

Kerbside Collections – Factors for Success

**A Review of Scottish
Kerbside Recycling Schemes
To identify factors delivering high recycle recovery**

Phase 1 - Analysis of Results

Remade Scotland

Executive Summary

Scottish local authorities have made significant progress in increasing recycling rates, and achieving the 25% by 2006 target. However one important factor to achieve 40% and beyond, will be the need to improve the recovery rates from kerbside recycling collections. The average recovery rate in Scotland is 2.08kg/hh/wk while in England and Wales the figure is 50% higher at 3.21kg/hh/wk.

In Autumn 2006 Remade Scotland surveyed all 32 Scottish local authorities to gather data on kerbside recycling, with 29 full sets of data being gathered, the information covering the financial years 2004/5 and 2005/6.

The survey found that a total of 336,488 tonnes of recyclate was collected at the kerbside in 2005/6 from a combination of dry recyclate and garden waste collection schemes.

	Dry Recyclate	Garden Waste
% of total kerbside tonnage	49.8%	50.2%
No. of LAs offering scheme (out of 29)	29	27
% of hh with access to scheme	76%	65%
Average kg/hh/wk	2.08	2.59

The factors influencing high recovery rates for dry recyclate collections were found to be collection frequency, collection capacity, number of materials collected, and collection frequency of residual waste.

Factor	Effect
High Recyclate Collection Frequency	Weekly collections 64% higher recovery rates than fortnightly, 96% higher than every 4 weeks
High Collection Capacity	Weekly capacity >101litres 56% higher recovery rates than 51-100 litres, 115% higher than <50 litres
N ^o . of Materials Recycled	Multi material schemes with 4 or more materials produce 137% more material than single material collection stream
Residual Waste Collection Frequency	Schemes integrated with fortnightly residual collection recover 65% more than with weekly residual

Additional factors likely to improve recycling rates are the introduction of food waste collection and educational/promotional campaigns to increase participation and capture rates.

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1 Introduction

The Project aim is to identify the elements which lead to high recyclate recovery rates of kerbside collection schemes and is being undertaken in 4 phases.

Phase 1 – Analyse the data from Scottish Council kerbside collection schemes to identify any patterns supporting high recovery rates.

Phase 2 – Through workshops and consultation, work with Councils to identify and analyse specific factors affecting recovery rates.

Phase 3 – Provide written guidance of findings.

Phase 4. – Work directly with individual Councils to assist improvements in recovery rates.

This report presents the findings from Phase 1, which are summarised below.

Scottish local authorities have made significant progress in increasing recycling rates, achieving the 25% by 2006 target. However an important factor in moving towards 40% recycling rates and beyond, will be continual improvements in the recovery rates from kerbside recycling collections. This report assesses the current state of kerbside recycling in Scotland and investigates factors associated with high recyclate recovery rates. This information can be used by local authorities, with the assistance of Remade Scotland, SWAG and the Scottish Executive, to maximise the amount of recyclate being recovered from the kerbside.

Remade Scotland undertook a survey of all 32 Scottish local authorities to gather detailed information on kerbside recycling. Full data sets were gathered for 29 authorities, the analysis of which forms the basis of this report.

The survey found that a total of 336,488 tonnes of recyclate was collected at the kerbside in 2005/6, with dry recyclate and garden waste contributing equal amounts (49.8% and 50.2% respectively).

All 29 local authorities offered a dry recyclate collection, with 76% of households having access to a kerbside collection of at least one material. Paper/card contributed the highest recovery rate within dry recyclate materials, with all schemes except one offering the collection of paper. The average recovery rate for dry recyclate is 2.06 kg/hh/wk. The recovery rate varies with the number of materials accepted, the container type, method of segregation and frequency of collection.

27 out of 29 local authorities offered a garden waste collection at kerbside, with 65% of households being covered. Lower percentages of households were covered in urban areas due to the nature of the housing stock, and in rural areas, perhaps a reflection on higher home composting rates in rural areas. Garden waste collection was shown to be seasonal in nature, reflected by the fact that a third of schemes are seasonal in nature, with collection ceasing over the winter months. The average recovery rate for garden waste is 2.59 kg/hh/wk.

The main factors associated with high recovery rates were found to be high frequency of collection, high collection capacity, a wide range of materials collected, fortnightly collection of residual waste and effective educational campaigns.

2 Background

The successful implementation of efficient local authority kerbside recycling programmes is integral to Scotland meeting both its biodiversion and recycling targets.

The European Landfill Directive (99/31/EC) Article 5 sets out the targets for member states to reduce the weight of biodegradable municipal waste (BMW) consigned to landfill based on 1995 levels. The targets set for reduction of BMW to landfill are as follows:

- 75% of the quantity sent to landfill in 1995 by July 2010
- 50% of the quantity sent to landfill in 1995 by July 2013
- 35% of the quantity sent to landfill in 1995 by July 2020

In response to these targets, Scotland has developed a National Waste Plan (Scotland) 2003 which sets an initial target to recycle and compost 25% of all municipal solid waste (MSW), and to reduce the amount of BMW being landfilled by 1.5 million tonnes, by 2006. The long-term target is to recycle and compost 55% of MSW by 2020.

The National Waste Plan includes the grouping of the thirty two Scottish local authorities into eleven Waste Strategy Areas (WSAs). Each WSA has devised its own Area Waste Plan to achieve these targets using the best practicable environmental options (BPEO) for their own areas.

The Scottish Executive has provided specific funding through the Strategic Waste Fund (SWF) in order to support local authorities in the drive to fulfil the targets outlined above. From the period 2001/02 to 2006/07, the Scottish Executive has made £507.9 million of funding available for a range of initiatives focusing on waste minimisation and diversion from landfill, including the introduction or expansion of the separate collection of recyclate from the kerbside.

Considerable progress has already been made, with local authorities recording an average 24.4% recycling/composting rate for the rolling year April 2005-March 2006. However, in order to achieve the 2020 targets the performance of recycling schemes has to be maximised, in combination with alternative treatment technologies for residual waste.

In order to assess the range and effectiveness of current kerbside recycling schemes, a review was undertaken by Remade Scotland in Autumn 2006. The aims were as follows:

- survey 32 Scottish local authorities
- gather data on individual schemes for 2004/5 and 2005/6
- to examine and compare local authority kerbside recycling programmes and evaluate their performance
- to identify factors which result in high recovery rates
- provide guidance to assist local authorities in maximising scheme performance.

The data collected was obtained by means of a survey conducted via e-mail and telephone, by Remade Scotland staff with the co-operation of local authority staff.

Local authorities were asked to provide details on the number of households in their authority and the proportion served by dry and green waste kerbside recycling

services. Data was collected on a scheme by scheme basis including quarterly tonnages, containment methods, materials accepted and collection frequencies, including any seasonal variations. Collection frequency was also established for the residual collection.

Data was collected between September 2006 and January 2007, with the long time-frame essential in order to achieve as full a data-set as practicable. Twenty-nine local authorities were able to provide the full range of data required in this time-period, and the analysis in this report is largely based on this data. Where the report refers to results for all thirty-two Scottish local authorities, data has been supplemented by information collected from other recognised sources such as LAWAS (Local Authority Waste Arisings Survey) and LAS (Landfill Allowance Scheme) data. The remaining three local authorities were unable to provide data within the necessary time-frame due largely to constraints in their data-collection systems.

The analysis of the data presented in this report represents an initial review of kerbside recycling in Scotland and considers factors which appear from the data to be associated with high recycling rates. Following on from this Remade Scotland will be consulting with local authorities who participated in the study to seek input into further clarification of these factors before a final report is produced.

This survey has focused exclusively on kerbside recycling schemes and not overall recycling rates. It must therefore be recognised that other methods of collection can play an important role in achieving targets, such as recycling centres and points (civic amenity sites and bring sites) and bulky waste collections. Indeed many local authorities, particularly rural ones with low population densities where kerbside collections can be uneconomic, have focused substantial energy and investment in recycling centres and points and reaped the benefits in terms of recycling rate improvements.

3 Data Analysis

3.1 Frequency of Kerbside Collection Services

Dry recycle, green waste, and residual waste are collected with varying frequencies as shown in Table 1. Dry recycle collection is the most variable, with box systems tending to be collected weekly or fortnightly and wheeled bin services fortnightly or every 4 weeks. Garden waste is collected predominantly fortnightly or every 4 weeks, with a third of garden waste services being seasonal. Residual waste is collected either weekly or fortnightly.

Table 1: Frequency of Kerbside Collection Services across all Scottish Local Authorities

	WEEKLY		FORTNIGHTLY		EVERY FOUR WEEKS	
	NUMBER	%	NUMBER	%	NUMBER	%
Residual	17	59%	12	41%	0	0%
Dry recycle*	8**	20%	19	49%	12	31%
Garden waste	2	7%	18	67%	7	26%

*Six authorities operated services on different frequencies.

**Edinburgh's tenement scheme included here is collected twice-weekly.

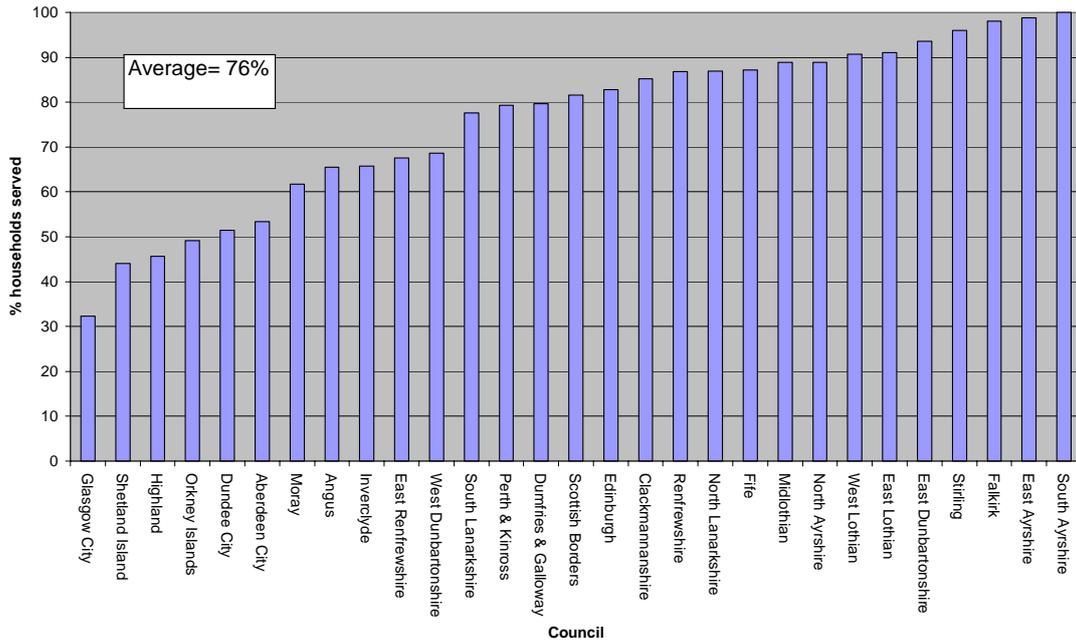
3.2 Roll-out of Kerbside Recycling Schemes

By the end of the survey period in March 2006 the majority of local authorities had rolled out their kerbside recycling schemes to the maximum number of households planned. A minority of local authorities still have roll-outs planned in the near future, most significantly in "harder to reach" housing types such as flats/tenements.

Table 2: Households Served by Family Group

Family Group	% households dry	% households garden waste
Urban	73	60
Rural	63	38
Mixed	83	80

Figure 1: Percentage of Households Served by Dry Recyclate Kerbside Collection



For dry recyclate collection the percentage of households covered by at least one kerbside scheme varies from 32% in Glasgow City to 100% in South Ayrshire with the average being 76% as shown in Figure 1. Many local authorities have concentrated their efforts on “easy to reach” detached/semi-detached properties and while some are serving flats/tenements, many of these types of property still have no access to a kerbside service.

Figure 2: Percentage of Households Served by Dry Recyclate Kerbside Collection by Family Group

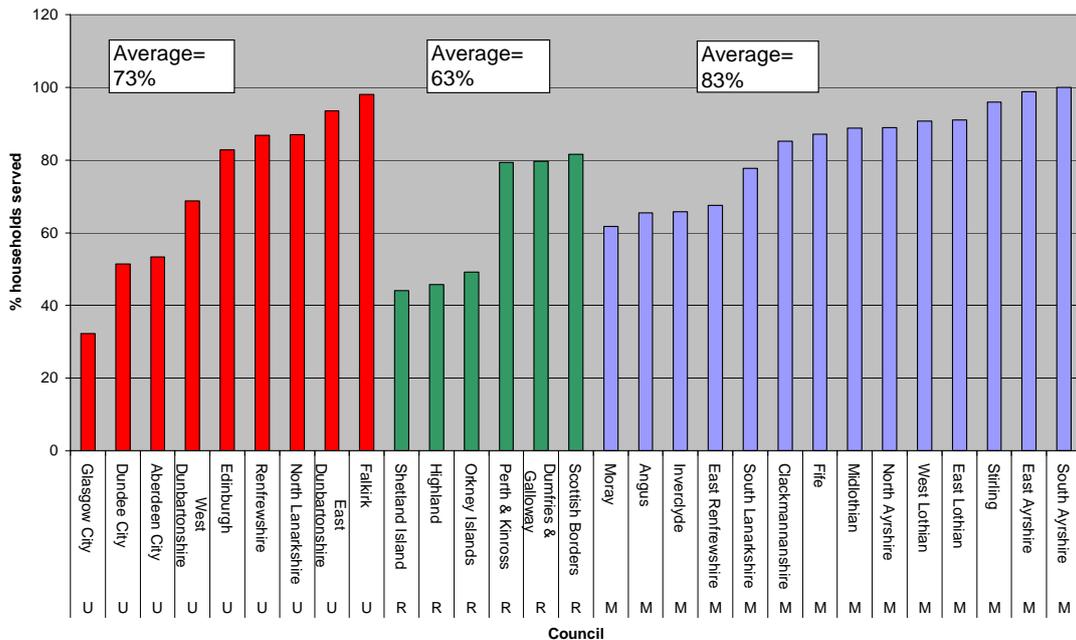
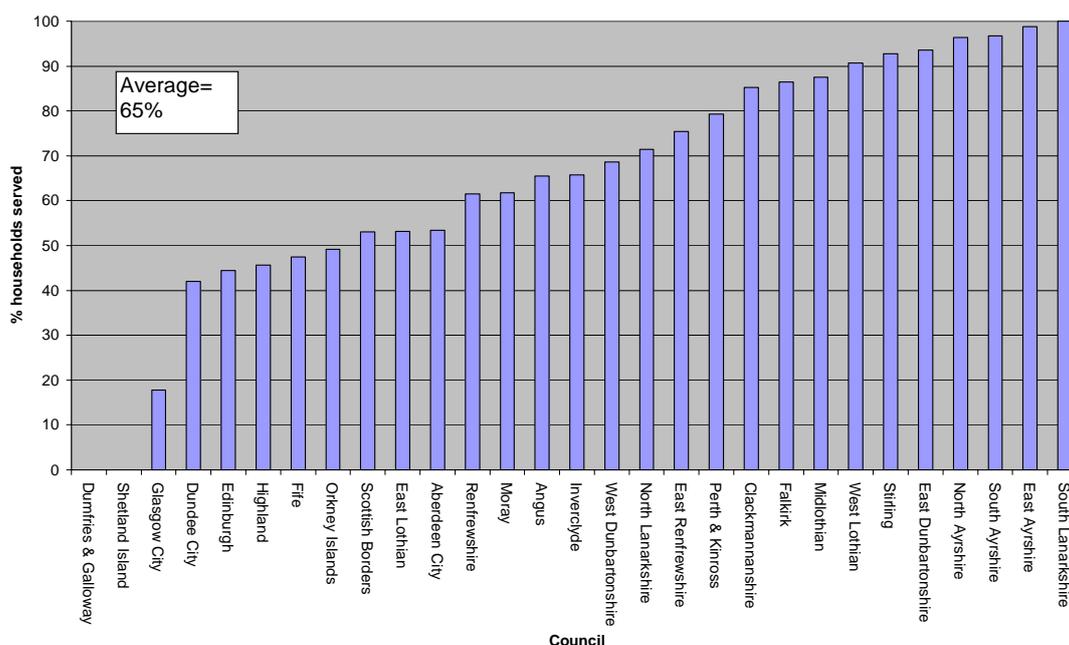


Table 2 and Figure 2 provide details of households served by family group. Mixed councils have the highest average at 83%, followed by urban at 73% and rural at 63%. The lower figure in urban authorities is likely to result from a higher proportion of the housing stock consisting of flats/tenements, while rural areas experience problems relating to low population densities in remote areas with the subsequent high costs of operating a kerbside service and questions of environmental best practice in long distance transport of recyclate.

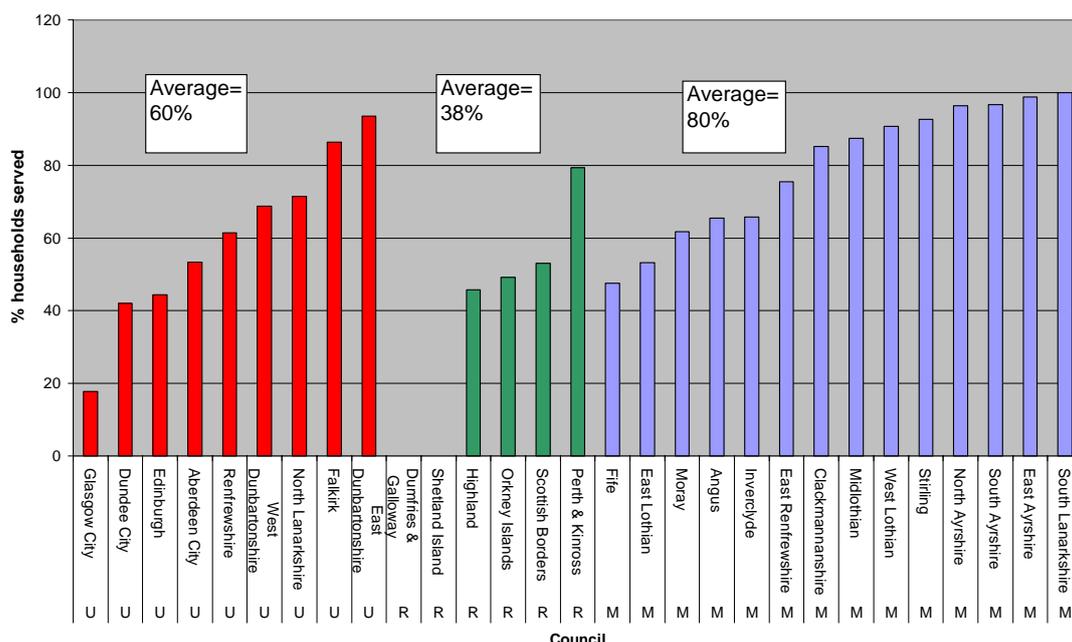
Figure 3: Percentage of Households Served by Garden Waste Kerbside Collection



For local authorities with kerbside collection of garden waste the percentage of households served varies from 18% in Glasgow City to 100% in South Lanarkshire as shown in Figure 3. Two authorities, Dumfries & Galloway and Shetland Islands do not operate a collection of garden waste from kerbside. In the case of Dumfries & Galloway this is likely to be related to organic material going instead to the Ecodeco plant.

The average percentage of households served by a garden waste collection is 65%. In terms of family group, mixed authorities again demonstrated the highest levels of roll-out with 80%, followed by urban with 60% and rural with 38% (see figure 4).

Figure 4: Percentage of Households Served by Garden Waste Kerbside Collection by Family Group



Urban authorities as expected have lower levels of garden waste collection due to the higher number of properties without a garden, while the low levels in rural areas are likely to result from both low population densities making kerbside schemes expensive and a higher concentration on home composting with its benefits of waste reduction at source.

3.3 Garden Waste Collection

The collection and composting of garden waste from households is a valuable way for local authorities to divert organic material from landfill, helping towards compliance with early Landfill Directive targets. 27 of the 29 local authorities studied, operate a kerbside garden waste collection service. The 2 authorities without a scheme are Dumfries & Galloway and Shetland Islands, with the former using an MBT plant and the latter being an isolated rural Council where home composting may be a more appropriate form of organic waste treatment. All of the authorities with the exception of Stirling accept only green garden waste in their brown bin collections. Stirling includes garden waste and cardboard. Throughout the 29 authorities, 59% of households have access to a kerbside collection of garden waste.

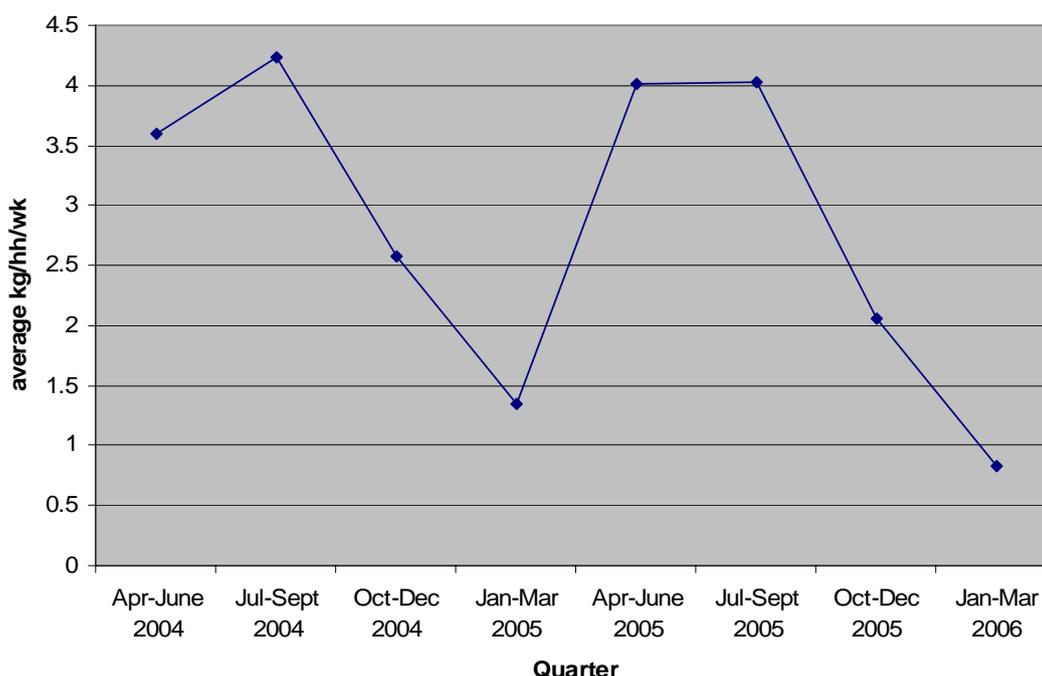
Table 3: Garden Waste Collection Variables

CONTAINMENT METHOD		FREQUENCY		SEASONALITY	
240 litre bin	89%	weekly	7%	year round	67%
140 litre bin	4%	fortnightly	67%	9 months	18%
disposable bag	4%	every 4 weeks	26%	8 months	4%
bundles	4%			7 months	11%

The majority of schemes (89%) use a 240 litre wheeled bin to collect garden waste, with the alternative containment methods of a 140 litre wheeled bin, disposable bag and bundles being used by only one Council each (see Table 3). In terms of frequency, two-thirds of schemes are operated on a fortnightly basis, with the next most popular being every 4 weeks (26%). Only 2 schemes are operated on a weekly basis.

Garden waste arisings are seasonal in nature (see figure 5), which is reflected in the fact that a third of authorities discontinue garden waste collections in the winter months.

Figure 5: Garden Waste Seasonality shown by average kilograms/household/week for all Garden Waste Schemes



3.4 Scheme Performance

The output from garden waste schemes ranges from 1.43 kg/hh/wk in Scottish Borders to 4.67 kg/hh/wk in Moray, with the average being 2.59 kg/hh/wk (see figure 6). In terms of family groups, mixed authorities had the highest yield with an average of 2.73 kg/hh/wk, followed by urban with 2.54 and rural with 2.23 (Figure 7). The reason for rural authorities collecting less material per household may well be the result of a higher proportion of households practising home composting rather than using the kerbside service. High recovery rates for garden waste must be treated with caution as collection schemes may be collecting “additional waste” not previously collected at kerbside. A number of local authorities in England have successfully introduced charging for garden to reduce this effect. Home composting as a waste prevention measure has an important role to play, but unfortunately cannot yet be counted towards recycling targets due to difficulties associated with the quantification of tonnage diversion.

Figure 6: Garden Waste Scheme Performance

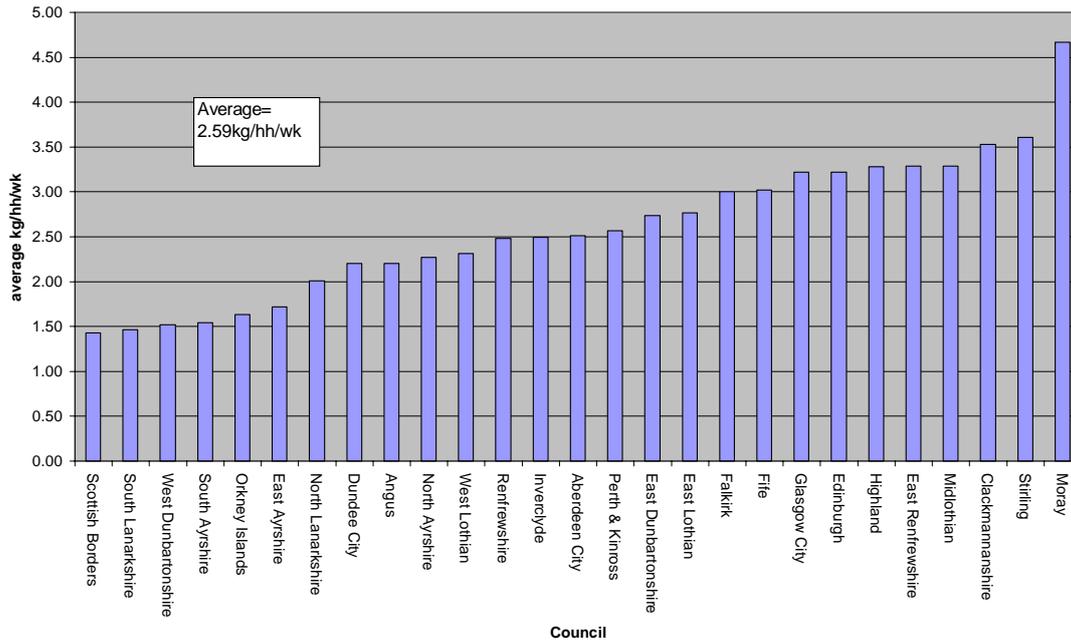
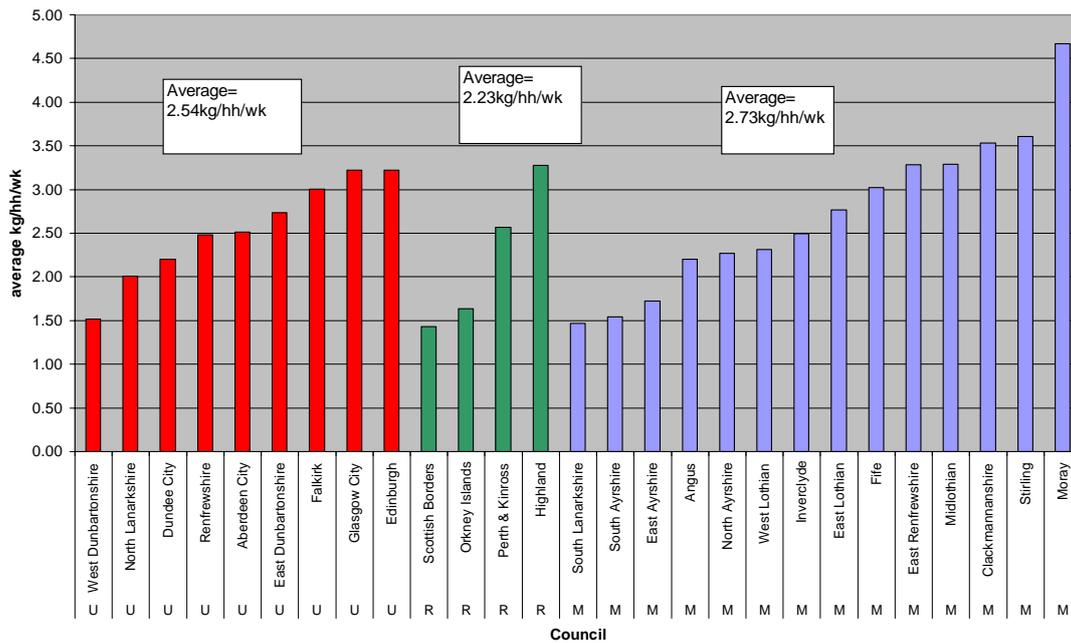


Figure 7: Garden Waste Collection by Family Group



3.5 Dry Recycle Collection

The collection of dry recycle material from householders is an important contribution to recycling rates for local authorities. All 29 local authorities surveyed offered a kerbside collection of one or more dry recycle materials to a percentage of their households. In total 76% of households have access to a dry recycle kerbside collection for one or more materials.

Local authorities use three main types of containment – wheeled bins, boxes and bags (reusable or disposable); with boxes being the most popular at 47% (see Table 4). In terms of frequency, services are weekly, fortnightly or every 4 weeks, with

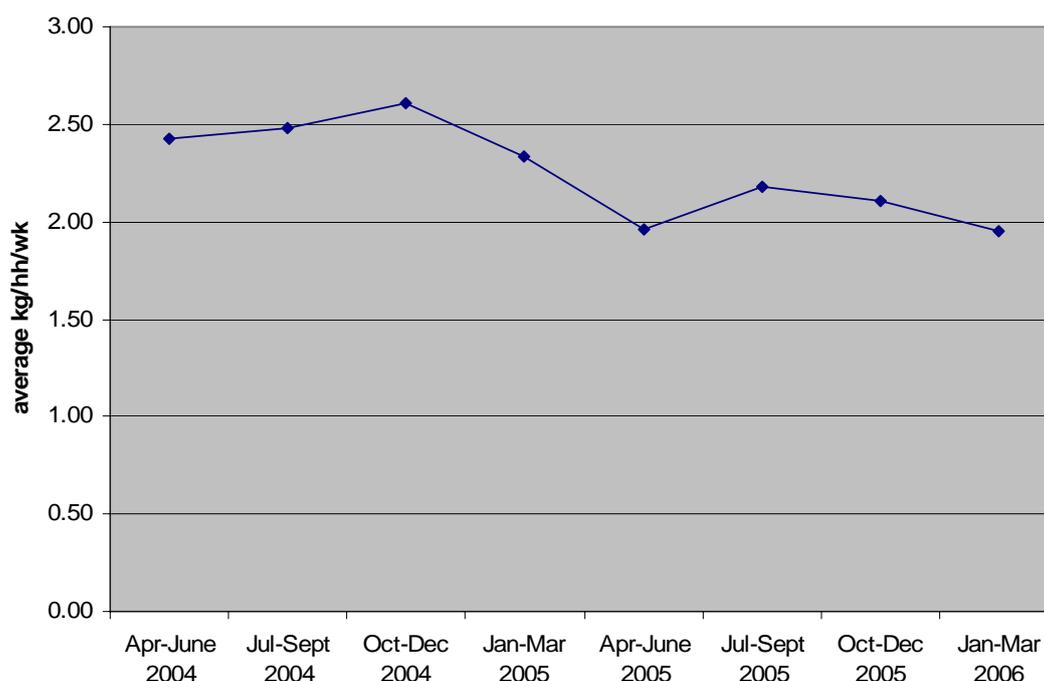
fortnightly being the most popular at 47%. The level of segregation ranges from source-segregated, through kerbside sort to co-mingled material destined for MRFs, with an approximately equal split of a third each.

Table 4: Dry Recyclate Collection Variables

CONTAINMENT METHOD		FREQUENCY		SEGREGATION	
wheeled bin	32%	weekly	21%	source - segregated	31%
box	47%	fortnightly	47%	kerbside sort	36%
bag	21%	every 4 weeks	32%	co-mingled (MRF)	33%

Dry recyclate collections do not show any seasonal variations (see Figure 8), but do appear to demonstrate a slight fall in performance over time, perhaps indicating the need for educational campaigns to be continued after the initial embedding of the scheme.

Figure 8: Dry Recyclate Collection over Time



3.5.1 Scheme Performance

Recovery rates from dry recyclate collections ranged from 0.18 kg/hh/wk in the Edinburgh tenement scheme to 5.88 kg/hh/wk in Moray, with an average of 2.08 kg/hh/wk., as shown in Figure 9. In terms of family group (Figure 10), mixed local authorities again produced the higher recovery rates with an average of 2.60 kg/hh/wk compared to 1.60 kg/hh/wk for both rural and urban authorities. Again, this is likely to be a consequence of the particular problems faced by rural and urban authorities, namely low population densities and difficult housing types.

A further complication in terms of dry recyclate is that several authorities send household waste either to an energy-from-waste plant (Dundee, Angus, Perth & Kinross, Orkney Islands & Shetland Islands) or to an MBT (mechanical-biological treatment) plant (Dumfries & Galloway). This has implications for the amount and type of material which can be removed from the waste-stream for recycling while still for instance, maintaining a high calorific value necessary for incineration.

Figure 9: Dry Recyclate Collection

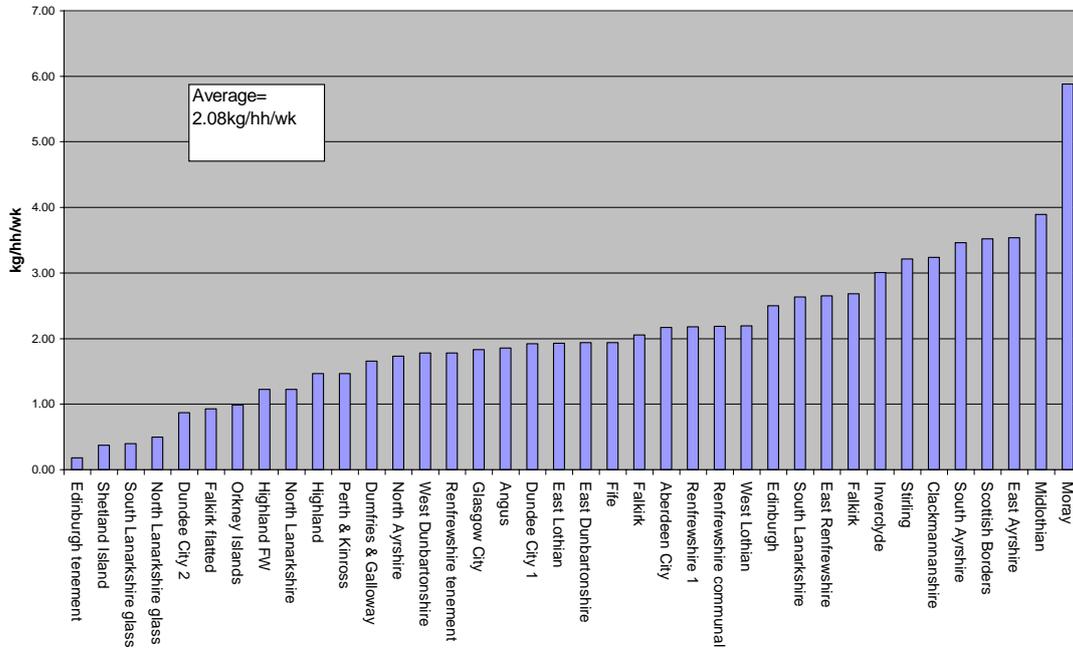
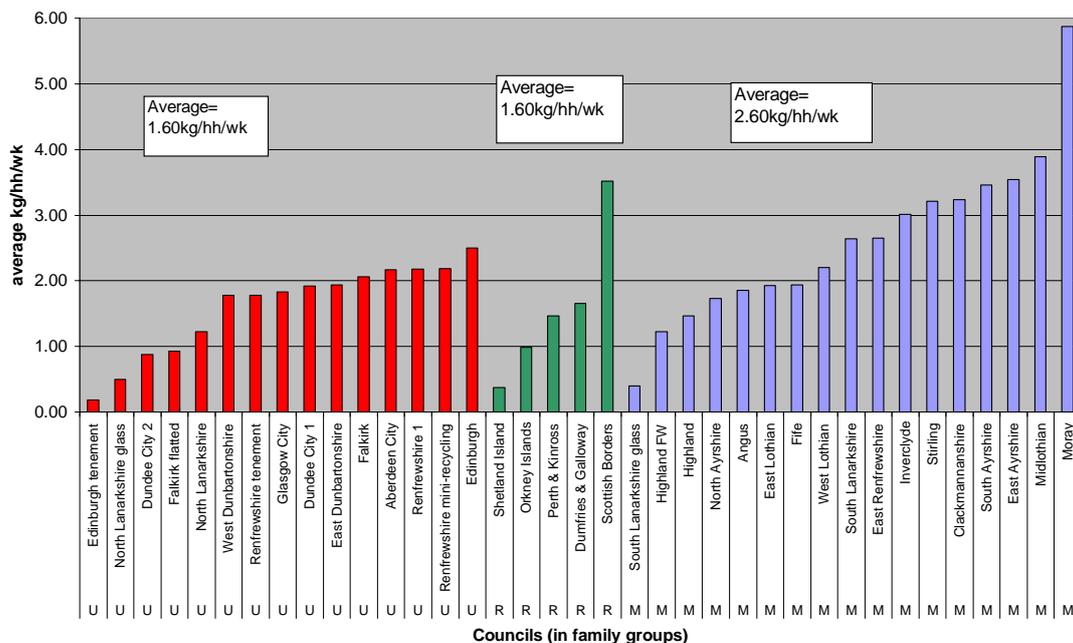


Figure 10: Dry Recyclate Collection by Family Group

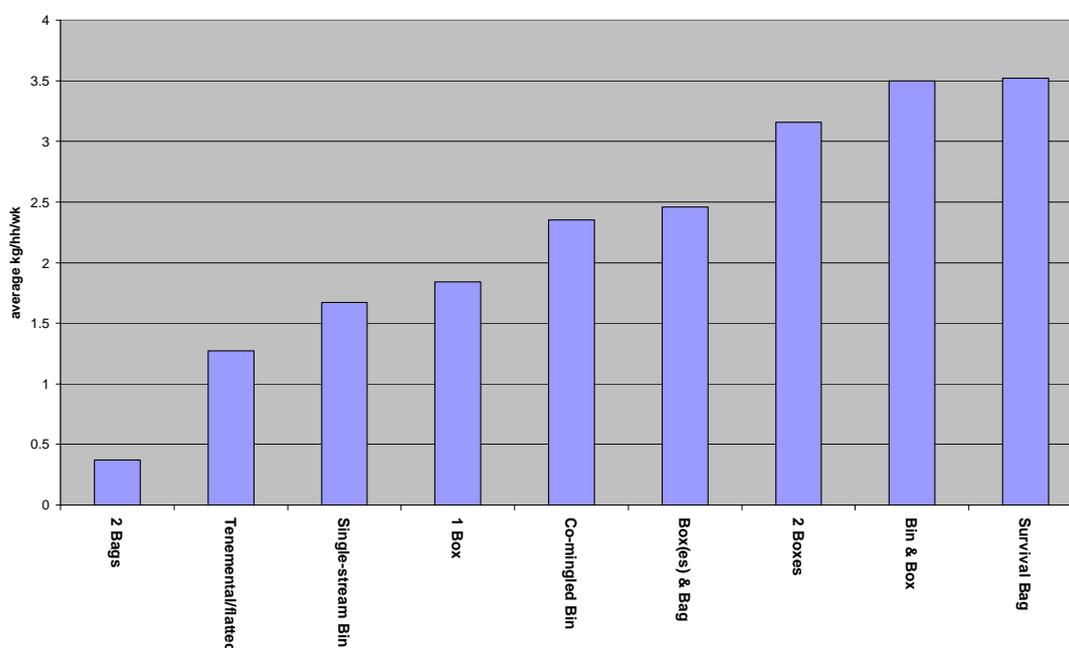


A wide range of dry recyclate collection schemes exist in Scotland, with variations in type of collection receptacle, frequency of collection, number of materials collected and method of segregation. For the purposes of this survey, a number of different classifications have been used to compare schemes.

3.5.2 Container Type

The type of container used appears to have a bearing on the recovery rates for dry recyclate, with averages ranging from 0.37 kg/hh/wk for a 2 bag system to 3.52 kg/hh/wk for a survival bag system (Figure 11). Schemes with more than one receptacle appeared to have higher recovery rates, the probable result of more materials being collected and a greater collection capacity. Single-stream bin collections, predominantly paper/card, averaged 1.67 kg/hh/wk, while co-mingled bins averaged 2.35 kg/hh/wk, a result of the greater range of materials being collected.

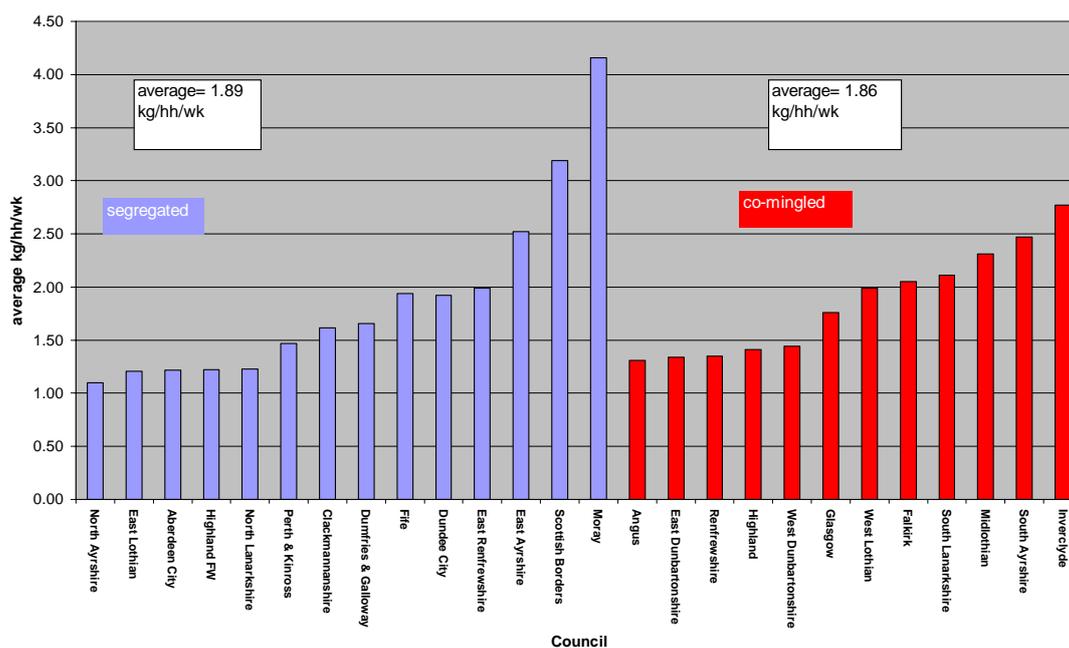
Figure 11: Dry Recyclate Collection by Container Type



3.5.3 Paper Collections – Segregated vs Co-mingled

An interesting question is whether more paper is collected in a single-stream paper bin compared to a co-mingled bin. Figure 12 shows that the amount of paper collected is in fact almost identical, with 1.89 kg/hh/wk for segregated and 1.86 kg/hh/wk for co-mingled collections.

Figure 12: Paper Collections – Segregated Vs Co-mingled



3.5.4 Method of Segregation

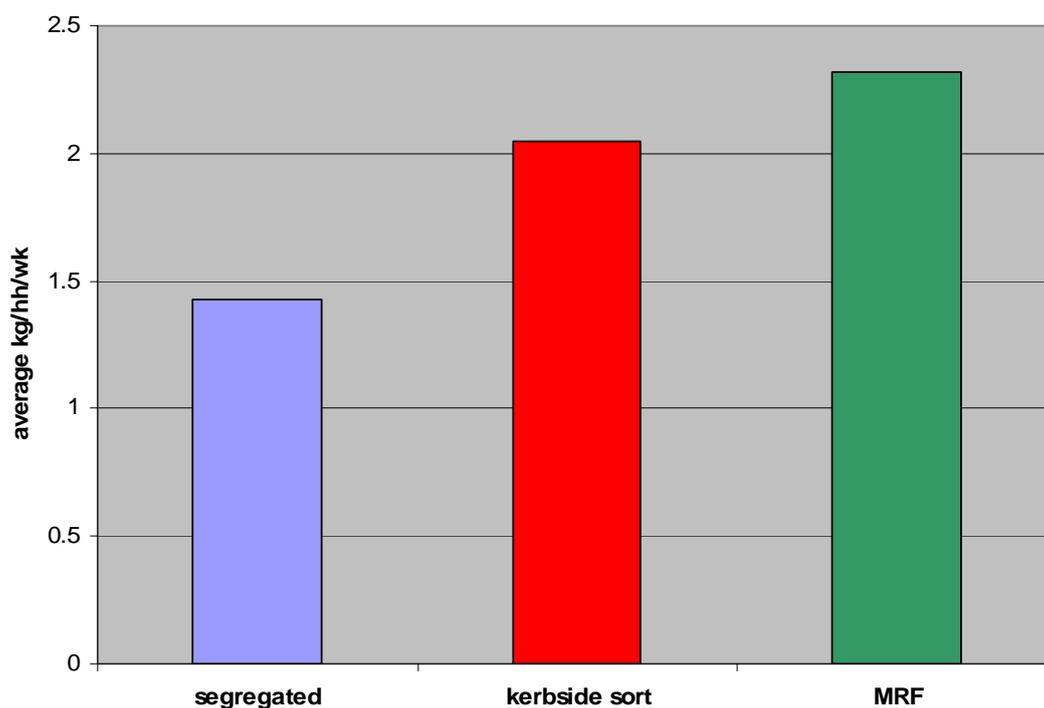
Three different methods of segregation were reported in the survey; source-segregation, kerbside sort and sorting at a MRF. Source-segregation, where a single-stream material is collected, has the advantage of not requiring further segregation, thus saving costs and often providing income, with a further plus point being that single-stream collections are the least likely to suffer from contamination. The downside, as shown in Figure 13, is that the recovery rate is lower than for other methods of collection.

Kerbside sort is where materials are collected co-mingled in a container(s) and subsequently sorted at the kerbside using a special kerbsider vehicle. This allows a range of materials to be collected and avoids the need to pay a gate fee for sorting at an MRF, but the collection itself is more time and cost intensive.

Co-mingled collections are where a range of materials are collected in one or more containers and subsequently sorted at an MRF. This has the advantage of allowing a range of materials to be collected quickly and with reduced collection costs, particularly where collection vehicles are shared with residual collection on a weekly cycle. The disadvantages are that a gate fee has to be paid for the MRF and contamination levels may be higher than with other methods of collection.

There is an approximately even split between the 3 methods, with 14 kerbside sort systems, 13 co-mingled for MRF and 12 source-segregated (36%, 33% and 31% respectively). Co-mingled collections sorted at MRFs recorded the highest recovery levels with an average of 2.32 kg/hh/wk, followed by kerbside sort at 2.05 kg/hh/wk then source-segregated at 1.43 kg/hh/wk.

Figure 13: Method of Segregation



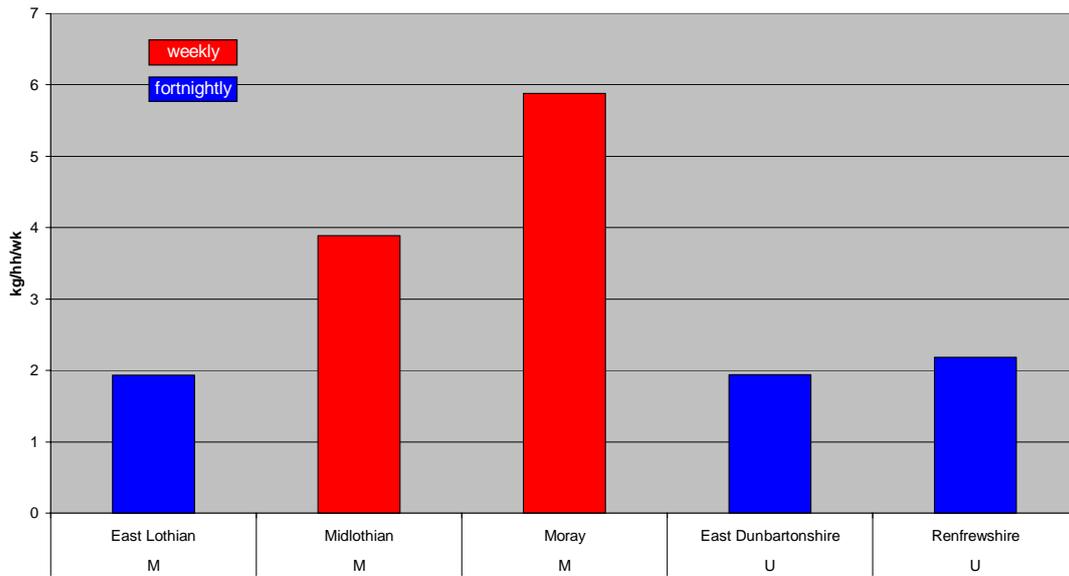
3.5.5 Scheme Types

In addition to comparing scheme types, it is also useful to identify variations within similar schemes, and investigate possible explanations for the differences in recovery rates found.

3.5.5.1 Two Box Systems

Five local authorities in total used a 2 box system, 3 mixed and 2 urban. The collections are all either weekly or fortnightly. The main factor influencing the recovery rate appears to be collection frequency as opposed to where the authority is mixed or urban. The 3 fortnightly collections record remarkably similar rates of between 1.93 and 2.18 kg/hh/wk, while the weekly collections are significantly higher at 3.89 and 5.88 kg/hh/wk (Figure 14). This may be caused by a limitation in collection capacity, which is discussed further in section 4.6.2. This may be particularly relevant where high volume but low weight materials such as plastic bottles are included in a collection.

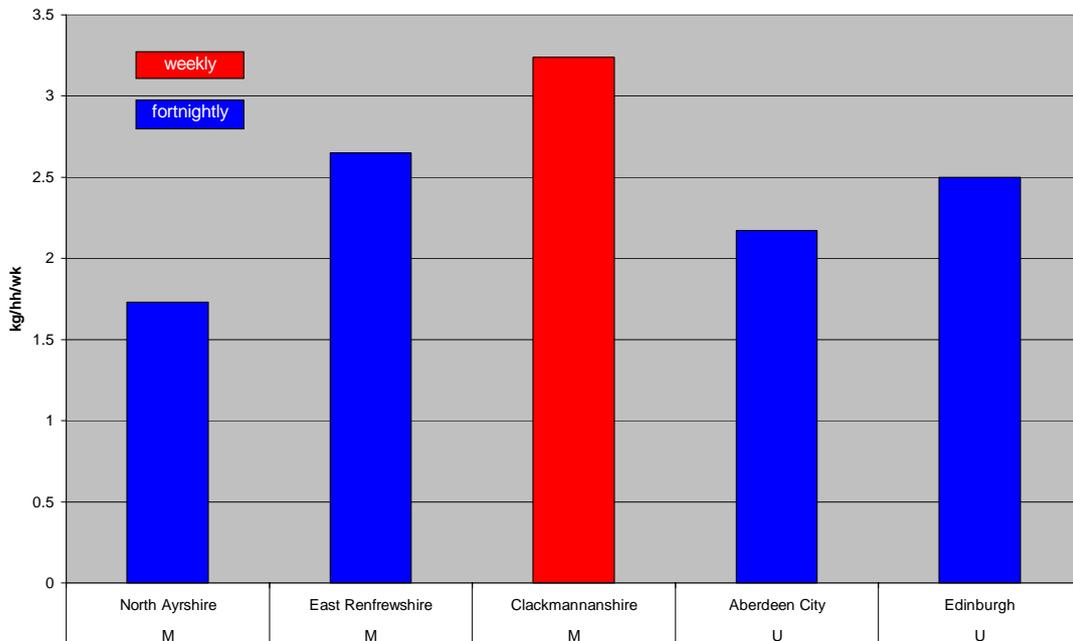
Figure 14: Two Box Systems



3.5.5.2 Box and Bag Systems

Five local authorities operate a box and bag system, predominantly with a single-stream paper collection in the bag, accompanied by a single-or multi-stream box collection. The collections are either weekly or fortnightly. Again, this type of scheme is operated by 3 mixed and 2 urban authorities. As shown in Figure 15 there is no clear difference between mixed and urban authorities. The highest recovery rate is shown by the authority operating a weekly collection.

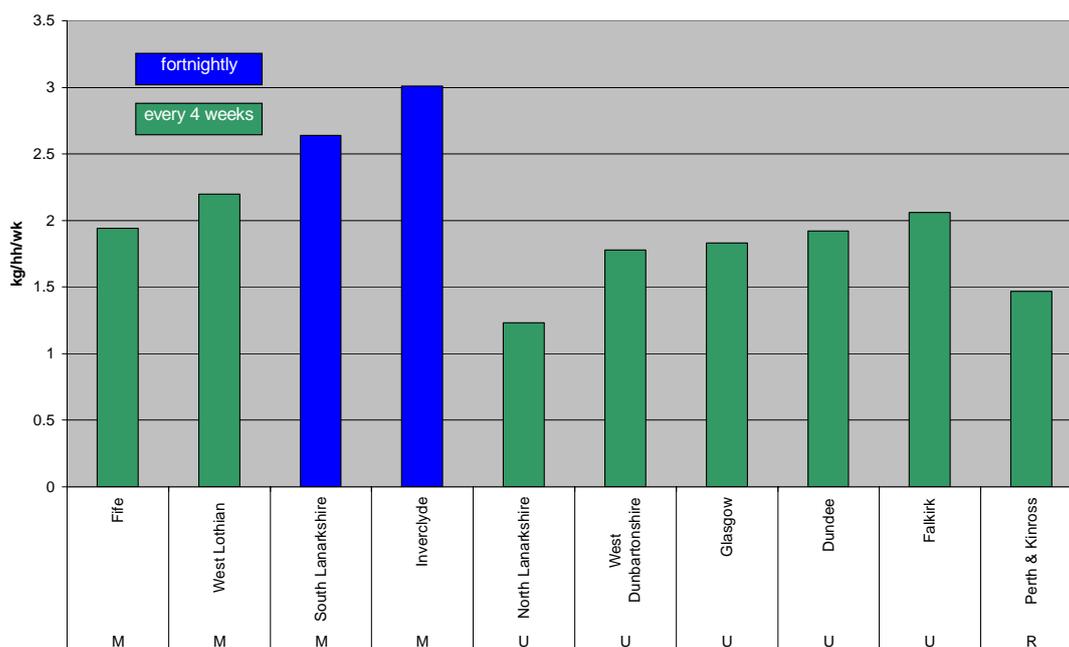
Figure 15: Box and Bag Systems



3.5.5.3 Wheeled Bin Systems

The most popular type of container is a wheeled bin (240 litre in the majority of schemes), with ten local authorities using this method to collect dry recyclate. The ten consists of 4 mixed authorities, 5 urban and 1 rural. Wheeled bin collections are collected either fortnightly or every 4 weeks. The mixed authorities record higher recovery rates with a wheeled bin collection, averaging 2.45 kg/hh/wk, as opposed to 1.76 for urban and 1.47 for rural (Figure 16). Again, the frequency of collection appears to be a contributing factor with the 2 fortnightly collections recording the highest recovery rates.

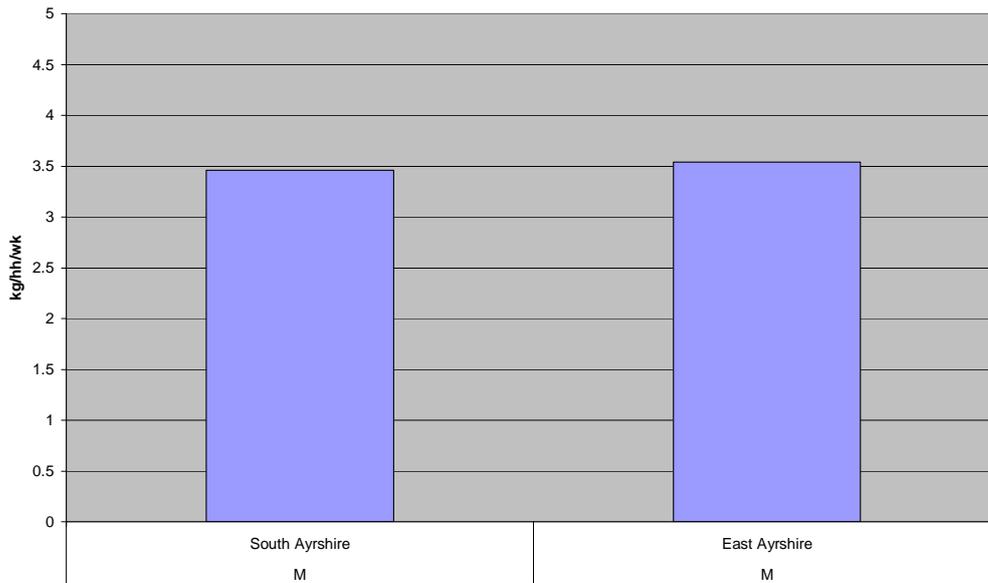
Figure 16: Wheeled Bin Systems



3.5.5.4 Bin and Box Systems

Only 2 local authorities use a wheeled bin and box system, South and East Ayrshire. Both collect the bin every 4 weeks and the box fortnightly. They show very similar recovery rates with 3.46 and 3.54 kg/hh/wk, an average of 3.50 (see Figure 17).

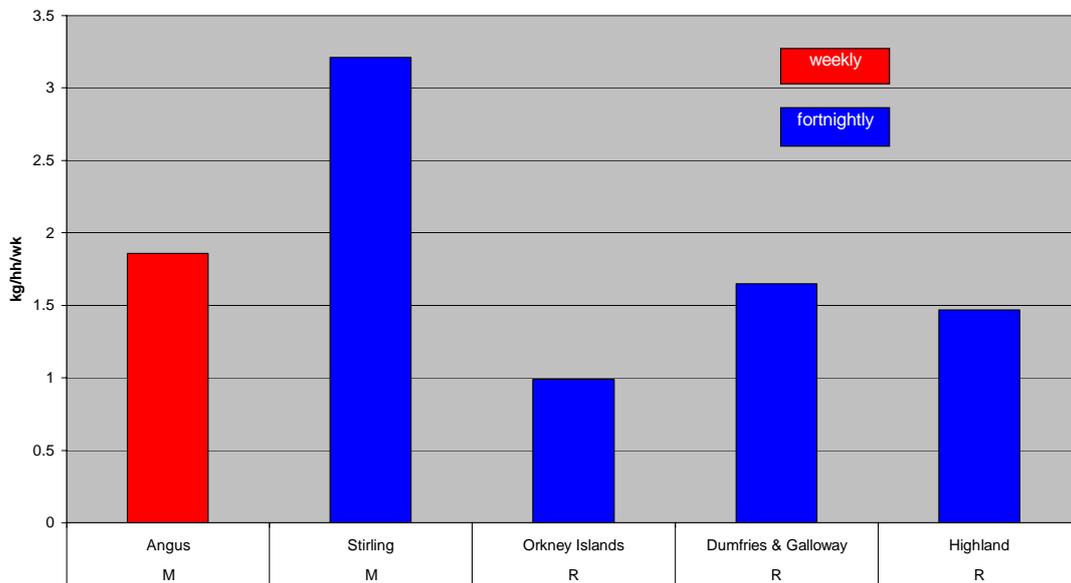
Figure 17: Bin and Box Systems



3.5.5.5 One Box Systems

Five local authorities use one box to collect dry recyclate, 2 mixed and 3 rural. The average recovery rate is 1.84 kg/hh/wk, with mixed authorities demonstrating higher rates than rural ones, at 2.54 and 1.37 respectively (see Figure 18). In this case the frequency of collection doesn't appear to be an influencing factor.

Figure 18: One Box Systems



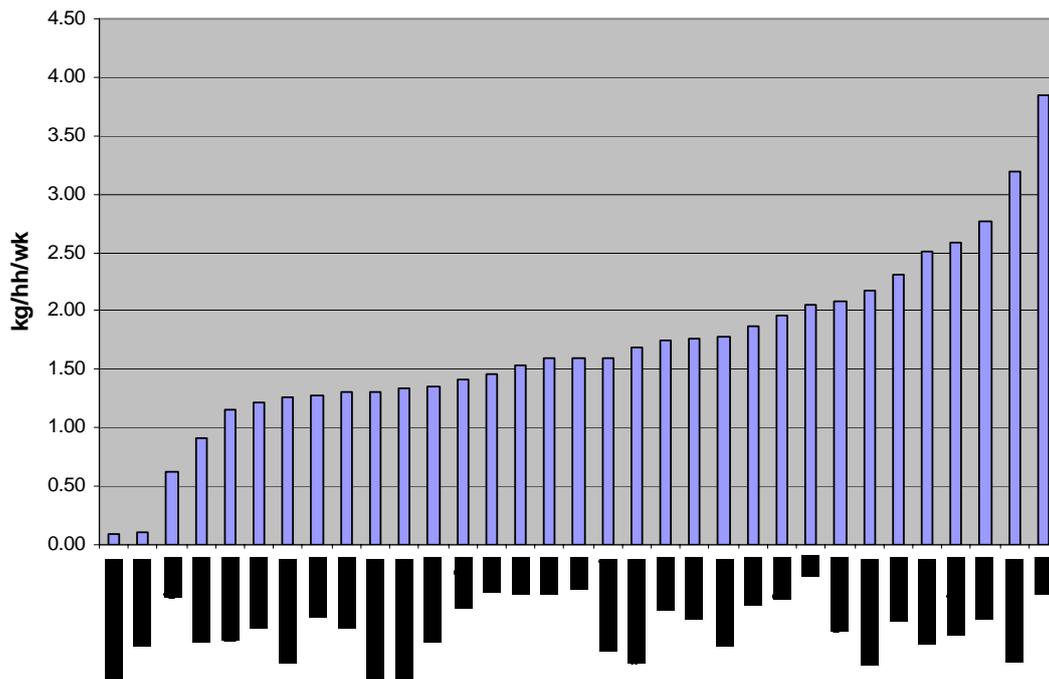
3.5.5.6 Other Systems

Two other methods of dry recycle collection are utilised, each by only one local authority. Shetland Islands use a 2 bag system, which has a low recovery rate of 0.37 kg/hh/wk, related to the fact that paper is not collected, which contributes the highest percentage to dry recycle collections. Shetland Islands uses an energy from waste plant to treat household waste. Scottish Borders Council is the only authority in Scotland to use a survival bag system, which is collected weekly. This produces a high recovery rate of 3.52 kg/hh/wk.

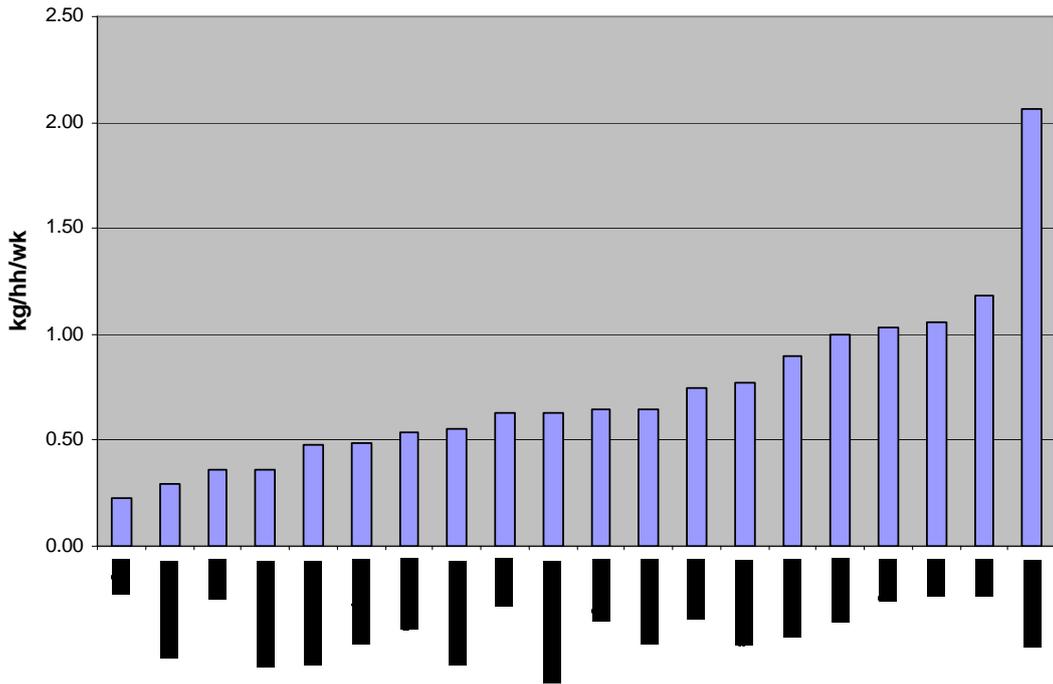
3.5.5.7 Individual Materials

Paper/card is the highest contributor to dry recycle collection schemes, with an average of 1.68 kg/hh/wk, followed by glass with 0.73, plastic bottles (HDPE & PET) with 0.15 and cans (aluminium and steel) with 0.12. Within individual materials there is also a significant variation in recovery rates, for example paper/card varies from 0.09 kg/hh/wk to 3.85 and glass from 0.23 to 2.06 kg/hh/wk (see Figure 19a-d). Other materials collected included foil trays, textiles and other types of plastic. However, these materials contribute minimally to the overall tonnages collected.

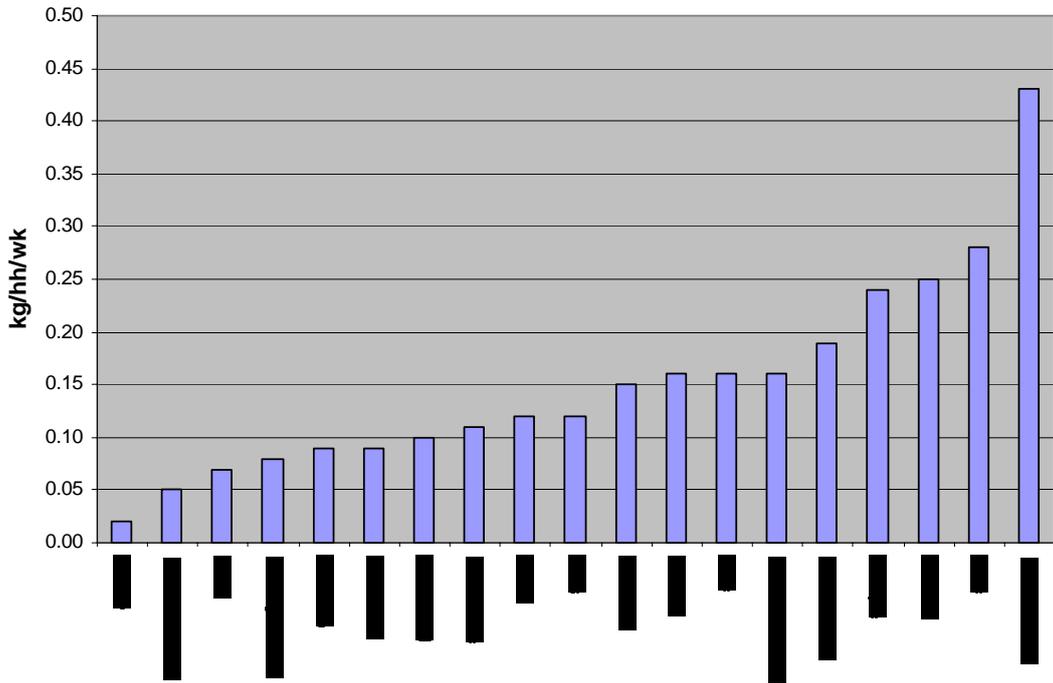
Figure 19: Individual Material Recovery Rates
a) Paper/card



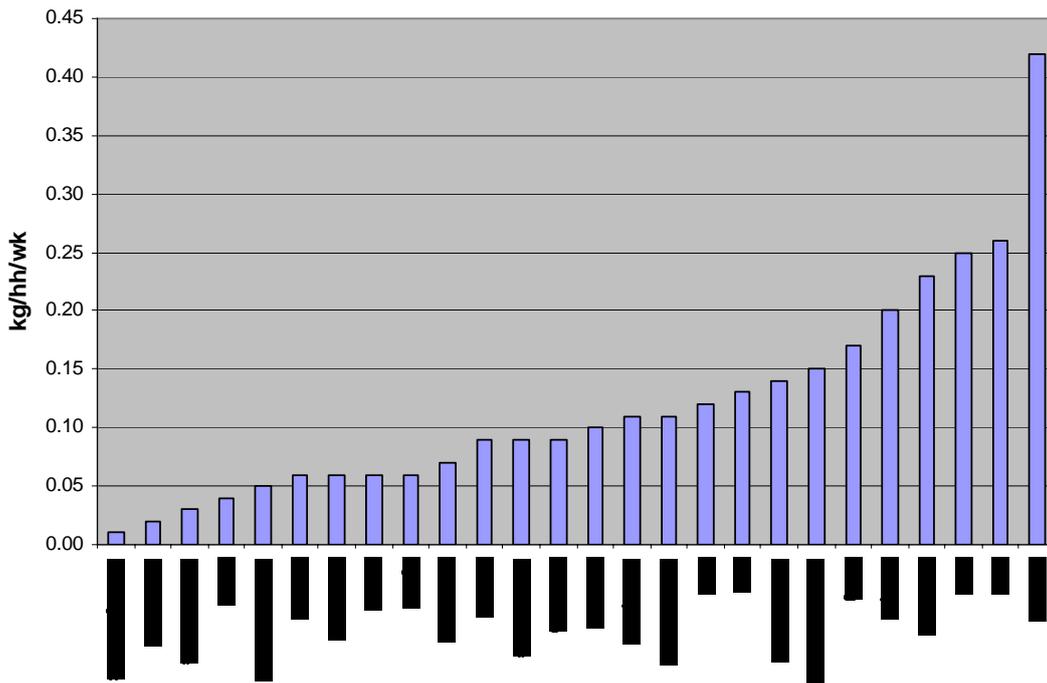
b) Glass



c) Plastic Bottles



d) Aluminium and Steel Cans



3.5.6 Collection Variables

A total of 81 different schemes were reported from the 29 local authorities. Further investigation showed an incredible variation in a range of collection factors detailed in the Table 5 below, so much so that it was difficult to find 2 schemes with exactly the same variables, particularly for dry recyclate collection. This made it difficult to directly compare schemes.

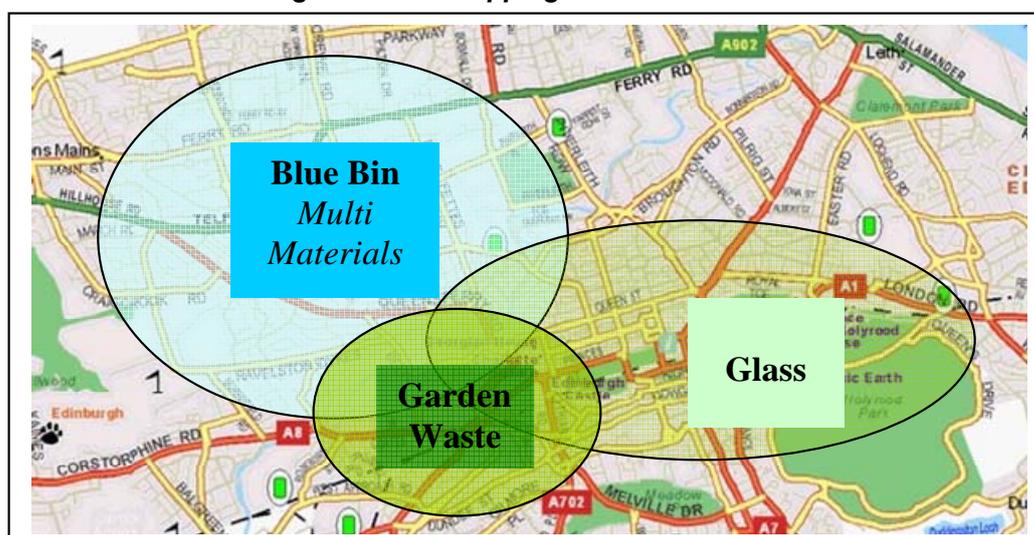
Table 5: Collection Variables

Collection Variables	
Segregation	segregated, co-mingled
Sorting Method	kerbside sort, MRF
Containment	disposable bag, reusable bag, 40 litre box, 55 litre box, 140 litre wheeled bin, 240 litre wheeled bin, on-street bin
Frequency	weekly, fortnightly, every 4 weeks
Seasonality	year-round, 9 months, 8 months, 7 months
Type	opt-in, opt-out, compulsory
Residual Collection Frequency	weekly, fortnightly

Several other points in relation to the data-set should be noted:

1. Validity of data - the data collected didn't always concur with data from other sources and several changes were made in consultation with the local authorities involved.
2. The use of estimates for co-mingled material split – many local authorities with co-mingled collections which are segregated at MRFs are supplied with aggregated tonnages rather than those for individual materials. In these cases we have been provided with estimates based on latest analyses.
3. Overlapping dry recyclate schemes – many local authorities have more than one dry recyclate scheme. In the majority of cases these cover entirely separate households e.g. for tenement or flats. However, in some cases differing schemes overlap and some households receive one or the other scheme and some receive both. This makes it impossible to add the kg/hh/wk together and these have had to be left as separate schemes. Similarly it is not possible to factor up

Figure 20: Overlapping Collection Schemes



4 Factors Relating to High Recovery Rates

A number of factors have been identified which appear to influence recovery rates:

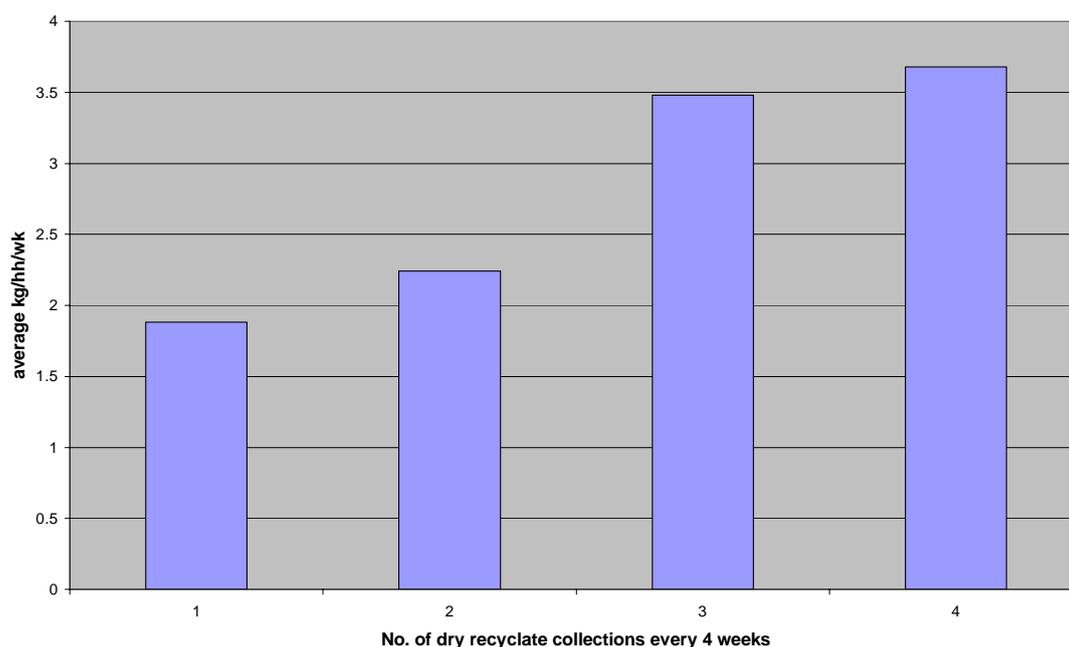
1. Frequency of dry recyclate collection
2. Collection capacity
3. Number of materials collected
4. Frequency of residual collection
5. Percentage of households served
6. Promotional/educational campaigns

4.1 Frequency of Dry Recyclate Collection

The frequency of dry recyclate collection is shown to have an influence on the tonnage of material collected per households, with weekly collections out-performing all others as shown in figure 21. Weekly collections demonstrated an average recovery rate of 3.68 kg/hh/wk, compared to 2.24 and 1.88 for fortnightly collections

and collections every four weeks respectively. Schemes with collections in three out of every four weeks averaged 3.48 kg/hh/wk.

Figure 21: Effect of Dry Recyclate Collection Frequency

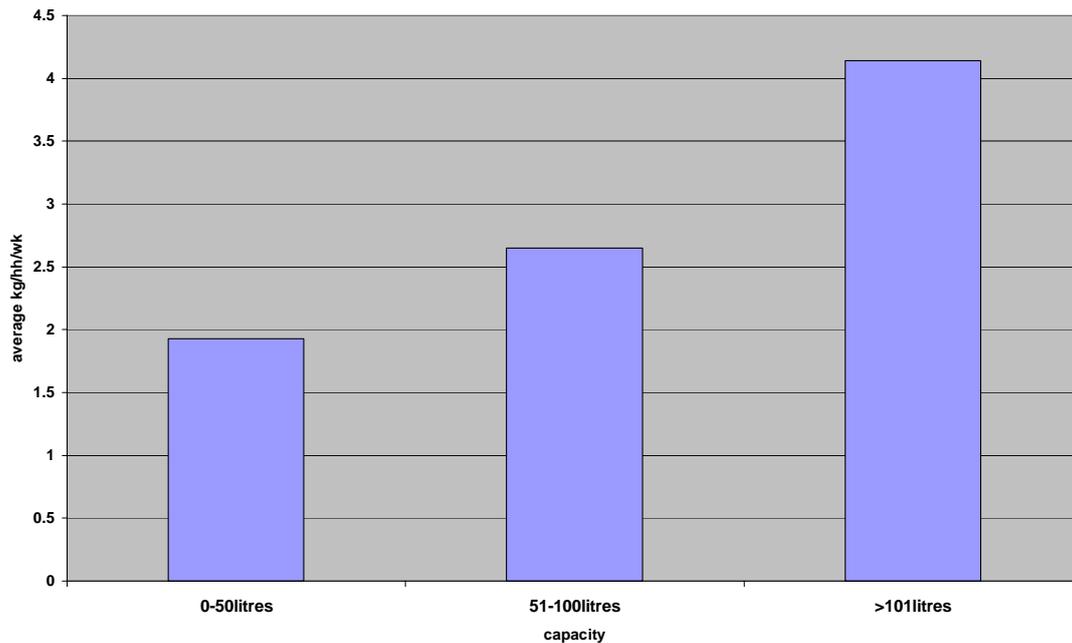


4.2 Collection Capacity

The collection capacity for dry recyclate offered to householders also appears to have a strong influence on recovery rates, as shown in figure 22. The weekly collection capacity for each scheme was calculated (i.e. 60 litres for a 240 litre wheeled bin collected every 4 weeks) and correlated with the tonnage collected per household. Schemes with 0-50 litres capacity per week recorded an average of 1.93 kg/hh/wk, ones with 51-100 litres 2.65 kg/hh/wk and schemes with over 101 litres 4.14 kg/hh/wk. It can therefore be theorised that the collection capacity offered is a limiting factor in some schemes, and if either a bigger container or more frequent collection was offered, householders may be able to recycle a higher percentage of the targeted materials. Further work is required in this area to identify if local authorities with lower capacities experience full containers on a regular basis.

A number of local authorities have already increased collection capacities by increasing collection frequencies, for example Clackmannshire Council changed their collection from fortnightly to weekly and noticed a marked increase in the amount of recyclate being collected. However, this coincided with residual waste being changed to a fortnightly collection and so the rise is likely to be the result of a combination of both factors. More recently West Lothian Council have moved their blue bin collection from every 4 weeks to fortnightly.

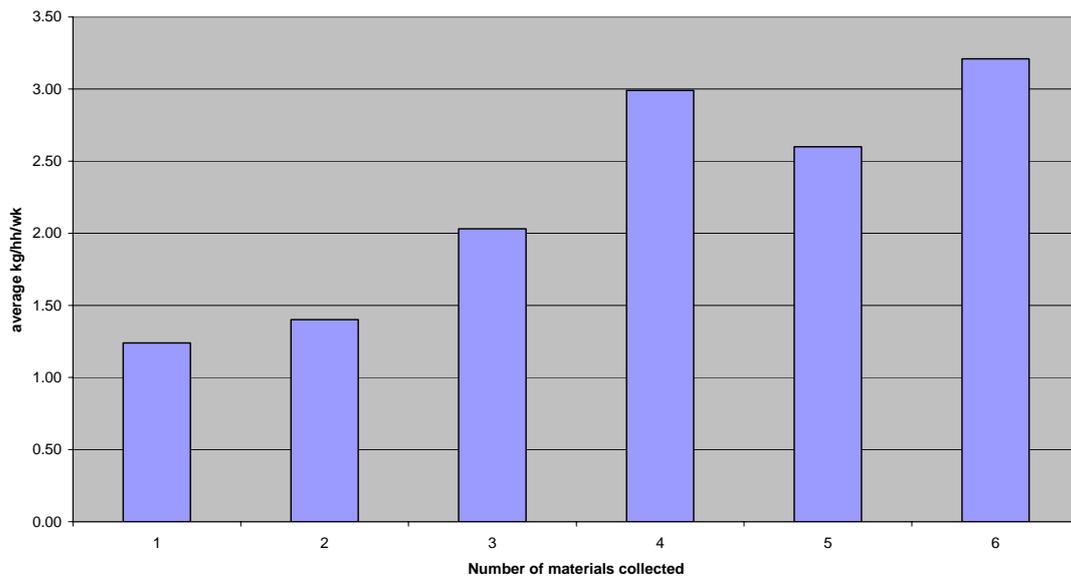
Figure 22: The Effect of Collection Capacity on Dry Recyclate Collection Rates



4.3 Number of Materials Collected

The number of materials collected by a scheme has an obvious influence on the recovery rate for that scheme, as shown in Figure 23. Single material schemes average only 1.24 kg/hh/wk compared to 3.21 kg/hh/wk for 6 materials. Schemes with 4-6 materials demonstrate the highest recovery rates. The greater the number of materials collected, the higher the potential tonnage available in the household waste-stream. Single material collections have less target material and therefore, even with high participation and capture rates, cannot match the tonnage per household for schemes collecting a range of materials. However, this is offset somewhat by the fact that the majority of single-stream collections are for paper/card, the material with the highest individual tonnage per household, and which can provide an income for local authorities as opposed to a gate fee for MRF destined collections.

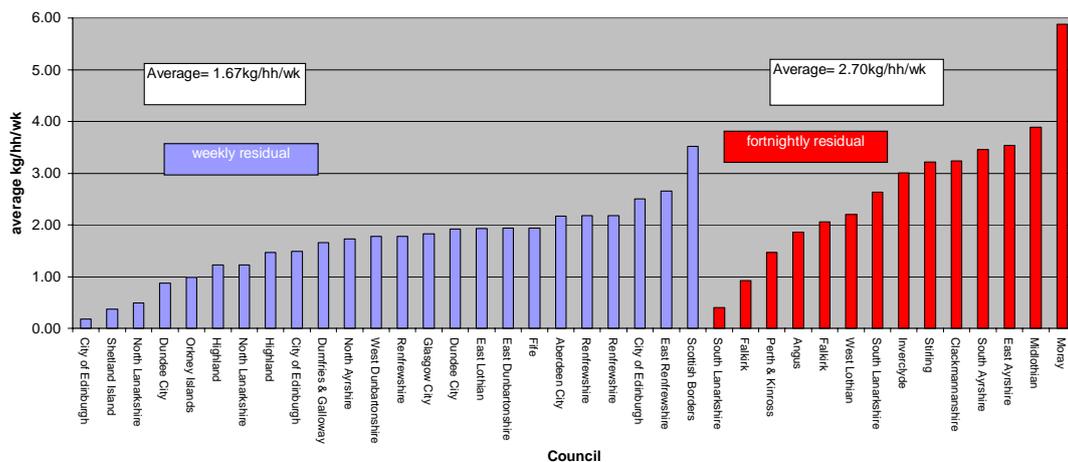
Figure 23: Effect of Number of Materials Collected on Dry Recyclate Collection



4.4 Frequency of Residual Collection

An increasing number of local authorities throughout Scotland are changing from weekly to fortnightly residual collections. This may have been implemented alongside the introduction of an integrated kerbside recycling service, or in alongside an established recycling system, in an attempt to increase recycling rates by “forcing” householders to recycle due to decreased residual capacity. A total of 12 local authorities are now collecting residual material fortnightly, with 17 maintaining a weekly collection. Evidence from this study clearly supports the theory that limiting residual collection with dry recyclate collection being 62% higher with fortnightly residual collection than weekly, with an average of 2.70 kg/hh/wk as opposed to 1.67 kg/hh/wk, as shown in Figure 24.

Figure 24: Effect of Residual Collection Frequency on Dry Recyclate Collection



4.5 Percentage of Households Served

The percentage of households served can also influence recovery rates. Local authorities which have focused on “easy to reach” housing types may experience

higher participation and capture rates than those which have also attempted to include “harder to reach” housing types such as flats and tenements. This is particularly true with urban Councils where a higher proportion of the properties are flatted, which typically demonstrate lower recovery rates than detached/semi-detached properties. Our survey doesn’t include information on housing types, however this is one of the additional factors we would welcome more data on for the next phase of the report.

4.6 Promotional/Educational Campaigns

With the introduction of new kerbside recycling services it is important to educate and inform householders of how the scheme will operate and why it is being introduced. However, it is also necessary to promote established schemes to ensure participation rates are maintained or even increased, to ensure householders are recycling all of the potential materials and to minimise contamination rates. Many schemes experience a slight fall in performance over time, which may be counteracted by promotional campaigns to maintain awareness and interest.

5 Discussion

5.1 Comparison of recycling in Scotland and Europe.

Scotland currently recycles 25% of MSW. While this is undoubtedly a significant improvement, many other countries in Europe and around the World have significantly higher recycling rates. The Netherlands with 65%, Austria with 59% and Germany with 58%¹ demonstrate that very high recycling rates can be achieved. England achieved a rate of 27% in 2005/6, with 27 local authorities achieving recycling rates of over 40%, with North Kesteven the highest at 51.5%².

A comparison can be made with DEFRA figures (MWM 2003/4) in terms of tonnages collected divided by the total number of households rather than the numbers actually served (see Table 6). The overall diversion figures are similar, with a mid-quartile of 3.11 kg/hh/wk for the Remade as opposed to 3.01 kg/hh/wk from DEFRA. However, the dry recyclate figures are significantly lower than the DEFRA figures and the garden waste ones significantly higher.

Table 6: Comparison of Survey Data with DEFRA Study

	Remade Scotland Survey(kg/hh/wk)	DEFRA Study ³ (kg/hh/wk)
Overall diversion rates	Lower quartile: 2.13 Mid quartile: 3.11 Upper quartile: 4.34	Lower quartile: 2.31 Mid quartile: 3.03 Upper quartile: 4.02
Dry recyclable diversion rates	Lower quartile: 1.05 Mid quartile: 1.46 Upper quartile: 2.07	Lower quartile: 1.88 Mid quartile: 2.35 Upper quartile: 2.99
Organic diversion rates	Lower quartile: 1.29 Mid quartile: 1.50 Upper quartile: 2.18	Lower quartile: 0.34 Mid quartile: 0.80 Upper quartile: 1.46

Looking at recovery rates for the households actually covered by the schemes, Scottish figures are lower in the average overall, dry and organic diversion rates (see Table 7). However, the highest yielding dry recyclate scheme outperforms the other studies. In terms of garden waste collections, DEFRA estimates that kerbside collection from semi-detached/detached properties will collect 3.85-5.00 kg/hh/wk, which only the highest performing Scottish authorities achieve, although many authorities may cover additional housing types with lower capture rates.

¹ http://www.foe.co.uk/resource/press_releases/recycling_rates_increasing_23012006.html

² <http://www.defra.gov.uk/environment/statistics/wastats/bulletin.htm>

³ DEFRA Municipal Waste Management Survey 2003/4

Table 7: Comparative Figures for Recovery Rates

	Dry Recyclable Diversion(kg/hh/wk)	Garden Waste Diversion(kg/hh/wk)
Highest yield		
England & Wales ⁴	4.33	6.87
Remade Survey	5.88	4.67
Average Yield		
England & Wales ⁵	3.21	3.75 ⁶
Remade Survey	2.08	2.59

5.2 Improving Recovery Rates

The previous section (4) detailed factors associated with high recovery rates for kerbside collection programmes. An additional method of improving recycling rates is the kerbside collection of food waste. Currently no Scottish local authority operates a council-wide food waste collection scheme, although Perth and Kinross Council is already operating a pilot collection scheme. Food waste accounts for 27-37% of the household waste stream and following the removal of dry recyclate and garden waste through current kerbside recycling programmes, remains the largest potentially recyclable material in the waste-stream. Food waste can be collected as a segregated waste stream, or in combination with garden waste collections. The addition of food waste recycling has the potential to recycling rates to 40-50%. In recognition of this the Scottish Executive will be funding a number of food waste trials starting from spring 2007.

5.3 Overall Recycling Rates

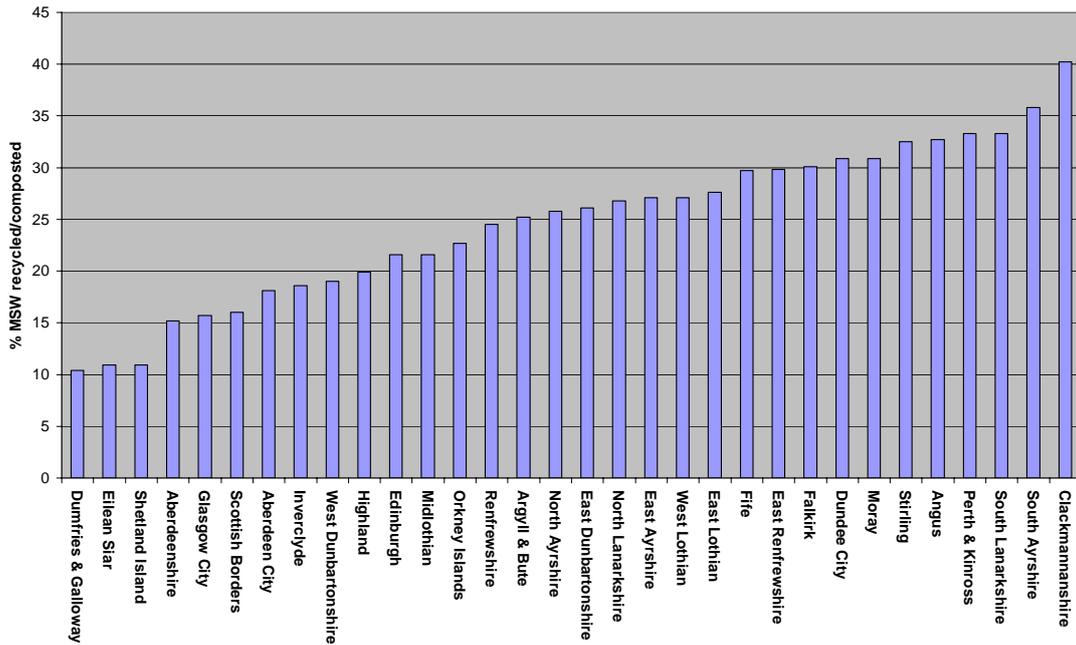
In addition to the kerbside collections analysed in this survey, recyclate collected from other sources such as recycling centres and points contribute to the overall recycling rate achieved by a local authority. A number of local authorities achieve high recycling rates, despite average kerbside recovery rates, due to relatively high contributions from recycling centres and points. Examples include Angus and Perth & Kinross, as can be seen in Figure 25.

⁴ <http://www.aylesford-newsprint.co.uk/pdf/recyclingAtlas-EngWales.pdf>

⁵ Resource Recovery Forum 2004 Project Report: High Diversion of Municipal Waste: Is it Achievable? Volume 1: Summary Report

⁶ The Composting Association (2004). The State of Composting.

Figure 25: Overall recycling Rates (from LAS 2005/6 data)

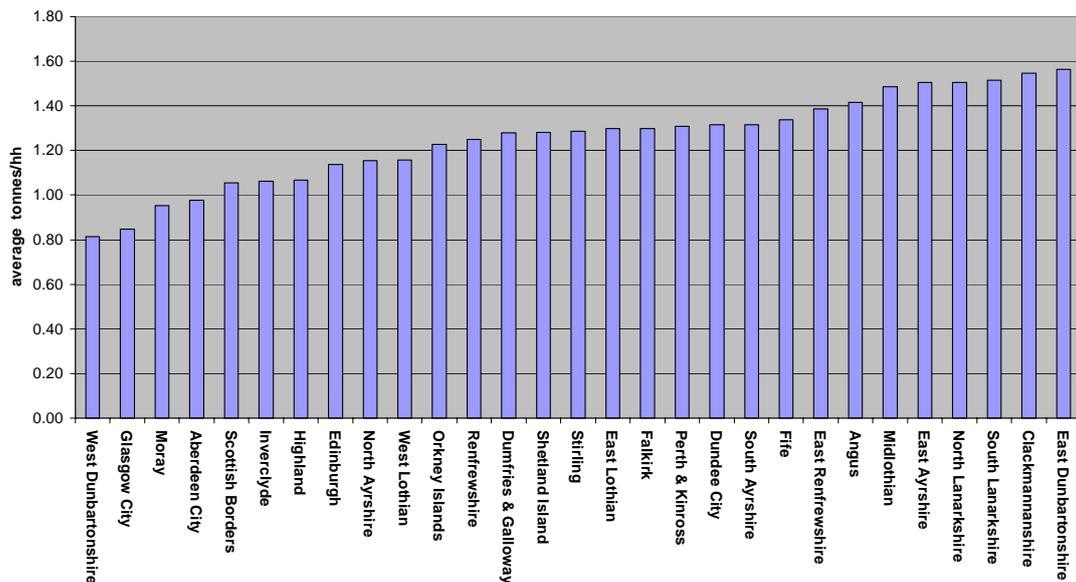


5.4 Waste Reduction

Recycling and landfill diversion targets placed on local authorities are all weight based, which encourages the collection of recyclate as opposed to placing emphasis on waste reduction, which is higher up the waste hierarchy. Despite this a number of local authorities have introduced a number of waste reduction measures such as home composting campaigns and real nappy campaigns.

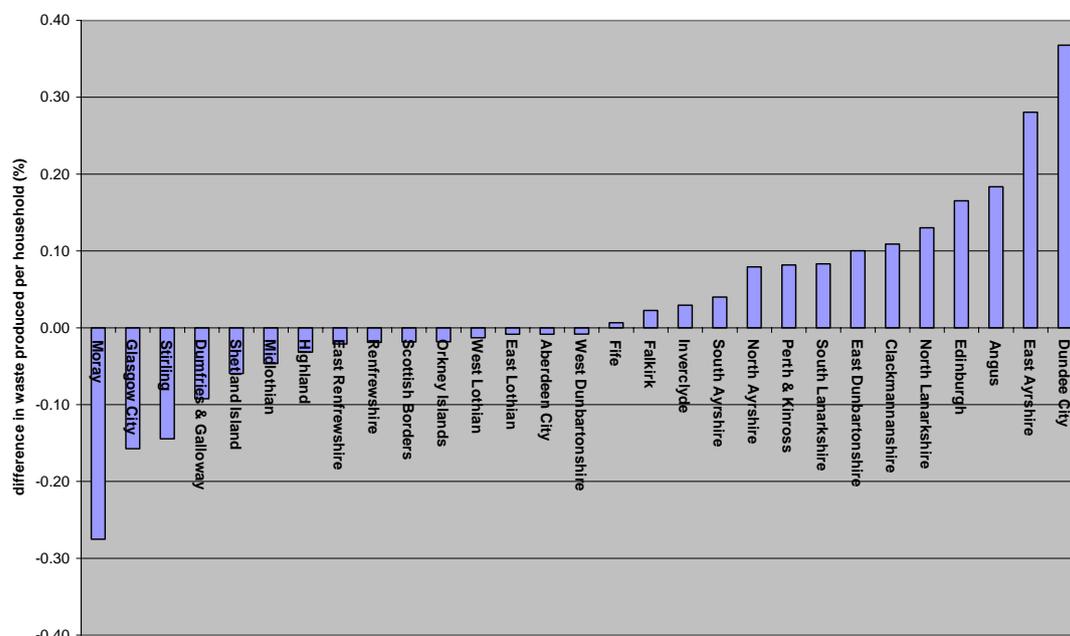
Waste production per household in 2005/6 ranges from 0.81 tonnes per annum in West Dunbartonshire to 1.56 in East Dunbartonshire, with an average of 1.25 (see Figure 26).

Figure 26: Waste Arisings 2005/6



Changes in waste arisings from the years 2004/5 to 2005/6 provides an indication of the success of waste reduction measure in some local authorities. While 14 authorities' waste arisings have increased, 15 have decreased over the period. The most significant increase is just over a third in Dundee, while the greatest decrease is nearly a third in Moray (se Figure 27).

Figure 27: Changes in Waste Arisings 2004/5 – 2005/6



5.5 Reprocessing Capacity

Thought must be given to the implications of all local authorities achieving high recycling rates in terms of reprocessing capacity. In terms of individual materials, there is no reprocessing capacity in Scotland but paper is now a world market with high demand from overseas, particularly from the Far-East. With plastics there is limited reprocessing capacity, but also a world market as with paper. For glass there should be theoretically no problem, with the potential for an additional 400,000 tonnes to be reprocessed. Composting capacity for green garden waste is likely to evolve, but potential problems are likely to arise if co-mingled with food waste, in which case in-vessel composting facilities are required. Similarly for segregated food waste collections we face a lack of accredited capacity. In summary, there are theoretically no problems for materials currently collected at the kerbside, so long as the collection schemes are integrated to treatment type and capacity. However, if/when food waste collections are added, there is a definite lack of reprocessing capacity. A problem which needs to be resolved before food waste collection on a wider scale is introduced.

5.6 Further Analysis

Following on from this discussion paper, a number of issues require further analysis before the final report is produced. These are as follows:

- Information from local authorities on how full containers are on presentation for collection to examine whether increasing capacity would increase recovery rates
- Information on housing types served by each kerbside scheme

- Experience from authorities who have already changed container size and/or frequency
- Experience from authorities who have moved to fortnightly
- Discussions with particular local authorities to identify factors leading to high recovery rates.

6 Conclusion

Scottish local authorities have made significant progress in increasing recycling rates, achieving the 25% by 2006 target. However, in order to move towards 40% and beyond, significant improvements will have to be made in the recovery rates from kerbside recycling collections.

In Autumn 2006 Remade Scotland surveyed all 32 Scottish local authorities to gather data on kerbside recycling, with 29 full sets of data being gathered, the information covering the financial years 2004/5 and 2005/6.

The survey found that a total of 336,488 tonnes of recyclate was collected at the kerbside in 2005/6, with dry recyclate and garden waste contributing equal amounts (49.8% and 50.2% respectively).

All 29 local authorities offered a dry recyclate collection, with 76% of households having access to a kerbside collection of at least one material. Paper/card contributed the highest recovery rate within dry recyclate materials, with all schemes except one offering the collection of paper. The average recovery rate for dry recyclate is 2.08 kg/hh/wk. The recovery rate varies with the number of materials accepted, the container type, method of segregation and frequency of collection.

27 out of 29 local authorities offered a garden waste collection at kerbside, with 65% of households being covered. Lower percentages of households were covered in urban areas due to the nature of the housing stock, and in rural areas, perhaps a reflection on higher home composting rates in rural areas. Garden waste collection was shown to be seasonal in nature, reflected by the fact that a third of schemes are seasonal in nature, with collection ceasing over the winter months. The average recovery rate for garden waste is 2.59 kg/hh/wk.

The factors influencing high recovery rates were found to be collection frequency, collection capacity, number of materials collected, and collection frequency of residual waste.

- Weekly collection of dry recyclate demonstrated 64% higher recovery rates than fortnightly collections, and 96% greater than collections every 4 weeks
- A collection capacity of >101 litres/week produced recovery rates 56% higher than those with 51-100 litres/wk and 115% higher than those under 50 litres/wk
- Schemes collecting 4 or more materials showed recovery rates 137% greater than those with only one material
- Dry recyclate schemes operated in conjunction with a fortnightly residual waste collection produced 65% higher recovery rates than those associated with a weekly residual collection

Additional factors likely to improve recycling rates are the introduction of food waste collection and educational/promotional campaigns to increase participation and capture rates.