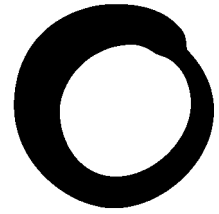


September 2010



**Friends of
the Earth**

Report

More jobs, less waste

Potential for job creation through higher rates of recycling in the UK and EU

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Executive Summary

As the UK and the rest of Europe attempt to recover from the global financial crisis and the consequent recession, we are entering a period in which Governments are urgently seeking solutions to curtail the size of the public sector, whilst encouraging innovation and enterprise by a hesitant private sector.

At the same time, despite the failure of Copenhagen, the imperative of climate change and the need to advance to a low carbon economy remains undimmed and urgent.

Our view is that these challenges can be met together. We have an opportunity to create valuable and sustainable 'green jobs' and this is even more important in the present economic situation. At a time when overall government spending on the environment is set to fall, the recycling and reuse sector can make a major contribution to the green economy.

In this report, we have identified the contribution of the recycling sector and its supply chain over the last decade and tracked the growth of employment in this sector as recycling rates and tonnages have increased. We have examined previous studies from the UK, EU and United States to establish trends and identify inconsistencies. There are limitations both on the quality and quantity of data on employment and waste generation both in the UK and EU. However, we have used the best available data and a transparent and defensible methodology to estimate the potential employment creation contribution the resource management industry could

deliver if much higher targets for recycling and reuse were implemented. This has taken account of potential incremental direct employment, indirect, and induced employment but has not quantified displaced jobs in sectors less in demand in the new low carbon economy, such as landfill.

On a European level, if a target of 70% for recycling of key materials was met, conservative estimates suggest that **across the EU27 up to 322,000 direct jobs could be created in recycling an additional 115 million tonnes of glass, paper, plastic, ferrous and non ferrous metals, wood, textiles and biowaste. These jobs would have knock on effects in down and upstream sectors and the wider economy and could create 160,900 new indirect jobs and 80,400 induced jobs. The total potential is therefore for more than 563,000 net new jobs.**

For the United Kingdom, if an ambitious but achievable recycling target of 70% for municipal waste was set and achieved by 2025, then conservative estimates suggest that **across the UK this could create 29,400 new direct jobs in recycling, 14,700 indirect jobs in supply chains and 7,300 induced jobs in the wider economy relative to 2006. Of these potential 51,400 total new jobs some 42,300 might be in England with an estimated 4,700 in Scotland, 2,600 in Wales and 1,800 in Northern Ireland.**

Projections for achieving similar rates of recycling for commercial and industrial (C&I)

waste (albeit on less robust data) suggest that **achieving the 70% target could lead to at least an additional 18,800 total new C&I recycling related jobs - on top of municipal recycling related jobs - of which 10,800 would be direct, 5,400 indirect and 2,700 induced.** Again these would mainly be in England but **at least 6,500 would be in Scotland, 3,600 in Wales and 2,450 in Northern Ireland.**

All too often, the employment and social dimensions are overlooked when considering waste and resource policy. This study focuses exclusively on the potential for employment creation through higher levels of recycling and reuse of resources in order to provide an additional contribution to the debate on future waste policy. However,

it should be seen firmly in the context of a sustainable development approach in which economic, social and environmental considerations work together to create a greener economy based on quality of life whilst using resources more effectively. In the new green economy, better use of materials formerly seen as waste, creating jobs closer to home in many instances and retaining value in the local and national economy should be seen as important policy objectives.

At the meeting point between resource efficiency and economic recovery, it is time for 'more jobs, less waste'.

Introduction and scope of this report

The UK has experienced the deepest economic recession since the Second World War and as a direct consequence unemployment figures have reached 2.51 million in early 2010 (ONS, 2010). The economy is now facing huge pressures for efficiency and demands to reduce waste on every level. The Coalition Government has stated its intention to decarbonise the economy and support the creation of new green jobs and technologies alongside a broader strategy of 'rebalancing' the economy by reducing the size of the public sector and focusing attention on the expansion of employment in the private sector. Specifically in "Our Programme for Government" (HMG, 2010), the Coalition Government has stated an intention to work towards a 'zero waste' economy and encourage councils to pay people to recycle. It also intends to encourage a huge increase in energy from waste through anaerobic digestion.

Europe's Vision 2020 (European Commission, 2010) for Europe's social market economy for the 21st century recognises the need for a strategy to help Europe emerge from the economic crisis as a smart, sustainable and inclusive economy with high levels of employment, productivity and social cohesion through three mutually reinforcing priorities – smart growth, sustainable growth and inclusive growth. A 'Resource efficient Europe' is one of seven headline targets in order to help decouple economic growth from the use of resources and support the shift towards a low carbon economy.

There are opportunities to contribute to all of these objectives by increasing the rate of recycling of key materials across Europe. Friends of the Earth's study '*Gone to Waste*' (FOE, 2009) estimated that around half of all the key recyclables available in the municipal and commercial and industrial (C&I) waste streams in 2004 were still being sent for disposal. If this material had been recycled it would have saved 148 million tonnes CO₂eq emissions and would have had a minimum potential monetary value of €5.25 billion. Across Europe, there is now a growing recognition of the job opportunities to be realised from this valuable resource. If this waste was recycled, reused or remanufactured it could provide the basis for an expanded recycling and resource management industry, creating many more 'green jobs' in reprocessing, sorting and collecting of recyclables.

This short desk research study has attempted to quantify - using a clear and defensible methodology - the potential jobs that could be created through increasing the recovery and reuse of resources beyond the 50% target currently set by the Waste Framework Directive (European Commission, 2008) and directing waste away from the residual waste stream. The analysis has been undertaken in the context of the 'New Austerity' reflecting current and projected depressed economic growth rates, constraints on public spending and strategies to promote the growth of 'green economies' and 'green jobs'.

The primary focus of the work is on the UK and EU27 municipal waste streams. C&I

and Construction, Demolition and Excavation (CD&E) are also covered, but to a lesser extent, due to the limited and often inconsistent data available for these waste streams.

It should be noted that this study is a first attempt, using existing data sources and co-

efficients for jobs per thousand tonnes of material and jobs multipliers derived from other studies. It is intended as an illustration of the order of magnitude of the opportunity for jobs through higher recycling targets rather than as a definitive statement.

Summary of previous work on employment creation through recycling and more sustainable resource use: United States, European Union and United Kingdom

Current employment in the waste management and recycling sector

While there are many gaps in availability of data and inconsistencies in methodology, studies and data from the United States (US), European Union (EU) and United Kingdom (UK) show that recycling contributes significantly to the economy through Gross Value Added, tax revenues and by providing jobs. Current estimates are of more than a million jobs in the US (US EPA, 2002) and 1.8 million in the EU27

(Ernst and Young, 2006), of which an estimated 0.12 million are in the UK (ONS, 2010). The definition of the sector is not standardised but in different studies is taken to include some or all of the activities in Figure 1. With the exception of the UK, data on employment are not regularly reported but have been estimated in one-off studies, of which the US national studies are the most comprehensive.

Figure 1: Activities related to recycling, reuse and remanufacturing of municipal, commercial and construction wastes



United States

The US generates 254 million tonnes of municipal waste a year (2007) of which 85 million tonnes (33.4%) is recovered for recycling and composting (US EPA, 2008). Nationally the recycling sector was estimated to generate US\$236 billion in turnover and directly employ over 1.1 million

people at 56,000 public and private facilities in 2001 (US EPA, 2002). In addition to the economic activity of the recycling and reuse industry itself, other economic activity is supported because the industry purchases goods and services from other types of business establishments (such as office

supply companies, accounting, legal, building and landscape maintenance firms, etc.). This is known as ‘indirect’ employment. In addition employees of the recycling and reuse industry (and employees in other businesses that support the industry) support another round of economic activity when they spend their wages in the economy. This is known as ‘induced’ employment.

In the US, for every direct job created across the sector (which includes recycling manufacturing – the most difficult group of activities to define), a further 1.2 ‘indirect’ jobs and 1.3 ‘induced’ jobs were created in the wider economy. Regional and individual state studies (CASCADIA, 2009) and (Seldman, 2006) show a similar picture. For

instance a study in Iowa found that for every job created in the recyclables processing sector, an additional job is created elsewhere in the state.

In the US, paper and steel mills, plastics converters and iron and steel foundries account for 50% of all recycling industry employees (UNEP, ILO, IOE, ITUC, 2008). Remanufacturing is also becoming a major business opportunity in areas such as motor-vehicle components, aircraft parts, compressors, electrical and data communication equipment, office furniture, vending machines, photocopiers, and laser toner cartridges. According to an industry study (Remanufacturing Institute, 2003) the sector was a \$40 billion business employing some 480,000 people by 2003.

Table 1: Estimated direct, indirect and induced jobs in the US recycling sector, 2001

Employment ‘000	Direct Employment	Indirect employment	Induced employment	Total employment
Recycling collection	32.0	4.2	20.4	56.6
Recycling processing	159.9	84.2	150.4	394.5
Recycling manufacturing	759.7	1124.9	1237.1	3121.7
Reuse/Remanufacture	176.1	112.5	124.9	413.5
Total All Groups	1127.8	1325.9	1532.9	3986.6

Source: (R.W.Beck Inc , 2001) based on a large scale survey of the sector

European Union

The EU27 generated 260 million tonnes of municipal waste (2008) of which 107 million tonnes (41%) were being recycled (Eurostat, 2010a). A study of the composition and recycling of municipal and commercial and industrial waste streams (Prognos et al, 2008) suggests that C&I and CD&E wastes accounted for a further 150 million tonnes.

Given the very different recycling practices across the EU27 in terms of labour intensity, investment in automated sorting equipment and the sophistication of materials recovery, separation, and processing and the different combinations of local authorities, private companies, community and third sector organisations involved, there is no reported data on employment trends in the sector and no single tally for the number of jobs in recycling, reuse and remanufacturing.

Box 1: Employment in the paper recycling sector

Although employment data for paper recycling are generally included within general recycling employment (including glass, steel, aluminium and plastic, etc) specific data are available for the US where the Environmental Protection Agency (EPA) estimates that 150,000 people are employed in paper recycling and remanufacturing while a further 1,932,000 are employed in general recycling collection and processing, of which some 54% is paper. An extremely rough estimate of those jobs attributed to paper could be calculated by weight. In 2006, paper comprised 44 million out of 81.8 million tons, or 53.7 % of all recycled materials. Using this figure, a rough estimate for the number of paper collectors and processors would add another 103,500 people for a total of 253,500. This is approximately one-quarter to one-fifth of the entire U.S. recycling industry. Similar or slightly higher employment figures would be expected for the European Union, which recycles more paper than the United States: 52.5 million tons in 2004 and 58.2 million tons in 2006. In 2000, 9,400 jobs in paper reprocessing were reported in the United Kingdom (WasteWatch).

Source: (UNEP, ILO, IOE, ITUC., 2008)

However, a study for the European Commission (Ernst and Young, 2006) building on a previous study (Ecotec, 2002) calculated likely 2004 employment in the pollution management and resource management sectors in an enlarged EU (EU27). The previous study provided data for EU15 member states for 1999. The two studies identified a pollution management sector (which includes waste management) worth €145 billion in addition to a resource management sector (including materials recycling) worth €82 billion in 2004. Employment in the sectors was estimated on the basis of environmental expenditure - broken down by Capital (CAPEX) and Operating (OPEX) expenditure – and assumptions about wage costs, GDP, population, the Consumer Price Index and Exchange rates. Together the sectors provided 3.4 million full time equivalent (FTE) jobs, of which an estimated 1.2 million direct jobs were associated with collecting, disposal and recovery of waste. A further quarter of a million 'indirect jobs' (in up- and down-stream businesses supported by operating expenditure of waste and recycling businesses) were identified (Table 2).

Growth in employment in the waste management sector in the EU15 appears to have fallen by about 0.7% per annum between 1999 and 2004 but employment in recycled materials grew rapidly at a

rate of up to 7% a year over the same period.

According to the same study nearly 80% of total direct jobs were in the EU15 countries, with Germany, France, Poland and the UK accounting for almost two thirds of employment in the sector. Employment is particularly high as a percentage of the workforce in Austria, Denmark, Estonia and Slovenia. In Germany the waste and recycling sector is bigger than either steel or telecommunications.

In 2000, the Product-Life Institute in Geneva (UNEP, ILO, IOE, ITUC, 2008) estimated that the remanufacturing sector in the EU accounted for about 4% of the region's GDP but there are no estimates for employment in the sector.

It should be noted that one of the limitations of both the US and EU studies to date is the limited attention given to the role of exports of recyclables. Both the US and the EU countries have expanded paper and plastics recycling through growth in export, particularly to China. While past employment studies have focused on domestic jobs, future expansion of recycling which partially relies on exporting recycle could create overseas jobs at the expense of US or EU based employment opportunities. It follows therefore that the more opportunities are made for 'closed loop' recycling within the EU, the fewer jobs are likely to migrate to other countries.

Table 2: Estimated EU 15 and EU27 employment in waste management and recycled materials, 1999 and 2004

Estimated employment	1999 (EU15)	2004 (EU27)		
	Direct	Direct	Indirect	Total
Solid Waste Management	639,607	813,305	165,184	978,489
Recycled Materials	253,269	596,792	203,355	800,147
Total waste collection, management and recycling	892,876	1,410,097	368,539	1,778,636

Source: (Ecotec, 2002) (Ernst and Young, 2006)

United Kingdom

The UK generated 33.4 million tonnes of municipal waste in 2008, of which 12.2 million tonnes (36.8%) was recycled (Defra, 2010a; SEPA, 2010; Welsh Assembly Government, 2010a; Northern Ireland Environment Agency, 2010). Best available data from the Annual Business Inquiry (ABI) 2008 (ONS, 2010) suggests that this in turn generated about 118,000 jobs in waste management businesses (including collection, recycling and sale for reuse of recyclable materials) of which 91,000 were in waste treatment, collection and disposal. The sector has seen continuous growth from 47,000 in 1998 (see Table 3) but changes in the Standard Industrial Classification (SIC) codes have produced inconsistencies in the data. Data do not

include the remanufacturing sector – such a large contributor in the US – but do include wider waste collection and disposal. A previous study (Waste Watch, 1999) estimated that – including 500 jobs in the third sector – the collection, sorting and reprocessing of household recyclable materials accounted for 17,400 jobs in 1999 (Table 4), equivalent to about a third of the total waste management sector. Table 4 and Figure 2 show the distribution of businesses and jobs across England, Scotland, Wales and Northern Ireland, based on assumptions about average business size from the ABI 2008 (ONS, 2010).

Table 3: UK employment in waste collection, recycling and reuse, '000s, 1998-2008

Standard Industrial Classification (SIC) Description	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08
SIC 1992/2003	Total employment ('000)										SIC '07
Recycling of metal waste and scrap	5	7	7	9	9	7	7	10	9	9	24
Recycling of non-metal waste and scrap	5	5	6	7	9	9	10	10	12	11	
Wholesale of waste and scrap	13	12	15	13	12	12	12	11	12	12	11
Retail sale of second-hand goods in stores	24	25	27	20	22	20	21	19	20	17	19
Collection and treatment of other waste (excl sewage)	-	-	-	-	-	50	52	53	51	51	64
Sanitation, remediation and similar activities	-	-	-	-	-	5	6	6	6	8	
TOTAL	47	49	55	49	52	103	108	109	110	108	118

Source: ABI 2008, Section E – Waste management and remediation activities (ONS, 2010).

Table 4: UK businesses and jobs in the waste collection, treatment and disposal sector, 2008

	No. Businesses	Estimated employment	Average size of business
England	5,380	74,810	14
Wales	475	4,630	10
Scotland	500	8,335	17
Northern Ireland	250	3,220	13
TOTAL UK	6,605	90,995	14

Source: Estimates based on ABI 2008 (ONS, 2010) employment by number and size of businesses

Table 5: Jobs in collection, sorting and reprocessing of household recycling materials in the UK, 1999

Activity	Number of jobs
COLLECTION	
Kerbside	2,750
Bring/drop-off site	1,700
Civic amenity site	1,000
TOTAL COLLECTION	5,450
SORTING	
Materials Recovery Facilities (MRFs)	1,624
REPROCESSING	
Paper/card	9,400
Glass	160
Steel	60
Aluminium	75
Plastic	70
TOTAL REPROCESSING	9,765
Community Sector jobs	500
TOTAL IN RECYCLING	17,339

Source: (Waste Watch, 1999)

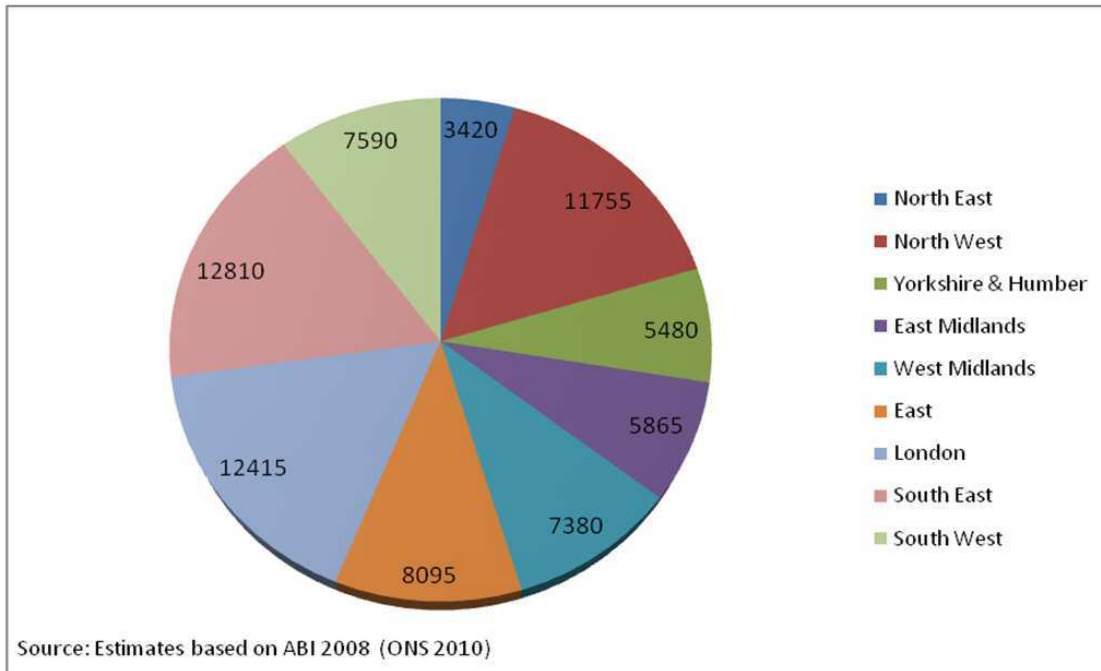
England

A breakdown of the ABI 2008 data (ONS, 2010) suggests that in 2008 up to 97,000 waste collection and recycling jobs were in England (82% of the total) with the South East, London and the North West regions having the largest share of employment reflecting both concentrations of waste generated and location of 25 large waste management companies (>250 employees). Almost half the employment in the sector is in companies with fewer than 100 employees.

A recent study (WRAP and REalliance, 2009) found that nearly 700 English civil society organisations are involved in 'resource recovery' activities - mainly of furniture, waste electrical and electronic equipment (WEEE), bicycles, wood, hand tools and paint – to create jobs and training opportunities, provide goods to people who need them, and support community

development. The survey found that these social enterprises and third sector bodies had a turnover of £133.8 million and handled nearly 0.25 million tonnes of material in 2008/9. Their activities have shifted from kerbside collection activities to repair and reuse of some 76,000 tonnes of bulky waste by 2008/09 – more than double 2005 levels. They provide an estimated 4,600 FTE jobs in resource recovery (an average of about 8 staff per organisation providing 6.6 FTE jobs) and jointly provide 43,500 opportunities for training and volunteering. In addition these organisations generate a considerable social multiplier: every £1 given to a local voluntary reuse charity organisation to run the bulky waste collection service is estimated to generate a total of £5.32 of social benefits locally (Anderson et al, Sept 2008).

Figure 2. Estimated share of employment by English region, 2008



Scotland

A recent study by the Scottish Executive (Scottish Executive, 2010) summarised in Table 6 suggests that employment in solid waste management in Local Authority, private, community, consultancy and government sectors in Scotland was about 8,000 jobs in 2004/6 having grown from about 4,600 in 1998 with a turnover of about £454 million in 2004. The study suggests that some 1,446 jobs were created in local authorities from 2003 to 2006. Collection and disposal makes up most of the employment (approximately 2,600 employees in 2004), followed by non-scrap recycling (600) and scrap recycling (500). Employment in recycling has remained constant over the review period whilst employment in disposal activities has grown

by 2,000. The waste management industry spent £230 million in 2004 on goods, materials and services. Capital expenditure has risen by over 300% since 1998. Using information from the Community Recycling Network for Scotland (CRNS), the study shows that as well as full time jobs the sector provides 970 training placements and over 3,200 voluntary positions.

An Input-Output analysis of the Scottish economy (Scottish Executive, 2009) shows that for every 100 jobs created in the recycling sector, 36 indirect jobs will be created in the supply chain and a further 27 induced jobs will be created as a result of employees in these businesses spending their wages in Scotland.

Table 6: Employment in the recycling sector in Scotland, 1998 to 2006

	1998 (unless shown)	2006 (unless shown)	Increase
Public Sector LA	1381 (2003)	2827	1446
Private Sector	1600	3700 (2004)	2100
Community Sector	360 (2003)	1100	740
Private sector consultancy	Relatively few	250	250
Government programmes	Relatively few	100	100
Total	3341	7977	4636

Source: (Scottish Executive, 2010; Audit Scotland, 2008)

Wales and Northern Ireland

No separate studies on employment in the sector have been identified, but the UK ABI 2008 (ONS, 2010) suggests that total employment in the waste collection, sorting and disposal businesses in 2008 was about 4,630 in Wales and 3,220 in Northern

Ireland, which corresponds with the total amount of municipal waste generated (5% and 3.5% respectively). No further information is available on the recycling sector specifically.

Recycling and Reuse versus Landfill and Incineration Jobs

The economic and employment benefits associated with sorting, reprocessing and recycling, in comparison to incineration or disposal to landfill, have been highlighted by a number of studies from the US (CASCADIA, 2009) and in the UK (Gray, 2002; WRAP, 2006; WRAP, 2009). Although landfilling and incineration still involve larger volumes, recycling now generates more than twice the revenue of the waste management industry because recycling recovers greater economic value bound up in discarded products and

equipment. Although none of the available studies is directly comparable (definitions of the recycling sector and methodologies having evolved as issues emerged during industry critiques of early studies), they have consistently shown that per tonne of material processed, recycling provides approximately ten times more jobs than landfilling and incineration (Table 7 and Box 2). The UK think tank Demos arrived at similar conclusions (Murray, 1999) (Table 8).

Box 2: US studies on the employment benefits of recycling compared to landfill

A recent literature review on recycling and economic development in the US (CASCADIA, 2009) reported that, on a national scale, the recycling industry has consistently been creating more jobs at higher income levels than landfill or incineration of waste. In California it was found that *'if all waste generation were disposed instead of being diverted at the 1999 rates, the state-wide economic impacts would be 17 to 20 percent lower'* (Goldman, 2001). A follow up study (CIWMB, 2003) calculated that recycling a tonne of 'waste' materials has approximately twice the economic impact of burying it in the ground, and on average recycling one additional tonne of waste will pay \$101 more in salaries and wages, produce \$275 more in goods and services, and generate \$135 more in sales than disposing of it in a landfill.

A study of the three US cities of Baltimore, Washington, D.C. and Richmond (CASCADIA, 2009) found that 79 jobs were required for every 100,000 tonnes of materials collected and sorted per annum and another 162 jobs for processing, making a total of 241. This is 10 times the job potential of waste disposal. In Vermont, recycling 1 million tonnes of material was found to generate 550-2,000 jobs, compared with 150-1,100 for incineration and 50-360 for landfills (US EPA, 2002; Seldman, 2006). In some areas, such as Massachusetts, recycling-based paper mills and plastic product manufacturers have been reported to employ 60 times more workers than do landfills on a per-tonne basis. Studies in California, Iowa, Minnesota, Michigan, Indiana, North Carolina, and Washington also showed that average income levels in the recycling sector were higher than the waste management sector overall (CASCADIA, 2009).

One state's study found that job creation in the recycling sector easily outweighed job losses in waste disposal and virgin materials mining and manufacture, with only 13 jobs displaced for every 100 gained.

Source: (CASCADIA, 2009; Seldman, 2006; US EPA, 2002)

In their research on the up- and down-stream employment impacts of recycling in London, the Local Economy Policy Unit (LEPU) calculated that for every 1,000 tonnes recycled per year, 6 jobs would be gained across the entire waste stream

(LEPU, 2004) as shown in Table 9. The collection and sorting of WEEE and plastics provide the greatest job opportunities, with a total of 40 and 15.6 jobs respectively being created per 1,000 tonnes of material processed.

Table 7: Job creation from reuse, recycling and conventional disposal of waste in the US

Type of Operation	Jobs per 10,000 tonnes processed per year
Product Reuse	
Computer Reuse	296
Textile Reclamation	85
Misc. Durables Reuse	62
Wooden Pallet Repair	28
Recycling-based Manufacturers – Average	25
Paper Mills	18
Glass Product Manufacturers	26
Plastic Product Manufacturers	93
Conventional Materials Recovery Facilities	10
Composting	4
Landfill and Incineration	1

Source: (CASCADIA, 2009) citing (Seldman, 2006)

Table 8: Job creation by different collection and disposal methods in the UK

Collection/disposal method	Jobs per 10,000 tonnes
Multi-compartment vehicle	50
Flat-back vehicle	38
Co-collection	40
Electric collection vehicle	32
Incineration	10
Landfill	11
Recycling (including composting)	59 – 112

Source: (Murray, 1999)

Table 9: Job gains from specific materials in the UK

Materials	Collection/ Sorting	Re-Processing (if in London)	Jobs gain per 1,000 tonnes
Plastics	15.6	0*	15.6
Paper	2.6	1.9	3.5
Glass (mixed)	0.33	0.42	0.75
Glass (separated)	0.60	0.42	0.75
Green waste	0.50	0.80	1.3
WEEE	40	-	40
Furniture (non-WEEE)	13.6	-	13.6
Aluminium	11	0	11
Steel	5.4	0	5.4

*NB: this study pre-dates the development of the Closed Loop London plastics recycling and manufacturing operation and the consequent potential for growing the reprocessing of food-grade plastics packaging closer to the consumer end-markets within the UK.

Source: (LEPU, 2004)

In the US, recycling programmes have also been reported to provide higher average wages than those found in conventional waste disposal sectors and also provide a good return on capital investment (CASCADIA 2009; R.W.Beck Inc 2001). The research also found that if material was diverted from landfill, total sales and value-added profits, and total income and job opportunities nearly doubled. These authors also found that for every 100 jobs created in the processing and manufacturing of recyclable materials, only 13 jobs were lost in corresponding up- and down-stream industries.

This body of research has faced the same data and methodological limitations as the current study but still provides a useful basis for estimating potential jobs associated with

moving towards higher recycling, reuse and remanufacturing rates in Europe. What the broad thrust of the research available shows is the significance of recycling and related activities in creating employment relative to other forms of waste treatment (such as landfill and incineration) and, despite the limitations in data, the pattern of steadily increasing employment in the recycling sector and its supply chain as recycling performance increases. However, it should be noted that since many of these studies were undertaken, both the US and EU have started to export paper and plastics recyclate. In the future the extent that potential jobs associated with higher recycling rates are domestic rather than overseas will depend on how 'closed loop' recycling is or how far higher rates are achieved through increased exports.

Methodology for estimating potential future job gains in recycling

Our methodology for estimating potential future jobs in recycling and reuse is based on best available published data for the EU27 and the UK and applying lessons learnt from more detailed studies on jobs per 1000 tonnes of material recycled, and multipliers for indirect, induced and displaced jobs from elsewhere (LEPU, 2004; Gray, 2002; CASCADIA, 2009; Murray, 1999). We have made some simplifying assumptions, which are clearly stated below, in arriving at conservative estimates of job creation associated with the recycling sector.

Our methodology is based on the following key steps, data sources and assumptions.

Baseline data on employment for the UK is drawn from the ABI 2008 survey (ONS, 2010) and for the EU is based on calculated (rather than reported) data for the waste management and recycled materials sectors for 1999 and 2004 (Ecotec, 2002; Ernst and Young, 2006).

Trend data for municipal waste arisings and management data for the EU27 are taken from Eurostat, 2010 for 1999 to 2008 and for England, Scotland, Wales and Northern Ireland from Department for Environment, Food and Rural Affairs (Defra, 2010a), Scottish Environment Protection Agency (SEPA, 2010), Welsh Assembly Government (Welsh Assembly Government, 2010a), and Northern Ireland Environment Agency (Northern Ireland Environment Agency, 2010) which draw from the

[WasteDataFlow](#)¹ database and precursor national municipal waste management surveys. No trend data on the generation of C&I and CD&E waste arisings is available for Europe. Data for C&I and CD&E waste arisings and recycling for the UK are taken from Defra returns to Eurostat (Defra, 2008) and industry estimates (CEPI (Confederation of European Paper Industries), 2010).

EU27 data for tonnages and rates of disposal and recovery for the key recyclable materials (across municipal, C&I, end of use vehicles and some CD&E waste streams) are taken from the Prognos study (2008) which provided a snapshot for 2004 based on numerous, but not necessarily consistent, industry sources. There are some inconsistencies with reported UK data which we have attempted to address by supplementing reported data with the results of a recent study (Resource Futures, 2010) on the composition of UK kerbside municipal waste collections and English and Scottish trend data on the composition of municipal waste recycling. Together these sources were used to calculate the 'current baseline' recycling rates and quantities recycled for the EU27 in 2004 (Prognos et al, 2008)) and England, Scotland, Wales and Northern Ireland in 2006 (Defra, 2010a).

¹ WasteDataFlow is the web based system for municipal waste data reporting by UK local authorities to government. WasteDataFlow has replaced the current Defra Municipal Waste Management Survey in England and similar surveys in Wales, Northern Ireland and Scotland.

Past trends in employment in the MSW and C&I sectors have been estimated based on the studies cited above and by applying co-efficients taken from the trends observable in the relationship between UK (municipal waste) recycling and employment in the sector, the only two datasets for which 10 year trends are available. This is expressed as a simple ratio between tonnages handled per full time equivalent employee. We have applied these UK co-efficients to EU27 recycling data which show crude fit for the years where employment data are available (1999 and 2004). UK data suggest a gradual rise in the amount handled per job between 1999 and 2008 - notwithstanding the discontinuity in data sets mentioned above - which would be consistent with economies of scale and the gradual change in the nature of materials being recovered from the waste stream. This trend towards increasing efficiency has then been projected into the future in relation to projections for total municipal waste arisings.

Future waste arisings for the EU27 have been estimated on the basis of official Eurostat population projections to 2025 by member state, and extrapolating past trends in waste arisings per capita (kg per capita per annum) in the context of 'New Austerity'. We have assumed that waste arisings will follow the downward trends first seen in 2007-8 as recession led to a reduction in waste arisings per capita in most member states (and a deceleration in more recent EU entrants). We have assumed that these patterns of 'New

Austerity' will continue - even as the economy starts to recover - as households and businesses recognise the need for and the benefits of waste reduction. As a result we have projected a steady fall in municipal solid waste generated across the EU27 to 2025.

Based on calculations for total waste arisings we have estimated the potential additional material which could be diverted from landfill and incineration to recycling, reuse and remanufacture in EU27 and the UK. We have assumed that the share of key materials will remain constant, based on 2004 shares (Prognos et al, 2008) and that recycling rates for each material will increase. Realistic assumptions for recycling rates across the EU27 by 2020 are shown in Table 10.

Employment creation from waste management and recycling for the EU27 has been calculated using two approaches: firstly, a simple tonnage/job ratio for all municipal waste recycled by projecting past trends in waste not going to landfill or incineration (ie a "Business as Usual" scenario); and secondly, a more disaggregated approach using the jobs per 1000 tonnes of key recyclables in the total waste stream (which indicates the additional jobs over and above the Business As Usual scenario which might be created by aspiring to higher rates of recycling). As noted above, some of these jobs could be overseas if recycling rates are achieved by exporting recycle rather than moving to closed loop recycling.

Table 10: Current EU27 rates of recycling for key materials (from Prognos 2008) and assumed recycling rates for 2020

Key recyclable material	2004 rate	Assumed rate 2020
Glass	50%	70% ¹
Paper	56%	70%
Plastics	17%	50% ²
Iron and Steel	76%	85%
Aluminium	66%	85%
Wood	31%	65%
Textiles	23%	60% ³
Biowaste	33%	65% ⁴
Total	48%	70%

Notes on 2020 recycling rates:

¹ highest 2004 rate was 78% in Denmark, but this is very likely to include some reuse.

² highest 2004 rate was 38% in Denmark: given limited end markets for rigid household plastics which make up a third of the total, even considerable advances in plastic film recycling make 50% a challenging recycling rate.

³ highest 2004 rate 40% in Germany: by raising public awareness of the opportunities for recycling used clothing a 60% rate could be reached.

⁴ highest 2004 rate was 63% in Luxembourg: this could feasibly be increased to 65% with a better mix of composting and anaerobic digestion technologies in other member states.

Source: Based on (Prognos et al, 2008)

For the Business as Usual recycling scenario we have taken the context of the Waste Framework Directive (WFD - 2008/98/EC) which sets a target of 50% recycling/composting of total municipal waste by 2020.

For a 'Significantly Increased Recycling' scenario we have built on the Prognos work which identified the potential monetary and

environmental benefits of achieving an average recycling rate for all (not just municipal) waste of 58%. We have assumed that by 2020 an average of 70% recycling could be achieved across all key waste streams in all EU27 member states, reflecting what has already been achieved in the best performing individual countries (Denmark, Luxembourg and Germany) for specific materials (see Table 10).

Estimating Potential Employment

We have then estimated **potential incremental direct employment** opportunities in the recycling sector, based on the lowest estimates for co-efficients for full time equivalent jobs for diverting 1,000 tonnes of key recyclable materials from landfill or incineration derived from the UK

and US. This is summarised in Table 11 below. Where no co-efficients are available from the studies (eg for wood and textiles), we have taken the most conservative estimates from rates from other bulky materials such as glass and compost.

Table 11: Jobs per thousand tonnes of recycled material

Key recyclable material	Ratios of jobs/000 tonnes recycled material		
	Jobs created per 000 tonnes (LEPU, 2004)	Jobs created from US studies (CASCADIA, 2009)	Assumed rates for EU27, 2020
Glass	0.75	2.6	0.75
Paper	3.5	1.8	1.8
Plastic	15.6	9.3	9.3
Iron and Steel	5.4	-	5.4
Aluminium	11	-	11
Wood	0.75	-	0.75
Textiles	5	8.5	5
Biowaste	1.3	0.4	0.4
Average all recycling	6.2	5.0	4.9

We have then estimated **indirect and induced employment** by applying average multipliers for the sector taken from the US, European and UK studies described below. A Type 1 multiplier calculates the indirect employment up and down-stream resulting from new direct employment in the recycling sector. A Type 2 multiplier calculates the induced jobs from spending by both direct and indirect employees in the local

economy. There are a number of ways in which multipliers can be calculated:

- Surveys of businesses and employees to determine how much they spend on local purchases. This information can be used to calculate local supply linkages (ie a Type 1 multiplier).
- Previous research/evaluations which identify direct jobs and spending in the

recycling sector and supply chain. No such studies have been carried out in the UK but in the US the study for EPA (2001) involved detailed surveys of company employment and expenditure and calculated both Type 1 and Type 2 multiplier effects associated with different types of recycling collection, processing, manufacturing and remanufacturing/reuse.

- Economic models – to develop relationships between local and national economies. This approach is more suited to local economic interventions and has not been applied to the EU or UK recycling sectors.
- Input-Output tables which identify supply linkages between sectors. The Scottish Executive provides both Type 1 and Type 2 multipliers for a wide range of individual Scottish industry sectors.

The study for EU27 (Ernst and Young, 2006) used a Type 1 multiplier of 1.22 for calculating the indirect jobs resulting from operating expenditure in the waste management sector. This is considered quite low, since it is only applies to operating expenditure and does not include capital expenditure by the sector. In the US the EPA's multi-state study (US EPA, 2002) identified Type 1 multipliers ranging from 1.13 for recycling collection to 2.48 for remanufacturing with an average of 2.18 across the whole sector. In the same study Type 2 multipliers ranged from 1.77 to 4.11 with an average of 3.53. For 2004 Scottish

multipliers (Scottish Executive, 2009) for the 'miscellaneous manufacturing not elsewhere specified including recycling' sector were 1.36 for Type 1 and 1.63 for Type 2. Type 2 multipliers for related sectors which include closed loop recycling were higher at 1.80 for glass, 1.93 for construction and 2.64 for paper and board.

Work in other sectors across the UK such as renewables and housebuilding (ADAS , 2003; Mackay Consultants, 2007) suggests that regional multipliers vary considerably, with the highest multiplier effects for England, then Northern Ireland, followed by Scotland and Wales. Employment multipliers for the whole of the UK are even higher than regional ones since there is less leakage in terms of imported equipment and supplies and a greater percentage of salaries are spent in the 'local' economy.

We have thus used a Type 1 multiplier of 1.50 and Type 2 multiplier of 1.75 to calculate indirect plus induced employment. These are considered conservative since they are lower than those generally applied in sectors such as mining, construction, manufacturing, transport, communication and utilities and only slightly above the Scottish regional multipliers for recycling in 2004.

Our findings provide an initial order of magnitude estimate of the job creation potential from further recycling and reuse of the valuable recyclable resources which are still going to landfill in the UK and within the EU.

Key findings on potential new jobs from recycling

European Union

Figure 3 shows the overall trend in the last decade of increasing recycling and composting of municipal waste in the EU, with key waste generating countries highlighted (Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Romania, Spain, Sweden and the United Kingdom) using data available to 2008 (Eurostat, 2010a).

Figure 4 shows projections for municipal waste arisings to 2025 in the EU27 using Eurostat data and the 'New Austerity' context described in this report, expressed in a standardised form as kg per person per year. This scenario assumes falling per capita waste arisings in most countries (and slower growth in recent entrant states) with the result that total EU27 municipal waste would reach about 260 million tonnes in 2010, stay at this level to 2020 and then fall to 259 million tonnes by 2025. Figure 4 also shows how waste arisings might increase if Europe returned to its wasteful pre-recession patterns of waste generation from 2015 onwards: municipal waste arisings would increase to 275 million tonnes by 2020 and 289 million by 2025. The New Austerity context is considered far more likely and so the wasteful alternative is not explored further here.

Municipal waste, under the EU definition^[1], includes "waste from households, as well as

other waste, which, because of its nature or composition, is similar to waste from households". Total municipal waste arisings were 260 million tonnes in 2008, up from 251 million tonnes in 2004 but with overall growth flattening off as a result of recession and waste policies in member states. Based on the Prognos study (2008) total C&I and CD&E waste added a further 150 million tonnes of recyclables in 2004. We note that the UK is in the process of modifying its previous approach to the EU definition of municipal waste to align more closely with the rest of the EU. However, this modification is unlikely to significantly affect the trend and projections for increased employment from higher levels of recycling.

Figure 5 shows the estimated make-up of waste streams in the EU27, highlighting the largest waste generating countries (including the UK) for key recyclable waste streams in 2004. Projections are based on the average tonnage in the waste stream as reported in the Prognos 2008 study and the assumption that recycling rates across EU27 have risen steadily since then, albeit there is a lack of any comprehensive set of data to prove this.

^[1] As defined in "The Landfill Directive" (Council Directive [1999/31/EC](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:18:2:0001:0019:EN:PDF) of 26 April 1999 on the landfill of waste, Article 2(b), available at

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:18:2:0001:0019:EN:PDF>.

Figure 6 shows our projections for potential new jobs from waste management in Europe using two different scenarios:

- **Scenario 1: 50% recycling (Business as Usual)**

Extrapolating the overall amount of municipal waste arisings and recycling based on the 'New Austerity' context, results in estimates of employment **gradually rising from 1.2 million in 2004 to reach 1.24 million by 2010, falling slightly to a stable level of about 1.22 million in 2020.** This scenario would not mean that all EU27 member states managed to meet the Waste Framework Directive (European Commission, 2008) targets for 2020. This scenario suggests that no new net employment would be created between 2004 and 2020, although there would be some growth in the recycled materials sector at the expense of employment in landfill and residual treatment activities.

- **Scenario 2: 70% Recycling**

In contrast we have assumed that high but realistic rates of recycling could be achieved for each of the key recyclable materials (covering municipal, C&I and CD&E waste streams) shown in Table 10 across the whole of the EU27 for 2020. This would mean that as a whole the EU27 would achieve a 70% recycling rate for these waste streams. We have then assumed that for every thousand tonnes of material recycled jobs would be created as shown in Table 11. In each case we have used

the lowest coefficient from the studies cited above. This shows that by recycling an additional 115 million tonnes of key materials each year by 2020 (compared to 2004) some 321,700 new direct jobs in the recycling sector could be created and that 160,000 indirect jobs could be created in the supply chain for recycling businesses. A further 80,400 induced jobs could potentially be created as a result of spending by employees in all these businesses contributing to a total of half a million new jobs across Europe. Displacement of jobs in the virgin materials and landfill and incineration sector has not been calculated but is accounted for by the choice of Type 2 multiplier. If less conservative but nonetheless justifiable estimates were used for either the number of jobs created per thousand tonnes or for multipliers this figure could be as high as 750,000.

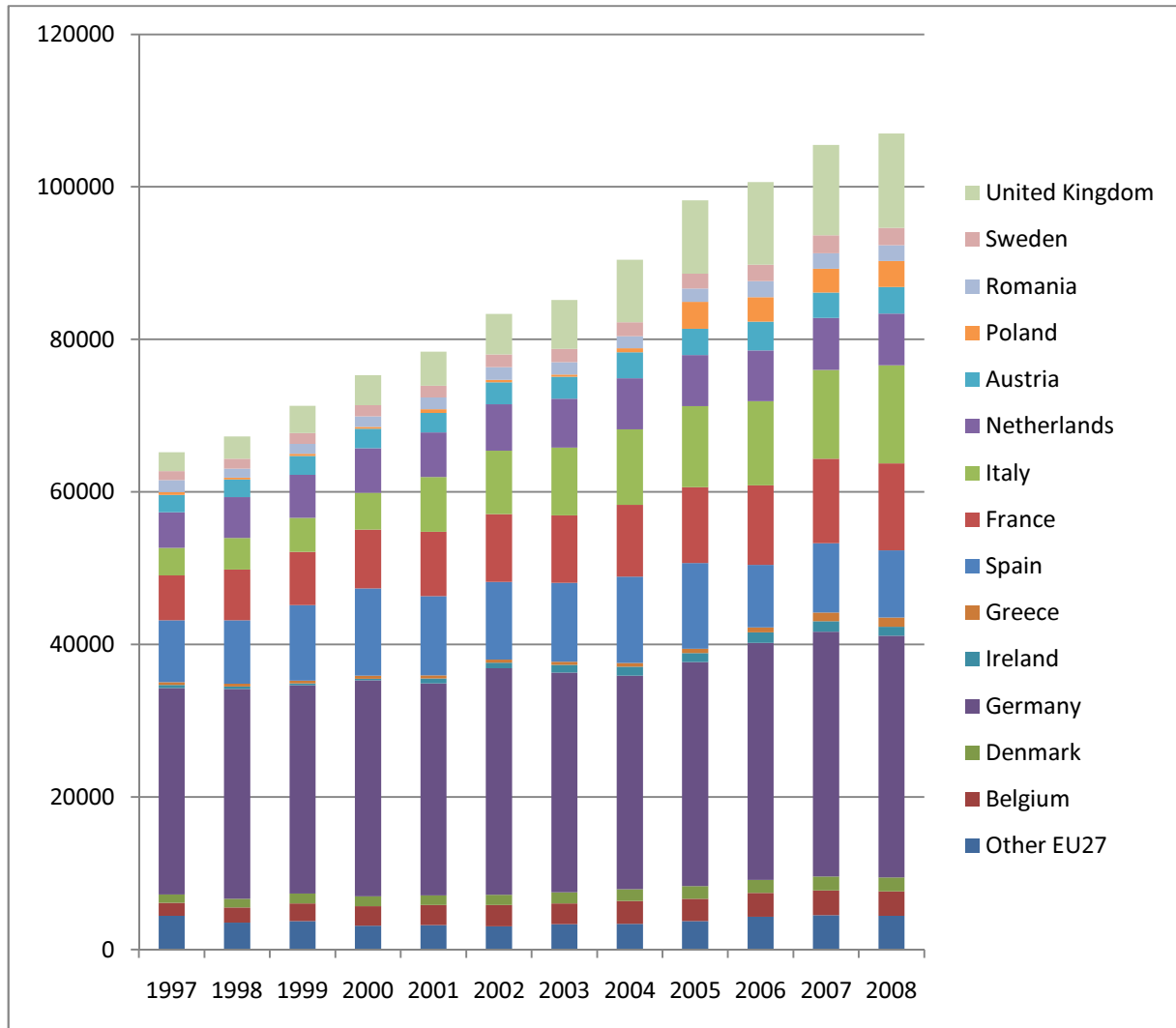
Table 12 highlights that the sectors with greatest potential for creating new jobs are paper and iron and steel (because of the large volumes involved) and plastics, biowaste and wood (because of the low base rate of recycling from which they are starting). Due to data limitations at the EU level, these estimates do not include opportunities for repair, reuse and remanufacturing from furniture and WEEE or other valuable waste streams, which reinforces the fact that these are conservative estimates.

Summary of findings for increased recycling of EU key waste streams

On a European level, if a 70% target for the recycling of key materials was met, conservative estimates suggest that **across the EU27 up to 322,000 direct jobs could be created in recycling an additional 114 million tonnes of glass, paper, plastic, ferrous and non ferrous metals, wood, textiles and biowaste. These jobs would have knock-on effects in down- and upstream sectors and the wider**

economy and could create 160,900 new indirect jobs and 80,400 induced jobs. The total potential is therefore for more than 563,000 net new jobs. However, it should be noted that if high rates of recycling are achieved through exporting recyclate rather than moving to closed loop systems, many of the processing and remanufacturing opportunities could be overseas rather than in Europe.

Figure 3: Trends in EU27 municipal solid waste presumed recycled and composted ('000 tonnes) going to neither landfill nor incineration) 1997-2008



Source: (Eurostat, 2010a).

Figure 4: Trends and projections for EU27 municipal waste arisings (kg per capita pa), by type of management: 'New Austerity' context and 'Back to Squandering' patterns

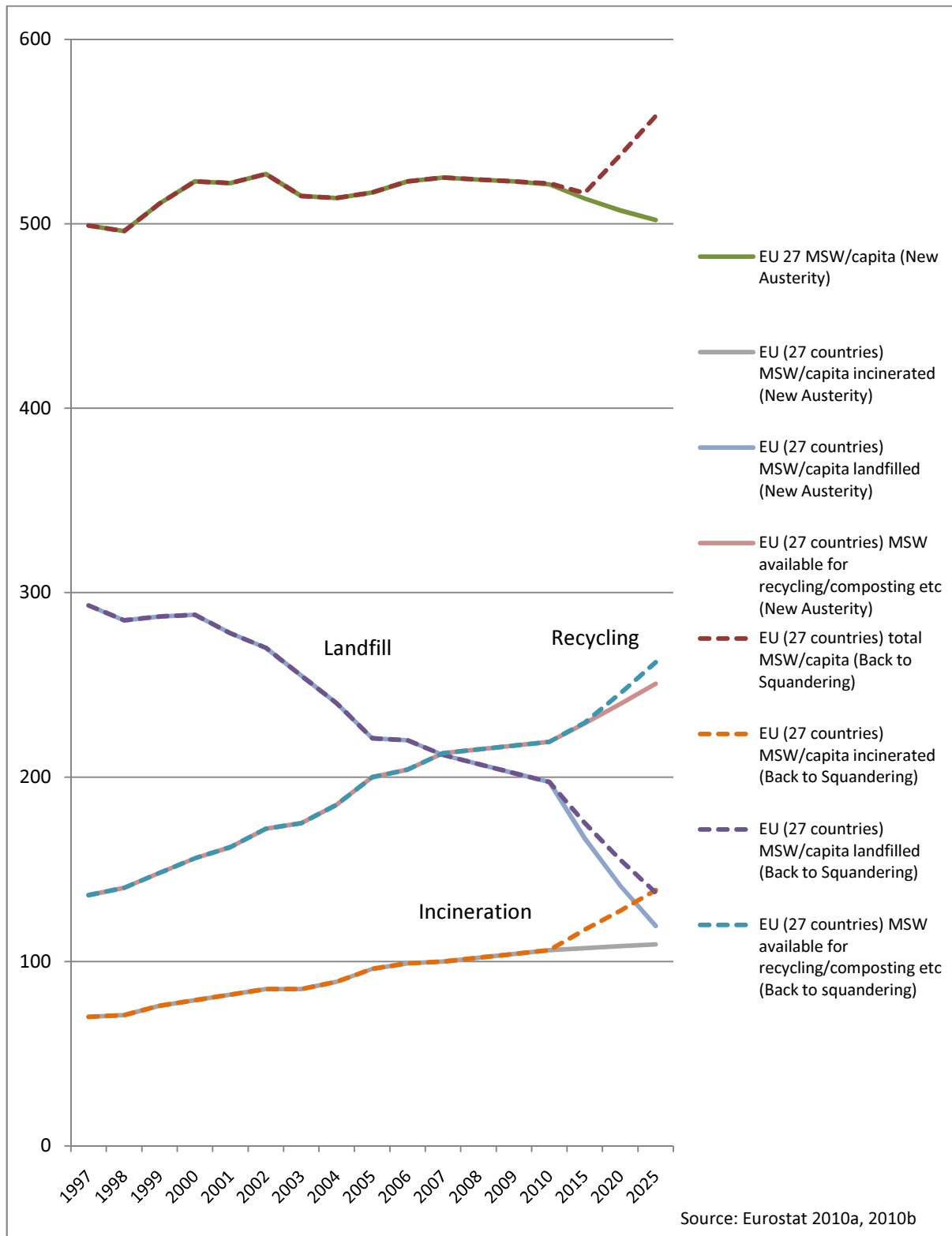
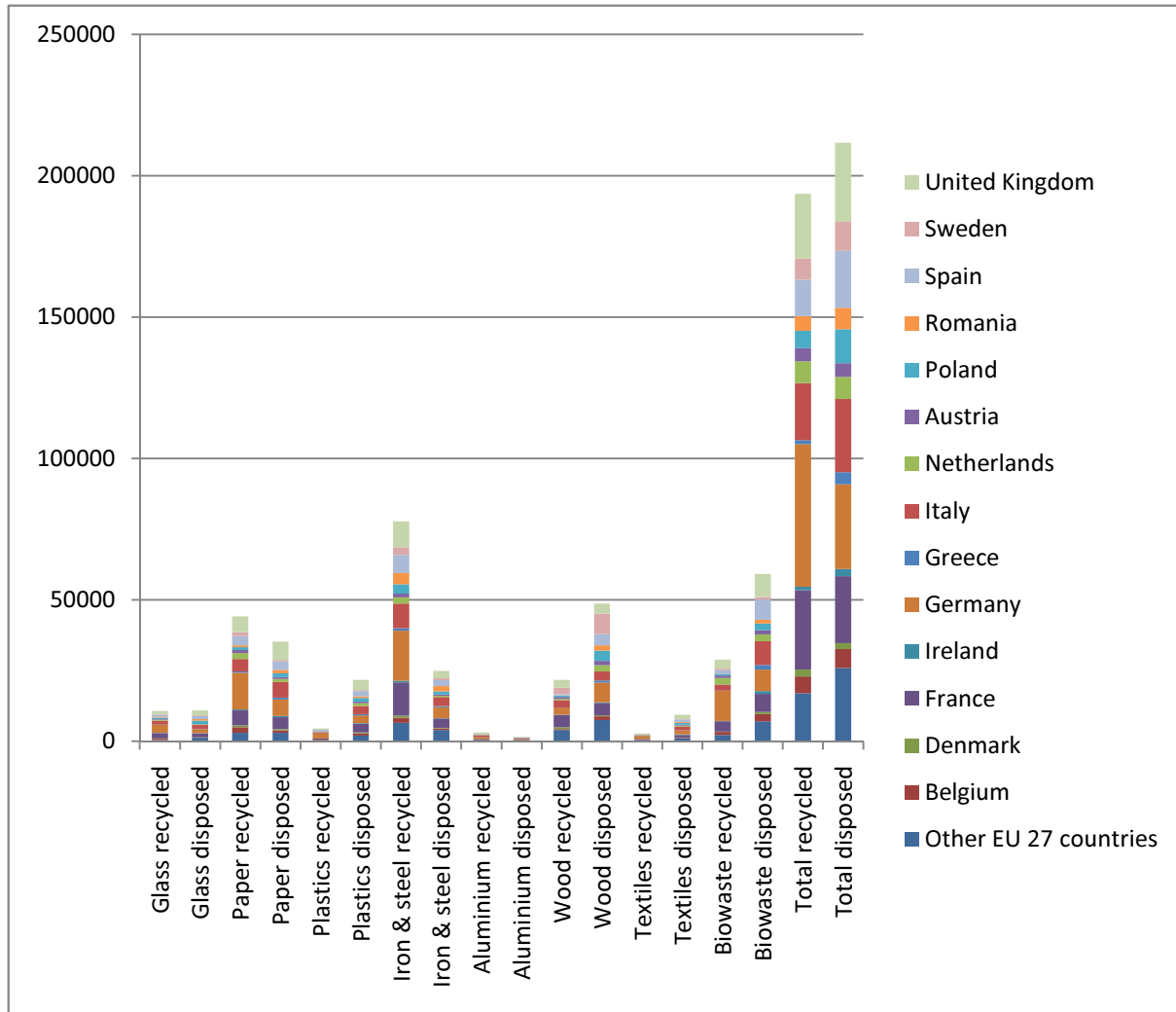


Figure 5: Total recycling and disposal of key recyclables, from municipal, commercial and industrial waste for key European countries ('000 tonnes), 2004



Source: (Prognos et al, 2008)

Figure 6: EU27 trends and projections for jobs ('000s) in waste management and recycling under 50% and 70% recycling by 2020

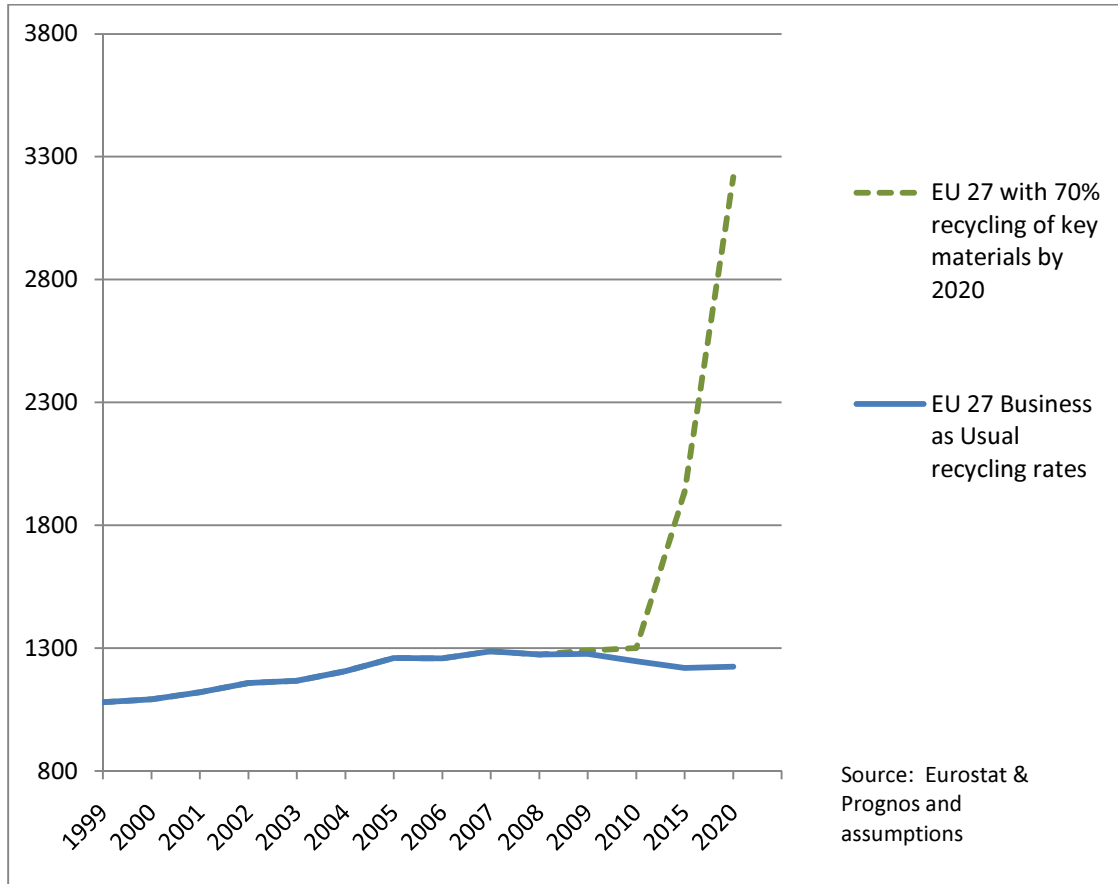


Table 12: EU27 potential new direct, indirect, induced and displaced jobs as a result of 70% recycling rate by 2020

Key recyclable material	Extra recycling of key materials each year by 2020 ('000 tonnes, relative to 2004)	Potential new jobs associated with recycling			
		Direct	Indirect Multiplier: 1.5	Induced Multiplier: 1.75	Total Net New Jobs
Glass	4882	3661	1831	915	6407
Paper	13202	23763	11882	5941	41586
Plastic	9955	92582	46291	23145	162018
Iron and Steel	17838	96326	48163	24081	168570
Aluminium	1270	13973	6987	3493	24453
Wood	28471	21353	10677	5338	37368
Textiles	5231	26154	13077	6538	45769
Biowaste	33779	43913	21956	10978	76847
Total	114628	321725	160862	80431	563019

Source: Estimates based on 2004 baseline (Prognos et al, 2008)

United Kingdom

For the UK better trend data is available on the generation of municipal waste and its composition and on the make-up and recycling of C&I waste. We have therefore developed four different scenarios as follows:

- **Scenario 1:** Potential new jobs from meeting **current targets (50% by 2020) for kerbside collection and recycling** in England;
- **Scenario 2:** Potential new jobs from meeting the **current EU-mandated target (50% by 2020) for recycling all municipal waste** across the UK;
- **Scenario 3:** Potential new jobs from meeting **potential targets for recycling, based on 70% average² recycling rate for all municipal waste by 2025** across the UK; and
- **Scenario 4:** Potential new jobs from achieving **70% recycling by 2025 across municipal and commercial and industrial** waste across the UK.

The analysis has involved the following steps:

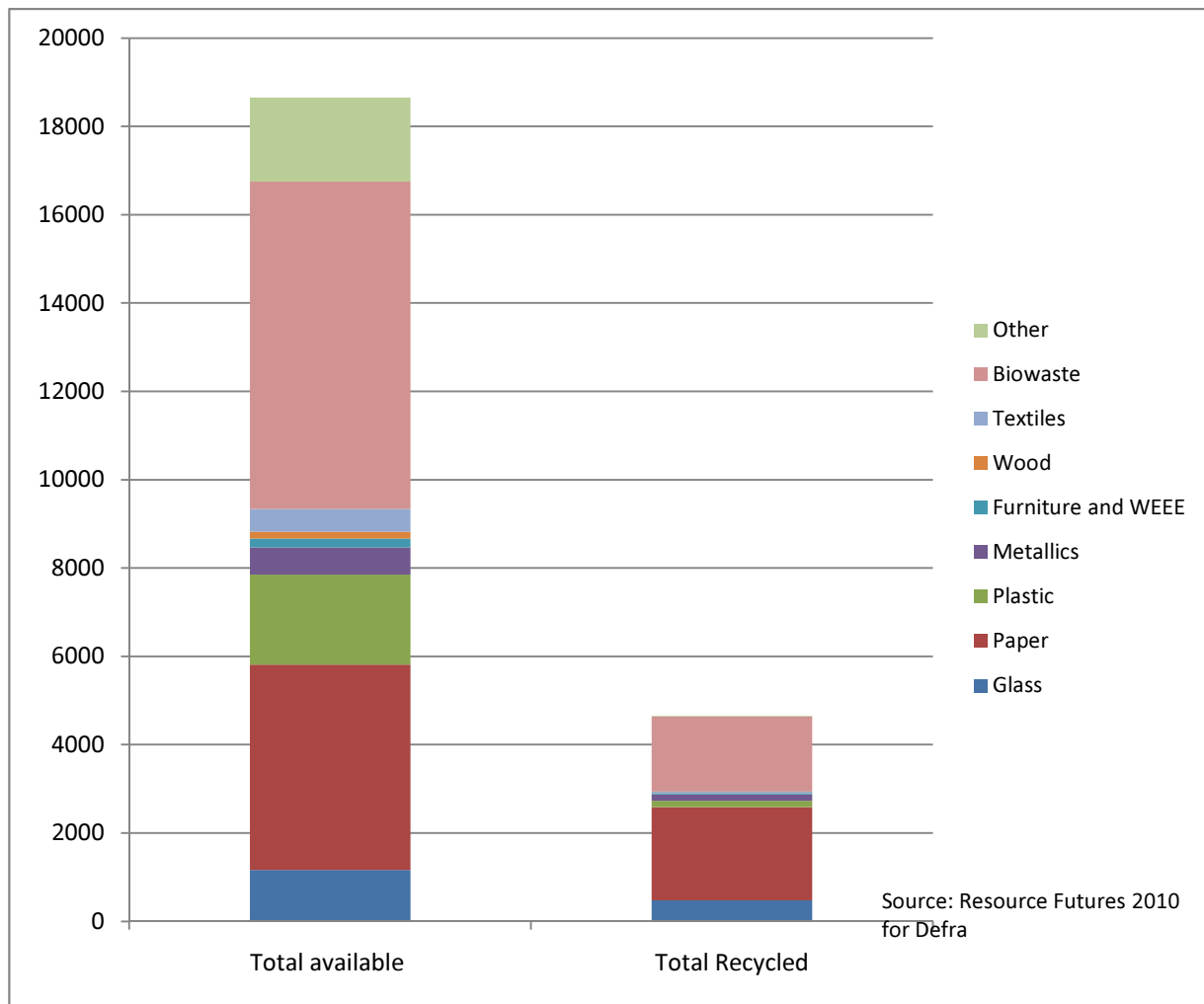
- The data we have collated and used on the current composition of English municipal waste collected at the kerbside comes from a recent study (Resource Futures, 2010) for Defra. This shows the breakdown of refuse and recycling collected at the kerbside in England during 2006/7 in terms of primary categories, as illustrated in Figure 7. This shows that of the nearly

19 million tonnes collected in 2006, some 4.6 million tonnes was recycled. Paper and card, biowaste and glass predominate, while textiles, wood, furniture and WEEE, plastics and metallic waste are starting from a low base. We have assumed that the current share of these materials in the waste stream will hold in the future.

- The projection of future municipal waste arisings for England on the basis of the 'New Austerity' context as described for the EU27 above. This implies that waste arisings will continue to fall by 0.5% per annum, even after recovery from recession. We have assumed that kerbside collection and recycling will hold its current share in total municipal collection (58% in 2006).

² For this analysis, 70% recycling rates are based on dry recyclables and compostable waste, and do not include any provision for Incinerator Bottom Ash (IBA) as has been included in some recycling targets (such as Wales)

Figure 7: Composition of kerbside collection of municipal waste, England, 2006 baseline



Building on the above approach we have then developed two scenarios for total UK municipal waste recycling. These have been developed on the basis of extrapolating English kerbside collection data to all municipal waste and the whole of the UK and then applying 50% (Business as Usual) and 70% recycling targets. We have used additional data on current municipal recycling of key materials in England (Defra Waste Statistics) and Scotland (SEPA Waste Statistics) where this is available (e.g. for glass, paper, metallic wastes, wood, furniture and WEEE). For other

materials we have extrapolated on the basis of the current share of kerbside collection in overall municipal waste. In the case of biowaste we have assumed that the vast majority of arisings are collected at the kerbside. England/Scotland data have been extrapolated for the UK by assuming that the current share of waste arisings and recycling by country will continue in the future. England currently generates some 82% of UK municipal waste with Scotland (9.2%), Wales (5.1%) and Northern Ireland (3.5%) accounting for much smaller shares.

Scenario 1: Potential new jobs from meeting current targets for recycling of kerbside municipal waste in England

Assumed future recycling rates for each of the key waste materials in order to achieve an overall 50% recycling rate by 2020 (rising to 55% by 2025) for Scenario 1 are shown in Table 13.

Table 14 shows that by 2025 a total of nearly 9 million tonnes of key recyclable

materials could be collected at the kerbside, 4.6 million tonnes more than in 2006. Applying the same assumptions about jobs per thousand tonnes for each material as for the EU27 suggests that by 2025 some 12,800 new direct jobs could be created in recycling and that these would in turn create 6,400 jobs in the supply chain and 3,200 induced jobs in the wider economy. In summary, even with relatively conservative assumptions, this Business as Usual scenario suggests that about 22,300 net new jobs could be created from kerbside recycling in England by 2020.

Table 13: Assumed recycling rates for kerbside collection of municipal waste in England to achieve 50% overall recycling by 2020 and 55% by 2025

Key recyclable materials	2006 ('000 tonnes)		Assumed recycling rates							
	Total available in kerbside collection	Total recycled from kerbside	2006	2007	2008	2009	2010	2015	2020	2025
Glass	1164	479	41	43	46	48	50	60	65	70
Paper	4646	2110	45	47	49	51	53	60	65	70
Plastic	2042	142	7	10	15	20	25	30	40	45
Metals	617	140	23	25	30	35	40	45	50	55
Furniture and WEEE	195	29	15	16	17	18	20	25	35	45
Wood	156	4	3	5	10	15	20	30	45	55
Textiles	517	30	6	8	10	12	15	30	45	55
Biowaste	7415	1706	23	25	27	30	35	40	50	55
Other	1899	14	1	2	3	4	5	10	18	21
Total	18651	4654	25	27	29	32	36	42	50	55

Table 14: Potential new jobs by 2025 (relative to 2006) by achieving 50% recycling of kerbside collection by 2020 and 55% by 2025 for England

	Overall recycling rate	Total additional recycling by 2025 (relative to 2006)	Potential new jobs (2025 relative to 2006)			Total net jobs
	%	000 tonnes	Direct	Indirect	Induced	
			Multipliers:			
				1.5	1.75	
2015	41.7	2599	7914	3957	1978	13849
2020	50.0	1155	3269	1635	793	5722
2025	55.0	537	1584	792	389	2772
Total additional by 2025	8945	4291	12768	6384	3160	22343

Scenario 2: Potential new jobs from meeting current targets for recycling of all municipal waste across the whole UK

Table 15 shows assumed recycling rates for key materials in overall UK municipal waste in order to achieve a target of 50% recycling of municipal waste by 2020 (rising to 55% by 2025).

The results of modelling are shown in Table 16 which suggests that at these rates of recycling, by 2025 the UK will have increased total recycling from 10.9 million

tonnes (2006) to 17 million tonnes, an increase of 6.1 million tonnes.

Using the same co-efficients for jobs per thousand tonnes of key materials as above this suggests that **by 2025 some 18,600 new direct jobs could be created in recycling of municipal waste and that these would in turn create 9,300 jobs in the supply chain and 4,650 induced jobs in the wider economy. Of the total 32,500 net new UK jobs the majority (26,800) would be in England, but nearly 3,000 would be in Scotland, 1,660 in Wales and 1,150 in Northern Ireland** (see Table 17).

Table 15: Assumed recycling rates for all UK municipal waste to achieve 50% recycling by 2020 and 55% by 2025

Key recyclable materials	2006 Baseline (Defra, 2010a)		Assumed recycling rate							
	Total potential	Total recycled	2006	2007	2008	2009	2010	2015	2020	2025
Glass	2438	1012	42	43	46	48	50	60	65	70
Paper	9212	4394	48	49	50	52	55	60	65	70
Plastic	3906	296	8	9	10	12	15	25	35	40
Metals	1701	795	47	48	49	50	50	55	60	65
Furniture & WEEE	494	94	19	20	21	22	25	30	35	40
Wood	347	58	17	18	19	20	25	30	35	40
Textiles	982	129	13	15	18	20	22	25	30	35
Biowaste	12300	3217	26	27	28	29	30	35	47	52
Other	4132	916	22	23	24	25	26	30	35	40
Total	35512	10910	31	32	33	35	36	42	50	55

Table 16: UK potential new recycling jobs by 2025 (relative to 2006) by achieving 55% recycling across all municipal waste

	Overall recycling rate	Total additional recycling by 2025 (relative to 2006)	Potential new jobs (2025 relative to 2006)			Total net jobs	
	%	000 tonnes	Direct	Indirect	Induced		
			Multipliers:		1.5	1.75	
2015	42.1	3017	9979	4990	2495	17464	
2020	50.0	2084	5803	2901	1451	10155	
2025	55.0	1013	2809	1405	702	4916	
Total additional by 2025	17024	6114	18591	9296	4648	32535	

Table 17: Number of potential new recycling jobs by nation: Scotland, Wales, England and Northern Ireland

	Scotland	Wales	England	Northern Ireland
% Total UK:	9.16%	5.09%	82.2%	3.5%
2015 (from 2008)	1600	889	14358	618
2020 (from 2015)	930	517	8349	359
2025 (from 2020)	450	250	4042	174
Total 2025 cf 2006	2980	1656	26748	1151

Scenario 3: Potential new jobs from meeting a 70% recycling target across all UK municipal waste

Table 18 shows the assumed recycling rates for key materials which could help to achieve 70% recycling across all municipal waste by 2025. This implies that recycling of municipal waste will double from 10.9 million tonnes in 2006 to 21.7 million tonnes in 2025, equivalent to an additional 9.5

million tonnes of recycle collected, processed and remanufactured. Applying the same ratio of jobs per thousand tonnes of material as before suggests that 29,400 new direct jobs, 14,700 indirect jobs and 7,300 induced jobs could be created across the UK (see Table 19). Again the majority of these **51,400 potential net new jobs** will be in England (42,300) but **Scotland, Wales and Northern Ireland would benefit from 4,700 and 2,600 and 1,800 net new jobs respectively** (see Table 20).

Table 18: Assumed recycling rates to achieve 70% recycling of total UK municipal waste by 2025

	2006	2007	2008	2009	2010	2015	2020	2025
Glass	42	43	46	48	50	60	70	80
Paper	48	49	50	52	55	60	70	80
Plastic	8	9	10	12	15	25	35	45
Metals	47	48	49	50	50	65	70	80
Furniture and WEEE	19	20	21	22	25	50	60	70
Wood	17	18	19	20	25	50	60	70
Textiles	13	15	18	20	22	50	60	70
Biowaste	26	27	28	29	30	54	65	75
Other	22	23	24	25	26	29	37	47
Total	31	32	33	35	36	50	60	70

Table 19: UK potential new recycling jobs by 2025 (relative to 2006) by achieving 70% recycling across all municipal waste

	Overall recycling rate	Total additional recycling by 2025 (relative to 2006)	Potential new jobs (2025 relative to 2006)			Total net jobs	
	%	000 tonnes	Direct	Indirect	Induced		
			Multipliers:		1.5	1.75	
2015	50	5643	15769	7884	3942	27595	
2020	60	2667	6952	3476	1738	12166	
2025	70	2454	6658	3329	1665	11652	
Total additional by 2025	21674	10764	29379	14689	7345	51413	

Table 20: Share of potential new jobs in recycling by region: Scotland, Wales, England and Northern Ireland

	Scotland	Wales	England	Northern Ireland
% Total UK:	9.16%	5.09%	82.2%	3.5%
2015 (from 2008)	2528	1405	22687	976
2020 (from 2015)	1114	619	10002	430
2025 (from 2020)	1067	593	9579	412
Total 2025 cf 2006	4709	2617	42268	1818

Scenario 4: Potential new jobs from meeting a 70% recycling target in the UK for municipal and commercial & industrial waste

There are currently severe limitations on the availability and compatibility of C&I and CD&E waste for the UK, although snapshot data is available from UK returns to Eurostat for the Waste Statistics Regulation for the years 2004 and 2006 (Defra, 2008) and from one-off studies for Defra (see data summaries in ERM 2005).

Best available data on the total arisings and recycling in these areas is shown in Table 21 (Defra, 2010a; Northern Ireland Environment Agency, 2010; SEPA, 2010; Welsh Assembly Government, 2010a). This shows that overall waste arisings in the UK from these sources were 230 million tonnes in 2005/6 of which 115 million tonnes (50%) was from CD&E and 81 million tonnes (35%) was from C&I. A total of 102 million tonnes of material was recycled (equivalent to 44%). Combined municipal and C&I recycling accounts for the collection and reuse of 47 million tonnes of material, an effective recycling rate of 41% in 2006.

No comprehensive data are available for the composition of these total volumes of waste and recycling. Prognos (2008) covers some of this, but with some apparent inconsistencies with Defra because of the inclusion of end of life vehicles, while the UK official data excludes scrap yards. However, Table 22 shows best estimates from comparing baseline data from 2004 and 2006 from returns to Eurostat (Defra, 2008) and for 2004 (Prognos et al, 2008) and data from trade bodies (CEPI (Confederation of European Paper Industries), 2010) relating to some 26

million tonnes of key materials in these waste streams.

The analysis has focused on the key materials for which robust data is available but we have also included estimates for furniture, WEEE and 'other'³ waste streams on the basis of published data for municipal waste grossed up to reflect the overall relationship between municipal and C&I waste arisings and recycling tonnages. The analysis thus covers some 37 million tonnes of waste being recycled in 2006. The 'missing' 10 million tonnes of C&I waste recorded as being recycled in Table 21 but missing from the material totals identified in Table 22 is partly associated with the re-use of mineral wastes and food wastes within industrial sectors and so has not been included in the analysis. The largest material streams are metallic wastes (10.5 million tonnes), paper and card (8.2 million tonnes) and biowaste/animal and vegetable waste (3.1 million tonnes). Where there are significant variations in Eurostat data for the UK our best judgement is that this is a result of differing treatment of materials exported and recycled at different periods of data collection.

³ batteries, fluorescent tubes, foils, oils, paints etc

Table 21: UK summary data for 2005/6 (unless shown) for MSW, CD&E; C&I waste streams (million tonnes per year)

	Recycling	Disposal	Other	Total	Recycling rate
MSW (2008/9)	12.22	21.15		33.37	36.62
CD&E (2005/6)	54.66	33.25	27.3	115.21	47.44
C&I (2005/6)	35.04	43.79	2.61	81.44	43.03
Total	101.93	98.2	29.92	230.05	44.31
Total Excluding CD&E	47.27	64.95	2.62	114.84	41.16

Source: Various datasets (Defra, 2008; Defra, 2010a; Northern Ireland Environment Agency, 2010; SEPA, 2010; Welsh Assembly Government, 2010a).

Table 22: 'Best estimates' of the quantities of key materials, from the UK municipal and C&I waste streams, which are sent to recycling

Waste sent to recycling, by waste type, million tonnes pa	UK submissions to Eurostat		Prognos (2008)	CEPI stats for UK paper/ card recycling, inc exports		'Best estimate'
	2004	2006	2004	2004	2006	2006
Metallic wastes	4.40	10.54	9.55			10.54
Glass wastes	1.93	1.20	1.14			1.20
Paper and cardboard wastes	6.89	4.17	5.69	7.20	8.20	8.20
Plastic wastes	1.48	0.43	0.36			0.43
Wood wastes	2.72	2.75	2.75			2.75
Textile wastes	0.28	0.12	0.31			0.12
Animal and vegetable wastes	6.32	11.19	3.14			3.14
Total for 'key materials'	24.01	30.39	22.93			26.36
Mineral wastes	61.77	65.49	NA			65.49

Source: (Defra, 2008; Prognos et al, 2008; CEPI (Confederation of European Paper Industries), 2010) and best estimates based on an assessment of available sources by Dr Julian Parfitt, Resource Futures

Table 23 summarises assumptions about recycling rates for key waste streams – glass, paper, plastics, metallics, wood, textiles and biowaste – based on similar assumptions to Scenario 3 for municipal waste streams in order to achieve an overall recycling rate of 70% by 2025.

Table 24 shows that – again assuming overall waste arisings will fall in the New Austerity context – the total recycled municipal and C&I material will increase by 18.5 million tonnes to reach a total of 55.8 million tonnes by 2025. Collection, processing and remanufacturing of this additional material could **create some 40,150 direct, 20,100 indirect and 10,000 induced jobs across the UK. Of these**

70,300 total new potential jobs at least 57,800 will be in England with 6,500 in Scotland, 3,600 in Wales and 2,500 in Northern Ireland (Table 25).

These estimates appear to fit well with Scottish Government expectations of 1,995 new direct jobs for the recycling sector over the next six years (see Table 26), based on their bottom up assessment of implementing the ‘Zero Waste Plan’ (Scottish Executive, 2010). This study also suggests that accredited training could be provided to 2,000 trainees and volunteers per annum by 2013.

Table 23: Assumed recycling rates for key materials in the municipal and C&I waste streams to achieve 70% overall recycling by 2025

	2006 '000 tonnes			Assumed Recycling rates						
	Total available	Total recycled	2006	2007	2008	2009	2010	2015	2020	2025
Glass	2848	1200	42	43	44	45	48	60	70	80
Paper	14141	8200	58	59	60	61	62	65	70	80
Plastic	4778	430	9	10	15	20	25	30	40	50
Metallics	13688	10540	77	78	79	80	81	82	84	85
Furniture & WEEE	1206	270	22	23	24	25	30	50	60	70
Wood	6165	2750	45	47	48	49	50	55	65	70
Textiles	687	120	17	18	19	20	22	50	60	70
Biowaste	37300	11190	30	31	32	33	35	50	60	70
Other	10084	2627	26	27	28	29	30	35	40	45
Total	90898	37326	41	42	43	44	46	55	63	70

Table 24: Potential new UK jobs (relative to 2006) by achieving recycling targets for 70% by 2025 for key materials in MSW and C&I waste streams

	Overall recycling rate	Total additional recycling by 2025 (relative to 2006)	Potential new jobs (2025 relative to 2006)			
	%	000 tonnes	Direct	Indirect	Induced	Total net jobs
			Multipliers:		1.5	1.75
2015	55	9575	21820	10910	5455	38184
2020	63	4657	9489	4744	2372	16605
2025	70	4465	8838	4419	2209	15466
Total additional by 2025	56023	18697	40146	20073	10036	70255

Table 25: Potential new jobs from reaching 70% recycling target by 2025 across the municipal and C&I waste streams –Scotland, Wales, England and Northern Ireland

	Scotland	Wales	England	Northern Ireland
% Total UK:	9.2%	5.1%	82.2%	3.5%
2015 (from 2008)	3513	1947	31393	1331
2020 (from 2015)	1528	847	13652	579
2025 (from 2020)	1423	789	12715	539
Total 2025 cf 2006	6463	3583	57759	2450

Table 26: Estimated potential new jobs in the recycling sector in Scotland over the 6 years of the 'Zero Waste Plan' from 2010, (Scottish Executive, 2010)

Potential new jobs	
Recycling collections	1450
Sorting of waste	200
Resource efficiency	100
Food waste processing	120
Plastic waste processing	20
Residual waste treatment infrastructure	100
Total	1990

Summary of findings for increased recycling of UK municipal waste

Figure 8 summarises the potential new recycling in thousands of tonnes and Figure 9 summarises potential new recycling jobs for each of the 4 scenarios above.

If England increases recycling through kerbside collections to 50% by 2020 and 55% by 2025, based on conservative estimates this could mean 22,300 total net new jobs in recycling, supply chains

and induced employment in the wider English economy.

If these targets are met for the UK as a whole across all municipal waste, this could mean 32,500 total net new jobs of which the majority (26,700) would be in England, but up to 3,000 would be in Scotland, 1,650 in Wales and 1,150 in Northern Ireland.

Figure 8: Projections for total and new recycling ('000 tonnes) by 2025 under four scenarios for the UK.

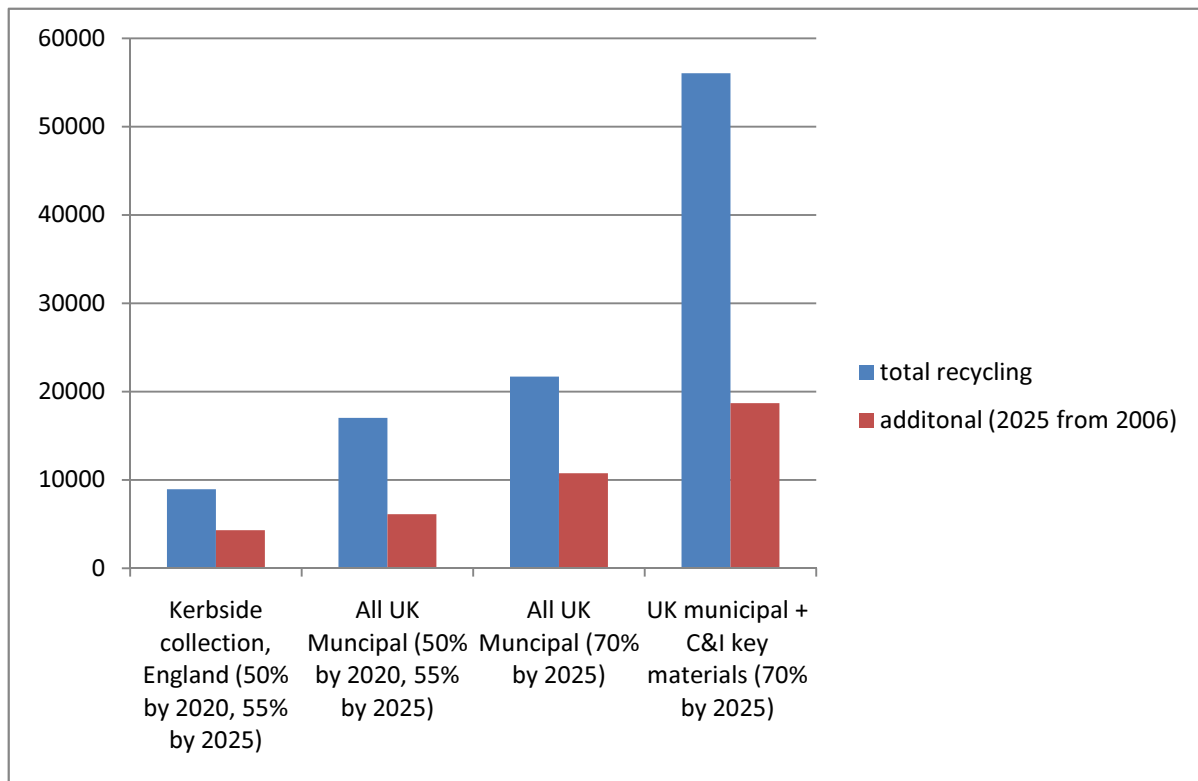
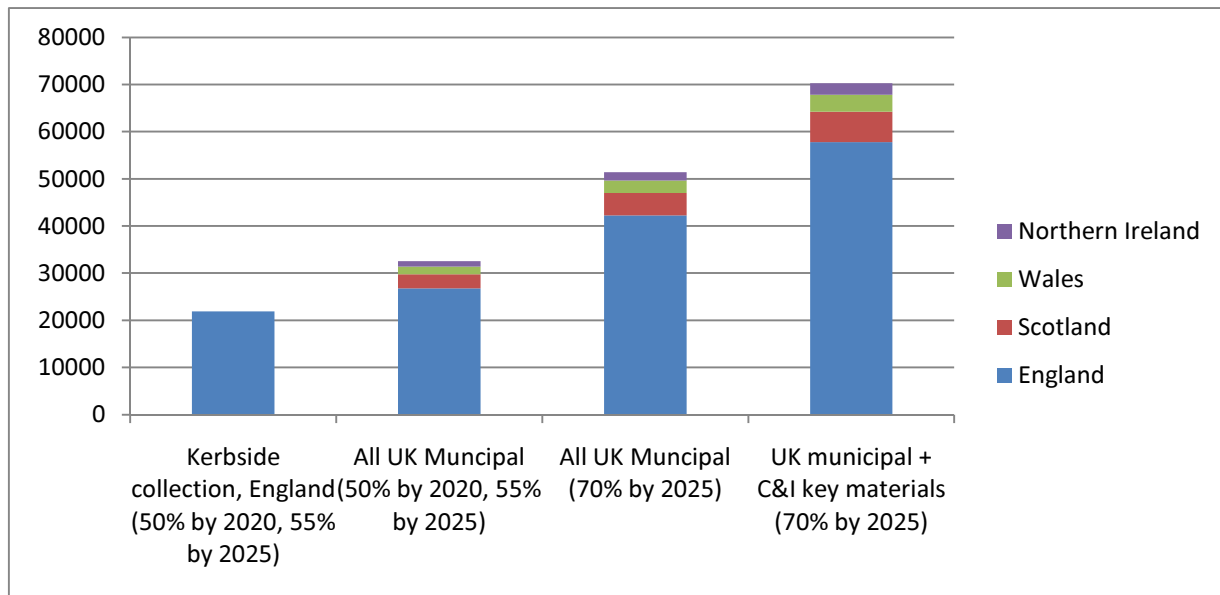


Figure 9: Potential new jobs from increased UK recycling (2025 compared to 2006 baseline)



If more challenging recycling rates of over **60% by 2020 and 70% by 2025 are pursued across the UK for all municipal waste, this could create 51,400 total net new jobs by 2025 relative to 2006.** Again over 80% of these would be in England with an estimated 4,700 in Scotland, 2,600 in Wales and 1,800 in Northern Ireland. Projections for potential jobs from recycling of municipal and C&I – albeit on less robust data – suggest that across the entire waste stream these higher targets would lead to 70,300 total new jobs in recycling, reuse and remanufacture. These estimates fit well with the Scottish Government’s bottom up estimate for potential new jobs created from pursuing their ‘Zero Waste Plan’.

Meeting the 70% by 2025 target would be challenging – particularly for biowaste, textiles, wood, furniture and WEEE which are all starting from a relatively low base. **But the 70% target for municipal waste recycling alone suggests that nearly 19,000 additional new jobs could be created** as a result of achieving this higher rate of recycling.

Many of these additional jobs would be in the reuse and remanufacturing sectors which have been shown to have considerable additional social benefits when undertaken particularly by third sector organisations.

Conclusions

This short research study has sought to make the best use of the available data on employment in waste and recycling, municipal waste generation and C&I and CD&E waste generation across the UK and EU. In general, the data for municipal waste is much better than for commercial and construction wastes and so there is inevitably a stronger focus on projections for municipal waste. Likewise with employment data, the inconsistencies and limited availability of data from some EU countries means that this short study is useful as an indicator of potential and gives an order of magnitude to the potential for job creation from more waste recycling.

Despite the limitations of the data and the varied nature of such studies into employment in the waste management and recycling industries as have been done, it has been possible using some simple assumptions and focused methodology to look at the trends of both employment and increased recycling and make projections for the improved employment opportunities that much higher rates of recycling in the UK and EU might generate.

This very preliminary analysis based on simple but defensible assumptions suggests that **across the EU27 up to 322,000 direct jobs could be created in recycling an additional 115 million tonnes of glass, paper, plastic, ferrous and non ferrous metals, wood, textiles and biowaste.** These jobs would have knock on effects in down- and up-stream sectors and the wider economy. Even once jobs displaced from traditional waste

management and virgin materials are taken into account, **the total potential is for more than half a million net new jobs.**

These figures should be regarded as estimates not as targets. They are based on conservative assumptions, so avoiding false expectations and leaving considerable potential for them to be exceeded in a policy climate which prioritises high recycling and accounts for green job creation as an important benefit of such a policy.

In the UK more than half of municipal waste ends up being landfilled or incinerated, and unemployment is rising in an economic context where reductions in public spending are adding more uncertainty to the economic climate. In this context, we hope that the positive message contained in this report is a contribution to the debate about future waste and resource policy. Just as we are moving towards rethinking 'waste' as a valued resource, so we should also be recognising the value of our human resource – the potential 'green jobs' workforce – and the role they can play in increasing recycling and reuse, reducing carbon emissions and contributing to a more sustainable economy here and across the EU.

Although we acknowledge that more work should be done to assess the role of exports of recyclables in the growth of recycling and employment, many of the new 'green jobs' will be based on recycling and reuse collection and reprocessing systems close to home as well as the emerging areas of waste prevention, food waste collection and energy from waste through anaerobic

digestion and other technologies to process biowaste. They will provide many valuable opportunities in the public, private and third sectors for training and work for people who are often marginalised from other employment.

The link between job creation and better waste management through recycling has

been known for some years. We hope that this contribution to the debate reinforces the value of that link, and places it firmly in the spotlight as the Coalition Government begins to articulate the detail of its programme for the Big Society, linked to the emergence of a Zero Waste and Low Carbon economy.

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