and post campaign performance monitoring

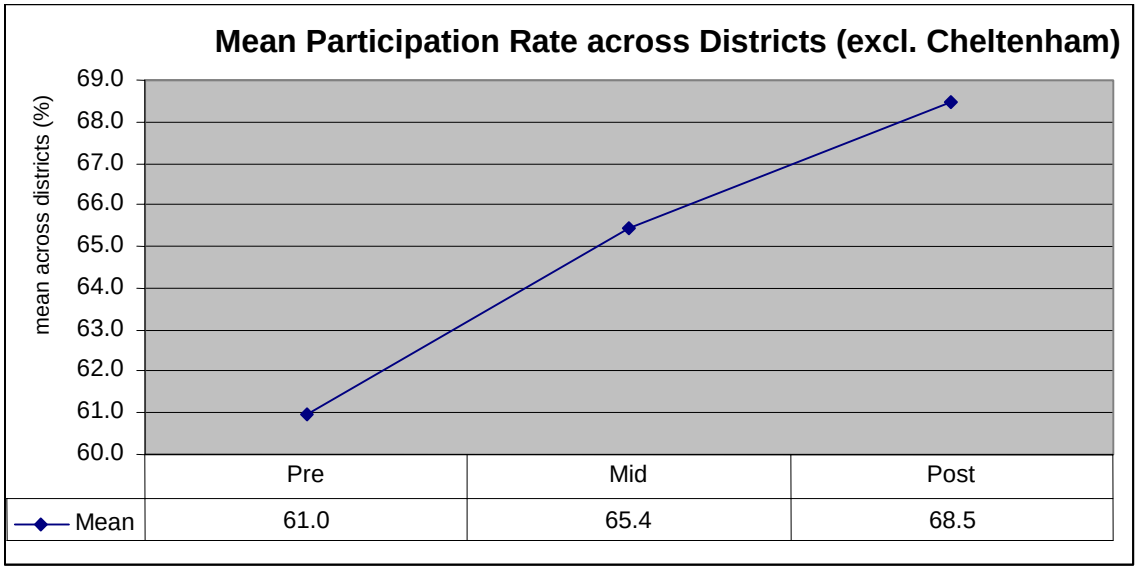
	Pre Campaign Participation Monitoring	**Mid Campaign Participation Monitoring**	**Post Campaign Participation Monitoring**
Survey carried out between:			
start date	September 2004	March 2005	January 2006
end date	November 2004	April 2005	February 2006
Type of service monitored (e.g. kerbside dry):	Kerbside dry	Kerbside dry	Kerbside dry
No. of households receiving service	231,186	248,751	248,751
No. of households in sample	13,683* (i.e. achieved sample size)	10,478* (i.e. achieved sample size)	10,190* (i.e. achieved sample size)
Participation rate	**61.02%**	**65.4%**	**68.5%**

N.B. Participation Rates and sample sizes exclude Cheltenham Borough Council data as the pre-monitoring was not carried out.

Figure 4.1 looks at the mean participation rate across all districts for each monitoring period (excluding Cheltenham). This shows that overall there was a steady increase in participation rates over time.

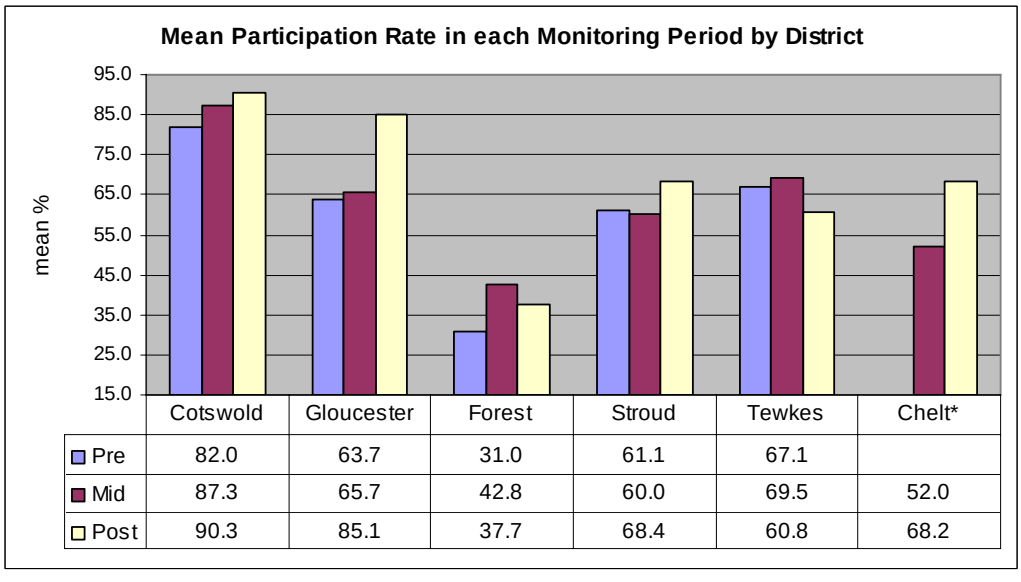
[4] See section xx for information on the 'Recycle for Gloucestershire Campaign'

Figure 4.1 Mean Participation Rates



The increase in the mean participation rate seen in Figure 4.1 above is generally consistent with analysis at a District level. Figure 4.2 shows that participation rates increased between the pre and post stage in the Cotswold, Gloucester, Forest, and Stroud Districts. Cheltenham also showed an increase between Mid and Post rounds. Conversely, Tewkesbury Borough saw a decline in rates over time. The picture at an individual round level was much more variable, but the general pattern of an increase between the pre and post monitoring periods seems fairly robust, with the exception of two out of three of the Tewkesbury rounds.

Figure 4.2 Mean Participation Rate in Each Monitoring Period by District



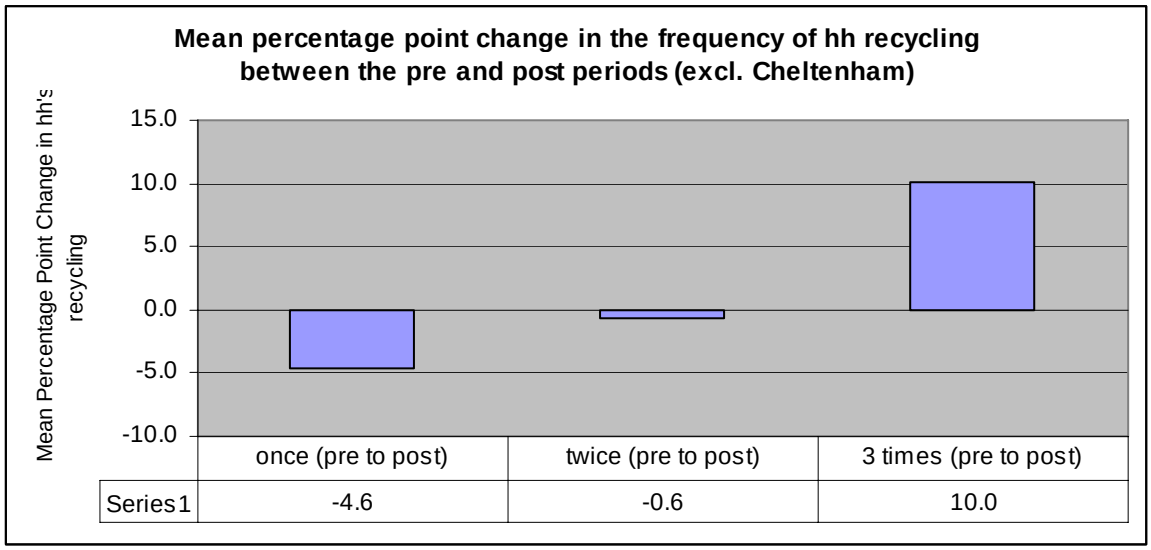
	Cotswold	Gloucester	Forest	Stroud	Tewkes	Chelt*
Pre	82.0	63.7	31.0	61.1	67.1	
Mid	87.3	65.7	42.8	60.0	69.5	52.0
Post	90.3	85.1	37.7	68.4	60.8	68.2

4.1.1.1 Frequency of Recycling

For each round, the percentage change in the frequency of recycling between pre and post monitoring was calculated. A mean change was then calculated across all of these percentage point changes. The results are presented in Figure 4.10. It can be seen that on average the proportion of households recycling three times (over a 6 week period) increased by 10 percentage points between the pre and post stage. At the same time the average proportion of households recycling once fell by 4.6 percentage points. In

combination with the participation rate increases, these frequency changes suggest that more people are recycling and that people are also recycling more often. The 10 percentage point figure should not be taken literally because mean scores are highly susceptible to distortion by wide variation in the raw data (as was the case here - demonstrated by the standard deviation of 7.7 percentage points around the mean). However, the results certainly suggest that overall there was an increase in frequency of recycling by households in the study. Again the Cheltenham data was excluded.

Figure 4.3 Mean percentage change in recycling frequency across time



4.1.2 Awareness campaign surveys

During the Recycle for Gloucestershire campaign, two phases of research was carried to measure awareness of the campaign. The surveys covered all six Districts and involved interviewing 902 in the first phase and 1,252 residents during the second phase. The average interview time was slightly longer at 14 minutes.

The methodology was the same during both surveys. The objectives were also the same, with the additional objective of determining how the post campaign findings differed from the previous results.

4.1.2.1 Findings relating to the use of kerbside schemes

There is extensive evidence from these surveys that there is increasing recycling behaviour amongst the County's residents. For example, in the 2004 survey, 80% of households put at least one recycling box out for collection – that proportion has now increased to 86%. There has also been a significant increase in the number of people using their kerbside scheme for glass, newsprint, steel and aluminium food cans, and for green garden waste.

There has been a significant drop in the number of people across the County who could be considered to be non-users of recycling facilities. In 2004/5, 5% of people interviewed in the survey did not make use of any recycling facilities at all – this year the figure is 2%.

Awareness of the recycling schemes within the County continues to be almost universal. Overall, 94% of respondents said that they were aware of the kerbside recycling schemes and, although this has fallen by a very small amount within the last

15 months (from 96% in the Phase I survey), we suspect that this is because recycling is becoming absorbed into people's normal behaviour.

Most people are aware of what materials can be recycled; most know that glass bottles and jars, and newsprint can go into the recycling box, but awareness that the box can be used for aluminium or steel cans is less, at around two-thirds overall. Unprompted awareness for cans is much higher than it was 15 months ago (which might be attributed to the "Can car" adverts on TV and adapted within Gloucestershire for an advertising campaign).

4.1.2.2 Other Recycling Behaviour

On average, nearly two-thirds of households (65%) are now using their local recycling banks (up from 55% since the last survey); and, although their level of usage of these facilities continues to be very low, there are signs that more households are using them for particular items than a year or so ago. For example, last year about 20% of households recycled clothing and footwear via a local bank; now the figure is almost a third. These findings also reflect service changes, where a number of districts have introduced collection banks for plastics and card over the period of this campaign.

The overall usage of household recycling centres (HRCs) across the County is almost exactly the same as it was last time; nearly six in every ten households continue to recycle at least some items via HRCs. The predominant use is for household appliances (now 35% of households), car batteries (15%) and cardboard (13%). This is at odds with our tonnage data, which shows that the amount of waste received by HRCs in 05/06 is approximately 8,000 tonnes greater than in 2003/04. However this may be a result of users discovering that a greater range of materials can be recycled at HRCs such as DIY waste.

4.1.2.3 Increasing Recycling Behaviour

About a quarter of the County's residents say that they recycle everything that they can, but the majority (about two-thirds overall) recognise that they recycle a lot, but not everything that could be.

Across the County, the scope for increasing usage of the kerbside box scheme is quite substantial, with a large proportion of residents being interested in an extension of the range of materials that could be collected. Around two-thirds of residents expressed an interest in being able to recycle plastic bottles, other plastic packaging and cardboard. Only slightly fewer residents were interested in non-plastic cartons, and more than a half in household batteries. For garden and kitchen waste, the level of interest is much lower – but, even here around one third of residents would be interested in the idea.

The survey showed that there are sizable minorities who obviously experience some difficulties with current arrangements, notably with the size of the recycling box being too small (30%) and with the weight of the box when full (17%). Overall satisfaction with the kerbside recycling schemes across the County remains very high, and has actually increased since the Phase I survey. It now stands at 86%. Levels of actual dissatisfaction are very low indeed – at about 7% on average (but little changed since late 2004).

4.1.2.4 Marketing and Promotions

More than sixty percent of respondents had seen or heard any advertising or promotion about recycling in the last six months – a significant increase of nearly 15% since the Phase I survey in October 2004.

Most people had seen or heard an advertisement or promotion for recycling either by means of a leaflet dropped through their door (35%), on television (32%) or in a local newspaper (23%). Awareness of promotional activity on television has significantly increased since 2004. However, very few of the other advertising media deployed during this campaign appear to have any great impact on recall although, across the County, about one in ten residents recalled a council newsletter.

4.1.2.5 On-Street Campaign Awareness Survey

An on-street survey was conducted in February 2006 to assess the audience penetration of the Recycle for Gloucestershire Campaign. Surveys were conducted in the main town of each of our six districts.

Findings relating to recycling behaviour were consistent with the telephone survey results. 88% of respondents used their kerbside recycling service (compared to 86% for the telephone survey). Stated use of other facilities was, however, lower than our telephone survey findings, with 36% using the HRCs (compared to 60%), 32% composting at home (compared to 54%) and 25% using recycling banks (compared to 65%).

70% of those surveyed could recall seeing or hearing promotion on recycling in the last six months. 39% recalled seeing an advert on TV, 31% recalled having received direct mail, 23% had seen an item in the local press and a further 23% had seen recycling information in a council publication. Recall of other media was much lower, although both roadshows and outdoor posters scored a recall level of 8%. These findings are consistent with our telephone survey results. The main message people took from the promotion was that recycling is important (30% of respondents), whilst 28% perceived a message on how to recycle.

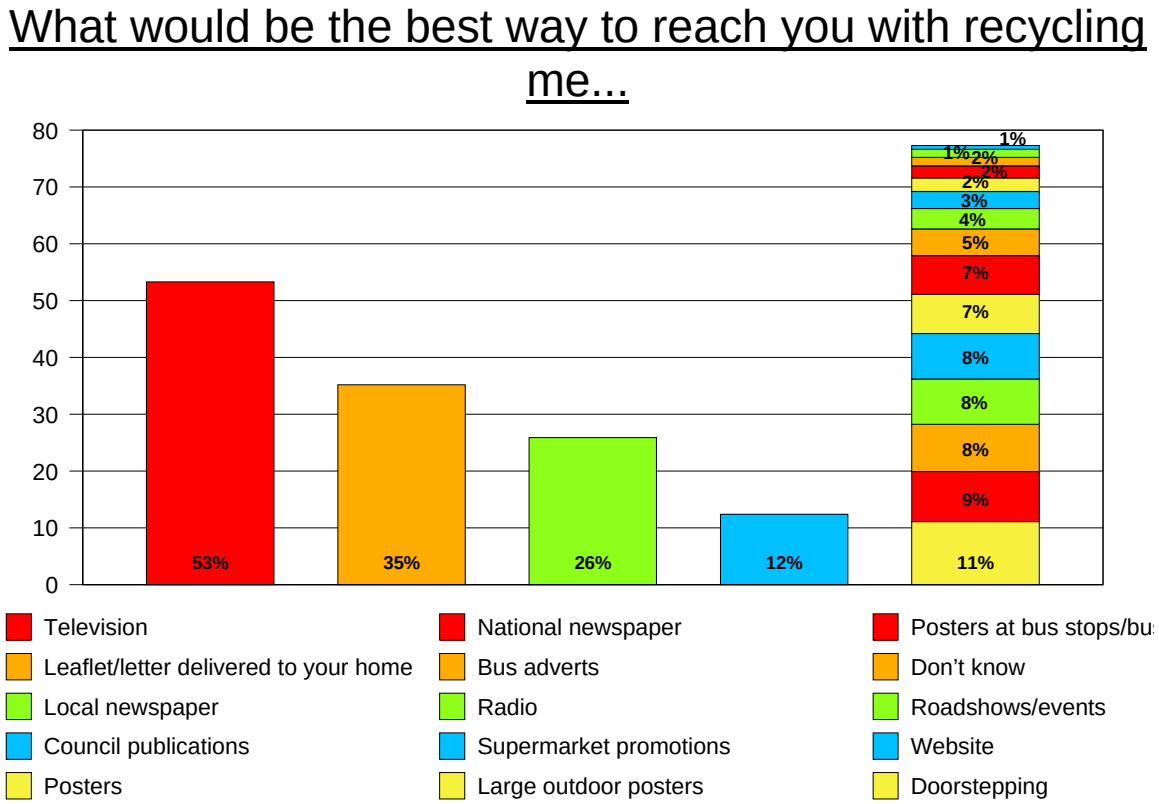
The recycle for Gloucestershire brand was recognised by 26% of those surveyed. This is a positive finding given that the brand has been in existence for less than two years. Recognition of the “get it sorted” brand remains strong. This has been in existence since 2001 and still featured until quite recently on our campaign materials. The national “recycle now” brand recognised by 24% of respondents. Most people recalled seeing the logos on a leaflet (20%), a local newspaper (18%) or on posters (18%). These scored higher than TV (15%).

The most widely recognised recycle for Gloucestershire advertising campaign was the Can car (38% of people recognised this). This was undoubtedly boosted by the national campaign and most people (62%) cited television as where they had seen it.

When asked whether they did anything in response to the advertisements, 71% offered no reply. However, 15% claimed to have recycled more as a result and 12% felt that they had a better understanding of recycling issues.

When asked of the most effective way to reach them with recycling messages most opted for television, followed by leaflets. The detailed results are illustrated in figure 4.4.

Figure 4.4 The most effective media for recycling messages stated by survey respondents



4.2 Capture Rates

Capture rate is the proportion of the total of a material in the waste stream that is diverted through a given recycling scheme. This is largely dependent on how well the householder recycles and if they are aware of all the materials they can recycle.

During the Waste Compositional Study (2004/5), on average, 22% of the waste presented for regular collection by Gloucestershire households was recovered by separate collection schemes during the winter survey and 29% during the summer. This difference was almost entirely accounted for by the green waste collections, which accounted for 7% of the recovery.

The main categories of recyclate accounting for the remainder were newspapers, magazines and glass bottles in both seasons. A significant proportion of the waste produced in both winter and summer was biodegradable paper based waste.

Figure 4.5 Capture Rates for Separately Collected Materials in 2003/04

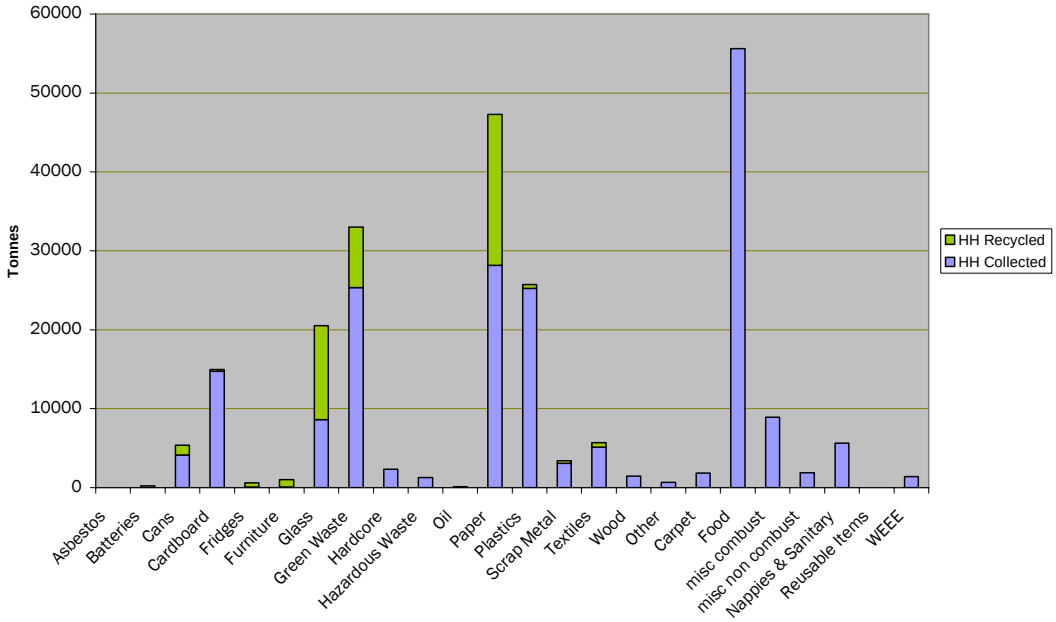


Figure 4.5 shows the amounts of each type of material that are currently being captured by the kerbside recycling collection systems relative to the residual household material being collected. The chart shows that approximately a third of the available paper, a third of the available glass bottles, and a quarter of total green waste are being collected for recycling while only small amounts of other targeted materials are being collected. The item which clearly stands out as having the greatest potential for recovery, and which has not being targeted, is kitchen waste. Aside from kitchen waste, paper, garden waste and plastics appear to have the greatest tonnages available for capture or reduction.

The waste compositional data has highlighted that there is still a high percentage of recoverable materials within residual waste that is still being landfilled. There is still between 59 and 77% of paper to capture and between 37 and 74% of glass to capture from the waste stream. Stroud DC is currently capturing the highest proportion of paper and glass. (NB. Some of the paper included in the waste sort is non-recyclable)

Figure 4.6 Capture Rates for HRC Materials

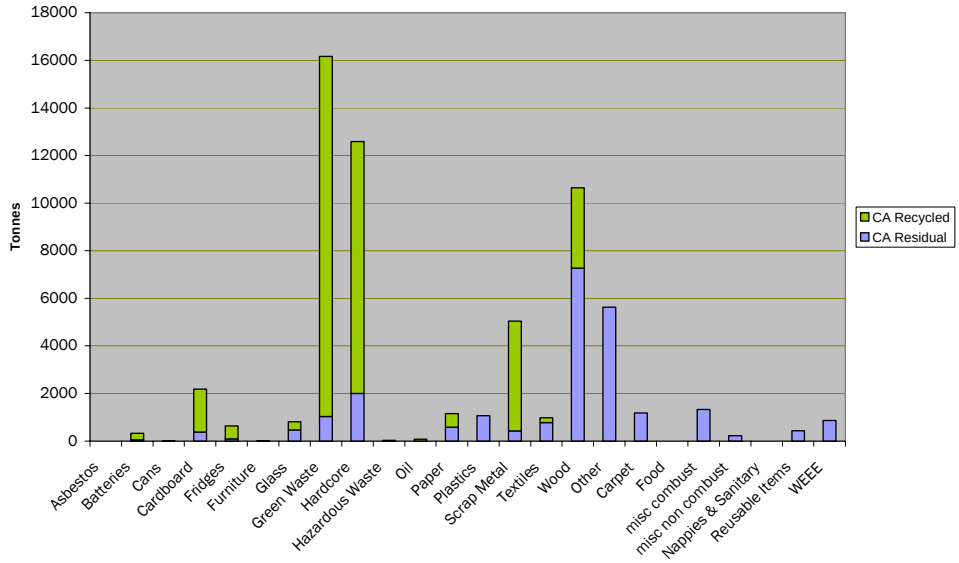


Figure 4.6 shows levels of capture for HRC collected material. Compared to the kerbside collected material capture rates are high with only wood waste of the targeted materials not having the majority of material captured. Of the materials targeted, capture rates range from 100% for cans, 93% for green waste and 91% for scrap metals to 32% for wood waste and 21% for textiles.

Figure 4.7 Capture Rates for Kerbside & HRC Materials Combined

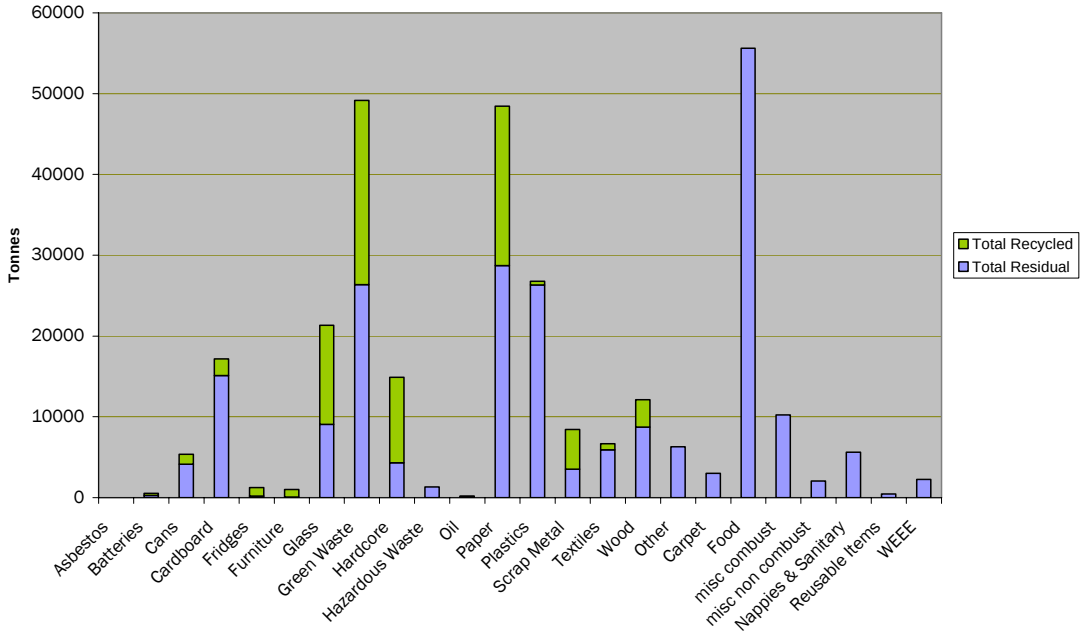


Figure 4.7 shows the combined capture rates for HRC and kerbside collected material. Together these streams make up 94% of Gloucestershire's Municipal Waste arisings, and so the above composition is likely to be fairly representative of the composition of the household stream as a whole. The capture rates are substantially similar to those for the collected material as the collected material accounts for the largest fraction.

4.3 Overall Findings of WRAP research

The existing recycling collection schemes were found to be effective at diverting materials from residual waste, however, a significant quantity of recyclable material still exists in the residual stream that could be separated by householders. Rates of material capture and participation (as set-out) rates were found to vary considerably between areas in Gloucestershire. High capture rates of a material in one area would suggest that it is also achievable elsewhere in Gloucestershire due to the similarities between kerbside collection systems.

Participation in kerbside recycling has risen by 7.5% overall. In addition, not only are more people recycling, but those that are, are now recycling more. On average the proportion of households participating in three consecutive collections has risen by 10% over the campaign period.

The amount of waste landfilled has reduced by 10,662 tonnes over the period of the campaign. This can be attributed to new and improved recycling and composting services, but also in part to our waste minimisation activities. For example, Mailing Preference Service registrations increased by 76.23% over the lifetime of the campaign. 19.77% of total registrations occurred after our Quarter 8 mail out to all households.

Awareness surveys show that 94% of respondents are aware of kerbside schemes and 86% stated participation. Stated usage of recycling banks has increased by 10% during the campaign period. According to our Telesurvey results, awareness of recycling promotions has risen by 15% to over 60%, whilst our recent “on street” campaign awareness survey showed that 70% of respondents recall seeing or hearing a promotion in the last six months.

5. Current Arrangements for Waste Management

Our current approach to waste management is set out within this section. This includes Gloucestershire County Council's duties as Waste Disposal Authority and the District Councils functions as Waste Collection Authorities. Additionally, a variety of joint projects are undertaken to promote sustainable waste management. Table 5.4 provides an overview of the services and their performance during 2005/6.

5.1 Recycling Services

5.1.1 Kerbside Recycling Collection

There is some commonality in the way that dry recyclables are collected by District Councils. Each Council provides a kerbside box to residents and recyclable materials left at the side of the container ('side waste') are also accepted. All materials are sorted at the kerbside and loaded into "*kerbsider*" or stillage type vehicles.

All householders receive a fortnightly collection of dry recyclables, except in Gloucester City, where weekly collections operate.

Each Council has in place a separate kerbside collection for paper (newspapers, magazines and leaflets), glass (separated by colour) and cans (steel & aluminium). Some Councils collect additional materials; plastic bottles are collected from the kerbside in Gloucester City and Stroud. Each district operates the scheme across 100% of their area. The individual schemes are summarised in Table 5.1.

Table 5.1 District Kerbside Dry Recycling Collection Schemes 2005/6

District	Frequency	Receptacle	Materials Collected
Cheltenham	Fortnightly	55 litre box	Glass bottles and jars, newspapers and magazines, food and drink cans, white office paper, collection from some households.
Cotswold	Fortnightly	44 litre box and lid	Glass bottles and jars, newspapers and magazines, junk mail, envelopes, photocopy-type paper, food and drink cans, empty aerosol cans, telephone directories, yellow pages,
Forest of Dean	Fortnightly	55 litre box	Glass bottles and jars, aluminium and steel cans, newspapers and magazines,.
Gloucester City	Weekly	55 litre box	Glass bottles and jars, newspapers and magazines, white office paper, food and drink cans, textiles, shoes, colourless plastic milk bottles.
Stroud	Fortnightly	55 litre box	Glass bottles and jars, newspapers and magazines, junk mail, food and drink cans, foil, telephone directories, plastic bottles, household (non-rechargeable) batteries.
Tewkesbury	Fortnightly	55 litre box and lid	Glass bottles and jars, newspapers and magazines, white office paper, food and drink cans.

5.1.2 Bring Bank Recycling

In addition to kerbside recycling, the District Councils operate a network of local 'bring sites' for dry recyclables, usually based in supermarket car parks, local shopping areas, community centres and village halls. These consist of collection points for paper (newspapers, magazines and leaflets), glass, mixed cans and textiles, to which the public bring materials for recycling. Some authorities offer collection points for plastic bottles (Cotswold D.C and Gloucester City only), aluminium foil, books (Cotswold D.C only), and oil (Stroud D.C and Cheltenham BC), and some districts have started to collect cardboard and plastic bottles at Bring sites.

Table 5.2 Bring Bank Recycling 2005/6

Cheltenham	20 sites situated across the Cheltenham Borough collect materials including: PAMs, glass bottles and jars, food and drinks cans (aluminium and steel), textiles, card, books/videos and shoes. (The range of materials collected varies from site to site).
Cotswold	42 sites situated across the Cotswold District collect materials including: PAMs, glass bottles and jars, food and drinks cans (aluminium and steel), textiles, card, plastics, books/videos and shoes. (The range of materials collected varies from site to site).
Forest of Dean	44 sites collect materials including: PAMs, glass bottles and jars, food and drinks cans (aluminium and steel), textiles, card, books/videos and shoes. (The range of materials collected varies from site to site)
Gloucester	36 sites situated across Gloucester City collect materials including: PAMs, glass bottles and jars, food and drinks cans (aluminium and steel), textiles, card, plastics, books/videos and shoes. (The range of materials collected varies from site to site)
Stroud	39 sites situated across the Stroud District collect materials including: newspapers and magazines (PAMs), glass bottles and jars, food and drinks cans (aluminium and steel), textiles, card, plastic bottles, books/videos and shoes. (The range of materials collected varies from site to site)
Tewkesbury	65 sites situated across the Tewkesbury Borough collect materials including: PAMs, glass bottles and jars, food and drinks cans (aluminium and steel), textiles, card, books/videos and shoes. (The range of materials collected varies from site to site).

5.2 Organic Waste Collection

Four authorities (Forest of Dean, Cotswold, Cheltenham and Gloucester City) are currently providing a garden waste collection service. The individual schemes are summarised in Table 5.3. There is currently no collection service for the separate collection of kitchen organic waste in Gloucestershire.

Table 5.3 District Organic Waste Collection Schemes 2005/6

District	Frequency	Receptacle	Charge	Materials	Opt in or Opt out?	No. of Households (coverage%)
Cheltenham	Fortnightly	sack	First sack free then £2 a sack	Garden waste only	Opt out	23,000 (50%)
Cotswold	Fortnightly	240 litre wheeled bin (paper sack where requested)	No charge	Garden waste only	Opt out	34,500 (100%)
Forest of Dean	Fortnightly	240 litre wheeled bin	Bins purchased for £20	Garden waste only	Opt in	25,000 (66%)
Gloucester City	Fortnightly	Reusable sack 120 litres	Two sacks supplied free of charge. Replacement/additional sacks cost £2.00	Garden Waste Only	Opt in	26,000 (56%)
Tewkesbury Borough Council	Fortnightly	240 litre wheeled bin	£26 per annum	Garden Waste Only	Opt in	7,000 (20% uptake of the scheme)

5.3 Household Residual Waste Collection

Each of the District Councils offers a weekly collection of household waste. Cheltenham, Gloucester City and Tewkesbury provide wheeled bins for the containment of waste, Stroud provides black sacks (1 sack per household per week free of charge), and Cotswold and the Forest of Dean require residents to provide their own black sacks. The overall waste arisings was not found to differ particularly between those authorities collecting waste in black sacks (Cotswold, Forest of Dean and Stroud) to those using wheeled bins for residual waste collection.

Table 5.4 Waste Collection systems and their contribution to recycling and composting targets (2005/6)

District	Dry Kerbside Recyclables		Bring Brings	Green Waste Collections		Residual Collection
	Freq & Receptacle	Recycling %	Recycling %	Type of Scheme	Composting %	
Cheltenham	Fortnightly55 litre box	10.8	5.6	• Fortnightly sack collection, • First sack free then £2 a sack • Opt out (36,000 hhs using the scheme (60%))	9.5	Wheeled bin, weekly
Cotswold	Fortnightly44 litre box and lid	12.2	5.0	• Fortnightly 240 litre wheeled bin (paper sack where requested) • No charge • Opt out (34,500 hhs provided the scheme (100%))	19.8	Sacks Weekly,
Forest of Dean	Fortnightly 55 litre box	12.4	1.3	• Fortnightly 240 litre wheeled bin • Bins purchased for £20 • Opt in (25,000 hhs using the scheme (66%))	20.5	Sacks, weekly
Gloucester City	Weekly 55 litre box	11.9	2.6	• Fortnightly reusable sack 120 litres • Two sacks supplied free. Replacement cost £2.00 • Opt in (26,000hhs using the scheme (56%))	1.3	Wheeled bin, weekly
Stroud	Fortnightly55 litre box	20.9	1.0	N/A	0	Sacks, Weekly
Tewkesbury	Fortnightly55 litre box and lid	13.4	3.1	• Fortnightly charged collection (£26/annum) introduced March 06 • 240 litre wheeled bin • Opt in (7,000hhs signed up to the scheme (20%))	0	Wheeled bin, weekly

5.4 (ELFF) Collection

There is a special collection service for bulky household waste enabling residents to dispose of bulky household items and fridges and freezers. The Forest of Dean, Gloucester City and Stroud offer a free service, whilst Cheltenham, Cotswold, and Tewkesbury charge a small fee. Collection is scheduled on an appointment basis and items are collected within a 10 day period.

5.5 Clinical Waste Collection

Gloucestershire's waste collection authorities are currently negotiating with the three Primary Care Trusts and the Pharmaceutical Services Negotiating Committee for the safe and accountable disposal of used hypodermic syringes (sharps) used by outpatients, mainly diabetics.

Negotiations have only recently been possible following the relaxation of the Environment Agency's view of the operation of a take back scheme through local pharmacists. Gloucestershire is keen to pursue the collection of "sharps" in this way, as it provides a suitable disposal point for outpatients and a more cost effective service solution when compared to the collection of sharps from individual households.

5.6 Hazardous Household Waste

The County Council makes provision for asbestos disposal by householders, without charge, at a suitably licensed facility near Gloucester. Gas bottles are accepted at the Wingmoor HRC and other household chemicals such as engine oil, fluorescent tubes, pesticides, household chemicals and paint are accepted at all the HRCs within the County. For a full list of accepted materials please visit, **www.recycleforgloucestershire.com** .

5.7 Commercial Waste Collection

Three districts offer a waste collection service for commercial waste. This service is undertaken as part of the household waste collection service, where commercial waste is collected on the same vehicles as household waste. Over the last 5 years the tonnage collected has been minimal at approximately 8,500 tonnes per annum. This service to local businesses, provided at a competitive charged rate, is available from Tewkesbury Borough, Cheltenham Borough and Gloucester City Councils (2004/5).

5.8 Destination of recyclables and other materials

Dry recyclables are collected from the kerbside, from bring banks and from Household Recycling Centres throughout Gloucestershire (see 4.1 and 6.1.1). Each authority currently bulks and sends the dry recyclables to reprocessors or merchants throughout the UK. Some materials are exported oversees and this export is mainly dependent on market prices. All materials are sorted prior to baling and export and configures with all Transfrontier Shipment regulations and paper meets the CEPI Paper Standards.

5.8.1 Where all waste materials go and what they are made into.

Tables 5.5 – 5.11 District breakdown

District	Materials	Destination	What it's made into
Cheltenham	Paper	Aylesford, Kent	Pulped and made into new paper products
	Glass	British Glass CM20 2UG	Melted and used to make new glass packaging and products
	Cans - aluminium	Kingsmead Recycling Centre SN6 6JR	Back into aluminium
	Cans- steel	Kingsmead Recycling Centre SN6 6JR	steel products
	Textiles	Devizes Textiles SN10 2HW	Resold and distributed via a network of shops
	Card	Severnside Recycling GL51 6SX	Cardboard packaging
	Plastics- milk bottles	Central Recycling Group WA9 4HY	?
	Plastics- plastic bottles	Central Recycling Group WA9 4HY	?
	ELFFs	Sims Metal NP20 2WE	
	Batteries	G & P Batteries WS10 8JR	
	Yellow Pages		
	Garden Waste	Cory Environmental GL52 4RT	Compost is used for landfill restoration at Wingmoor and Hempsted, and as a fertiliser for agricultural use (Dymock).
	Oils (automotive)	Feakins Oil Recoveries DY10 4HS	
	Metals	Harry Buckland GL51 0SS	

District	Materials	Destination	What it's made into
Cotswold	Paper	Shotton Mill, Cheshire & China	Loose paper is Pulped and made into new paper products in the UK and the remainder is sold to a Paper Mill in China
	Glass	Reuse Glass Knottingley, WF11 8DJ	Melted and used to make new glass packaging and products
	Cans - aluminium	Novelis, Warrington, WA4 1NP	Back into aluminium products
	Cans- steel	Corus, Port Talbot, SA15 2HD	Back into steel products
	Textiles	tbc	
	Plastics - milk bottles	Plastics Recovery Limited, Preston, PR26 7QS	
	Plastics - plastic bottles	Plastics Recovery Limited, Preston, PR26 7QS	
	ELFFs	tbc	
	Books	tbc	
	Garden Waste	Cory Environmental (Gloucestershire) Ltd, Bishops Cleeve	Compost is used for landfill restoration at Wingmoor and Hempsted, and as a fertiliser for agricultural use (Dymock)

District	Materials	Destination	What it's made into
Forest of Dean	Paper	Aylesford, Kent	Pulped and made into new paper products
	Glass	Berrymans, West Midlands	Melted and used to make new glass packaging and products
	Cans - aluminium	Novelis (Alcan)	Back into aluminium products
	Cans- steel	Corus, S.Wales	Back into steel products
	Textiles	BCR, West Midlands	Resold and distributed via a network of shops and to developing countries
	Bulkies	Greenmore, Longhope	Re-use and recycling where possible
	ELFFs	Sims Metal NP20 2WE	
	Garden Waste	Cory Environmental, Dymock	Compost is used for landfill restoration at Wingmoor and Hempsted, and as a fertiliser for agricultural use (Dymock)

District	Materials	Destination	What it's made into
Gloucester City	Paper	Shotton, Cheshire	Pulped and made into paper products (newsprint)
	Glass	Berrymans, West Midlands	Melted and used to make new glass packaging and products
	Cans - aluminium	Novelis (Alcan)	Back into aluminium products
	Cans- steel	Corus, S.Wales	Back into steel products
	Textiles	BCR, West Midlands	Resold and distributed via a network of shops and to developing countries
	Card	Severnside, Cheltenham	Cardboard packaging
	Plastics- milk bottles	Delleve, Birmingham	HDPE regrind and Plastic pipes
	Plastics- plastic bottles	Delleve, St.Helens	HDPE regrind and Plastic pipes
	Garden Waste	Cory Environmental, Gloucestershire	Compost is used for landfill restoration at Wingmoor and Hempsted, and as a fertiliser for agricultural use (Dymock)

District	Materials	Destination	What it's made into
Stroud District Council	Paper	Aylesford, Kent	Pulped and made into new paper products
	Glass	Recressco	Glass making or road building in the UK or exported to Europe
	Cans - aluminium	AMG Resources then to Novelis	Back into aluminium and steel products
	Cans- steel	AMG Resources then to Novelis	
	Textiles	BCR, West Midlands	Resold and distributed via a network of shops
	Card	Smiths, Moreton Valance	Cardboard packaging
	Plastics- plastic bottles	Roydon Plastics	Taken to Hong Kong, then China for recycling
	Bulkies	Smiths, Moreton Valance	
	Books	Oxfam	Re-use
	Batteries	Smiths, Moreton Valance and onward to G&P Batteries	
	Yellow Pages	Sundeala, Cam	

District	Materials	Destination	What it's made into
Tewkesbury Borough Council	Paper	Shotton Mill	Pulped and made into paper products (newsprint)
	Glass	British Glass	Melted and used to make new glass packaging and products
	Cans - aluminium	Richard Freeth and on to Novelis	Back into aluminium products
	Cans- steel	Richard Freeth and on to ?	Back into steel products
	Textiles	Permissive banks only	Distributed to the developing countries
	Card	Severnside, Caldicott	Cardboard packaging
	Plastics- milk bottles	Delleve, Oldham	HDPE regrind and Plastic pipes
	Plastics- plastic bottles	Delleve, Oldham	HDPE regrind and Plastic pipes

District	Materials	Destination	What it's made into
Gloucestershire County Council	Paper	Aylesford Newsprint, Ashford Kent & Holman Paper, Chatham Kent (Merchants and markets dependent on prices)	Pulped and made into new paper products
	Glass	Berrymans, Knottingley & Richardsons, Cwmbran, S Wales; United Glass, Harlow, Essex (Merchants and markets dependent on prices)	Melted and used to make new glass packaging and products
	Cans - aluminium	Freeths Alcan, Swindon	Back into aluminium products
	Cans- steel	Sims Metals, Cinderford, Glos Alumiminium foil is taken to Fairtide, Lydney (alu pro scheme)	Back into steel products
	Textiles	Salvation Army & Shoes, Oxfam Unsold rags are collected by a variety of rag merchants	Resold and distributed via a network of shops
	Card	Severnside Gloucester & SCA Caldicot, S Wales. Quantities are dependant on Markets	Cardboard packaging
	Plastics- milk bottles	Gloucester City Services then on to Delleve, Birmingham	HDPE regrind and Plastic pipes
	Plastics- plastic bottles	Gloucester City Services then on to Delleve, St. Helens	HDPE regrind and Plastic pipes
	Bulkies		
	ELFFs	Sims Metals, Newport, South Wales	Shredded and goes to the international market
	Books	British Heart Foundation	Re-used and sold via network of shops
	Batteries	G&P batteries, West Bromwich	Wet processed to recover plastic and lead; dry processed to recover other metals
	Yellow Pages	Print waste Cheltenham	
	Garden Waste	Cory Environmental, Gloucestershire	Compost is used for landfill restoration at Wingmoor and Hempsted, and as a fertiliser for agricultural use (Dymock)
	Wood	Cory Environmental, Gloucestershire	Used as a construction product at the Wingmoor and Hempsted Landfills
	Oils (automotive)	West Oils, Gloucester	Refined and used as a lubricant
	Cooking Oil	C&D Oil	Used in manufacture of biodiesels
	Metals	Sims Metals, Cinderford	Shredded and goes to international markets
	Rubble and DIY waste	Keyway Gloucester, Allstone Sand and Gravel, Gloucester	Recycled into aggregates
	Asbestos	Smiths, Gloucester	Hazardous waste landfill disposal
	Fluorescent tubes and light bulbs	JG Lampcare Blandford	Mercury is recovered and glass recycled into other glass products
	Chemical waste	Chemtech Birmingham-	Recovery or high temperature incineration

5.9 Waste Management Facilities

To manage the current waste arisings within the county, the county council uses a number of existing facilities throughout the county. The details of the facilities used to deliver the existing waste service and their ownership are found in Table 5.4. There are currently five HRCs, three windrow composting sites, two transfer stations, two active landfill sites, three closed landfill sites and a number of other facilities. Our current arrangements for waste services are provided through our Waste Management Services Contract that is due to expire on 6 August 2006.

The requirements of the EU Landfill Directive will lead to a dramatic shift in the way that municipal waste is collected and disposed of within Gloucestershire over the next 10-20 years. Additional recycling and composting infrastructure will need to be developed in order to deliver increased rates of recycling and composting, and infrastructure for the treatment of residual waste will need to be implemented in order to divert biodegradable waste away from landfill disposal.

Table 5.12 Gloucestershire's existing waste facilities, their ownership and accepted wastes

No	Waste Facility	Accepted wastes
1	Hempsted Landfill, Gloucester	Inert wastes, metal wastes (bulk loads not permitted), household wastes, commercial wastes, filter cake/zinc, nickel hydroxide.
2	Wingmoor Farm Landfill, Stoke Orchard, Cheltenham	Household, commercial and industrial wastes.
3	Lydney Transfer Station, Lydney	Non hazardous household, commercial and industrial waste, difficult wastes, Group E clinical wastes, garden waste.
4	Cirencester Transfer Station, Cirencester	Inert wastes, general and biodegradable wastes, metals and discarded (scrap) composite equipment, animal carcasses, ELFF, garden waste.
5	Hempsted Garden Waste Composting Facility, Gloucester	Green wastes being defined as biodegradable wastes consisting of tree branches, grass cuttings, bushes and other vegetation.
6	Wingmoor Garden Waste Composting Facility, Cheltenham	Green wastes being defined as biodegradable wastes consisting of tree branches, grass cuttings, bushes and other vegetation.
7	Rosehill Farm Windrow Composting Facility, Nr. Dymock	Green wastes and cardboard.
8	Hempsted ELFF Storage Area, Gloucester	ELFFs.
9	Wingmoor ELFF Storage Area, Cheltenham	ELFFs.
10	Cinderford ELFF Delivery Point	Scrap vehicles, scrap equipment, scrap, metal, white goods, swarf/turnings, transformers/capacitors, motor vehicle batteries.
11	Smiths, Moreton Valance Asbestos Delivery Point	Household asbestos, delivered by the public and District Councils if fly-tipped.
13	Fosse Cross Household Recycling Centre, Calmsden	Domestic waste only; household waste, scrap metal, waste oil, materials for recycling. No asbestos and/or other special wastes.
14	Gloucester Household Recycling Centre, Hempsted, Gloucester	Domestic waste only; household waste, scrap metal, waste oil, materials for recycling. No asbestos and/or other special wastes.
15	Oak Quarry Household Recycling Centre, Broadwell, Coleford	Domestic waste only; household waste, scrap metal, waste oil, materials for recycling. No asbestos and/or other special wastes.
16	Pyke Quarry Household Recycling Centre, Horsley, Nailsworth	Domestic waste only; household waste, scrap metal, waste oil, materials for recycling. No asbestos and/or other special wastes.
17	Wingmoor Farm Household Recycling Centre, Stoke Orchard, Cheltenham	Domestic waste only; household waste, scrap metal, waste oil, materials for recycling. No asbestos and/or other special wastes.

5.9.1 Haulage and Transfer Arrangements

There are two transfer stations within Gloucestershire, Lydney and Cirencester. Waste derived from Cotswold is currently transferred via Cirencester transfer station, and waste from the Forest of Dean is transferred via Lydney transfer station to Hempsted landfill site.

Lydney Transfer Station is licensed to accept 73,000 tonnes per annum. (Non hazardous household, commercial and industrial 200t/d; Difficult waste per working plan 15t/d; Group E Clinical Wastes 5t/d; Maximum storage at any one time 500 tonnes, garden waste).

Cirencester Transfer Station has a maximum storage capacity of 90 tonnes (Inert wastes, general and biodegradable wastes, metals and discarded (scrap) composite equipment, animal carcasses, ELFFs).

5.9.2 Composting Facilities

There are currently three windrow composting facilities used to compost garden waste collected at the HRCs and collected at the kerbside by Forest of Dean:

1. Wingmoor composting Facility, near Bishop's Cleeve, owned and operated by Cory Environmental.
2. Hempsted Composting Facility, Gloucester, operated by Cory Environmental. This site is licensed to accept 10,000 tonnes per annum, which is currently exempt requiring that all compost produced must be used on site. Rose Hill Farm, near Dymock, owned and managed by Mr. M. Bennion. This site is licensed to accept garden waste from the Forest of Dean D.C. The compost is used on site as an agricultural fertiliser.

There are also a small number of community composting sites within Gloucestershire. Details can be found at www.gcwp.org.uk.

5.9.3 Waste Disposal Sites

Currently all residual waste is disposed of at two landfill sites located at Hempsted, Gloucester and Wingmoor Farm, near Bishops Cleeve, Cheltenham. At current levels of disposal, these sites have a life expectancy of 9 years and 13 years respectively.

6. Related Projects

6.1 Joint Working

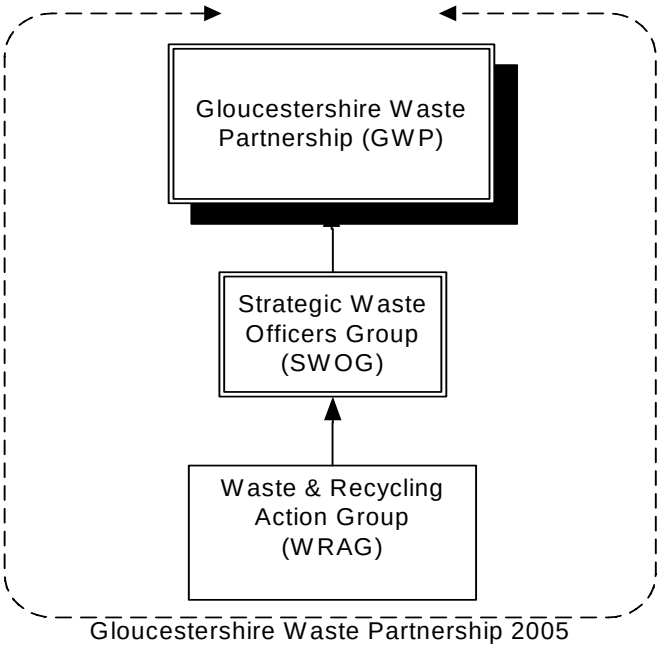
Gloucestershire local authorities have long realised the benefits of working together in waste management and have recently sought to strengthen the working relationship between County and District tiers with the formation of the Gloucestershire Waste Partnership (GWP). The GWP consists of senior officers and elected members with responsibility for waste management. The group was formed to identify and develop opportunities for joint working and to further the aims of achieving sustainable waste management in Gloucestershire. Presently, the GWP is responsible for:

- Recommending to constituent authorities ways of co-ordinating arrangements for collection, recycling, recovery, composting and disposal;
- Overseeing the monitoring and review of the Joint Municipal Waste Management Strategy;
- Overseeing the work of the 'Recycle for Gloucestershire' campaign and coordinating Gloucestershire waste awareness initiatives; and
- Developing a business case for the establishment of a Joint Waste Board.

The GWP is not currently a decision making body, but makes recommendations to each of its constituent authorities on waste management issues that have a strategic or county-wide impact. The group does have an elected chair and vice chairman. GWP is serviced by the Strategic Waste Officers Group (SWOG), which comprises the waste managers from each of the Gloucestershire local authorities. SWOG meets regularly to discuss policy issues affecting this strategy. Our joint working arrangements are given in Figure 5.1.

Some of the benefits of joint working are already being realised. The GWP in partnership with the Shropshire Waste Partnership (SWP, the Shropshire local authorities) was successful in gaining £3.3 million of funding from the DEFRA Waste Minimisation & Recycling Partnership Fund in 2003 to develop joint working in each of our administrative areas and to introduce new recycling infrastructure.

Figure 6.1 Joint working arrangements (2004/5)



6.2 Waste Minimisation Projects

There is already an established foundation in terms of waste prevention in Gloucestershire, with the County, Districts and Non Government bodies involved in various initiatives across the county. The strategy aims to build upon this foundation, using both existing initiatives as a basis for development, and recommending new programmes. The current waste prevention activities in Gloucestershire include:

6.2.1 Real Nappy Campaign

In Gloucestershire there has been an ongoing, albeit low key, campaign over the last few years. This campaign has been delivered primarily through a nappy 'ambassador' who delivers talks and demonstrations across the County. The county also lends trial packs to parents wishing to investigate using real nappies and the scheme has been advertised in the local press. The campaign won second prize in the 2004 WEN Real Nappy Awards for small projects with a prize of £1,000, which was used to purchase extra trial kits.

In 2004 and 2005 the nappy ambassador contacted 300 parents through 22 talks funded by the County Council and districts. 30 parents have used the trial kits since mid 2004.

Funding from Defra has enabled the campaign to continue, with the local authorities providing match funding. A company 'Green Nappies' has also come on board with the project and provides free nappy packs to give away.

6.2.2 No Junk Mail Campaign

The Get it Sorted Campaign run by ENCO has run a successful junk mail campaign with leaflets, press and radio ads. The current campaign involves using the current run of leaflets and information that is distributed at roadshows and in council carousels.

Promotion of the Mailing Preference Service (MPS) has already been undertaken, and figures from the MPS show that between December 2003 and January 2006 over 19,500 households in Gloucestershire had registered with the service.

6.2.3 Home Composting

Gloucestershire County Council is currently part of the WRAP funded home composting initiative, which provides subsidised bins and promotional information to households across Gloucestershire. A range of home composting bins and accessories such as kitchen caddies are made available to residents at a greatly reduced price. WRAP also provides a composting advisor for Gloucestershire, who promotes the scheme around the county and provides advice to customer on successful home composting.

At present the scheme has sold over 10,000 bins (which equates to one in every 24 households owning a compost bin). Approximately 33,000 composting bins have been sold through Gloucestershire local authority schemes over time. We have been invited to be partners in the WRAP scheme for 2006 and will again be offering three different bins for sale as well as a presence at events around the county.

The GWP continues to support the Gloucestershire Wildlife Trust “Don’t Waste Wildlife” project which promotes home and community composting (www.**gloucestershirewildlifetrust**.co.uk)

6.2.4 Community Composting

Currently two community composting schemes are operational within Gloucestershire, which are coordinated and run by community organisations. A third group is also interested in establishing a scheme and is currently in the planning stage.

One of the Gloucestershire WCAs also operates a shredder, which has, in the past, been made available to community groups.

6.2.5 Phone & Printer Cartridge Recycling

In Gloucestershire a low key campaign run by the Winstons Wish charity (supporting children who are grieving) involves leaving envelopes at HRCs into which the public can place their empty phone and printer cartridges. However, no data is available as to the volume of cartridges received.

6.2.6 Re-Paint

Two paint re-use initiatives are currently operational in Gloucestershire; one run by Reclaim in Cheltenham with a second scheme being operational in Stroud (the Stroud Valleys Project). Data is not available regarding how much paint has been redistributed by them.

6.2.7 Furniture Re-Use

In Gloucestershire, Reclaim undertake the collection of bulky waste in Cheltenham, with waste contractors collecting the materials in other areas. In addition, the Gloucestershire Furniture Recycling Project (FRP) has a workshop located at Gloucestershire docks with a main warehouse in Gloucester and a second warehouse in Stroud. The project collects 12,000 items per year from households and employs 20 staff. Goods are collected free of charge from householders, and disadvantaged households can purchase goods on a not for profit basis. In February 2006, the FRP announced that it was to open a shop in Gloucester City Centre using a £140,000 grant provided by the national lottery[5]. The service offered by the FRP is in addition to the bulky waste collection service offered by the WCAs across Gloucestershire.

6.2.8 Scrap Store

The scrap store in Gloucester (located at City Works) collects over 180 tonnes of business waste each year[6]. This waste is then passed onto community groups to re-use (for a nominal charge). The store is open three days per week and is open to registered community groups.

6.3 Communications & Marketing

6.3.1 'Get it Sorted' campaign

In 2004 the decision was taken to bring the existing 'Get it Sorted' campaign under the direct management of the GWP. Using funding awarded by Waste and Resources Action Programme (WRAP) a communications manager and assistant were recruited to oversee the running of all recycling campaigns.

A telephone survey was conducted in Feb 2004 (funded through DEFRA partnership project funding) to explore service user satisfaction levels and to identify any barriers to recycling. Results showed that 96% of householders are recyclers in one way or another – through kerbside, bring banks or HRCs. The survey indicated that major gains in participation and tonnage will come through encouraging existing recyclers to recycle more.

The current "Recycle for Gloucestershire" campaign links closely to the national Recycle now campaign introduced by WRAP. The Gloucestershire campaign mirrors the national identity. It focuses on direct contact with householders wherever possible, through roadshows, door-step canvassing and direct mail. This is backed up by an advertising and media campaign, which uses press advertising, outdoor posters and bus adverts. For further information on the campaign visit www.recycleforgloucestershire.com .

Each council supplements campaign activities with additional talks, visits, newsletters and local media, particularly to promote new kerbside collection schemes.

[5] http://www.frpglos.fsnet.co.uk/locations.htm
[6] http://www.grcltd.org/scrapstore.html

6.3.2 The "Recycle for Gloucestershire" Campaign

The "Recycle for Gloucestershire" campaign, funded by WRAP, has built upon the awareness raising work of its predecessor, Get it Sorted, which operated from 2001 to 2004. "Recycle for Gloucestershire" has used high-level advertising and consistent branding to further increase levels of awareness and to encourage people to recycle. Quarterly advertising campaigns were run using outdoor media such as adshels and billboards, as well as press advertising.

The campaign recognised that many householders already used at least one recycling service (based on our 2004 telesurvey results) and aimed to retain and build relationships with existing recyclers through the use of direct mail and (more recently) the development of a new website, encouraging them to recycle more over time. Doorstep canvassing was employed in areas where participation in recycling services was considered to be low. Residents were given clear and simple instructional messages on how to access and use their recycling services.

The "Recycle for Gloucestershire" campaign has incorporated a number of other third party funded projects. These include: Gloucestershire's £1.65 million NWMRF partnership project, which introduced new kerbside dry-recycling and garden waste collection schemes to over 100,000 homes; a WRAP funded home composting bin promotion, which has distributed over 10,000 composters; a DEFRA Community fund grant for the promotion of real nappies; a DEFRA funded incentives scheme to encourage individuals and communities to recycle more and; a landfill tax funded waste education officer to work with schools and youth groups.

Table 6.1 Key Milestones for the Recycle for Gloucestershire Campaign from June 2004 to April 2006

Milestone	Achievements	Completion date
1. Project coordination	A Waste Marketing Campaign Manager and a (WRAP funded) Marketing Campaign Assistant were recruited to deliver the campaign.	Jun 2004 and Jan 05 respectively
2. Telephone Survey	A pre-campaign survey was conducted in October 2004 and a post campaign survey conducted in February 2006	Feb 2006
3. Doorstep canvassing	Four stages of doorstep canvassing have been completed between Jan 2005 and Feb 2006, covering approximately 30,000 households.	Feb 2006
4. Promotional materials	Quarterly advertising campaigns have been conducted using outdoor media (billboards, adshels and bus sideliners). More recently this has been supplemented by the distribution of A3 & A4 posters to local centres such as post offices and shops. District specific recycling guides have been produced and distributed to each household.	Jan 2006
5. Press campaign	Press adverts were placed in the five main newspapers within Gloucestershire to coincide with our quarterly advertising campaigns. Adverts have also been placed in selected magazines (Here & Now and Primary Times), where a good fit with our own target audience has been recognised.	Jan 2006
6. Schools	Milestone not funded by WRAP.	N/a

7. Roadshows	24 roadshows were conducted over the life of the campaign - 4 in each district. Approximately 24,000 residents were engaged on recycling issues through this campaign element.	Feb 2006
8. Website	A new website was launched in Dec 2005, which incorporated the "Recycle for Gloucestershire" branding and featured the latest information on recycling services and waste reduction measures within the County.	Mar 2006
9. Waste reduction campaigns	Gloucestershire was accepted on to the WRAP home composting programme in 2005, which has subsequently distributed approximately 10,000 home composters to Gloucestershire residents. A mail out of the home composting leaflet was combined with the distribution of our recycling guides and also a Mailing Preference Service leaflet (reduction of junk mail). Registrations to the MPS have increased by 22,631 over the period of the campaign (Jul 04 to Mar 06).	Jan 2006
10. Household recycling centre promotions	New high-level signage has been constructed at each of our HRC sites. On site billboards have also been erected to display campaign messages. Press advertising has provided information on the facilities, such as location, opening hours and the range of materials that can be recycled.	March 2006
11. Community Waste Action Groups	A partnership has recently been formed with the Cheltenham based ReClaim charity to deliver doorstep canvassing work. The charity already operates a furniture reuse schemes and a community repaint project.	March 2006
12. Participation Monitoring	Three phases of Participation Monitoring were carried out in all 6 districts in: October 2004, April 2005 and January 2006.	January 2006

The 2004 – 2006 WRAP funded "Recycle for Gloucestershire" Campaign has been very successful. Positive changes have occurred in many areas including increases in: recycling rates, participation and frequency of participation, tonnages recycled and awareness of services and campaign activity. Tonnages sent to landfill have decreased. In summary, more people in Gloucestershire are recycling more materials, more often.

There have been "softer" benefits from the campaign. It has, for example, helped to develop partnership working between the local authorities by providing a very tangible and challenging project for the GWP to manage. The development and consistent application of shared branding (Recycle for Gloucestershire), cemented by the more recent identity guidelines, reinforces this partnership working.

The end of this campaign leaves the GWP in a strong position. Simple and effective design templates are in place for leaflets, press ads etc. We have a number of new assets (such as our website and exhibition panels) to use in future. We have also gained a great deal of experience and knowledge as to what communication techniques are most appropriate and most effective within Gloucestershire. This will allow us to refine and target our future campaigns.

6.4 Community Waste Projects

The County Council presently pays recycling credits to charitable organizations and social enterprises that divert materials in the waste stream from landfill. In 2003-2004 over £15,000 was paid in recycling credits; this equates to almost 400 tonnes of diverted materials.

District and county recycling officers actively support a variety of community-based activities including:

- Adult Opportunity Centres (AOCs);
- Furniture recycling projects;
- Community Re-paint scheme;
- Community composting groups; and
- Community Counts neighbourhood renewal project.

The GWP works with a number of groups to promote community & environmental well being throughout Gloucestershire, these currently include Stroud Valleys Project, Cheltenham Centre for Change and the Social Enterprise Alliance (SEA).

Envolve Partnerships for Sustainability, a registered environmental charity based in Bath, recently carried out a research project looking at waste based social enterprises within Gloucestershire[7]. The aims of the project were to:

- identify the extent of existing reuse and recycling based social enterprise within Gloucestershire;
- scope the extent of existing support for social enterprise and social enterprise development relating to waste reuse and recycling within Gloucestershire and the South West of England;
- draw out examples of reuse and recycling based social enterprise and support structures from throughout the UK in order to identify best practice to inform the development of social enterprise within Gloucestershire;
- identify relevant domestic and commercial waste material arisings and the potential market opportunities for processed materials within Gloucestershire; and
- make recommendations for the further development of waste reuse and recycling based social enterprise and appropriate support structures needed to promote and seed this development in Gloucestershire.

The GWP acted on the report findings by establishing the Gloucestershire Community Waste Partnership, which is open to all waste based enterprises in Gloucestershire. The districts and county council are also part of the Partnership, which aims to improve partnership working between community waste enterprises and increase contact between the community and public sector within waste management. The partnership has recently launched its own website and a paper based directory in order to promote the partnership, its members, and their activities. The website address is www.gcwp.org.uk .

[7] Waste-based social enterprise development in Gloucestershire. Envolve Partnerships for Sustainability and Stroud Valleys Project. 2004

6.5 Waste Education Programme

In Gloucestershire there is a strong emphasis on working with schools. The work involves liaising with head teachers, developing activities and visiting schools to deliver the activities. There are a series of activities already prepared for schools covering a range of waste related issues, which are delivered to children across the national curriculum.

Current work with schools can be divided in to two broad components:

- Education and curriculum support; and
- Provision of recycling facilities for school premises.

6.5.1 Education and curriculum support

In 2003, the former Gloucestershire Waste Action Trust provided funding for a Global Action Plan project officer to work with twelve primary and secondary schools across Gloucestershire (Global Action Plan are an environmental charity). The main aim of the project was to promote waste education and set up initiatives within the schools in order to reduce waste going to landfill. The twelve schools comprising 3,713 pupils who were recruited for the project achieved an average 36.5% reduction in waste being disposed of to landfill.

In 2004, GWP were successful in gaining further GWAT funding to part fund a new waste education officer for a further 18 months (the officer is based at Gloucestershire County Council). An increasing range of lessons and activities are provided across the curriculum. For further information on the waste education support offered visit www.recycleforgloucestershire.com.

The Council's Recycling Officers supplement the work of the waste education officer where possible by visiting schools and undertaking waste related activities with the children. School competitions for pupils to design posters promoting recycling have also been initiated.

6.5.2 Provision of recycling facilities for school premises

In order to support waste education activities, GWP has sought to provide recycling facilities for schools. Gloucester City now collects paper from about 30 schools. In Stroud, 28 schools are recycling paper through a local firm, PrintWaste. It is hoped that by reducing the amount of residual waste for disposal and therefore the disposal costs, the scheme can be made cost neutral for schools by using savings on residual waste to fund the paper recycling scheme.

A new countywide waste contract is in procurement, which will be available to all county council premises, including schools, in 2006. The Contract will include as a minimum the recycling of paper, cardboard and fluorescent tubes.

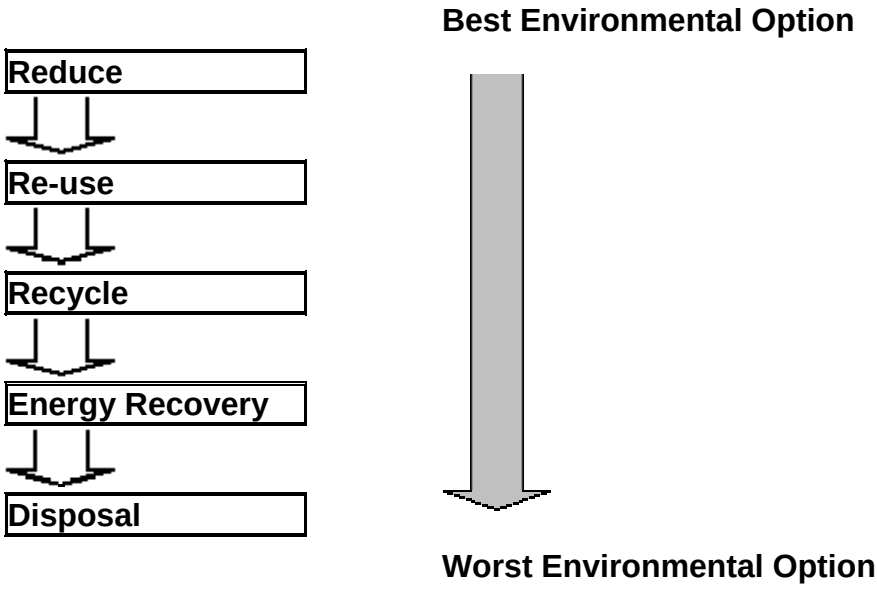
The County Council is now also part of the GLEN (Gloucestershire Global Education Network) group and has presented waste education activities to the group. The network links various organisations, both community and local authority, who are all involved in educational activities throughout Gloucestershire. The aim of the group is to co-ordinate education activities and share experiences. We hope in the future through this network to add an international dimension to the work.

7. Legislation and Policy

7.1 Overview

Central Government, in response to European legislation, has in recent years introduced policies, legislation and fiscal incentives intended to transform the UK's waste management system from one which depends heavily on landfill to one which is led by the waste management hierarchy.

The Waste Hierarchy



European Union and National legislation are the biggest factors influencing waste management activities within the UK and Gloucestershire is no exception. A comprehensive legislative review is included at Appendix 1, which also sets out how each piece of legislation affects our services.

Many of the legislative controls and policies have a fundamental impact on the way in which waste is managed in Gloucestershire. As well as statutory recycling and composting targets for household waste, recovery targets for municipal waste and Best Value Performance Indicators, more recent and emerging policy and legislation will need to be taken into consideration during the development of the Joint Municipal Waste Management Strategy.

These national recycling targets for household waste have been translated into phased individual Best Value Performance standards for each local authority. The government

has recently announced that for 2007/8, all local authorities will have to equal their recycling and composting target for 2005/6 except those with a target of 18%. This target will be increased to 20%. For the Gloucestershire authorities they are as follows:

Table 7.1 Gloucestershire BVPI recycling and composting performance and 2007/8 targets

Council	Actual				Target
	1998/99	2002/03	2003/04	2005/06	2007/8
Cheltenham Borough	8%	12.9%	14%	26%	24%
Cotswold District	19%	16.5%	18%	37%	30%
Gloucester City	6%	8%	9.7%	16%	20%*
Forest of Dean District	11%	11.7%	26%	34%	30%
Stroud District	13%	20.5%	21%	22%	30%
Tewkesbury Borough	7%	8.7%	14%	17%	21%
Gloucestershire County	12%	16.7%	21%	30%	30%

* Statutory target increased from 18% to 20% (Government response to the consultation on options for Local Authority Statutory Performance Standards on Recycling and Composting in 2007/08 (Defra))

In particular, the EU Landfill Directive will lead to a dramatic shift in the way that municipal waste is collected and disposed of within the UK, and will have major implications for waste management within Gloucestershire over the next 10-20 years. The Directive has been transposed into UK legislation by the Waste and Emissions Trading Act 2003 (WET Act), which will lead to a dramatic reduction in the amount of Biodegradable Municipal Waste (BMW) that can be landfilled.

More biodegradable waste will need to be diverted to achieve the landfill diversion targets allowances, either through increased recycling and composting, biological waste treatment, or thermal treatment.

The overall effects of the growing body of legislation governing waste management will be a reduction in the amount of municipal waste landfilled, coupled with increased recycling and composting. The government is using financial measures such as the landfill tax and the LATS to reduce reliance upon landfill.

Some incentives have been offered to encourage greater recycling, such as the DEFRA Waste Minimisation and Recycling Fund and its successor, the Waste Performance & Efficiency Grant, but waste management costs have increased dramatically (doubling in the last five years). This trend is likely to continue presenting real challenges for local authorities.

7.1.1 The Planning Framework

Planning Policy Guidance Notes set out the Government's policies on different aspects of planning. They must be taken into account by local planning authorities as they prepare their development plans and may be material to decisions on individual planning applications. The UK Government first issued local authorities with planning guidance for waste management in 1999, through Planning Policy Guidance Note 10 (PPG10). However, it has been clear for some time that the planning framework was not bringing forward new waste management facilities at the speed required for the UK to meet its national recycling and EU landfill diversion targets.

The Cabinet Office report Waste Not, Want Not (2002) recommended an urgent review of PPG10. The review, conducted by the Office of the Deputy Prime Minister (ODPM), has resulted in Planning Policy Statement PPS10: Planning for Sustainable Waste Management being published in July 2005 which replaces PPG10: Planning and Waste Management.

As a result several structural changes were established to the waste planning system:

1. The waste hierarchy, self-sufficiency and proximity are now incorporated as specific objectives to be delivered through waste management strategies and local development plans.
2. These objectives will be actioned through regional spatial strategies prepared by Regional Planning Bodies (RPBs). These will allocate to Waste Planning Authorities (WPAs) the waste tonnages to be managed and where required, the pattern of waste facilities. Local development documents prepared by WPA's will in turn identify appropriate sites and locations for facilities.
3. The requirement for Best Practicable Environmental Option, (BPEO) appraisal will be removed. In its place, planning strategies will undergo a Strategic Environmental Assessment (SEA) and sustainability appraisal.
4. When determining planning applications for new facilities, planning authorities will be "plan led". Generally developers will not be required to demonstrate a market need, nor to undertake a BPEO assessment.

7.1.2 Strategic Environmental Assessment

Under guidance issued by the Department of Environment, Food and Rural Affairs (DEFRA) in July 2005[8], Municipal Waste Management Strategies must be subject to a Strategic Environmental Assessment (SEA).

The SEA for Gloucestershire will be undertaken alongside the development of the JMWMS. This means that the findings of the SEA will influence the development of the JMWMS and maximise its positive impact on the environment.

SEA was introduced as a legal requirement for certain plans and programmes under a European Directive, the 'SEA Directive' (2001/42/EC), enacted in the UK under the *Environmental Assessment of Plans and Programmes Regulations 2004'*[9] in July of that year.

The aim of SEA is:

> "*to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development*"[10]

SEA does this by assessing the most significant impacts on the environment of the JMWMS and how these impacts can be managed to reduce negative effects and enhance positive features. When developing a framework for the SEA process, it is

[8] Guidance on Municipal Waste Management Strategies, DEFRA, July 2005 (paragraph 3.2).
[9] Environmental Assessment of Plans and Programmes Regulations, ODPM, 2004.
[10] SEA Directive 2001/42/EC (Article 1).

good practice to broaden the scope to encompass social and economic issues in addition to environmental issues.

In support of this, DEFRA's *Guidance on Municipal Waste Management Strategies* (July 2005), states that in addition to assessing environmental effects, authorities should undertake a through evaluation of social and economic factors. The SEA framework for Gloucestershire's JMWMS has therefore been scoped to encompass environmental, social and economic issues.

The Directive defines SEA as a procedure includes:

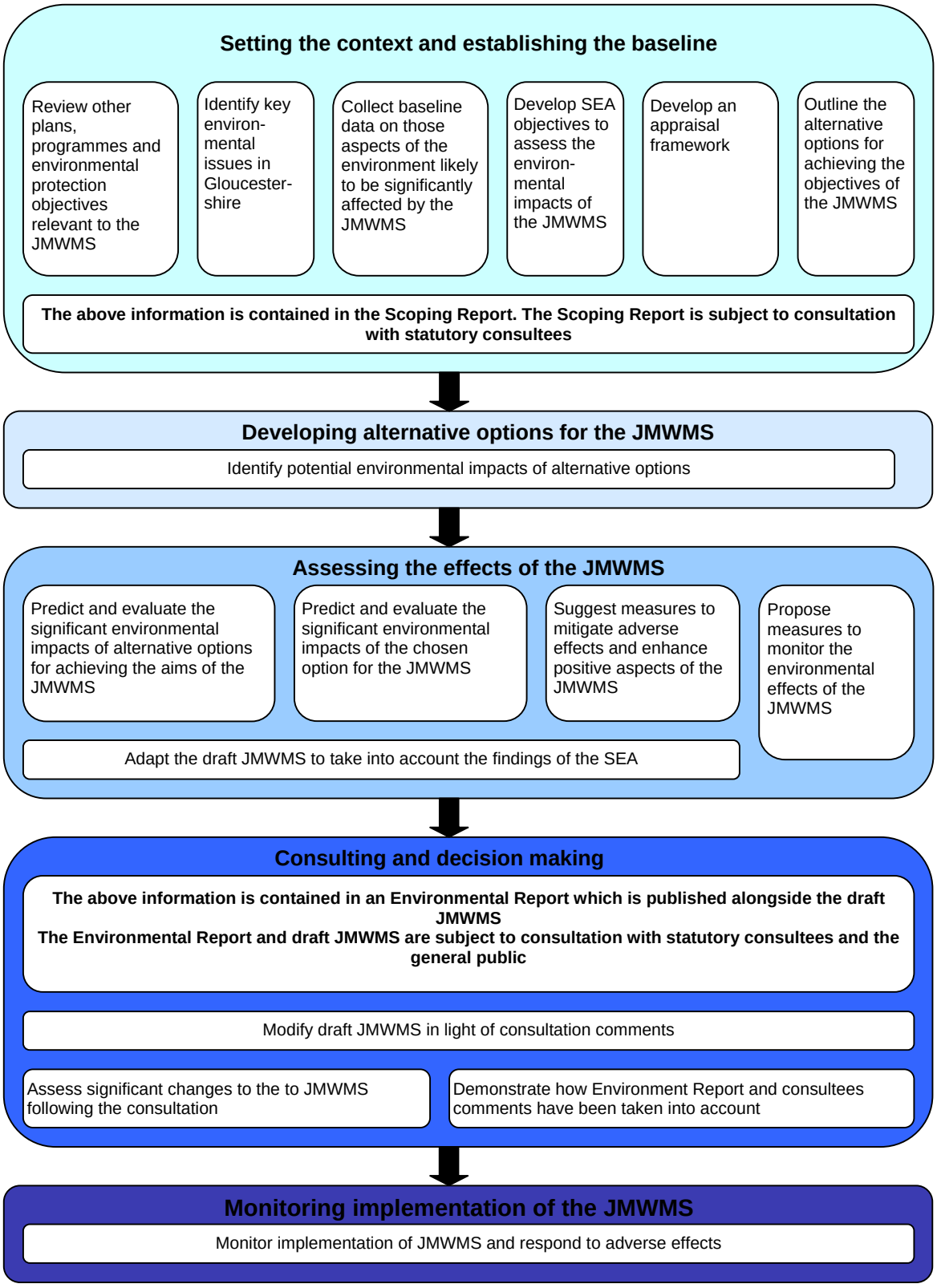
- Preparing an Environmental Report on the likely significant effects of the draft plan or programme;
- Carrying out consultation on the draft plan or programme and the accompanying Environmental Report;
- Taking into account the Environmental Report and the results of consultation in decision making; and
- Providing information when the plan or programme is adopted and showing how the results of the environmental assessment have been taken into account.

The SEA process adopted for the emerging Joint Municipal Waste Management Strategy for Gloucestershire will have two key outputs:

- **Scoping report:** this establishes appraisal objectives which will be used to assess the effects of the emerging JMWMS. The appraisal objectives will set out a description of the environmental baseline and the predicted future baseline; and provides a methodology and programme for appraising the emerging strategy.
- **Environmental report:** this will report on the detailed assessment of the likely significant effects of the emerging policies and alternative options of the JMWMS.

The stages in the SEA process are presented graphically in Figure 7.1.

Figure 7.2 The Main Stages in the SEA Process



8. Waste Technologies

A good understanding of the available waste management technologies is essential in order to understand how wastes produced within Gloucestershire can be managed most efficiently. This section of the report provides a technical review of a number of the technologies currently available for the treatment of municipal solid waste.

8.1 Composting

Composting can be defined as:

The breakdown of organic matter by micro-organisms in the presence of oxygen (air), producing water, carbon dioxide, ammonia, heat and a more stabilised, pasteurised organic material (compost).

The composting process is managed through a series of several distinct stages:

1. **Pre-composting**- designed to reduce the collected material to a format ideal to maximise the efficiency of the composting process. This generally includes the removal of any obvious contaminants (such as large plastic bags) together with shredding the material to the require particle size and subsequent mixing to homogenise the mass. At this stage additives such as wood chips may be added to improve the physical structure of the mix, ensuring that the pore space is such to allow an adequate supply of air (oxygen).
2. **Thermophilic Stage**- also known as Phase I or high temperature stage. Principal stage of material breakdown by micro-organisms raising the temperature of the composting mix to between 45^{o}C and 75^{o}C. This stage can last from anything between 3 days and several weeks depending on technology utilised and level of control exercised. Screening at the end of this stage removes oversize particles that can either be returned to the start of the process or disposed of.
3. **Mesophilic Stage**- also known as conditioning, Phase II or low temperature stage. Characterised by lower temperatures (40-45^{o}C) reached naturally due to the reduction in biological activity or artificially through forced aeration. This stage is generally longer than Stage 1, lasting from several days up to a number of weeks.
4. **Maturation Stage**- also known as the curing stage. Chemical processes and small biological activity at even lower temperatures (ambient- 40^{o}C) to produce a stable compost. Can last for several months depending upon the desired stability of the product required. Stability is marked by the potential for further decomposition and odour, together with the composts impact on the receiving soil (impact on soil carbon and nitrogen dynamics)
5. **Post-composting**- a stage that may or may not be required depending upon the type of composting technology used and the desired product quality. Generally this stage will divide the product into varying particle sizes, with any oversize particles potentially being returned to the composting process.

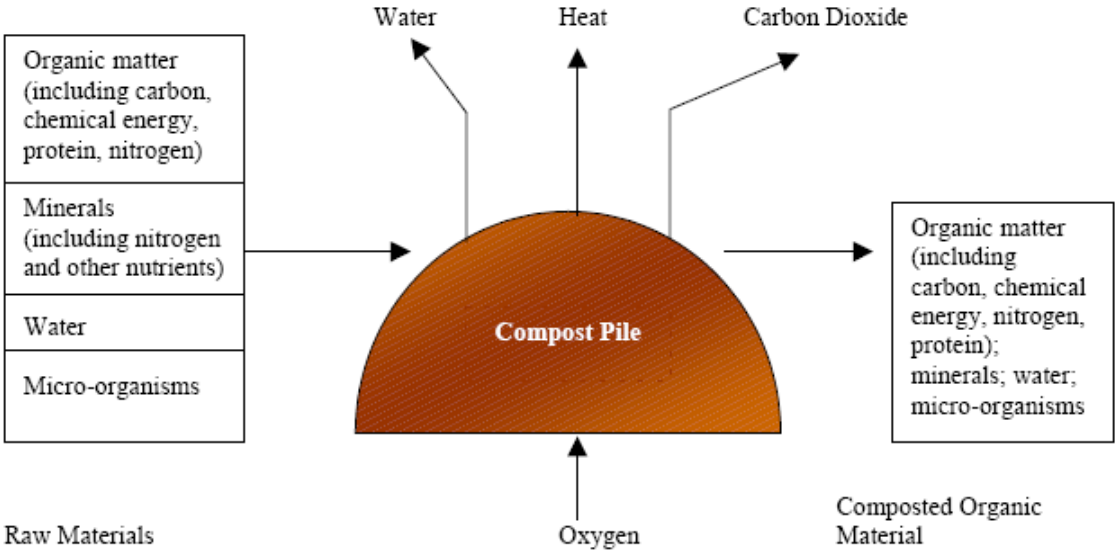
8.1.1 Windrow Composting

Windrow composting has long been recognised as a best practice method for composting green wastes, producing the highest qualities of waste derived composts compliant with PAS 100 standards.

Green waste is delivered to a reception area, is sorted to remove contaminants, and shredded. The shredded material is placed into windrows or tunnels which are typically triangular-shaped heaps of shredded material, measuring 4 metres width at their base and reaching 5 metres in height. The windrows are turned regularly (approximately every 10 days) to introduce fresh air, and water is added to maintain the ideal conditions for composting. The windrows are monitored throughout the composting process to ensure that the optimum temperature, oxygen concentration and moisture content are maintained.

The compost generally reaches maturation in approximately 12 weeks. At maturation the compost is placed on a trommel or sieve to extract oversized pieces. These can be separated from the compost, shredded and fed back into the windrows or tunnels.

Figure 8.1 The Composting Process[11]



The process can be split down into the following key stages:

1. **Waste Acceptance**
   Receipt of the waste, recording of source and contamination review

2. **Shredding**
   Shredding of input material and formation of windrows.

[11] Technical Guidance on Composting Operations – Environment Agency (2001)

3. **Moisture addition, adjustment**
   The moisture content of shredded green waste is 40-45% (w/w). Raising the moisture content to 50% or above will increase the rates of material breakdown and potentially reduce compost processing timescales.

4. **Active windrow composting**
   The turning of windrows on a regular basis (i.e. weekly) using mechanical plant and progressive moving through the site as the compost stabilises and matures. The sanitisation phase requires 5-6 weeks processing with weekly turning and subsequent monitoring of temperature and moisture content.

5. **Monitoring**
   Regular monitoring of the feedstock for temperature and moisture content throughout the composting process.

6. **Screening**
   Screening of the compost is usually undertaken with a trommel screen. Product ranges are dependent on end use, but typically the compost shall be screened to 10mm, 15mm, 25mm or 40mm. Oversize material are generally picked and reprocessed with fresh green waste. Highly contaminated waste products may be sent for disposal with other rejected waste and recorded on the weighbridge data system.

8.1.2 In-Vessel Composting

In-Vessel Composting is widely practised in Europe with many sites having been in operation for a considerable period of time. The technology has been less utilised within the UK , mainly due to the industry has only recently started developing to a scale where these types of operation become cost effective, and because until relatively recently green waste has been virtually the only material to be composted. In-vessel composting is becoming widely recognised by local authorities as a process which may assist in the achievement of LATS targets through the collection of organic wastes at the kerbside.

In-vessel systems offer a degree of control over the composting process which is not possible with open windrow composting. Monitoring of conditions within the waste mass permits optimum conditions to be maintained for sanitisation (in line with the Animal By-Products Regulations) and speed of degradation. Additionally the ability to capture all the process air enables odour to be controlled through the use of a biofilter.

There are a number of types of In-Vessel composting system, generally they can be divided into the following categories.

Table 8.1 Types of In-Vessel Composting

Type of In-Vessel composting System	Description
Container based systems	Container systems are based on a number of static or moveable containers ranging from <5m^3 to >175m^3. Modular system able to accommodate increasing waste throughputs. Containers can often be stacked allowing the footprint to be minimised. The loading of container based systems is usually either done through manual or plant handling or via a conveyor system.
Silo systems	Two types: *Dynamic systems* - the increased mixing rate of the waste input allows the system to treat 'wetter' wastes such as kitchen organics. In such cases, a ligno-cellulose 'buffer' is often added to aid the composting process and improve the quality of the end product, such as shredded green wastes. *Plug flow systems* - Vertical Composting Units (VCUs) are loaded from the top allowing the waste to flow through the system under its own weight while treated product is removed at the base. This system is more suited for drier wastes as there is less risk of compaction than in wet wastes. The disadvantage with plug flow systems is that the optimum composting process occurs in a 'hot-spot' in the centre of the column, where optimum heat and moisture levels occur. Although wastes must pass through this hot-spot during the compost process, it means there is uneven composting activity throughout the process unlike in some regulated systems.
Agitated Bay system	The feedstock is deposited between two walls along which turning and shredding machinery can move, or on runners above. This machinery turns the compost whilst moving it further down the bays as the compost matures. This provides aeration and a continuous flow movement for the process. Agitated bay systems often have forced aeration floor systems to regulate airflow and maintain the temperature throughout the composting process.
Tunnel composting systems	Two types: *Continuous Flow Systems* **-** Feedstock is loaded at one end and gradually pulled through the system by the use of a moving floor *Batch Systems* **-** Feedstock is loaded into the tunnel, processed, and then removed either by mechanical plant or conveyor. In either systems, a separate entrance and exit are required to comply with ABPR and so keep 'dirty' and 'clean' or sanitised wastes apart. Forced aeration is commonplace with tunnel composting systems, mostly through ducts fitted in the floor of the tunnel.
Enclosed Hall composting systems	Operated on a larger scale, usually undertaken under one roof with the feedstock resembling windrows. The turning of the feedstock by mechanical plant gradually moves the compost throughout the system. Aeration to the compost is either supplied through positive pressure; where air is forced up through the floor and through the composting material, or negative pressure; where air is sucked through the material. In either method the air is generally re-circulated and treated through a biofilter. The controlled airflow within the building also helps to regulate temperature and control odour emissions.

8.2 Anaerobic Digestion

Anaerobic Digestion (commonly referred to as AD or methanisation) is the process by which the biodegradable fraction of municipal waste is broken down to create biogas and a stabilised sludge or 'compost'. The process has many similarities with composting. The main difference between the two is the type of bacteria, which, in the case of AD, operate under anaerobic conditions and subsequently produces a biogas consisting of mainly methane (CH_4) and a lesser amount of carbon dioxide (CO_2). This gas can then either be separated and combusted or burnt in a combined heat and power generator. This has the added advantage of being able to feed heat and power back into what is a high-energy consumption process.

A serious consideration when deciding to use anaerobic digestion as a treatment process at all, will be the type of waste that is to be treated. Table 6.1 below summarises, those materials suitable for digestion under anaerobic conditions.

Anaerobic Digestion is more suited to either the mechanically separated organic fraction of residual waste, or separately collected garden and kitchen wastes. In both cases the material contains the type of composition preferable to anaerobic treatment (biogas production) and also is less likely to be contaminated with substances toxic to bacteria degrading the material. In addition, it is anticipated that the material is more likely to produce higher quality compost substitute and yield more biogas.

Table 8.2 Illustration of materials that can be degraded by anaerobic digestion

Waste Stream	Anaerobic digestion
Household garden material	✓
Household kitchen material	✓
Household residual wastes	(requires pre-treatment)
Parks waste	✓
Commercial organic wastes	✓
Commercial mixed wastes	(requires pre-treatment)
Straw	(only for bulking)
Wood	(only for bulking)
Coppice	(only for bulking)
General agricultural wastes	✓
Blood and meat wastes	✓
Poultry wastes	✓
Ruminant & pig wastes	✓
Sewage Sludge	✓

In the development of solutions incorporating anaerobic digestion there a number of factors that must be considered. These will influence plant configuration and design throughput. The first tier is based on the input material and the additional elements required taking this into account and the second tier is plant configuration and the process selection.

8.2.1 Segregated Organic (Bio) Waste

The collection of segregated green and kitchen wastes has the effect of removing the need for sophisticated front-end segregation systems. The material will need to be shredded/ milled and screened to <50mm particle size. Oversized material is fed back to the shredders until all is passed through. There are minimal rejects.

If the segregated fraction contains any material classified under the Animal By-Products Regulations (ABPR) a separate pasteurisation stage may be needed in order to meet the minimum treatment temperature requirements. If this stage is not included then only digestion under thermophilic conditions is likely to meet these standards and gain a Waste Management Licence.

The treatment of household segregated biodegradable fractions will lead to higher quality sludges for spreading to land or de-watering and use as a compost and the process is more likely to perform to claimed specifications and standards. However, for garden waste, a higher quality of compost and better economies can be achieved through aerobic composting. If kitchen waste is included, then the production of biogas and energy recovery provides an advantage over aerobic systems.

8.2.2 Mixed Municipal Wastes (including fractions from other processes)

The decision to use anaerobic digestion as a residual treatment process has a massive impact on the size, complexity and deliverability of the system. The main difference is the requirement for a proven pre-treatment phase. This will achieve the same function as with segregated waste treatment, to homogenise the input material and reduce the particle size. However, in addition to this, the technology employed will need to extract inerts and metals and to locate and remove materials likely to be toxic to the bacteria (e.g. split batteries, paints, chemicals etc). In reality, the anaerobic digestion phase will only treat a proportion of the residual waste delivered, with some waste sent for recycling and some for disposal.

AD has seen widespread deployment throughout Europe in the context of integrated waste management schemes. The use of AD in the UK has been mainly limited to the water industry for the treatment of sewage sludges.

8.3 Mechanical Biological Treatment

The term ‘Mechanical Biological Treatment’, or ‘MBT’, has been coined to describe a range of technologies and processes that are used in the management of Municipal Solid Waste (MSW). There is no single ‘MBT’ technology, but *all* MBT processes comprise at least two fundamental elements:

- A ***Mechanical*** processing step in which ‘raw’ or often source-separated MSW is treated to remove the most readily captured recyclables such as steel or aluminium from the mixed waste input, and the waste is often passes through mills and screens in order to control particle size and sometimes separate the waste into different size-fractions;
- And a ***Biological*** processing step, in which the input MSW or a part of the MSW is treated through at least some limited biological activity to change its characteristics. The biological element of the system can take the form of an

anaerobic or an aerobic process, depending on the desired end product or the technology supplier involved. The biological step may be limited to simple 'biodrying' in which the heat produced from initial biological decomposition is used to dry out and stabilise the waste, through to a more extensive composting or digestion step in which the aim is to produce a more useable compost-like product.

Different technology providers have different ways in which these two main process elements are put together. Indeed, some technology providers put the biological processing step in front of the mechanical processing step – this variant sometimes goes by the acronym 'BMT' ('Biological Mechanical Treatment').

The two main process types are:

- ***Biostabilisation*** – in which the great majority of the input waste-stream is subject to a biostabilisation step, where limited bio-drying activity takes place. The residue from this process is then disposed of to landfill as a more biologically stable material, or it can be used as a source of energy.
- ***Splitting*** – in which there is substantial mechanical sorting of the input waste stream, the different fractions then being subject to different processes. Typically, the smaller particle size material passes into a biological processing step, which can be either aerobic or anaerobic (or, indeed, both), the main product of which may be useable as a soil conditioner. The larger particle size material can often be used as a source of energy.

The main reasons for using MBT is to extract as many recyclables out of a mixed waste stream as reasonably possible, and to process the residue so that the amount of biologically active waste that ultimately gets sent to landfill is reduced. There are, however, a number of ways in which this can be achieved, and different permutations will give different outputs. The type of MBT process that is suitable for a particular application depends fundamentally on the objective for the process.

System outputs vary depending on the process employed and the degrees of separation desired, but generally consist of the following:

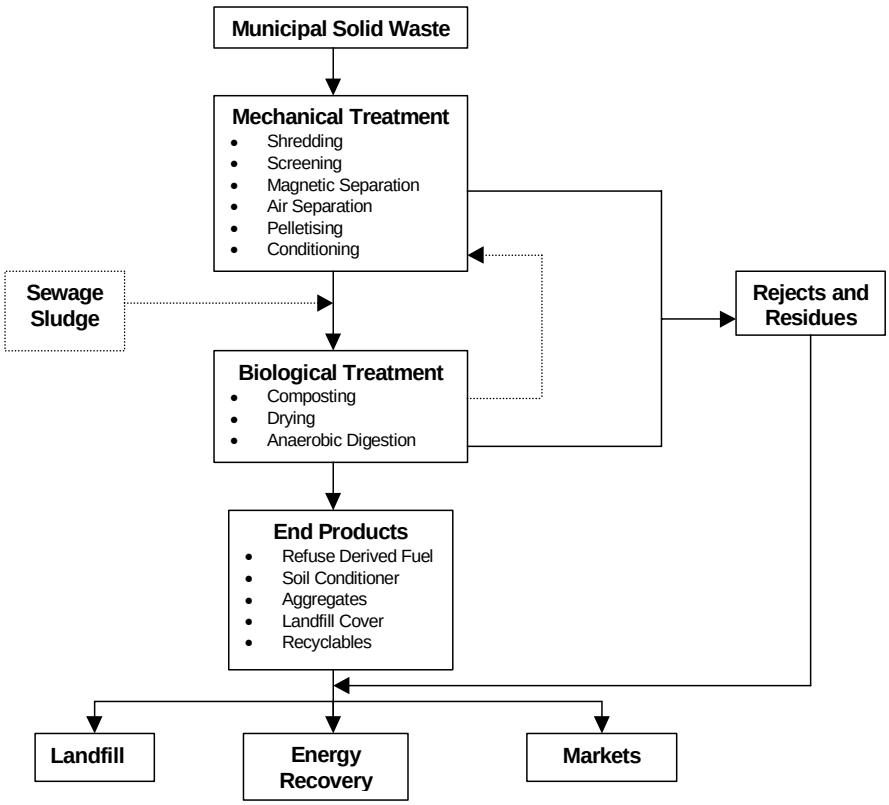
- Refuse Derived Fuel (RDF) or Solid Recovered Fuel (SRF);
- Compost/soil conditioner/landfill cover;
- Non ferrous metals;
- Ferrous metals;
- Glass;
- Plastics; and
- Stones (low grade aggregates).

All processes involve losses in terms of moisture and CO_2 as a result of the volume reduction, although some to a greater degree than others.

MBT has seen widespread deployment throughout Europe in the context of integrated waste management schemes MBT processes over the last ten years. The use of MBT in Europe is dominated by projects in Italy, Spain and Germany, although there are examples of projects in the Netherlands, Austria, Belgium, France, Portugal and

Poland. In the UK, many local authorities are moving towards integrated waste management solutions in the development of strategies and waste management plans, often incorporating MBT.

Figure 8.2 MBT Process Flow diagram



8.4 Conventional Combustion

Thermal processing of waste results in:

- Release of thermal energy or work
- Production of a flue gas comprising the gaseous products of combustion and the gases introduced into the process with the oxygen used in the combustion process
- Reduction of the non-volatile content of the waste stream into an ash.

A conventional combustor will receive the waste stream into a furnace. The furnace will operate at a temperature in the range of typically 850-1300ºC. Oxygen present in air introduced into the furnace will react with the waste, resulting in release of energy, production of gaseous by-products and reduction of the non-volatile components of the waste into ash.

A number of different types of furnace are possible – the three principal types being grate-based combustion, kilns and fluidised beds. The characteristics of grates and kilns a broadly similar, in that waste is introduced at the top of the grate or kiln and moves down the grate or kiln as it burns. Fluidised beds are different in a number of respects:

- They require a more sophisticated fuel feed system with a more homogenous feedstock (which may not be a problem for heavily pre-treated waste);
- They can incorporate in-bed reagents for control of pollutant emissions
- They can have inherently lower NO_x and CO emissions
- They can be sensitive to load variations.

Following the combustion furnace, the hot product gases will flow into a heat recovery section (usually integrated with the furnace) where the gases will be cooled by passing across water-cooled tubes. The water within the cooling tubes will evaporate to produce steam that can be used to drive a steam turbine and produce electricity. The condensed steam ejected from the steam turbine can be used in local applications requiring heat.

The cooled product gases are then passed through a flue gas treatment system in which the gas is contacted with reagents that remove contaminants prior to the ejection of the flue gas to atmosphere. The flue gas treatment process creates an additional, but small, flow of spent reagents that will require subsequent disposal.

8.4.1 Mass Burn Incineration (MBI)

This is commonly taken to mean the processing of MSW by means of conventional combustion with no or minimal pre-sorting of the waste stream. By virtue of the heterogeneous nature of the waste stream, mass burn incinerators tend to be based on moving-grate technology, which can process raw MSW more effectively.

8.4.2 Fluidised Bed Incineration (FBI)

This term is commonly used to describe incineration processes in which the combustion of the waste stream occurs within a single vessel. The combustion process relies on the intimate mixing of the waste stream with air (which provides oxygen) at a high temperature. The combustible material is oxidised and, in the process, releases energy (heat) and the products of combustion in the form of gases. The incombustible material is removed from the process as an ash.

A range of technologies employ conventional combustion, including moving grate, rotating kilns and fluidised bed. These technologies differ mainly in how they achieve the contact of the waste stream with the air stream. Some of these technologies require, or benefit from, the pre-processing of wastes.

8.5 Advanced Thermal Technologies (ATT)

This term is used to describe those technologies in which the various sub-processes that occur within conventional combustion are separated spatially, often with the intent of achieving a greater degree of control of the overall combustion process. The sub-processes include pyrolysis, gasification and oxidation.

8.5.1 Pyrolysis

The thermal degradation of material to produce char, oils and fuel gas. Pyrolysis usually occurs in the absence of oxygen and requires heat to provide a temperature in the range of 400-800ºC to effect the thermal degradation.

In a pyrolysis-based advanced thermal process, the waste stream will be introduced into the pryolyser. This takes the form of a heated vessel. The waste stream passes through the heated vessel, usually driven by a screw conveyor or an inclined rotating drum arrangement, and thermally decomposes producing a mixture of gas, oils, tars and char (a carbon-rich solid). The products of pyrolysis can then be presented to a conventional combustor or proceed to a gasification stage.

8.5.2 Gasification

Uses a controlled amount of oxygen and/or steam to break down the long chain hydrocarbons in the waste to produce gases with an energy value such as hydrogen, carbon monoxide and methane.

In the gasification stage, the products of pyrolysis will be reacted at a high temperature with a small amount of oxygen (insufficient to fully combust the products) or steam to convert the products into a fuel gas. Some technology suppliers introduce pure oxygen or high oxygen-content air to achieve a temperature within the gasifier that is sufficiently high to melt the solid ash residue, resulting, on cooling, in a vitrified solid. Gasifiers relying on air or steam will produce an ash residue, similar to that produced in a conventional combustor. The product fuel gas produced in the gasifier can then pass on to a simple gas furnace or to a gas engine.

8.5.3 Oxidation

The combination of oxygen (usually supplied by a stream of air) with the products of pyrolysis and gasification resulting in the release of thermal energy.

In a gas furnace, the gasifier product gas combines with oxygen present in the air introduced into the furnace resulting in the release of energy and production of gaseous by-products. The hot gases then pass into heat recovery and flue gas treatment stages, similar in concept and design to those used in conventional combustion systems. As with a conventional combustion system, the treatment of flue gases will lead to the production of a spent reagent waste stream. Again, as with conventional combustion, the condensed steam ejected from the steam turbine can be used in local applications requiring heat. This arrangement is conventionally termed a "heat" gasification system.

Alternatively, the gasifier product gas can pass into an engine (reciprocating or gas turbine) where it is ignited, resulting in release of motive energy to drive a turbo-alternator and produce electricity. In such a configuration, clean up of the fuel gas is required prior to entry into the engine in order to prevent damage to the moving parts within the engine. This arrangement is conventionally termed a "power" gasification system. The clean up of the fuel gas will lead to the production of effluents and solid wastes that will require subsequent disposal.

In reality, within a conventional combustion system, these same thermo-chemical processes are going on within the same vessel (see diagram below). The vessel could be thought of as comprising a number of different zones, and the actual thermo-chemical process taking place in each zone depends on its temperature and oxygen content. It is perhaps the heterogeneous nature of mixed municipal waste that gives the combustion technology designer a challenge with regard to its optimisation and control.

Some suppliers of advanced thermal technologies promote the concept that they can extract the gasifier product gas and use it as a feedstock for processes producing materials such as hydrogen, methanol or ammonia. Whilst this is commonplace in the petro-chemical industry where the feedstock (crude oil) is homogenous, it is not yet a proven concept on waste pyrolysis-gasification processes.

At present, due to the additional complexity, cost and technical risk associated with a "power" gasification system, many suppliers of advanced thermal technologies tend to couple their technology with a conventional steam cycle.

8.6 Mechanical Heat Treatment

8.6.1 Autoclave

Autoclaving technology has more traditionally been employed on clinical waste and other wastes arising in university/research establishment laboratories. The process is designed to sterilise throughput material leading to the total elimination of all biological life in the waste. Increased interest has recently been shown to use the autoclaving process as part of a pre-treatment stage for residual household waste/MSW.

Autoclaves use wet steam under pressure to clean materials, soften plastics and reduce biodegradable material into a fibre. The key process stages include: waste reception and storage, waste feeding, autoclaving, materials separation with recyclates recovery. Following the autoclaving or "cooking" process the materials can be more

easily and effectively separated in a MRF. An autoclave can be used instead of composting or AD element within an MBT process.

The primary product is a fibre. This comprises the putrescible, cellulose and lignin elements of the waste stream. It is understood that a number of development projects and joint ventures are being created to generate useful markets for the fibre. Alternatively the fibre could constitute a refuse derived fuel.

The secondary streams comprise of mixed plastics which have normally been softened and deformed which eases separation, a glass and aggregate stream which can be exceptionally clean of both plastic and paper and separate ferrous and non ferrous metals. The heat and steam and rotating action of the autoclave vessel strip of labels and glues from food cans leaving a very high quality ferrous/non-ferrous stream for recycling.

Previous use of Autoclaving in the UK has been limited, but the process is well proven on clinical waste. Over the past year however a number of companies have been offering Autoclaving as a treatment option for MSW to Local Authorities.

Table 8.3 Summary of Strengths and Weaknesses of Waste Technologies

Waste Technology	Strengths	Weaknesses
Windrow Composting	• Proven technology • Relatively low operating and capital costs • Simple equipment • Produces a range of marketable compost grades and reasonably easy to achieve PAS 100 accreditation. • Can contribute to BV 82 (a) & (b) • Generally receives a high level of support from the general public, and this may be fostered by the ability to deliver green waste and collect compost at any particular facility. • Can be operated at low cost by third parties (e.g. on-farm composting) removing the requirement to locate new sites for facilities. • Low planning risk	• Only suitable for green waste composting • Site selection issues due to EA restriction on locating facility within 250m of housing in order to minimise risk of air-borne bio-aerosols. • Constant monitoring to ensure optimum aerobic conditions maintained through windrow • Not suitable for kitchen organic wastes
In-vessel Composting	• Suitable for kitchen organic wastes, including meat and can comply with the Animal By Products Regulations • Often modular systems allowing capacity to be increased • Generally a fully enclosed system – less impact on dust, odour, bio-aerosols • Can contribute to BV 82 (a) & (b) • Compost produced can exceed the quality requirements of proposed European standards • Can contribute to high diversion of biodegradable waste from landfill • Monitoring can be done remotely or fully computer controlled • Often highly regulated systems allowing for change in composting conditions to achieve the optimum temperature and moisture levels • Greatly varying sizes and capacities of in-vessel module allow it to have a wide range of applications	• Higher risk of contamination than green waste composting • Risk of finding markets for compost • More expensive to operate and maintain than windrow composting • A large number of 'in-vessel' composting solutions are currently being marketed at greatly varying levels of quality and design

Waste Technology	Strengths	Weaknesses
Anaerobic Digestion	• Numerous reference plants operating on MSW in mainland Europe • Suitable for kitchen organic wastes, including meat and can comply with the Animal By Products Regulations • Allows food waste to be recycled and potentially used as an agricultural fertiliser. • Production of a biogas enabling renewable energy on demand. • Can contribute to BV 82(a), (b) or (c) dependant on the quality of the final product • Can be integrated with other waste infrastructure as part of a waste management solution (e.g. MRF and in-vessel composting) • Can be configured to generate a number of different outputs, e.g. RDF, biogas or soil conditioner • Electricity generated from AD Biogas is eligible under the ROCs scheme	• High capital and lifecycle costs • The technology is relatively under-developed in the UK for food waste, although very mature for sewage sludge stabilisation. • It is highly dependent on the collection of source separated organic waste • Greater visual impact than some other treatment technologies due to the digestion tanks • The majority of systems are net users of water • Can require some pre-treatment for MSW use
Mechanical Biological Treatment	• Numerous reference plants operating on MSW in mainland Europe • Can be modular in design capacity, allowing expansion • Suitable for kitchen organic wastes, including meat and can comply with the Animal By Products Regulations • The technology can be integrated with source segregated recycling and can recover additional value from the residual fraction. • Plant design can maximise water efficiency, effluent disposal and odour/dust control. • All waste activities are generally fully contained within an enclosed building, which can make gaining planning permission easier. • Volume reduction via release of process losses such as water and carbon dioxide • Separation of recyclable materials such as metals and low grade aggregates of which some can contribute to BV 82(a) • Can produce a stabilised biowaste in the form of compost or soil conditioning material and/or a high calorific fraction (RDF or SRF)	• Limited UK market for RDF and MBT derived soil conditioners at present • Compost fraction resulting from treating residual waste cannot be applied to agricultural land • Market failure would result in RDF and compost having to be landfilled leading to implications for achieving BMW diversion targets. • Only two commercially operational plants in the UK (one not integrated) so still perceived as an emerging or new technology. • Varying operational and capital costs from wide range of available 'MBT' solutions from numerous providers • Can require a large footprint dependant on the technology configuration chosen

Waste Technology	Strengths	Weaknesses
	• Proven technology in a number of other Countries • Some MBT plants can generate a mix of RDF and soil conditioner to avoid the reliance on one output stream • Some potential flexibility in the end product (e.g. switch from RDF to soil conditioner) • Generally the visual impact is similar to other types of waste facility of similar input size.	
Conventional Combustion	• Proven waste treatment method in the UK • Suitable for a wide range of wastes, including untreated MSW • Can contribute to BV 82(c) • Potential for energy recovery of Combined Heat and Power (CHP) schemes • Recent technology development has made conventional combustion more affordable on a smaller scale • Total diversion of BMW	• May need modification to accept higher calorific value fuels such as RDF • Poor public perception of incineration • Large footprint generally required • High planning risk • Requirement for ash disposal of which a proportion is deemed hazardous • Public concern over atmospheric emissions • High visual impact due to stack height (can be minimised through plant design)
Advanced Thermal Treatment	• Can contribute to BV 82(c) • Can accept higher calorific value wastes, e.g. RDF • Facilities can be built for low tonnage throughputs making them suitable for regional facilities and reduces the required footprint. • Smaller visual footprint that conventional combustion • Process efficiency generally lower than conventional combustion • Potential for energy recovery of Combined Heat and Power (CHP) schemes	• Requirement for some form of waste preparation prior to combustion • High lifecycle costs • Relatively unproven of municipal wastes in the UK, although successful trials have been run on clinical wastes • Better public perception that conventional combustion, but still viewed as incineration • Requirement for ash disposal of which a proportion is deemed hazardous • Planning risks associated with combustion technologies
Mechanical Thermal Treatment	• Proven on non-MSW applications • Process sterilises the waste • Enhanced removal efficiency for recycling; labels and glue are stripped away from food cans can increase the quality of metal recyclates • High volume reduction • Recovery in the form of secondary recycling and RDF production could displace virgin materials and fossil-fuel. • Materials can be easier to segregate from the treated material due to heat deformation	• To date, no commercially operated MSW plants in the UK • Perceived as new technology - local authority & funder concerns about risk-taking • Underdeveloped markets for recovered fibre: either as RDF or as a secondary material for composite building products (e.g. roofing tiles) • Products of combustion would result from subsequent use of RDF for energy recovery • The liquor from the process has a high BMW content and requires treatment if not to count towards LATS • Concerns over markets for recovered fibre

Appendix 1
Relevant Waste Legislation

X Pages

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
Hazardous Waste (England and Wales) Regulations 2005 and the List of Wastes (England) Regulations	These will replace the **Special Waste Regulations 1996** (as amended) in 2005. The new regulations are designed to discourage the production of hazardous waste, ensure the safe management of hazardous waste produced and to set tighter limits on hazardous waste sent to landfill.	• Requires registration of producers of hazardous waste (including CA sites). • More streamlined procedures for monitoring movements of hazardous waste. • Possible requirement to separate hazardous and non-hazardous waste and different types of hazardous waste. • Possible requirement for separate household collections for hazardous waste – cost implications for LAs. • Possible requirement for additional reception facilities for segregation at CA Sites – cost implications for LAs. • Additional wastes now classified as hazardous which had not previously been classified (e.g. computer monitor, televisions with cathode ray tubes, end of life vehicles). • Producers of hazardous waste must register with the Environment Agency to ensure that the waste is sent to an appropriate recovery or disposal facility.	16-Jul-05.	High
EU Landfill Directive (1999/31/EC) enacted through **Landfill (England and Wales) Regulations 2002**	The Directive aims to reduce the quantity of waste entering landfill. The directive implements a complete ban on certain hazardous wastes, liquid wastes and tyres entering landfill. Landfill sites are to be classed into three categories: hazardous, non-hazardous and inert. Under the directive, waste entering the landfill will be treated and the co-disposal of waste to be phased out. The directive also sets reduction targets for the amount of biodegradable waste sent to landfill.	• Ban on specific wastes disposed of to landfill (2003 whole tyres, 2006 shredded tyres; 2002 liquid hazardous waste, plus other hazardous wastes). • Requirements to pre-treat waste disposed of to landfill (2004 hazardous waste, 2007 all other wastes). • Co-disposal of waste to be phased out. • Targets for reduction of biodegradable waste (2010, 2013, 2020). • Reduction in number of landfill sites permitted to accept hazardous waste. • Major cost increase anticipated for disposal of Hazardous Waste collected at CA sites including asbestos and separately collected fluorescent tubes. • Current lack of treatment capacity for banned wastes.	15-Jun-02	High

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
Waste and Emissions Trading (WET) Act 2004 & Landfill Allowance and Trading Scheme (England) Regulations 2004	The WET Act is a new measure which the government is using to meet the demands of the European Landfill Directive. The WET Act is implemented in England through The Landfill Allowance Trading Scheme (LATS). This scheme sets progressively tighter restrictions on the amount of biodegradable municipal waste that disposal authorities can landfill.	• Allocation of a set amount of 'landfill allowances' annually to each waste disposal authority. • Authorities must ensure that they do not exceed their annual limits each year or, if they intend to landfill more than their allowance, buy more permits from other authorities who may have a surplus. • Heavy fines (circa £150/tonne) to waste disposal authorities, which dispose of more biodegradable waste than they have allowances for. • Urgent investment in recycling, composting and treatment infrastructure required to reduce BMW content of waste disposed to landfill. • Financial risks of landfill allowance trading. • Uncertainty of future availability of landfill allowances for trading.	01-Apr-05	High
Household Waste Recycling Act 2003	The Act amends the **Environmental Protection Act 1990** and requires all English local authorities to provide kerbside collections for all householders for a minimum of two materials by 2010.	• Higher degree of separation at the kerbside. Every local authority to collect a minimum of 2 recyclable materials from the kerbside from 2010. • Impact on WCAs collection arrangements, contracts, vehicles and cost. • Impact on available capacity of recycling infrastructure for segregation, bulking and baling.	30-Oct-03	High
Animal By-Products Regulations 2003 (SI 1482/2003)	Enforces **EU Regulation (EC) No 1774/2002 (as amended)**. It permits the treatment in approved composting and biogas plants of catering waste and other low risk (Category 3) animal by products.	• Increased cost of composting bio-waste in approved facilities. • Only green waste can be composted in open air windrow composting facilities. • Longer commissioning time for new facilities becoming operational. • Market constraints for compost.	01-May-03	High

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
Environmental Protection (Duty of Care) Regulations (Amendment) 2003;	Under the Environmental Protection Act 1990, a Duty of Care licence is imposed on persons who produce, import, carry, keep, treat or dispose of controlled waste.	• aims to prevent the escape of waste • ensure that waste is only transferred to an authorised person or to a person for authorised transport purposes • ensure that a written description of the waste is attached to the waste when transferred • prevent persons disposing, treating or storing controlled waste that is likely to cause environmental pollution or affect human health.	20-Feb-03	Medium
Renewables Obligation and associated Renewables (Scotland) Obligation	It requires power suppliers to derive a specified proportion of the electricity they supply to their customers from renewable sources. This starts at 3% in 2003, rising gradually to 10% by 2010. The cost to consumers will be limited by a price cap and the obligation is guaranteed in law until 2027.	• Eligible renewable generators receive Renewables Obligation Certificates (ROCs) for each MWh of electricity generated. These certificates can then be sold to suppliers, in order to fulfil their obligation. • Increasing proportion of renewable energy to be used (3% in 2003, 10% by 2010). • Source of possible income stream from waste recovery processes to offset capital cost of development.	01-Apr-02	Low
Waste Electrical and Electronic Equipment Directive (2002/96/EC)	The WEEE Directive aims to prevent the production of waste electrical and electronic equipment and encourages the reuse, recycling and recovery of WEEE. Regulations in the UK are expected summer 2005 and various Directive requirements are due to come into force in 2005 and 2006.	• Restrictions on the use of hazardous substances in electrical and electronic equipment. • A compulsory household collection target of 4 kg by 2006, with a new target for 2008 • Compulsory producer responsibility for the management of consumer WEEE waste • Producers able to use collective or individual financing schemes • Measures to minimise the disposal of WEEE by consumers as mixed municipal waste • Producers banned from preventing re-use or recycling of products with "clever chips"	The Directive came into force Feb 2003.	Medium

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
		• Increased segregation of WEEE at CA sites – storage capacity and cost impacts. • Possible amendment to the existing waste management licensing regime to implement the permitting requirements of the WEEED		
Ozone Depleting Substances Regulations 2002	The regulations requires all CFCs and HCFCs including that contained in the insulation foam to be removed from refrigeration equipment before such appliances are recycled or disposed of.	• Requires substantial processing of redundant fridges and freezers. • Fridges and freezers now classified as special/hazardous waste as a consequence of containing CFCs. • Local authorities required to make special arrangements for the storage and disposal of fridges/freezers at additional cost.	01-Jan-02	Medium
ROHS Directive (2002/95/EC)	The purpose of this Directive is to approximate the laws of the Member States on the restrictions of the use of hazardous substances in electrical and electronic equipment and to contribute to the protection of human health and the environmentally sound recovery and disposal of waste electrical and electronic equipment.	• from 1 July 2006, new electrical and electronic equipment put on the market cannot contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).	01-Jul-06	Low
Waste Incineration Directive (2000/76/EC) enacted in the UK through **The Waste Incineration (England and Wales) Regulations 2002 (SI 2002 No, 2980)**	Incorporates and extends the requirements of the **1989 Municipal Waste Incineration (MWI) Directives (89/429/EEC and 89/369/EEC)** and the **Hazardous Waste Incineration Directive (94/67/EC)**, forming a single Directive on waste incineration and repealing those three Directives from 28 December 2005. The Directive aims to reduce emissions to air, water and land from the incineration of non-hazardous wastes.	• Sets more stringent controls (air, water, land) on municipal waste incineration plant than 89/369/EEC and 89/429/EEC which are only concerned with certain emissions to air. • New plants required to comply by 2002, existing plants by December 2005.	28-Dec-02	Medium

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
End of Life Vehicles Directive (2000/53/EC) enacted through **The End of Life Vehicles Regulations (SI 2635)**	The main requirements of the Directive are to ensure that producers limit the use of certain hazardous substances in the manufacture of new vehicles and automotive components, and promote the recyclability of their vehicles	• ELVs are subject to de-pollution prior to dismantling, recycling or disposal. • Applies new environmental standards to existing licensed sites • requires operators working under a registered exemption to apply for a site licence (if they wish to continue to accept vehicles which have not been de-polluted). • sets new minimum technical standards for all sites that store or treat ELVs. • recovery and recycling targets to be met by 1 January 2006 and 1 January 2015. • By 2007, producers to pay 'all or a significant part' of the costs of treating negative or nil value ELVs at treatment facilities.	03-Nov-03	Medium
Local Government Act 1999 (Best Value) (Cover LGA 1972 as Joint Waste Board falls under this)	The Local Government Act 1999 introduced Best Value in England, requiring that local authorities provide services to the community, which are considered to be of Best Value. The core of Best Value is the 4 C's: challenge, compare, consult and compete.	• Requirements to report service performance against Best Value Performance Indicators (BVPIs) • Requirements to undertake Best Value Reviews • Services subject to the 4 C's: challenge, comparison, consultation and competition.	01-Apr- 00	Low
Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC) enacted in the UK through **The Pollution Prevention and Control (England and Wales) (Amendment) Regulations 2000**	The IPPC Directive replaced the IPC (Integrated Pollution Control) system and lays down measures designed to prevent, or where that is not practicable, reduce emissions to air land and water from these activities, including measures concerning waste.	• Change of thresholds that determine which installations require IPPC. • inclusion of additional activities on the permitted list of installations. • requirements for ongoing monitoring.	01-Apr-00 (Transition period until October 2007)	Medium

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
Waste Minimisation Act 1998	This Act provides for the authority to undertake and fund any action which is intended to minimise the production of waste.	• Increased powers to local authorities to promote and educate about waste minimisation. • Development of waste minimisation strategies/plans, campaigns to promote minimisation etc.	19-Nov-98	Low
Disposal of Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls (PCTs) Equipment Directive (96/59/EC) implemented as **The Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous substances) (England and Wales) Regulations 2000 (SI 2000 No. 1043)**	The regulations affect all holders of PCBs, but contain particular requirements for holders of contaminated equipment.	• where practicable, PCB containing equipment which is contained within another piece of equipment shall be removed and collected separately when the latter equipment is taken out of use, recycled or disposed of. • PCB containing equipment will need to be treated as special waste. • all contaminated equipment containing more than 50 parts per million (ppm) and a volume of PCB material in excess of 5 litres needed to be registered by 31st July 2000 with the EA. • requirement to dispose of PCBs >500 ppm by 31st December 2000	04-May-00	Low
European Hazardous Waste Directive (91/689/EEC enacted in the UK through **Special Waste Regulations 1996**	The Directive sets out the requirements for the controlled management of hazardous (special) waste. Amended by the Special Waste (Amendment) Regulations 1996, the Special Waste (Amendment) Regulations 1997 and the Special Waste (Amendment) (England & Wales) Regulations 2001	• The Regulations apply to any operator who collects, transports or recovers special waste unless activities are authorised by a waste management licence or the waste management activity is exempt from licensing. • Introduction of a consignment note system that requires waste to be accompanied by a note from the point of production to disposal. • Special waste must not be mixed into different categories or mixed with non-special waste. • Operators of waste management facilities who make a deposit of special waste in or on land must record the location of each deposit.		

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
	The Regulations updates the Control of Pollution (Special Waste) Regulations 1980 on defining special wastes in order to conform to EU legislation on hazardous wastes.	• Where liquid wastes are discharged directly into underground strata only a written statement of the quantity and composition of the waste and the date of its disposal is recorded.	01-Sep-96	Medium
Landfill Tax Regulation 1996	Landfill Tax is an environmental tax paid on top of normal landfill rates by any company, local authority or other organisation that wishes to dispose of waste in landfill. It is intended to encourage alternative means of waste disposal, such as recycling, by reflecting the environmental costs of landfill use more accurately in its price.	• Tax on every tonne of waste disposed of to landfill. • Two rates of landfill tax: a standard rate of £15 per tonne for active waste; and a lower rate of £2 per tonne for inert materials. • annual increase in the standard rate of £3 per tonne from 2005, with the medium- to long-term objective of reaching a rate of £35 per tonne. • Increase in fly-tipping and unlicenced waste disposal sites.	01-Aug-96	High
Environment Act 1995	This Legislation amended requirements from existing legislation (including the EPA 1990) to rationalise the requirements to plan effectively for waste.	• Require the preparation of a national waste strategy. • established the Environment Agency as the regulatory body for the management and disposal of waste in England and Wales. • the introduction of the principal of BPEO for each waste stream • the prioritisation of selected waste streams such as tyres and construction wastes • the introduction of the Producer Responsibility Obligations Section 93 (Packaging Waste) Regulations • the repealing of waste disposal plans set up by local waste authorities under the 1990 Environmental Protection Act.	19-Jul-95	Medium

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
Waste Directive (91/56/EEC) enacted in the UK through the **Waste Management Licensing Regulations 1994 (SI 1994/1056)** amended 1995 (SI 288), 1996 (SI 634), 1997 (SI 351, SI 2203), 2005 (SI 1728).	The Regulations implement and update the licensing and monitoring systems for waste disposal on land, under the **Environmental Protection Act 1990**. The main objective of the waste management licensing system is to ensure that waste management facilities do not pose a serious risk to the environment, human health or detriment to the amenities of the locality.	• Facilities and plant to be licensed by the Environment Agency to ensure that the authorised activities do not cause pollution of the environment, harm to human health or serious detriment to local amenities. • Facilities must be licensed before operations can commence. • Ongoing monitoring of compliance with licence conditions by the EA. • For some operations, licensing under the Waste Management Licensing Regulations is being progressively replaced by permitting under the Integrated Pollution Prevention and Control regime. The latest amendments, through the WML (England and Wales) (Amendments and Related Provisions) (No.3) Regulations 2005, Statutory Instrument 1728 came into force on July 1 2005, but with a transitional period imposed to cover existing exemptions until Oct 1 2005. • Registration of exemptions • Charging policy • Renewal of registration of an exemption • Record keeping • Transitional provisions • Changes to Exemption conditions for certain waste applications	01-May-94	Medium
Packaging and Packaging Waste Directive (94/62/EC) & (2004/12/EC) enacted through the **Producer Responsibility (Packaging Waste) Regulations 1997**	Producer Responsibility legislation which lays down essential requirements as to the composition, reuse recovery and recycling of all packaging waste.	• National requirement to recycle between 55% and 80% of packaging waste and recover a minimum of 60% by 31 December 2008.	06-Mar-97	Low

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
Transfrontier Shipment of Waste Regulations 1994 (Directive 93/259/EEC)	Introduces a system of control governing the shipment of wastes across national boundaries. The controls aim to ensure a high level of protection of the environment and human health.		06-May-94	Low
Controlled Waste Regulations 1992	These Regulations provide for certain descriptions of waste to be treated as household waste for the purposes of the EPA (1990).	• Legal definitions of the controlled wastes (household, commercial and industrial) • Certain types of litter and refuse to be treated as controlled waste • Ability to charge for the cost of collection of certain types of household waste. • Exemptions from the requirement for licensing under the Environmental Protection Act 1990 are specified.	01-Apr-92	Medium
Environmental Protection Act 1990	The EPA 1990 implements the Waste Framework Directive (75/442/EEC). It makes provision for the improved control of pollution arising from certain industrial and other processes and re-enact the provisions of the Control of Pollution Act 1974 relating to waste on land with modifications as respects the functions of the regulatory and other authorities concerned in the collection and disposal of waste.	• Defines the duties of waste collection authorities to provide a number of services, for the collection of household waste; the collection of commercial/industrial waste when requested; the development of a recycling plan; and street cleansing. • Defines the duties of waste disposal authorities to provide facilities for the disposal of waste collected by the Collection Authorities and locations where householders can bring waste for disposal.	01-Nov-90	High

Legislation	Description	Implications	Date of enforcement	Impact (High, medium, low)
Waste Framework Directive (75/442/EEC) implemented in the UK through the Environmental Protection Act 1990, amended by the Environment Act 1995 and also by various regulations.	Requires EU Member States to encourage the prevention or reduction of waste and its harmfulness by encouraging the development of clean technologies, technical product improvements and disposal techniques. In addition, they must encourage the recovery of waste (including its use as a source of energy) and prohibit uncontrolled dumping. Amended by council directive 91/156/EEC and adapted by council directive 96/350/EC).	• System for the coordinated management of waste within the community • Foundation for sustainable waste management • Defines waste and introduces the principles of the waste hierarchy, proximity principle and self sufficiency • Requires that the designated national Authorities draw up a waste management plan.	15-Jul-75	Low