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**Friends of
the Earth**

Briefing

Recycling collections – source separated or commingled?

Recycling saves energy, reduces raw material extraction and combats climate change. The vast majority of studies have found that recycling our rubbish is better for the environment rather than incinerating or landfilling it.

Most households now have kerbside collections of recycling and the number of different materials accepted is increasing. These materials can either be separated at the roadside into different compartments in the lorry or collected together and sorted afterwards.

It has been found that separating materials at the kerbside results in less contamination of recyclables than mixed or 'commingled' systems. Cleaner materials are more valuable to reprocessors and a higher proportion of these can be recycled.

This briefing outlines the environmental and financial benefits of separating materials at the kerbside.

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Introduction

In recent years household recycling rates have risen dramatically. This has been due in part to the Household Waste Recycling Act 2003, which Friends of the Earth drafted and with our supporters' help got passed into law. This law means that by 2010 English local authorities must collect at least two types of recyclable waste from households.¹ However, there are growing concerns in the recycling sector about the systems being used to pick up materials for recycling and the effect they are having on the quality of recyclables.

Local authorities operate two different systems to collect recycling:

- source separation - materials are separated at the kerbside, usually into a specially designed lorry with different compartments for different materials.
- commingled - materials are mixed together in a lorry which compacts the materials. The recyclables are separated later, usually at a materials recycling facility (MRF).

Defra advises local authorities that “source separation of materials is the first step to maximising the value of recycling”, and notes that “the earlier in the collection chain a recyclate is separated the lower the likely cost and environmental impact of the collection scheme.”²

One of the UK's largest waste management companies Biffa also argues that the earlier materials are separated, the better the overall system and the lower the likely environmental impact and cost.³ Their ‘Future Perfect’ report states “The householder is ideally placed to act in a way in which dry recyclables (and organic materials) are kept out of the waste, reducing both contamination and the quantity of residual waste for final disposal. This can capture a high level of the available materials in a form which would be welcomed by many processors, circumventing any need for MRFs, which tend to be both labour and capital intensive.”

But despite the evidence backing separated collections, many councils are moving away from source separation to commingled systems.

Why is source separation better than commingling?

Advantages of source separation

- source separation results in less contamination of recyclables and so a higher proportion of them can be recycled.
- stillage vehicles used for kerbside separation have lower fuel use than compactor vehicles used for commingled systems
- local bulking of sorted materials means lower mileages
- increased revenue from sale of materials
- lower capital costs and more local jobs
- staff separating materials at the kerbside can give immediate feedback to householders by leaving material which can't be accepted for recycling with a note, while still taking

those materials which can be accepted.

- kerbside separation of materials can easily cope with additional items – such as batteries, textiles – by adding extra compartments into the vehicle. These would be difficult or impossible to separate adequately in a MRF.
- the total cost of collection and processing together are lower in source separated systems than in commingled systems.⁴

Disadvantages of commingled collections

- less of the material collected gets recycled (typically 12 – 15 per cent is wasted in English MRFs,⁵ compared to less than 1 per cent for source separated systems)
- the risk of contamination makes it unsuitable to commingle some materials, for example glass should not be mixed with textiles or paper
- compaction can make it impossible to recycle some materials, particularly aluminium, plastic and glass⁶
- the trend in recyclate markets is likely to be towards requiring higher quality materials. Lower quality commingled recyclables are currently being bought by reprocessors in China. But in the future these processors will demand higher quality materials.
- increasing energy prices are likely to result in increased prices for recycled materials, particularly those with high embodied energy – e.g. aluminium, steel, glass, paper, plastic – which will shift the balance towards separate collection to maintain quality.

Recycling helps reduce climate change

The way we treat our waste has large impacts on climate change. Most life cycle assessment studies show that recycling offers more environmental benefits and lower environmental impacts than other waste management options.⁷ Therefore source separation is better for the environment because it results in less contamination of recyclables, meaning a higher proportion can be recycled.

Recycling reduces the need for extraction and processing of new resources, therefore saving fossil-fuel energy, and avoids the climate impacts of alternative waste treatment systems. These include the release of fossil-fuel derived carbon dioxide (CO₂) from incineration and the release of methane, a much stronger climate change gas, from landfill.

Landfills release methane when biodegradable waste, such as food, garden waste and paper is buried. Therefore biodegradable waste is one of the most important parts to remove from the residual waste stream. Commingled collections cannot include garden and food waste as these would cause too much contamination of other recyclables and would be too difficult to separate. Both garden and food waste should therefore be kept separate, unless households are able to compost them at home.

Garden waste can then be treated by composting, which returns nutrients and structure to soils, displaces other fertilizers and sequesters carbon. Food waste can be composted in-vessel or anaerobically digested, which generates 100 per cent renewable energy.

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For more information please see the briefings 'Food waste collections' at www.foe.co.uk/resource/briefings/food_waste.pdf and 'Anaerobic digestion' at www.foe.co.uk/resource/briefings/anaerobic_digestion.pdf

Source separated systems have been found to have a lower overall impact on the climate than commingled systems. When commingled collections replaced a kerbside sorted system in the London Borough of Camden, an energy audit found a 77 per cent increase in the overall carbon balance.⁸

Contamination of recyclables

WRAP commissioned a study on MRFs in the UK, US and EU. It found contamination rates of up to 20 per cent, with English MRFs typically being at the higher end.⁹ Some MRF managers reported that it is not cost effective for them to reduce contamination. Kerbside sorting typically achieves much less than 1 per cent contamination.

Where biodegradable materials rejected from MRFs are disposed of to landfill they will release methane, a powerful greenhouse gas. Often, all the waste delivered to MRFs is recorded as being recycled. However, Best Value Performance Indicator (BVPI) guidance recommends that rejected materials should be deducted from recycling figures.¹⁰ In future it is likely that any rejected materials which are landfilled could count against local authority Landfill Allowance Trading Scheme (LATS) allocations.

Quality of materials

Paper: Paper sorted from commingled collections is always contaminated with other materials including glass, cans and plastic, and maybe even food waste. Paper reprocessors therefore require separately collected paper in order to maintain the quality of their product.

Some paper mills will not source recovered paper from MRFs or paper that has been mixed with glass.¹¹ Another consequence is that paper recycling will rely on the export market, especially for paper collected with glass, and this market could also become limited in the longer term.

Aluminium: Aluminium may be only 1 per cent of the weight of a kerbside box, but perhaps 25 per cent of the value of materials. The aluminium reprocessing industry prefers to recycle items into the same item again, for example drinks cans are recycled into drinks cans. Aluminium foil uses a slightly different alloy so will be reprocessed separately. High levels of purity of aluminium are required, especially for drinks cans. If aluminium products are contaminated in a commingled system, they can only be used to create a much lower grade of aluminium product. This means the price paid for the recycled aluminium will be significantly reduced.

Glass: In order to re-melt glass into new containers, it requires a high level of purity and to have been sorted by colour. Mixed or crushed glass, such as that separated in MRFs, is of no use for re-melting and is usually sold much cheaper for use as aggregate.

There is a big environmental benefit to recycling glass - each tonne of glass re-melted in the UK saves 314kg CO₂. However last year 280,000 tonnes of glass collected for recycling was not suitable for re-melting.¹² Unfortunately there is no environmental benefit from using glass to make aggregate as it creates 2kg of CO₂ per tonne of glass collected.¹³ Therefore to be of

benefit to the environment, glass should be separated by colour as it is collected.

A very strong case can be made that recycling targets for both municipal waste and packaging waste should be restructured to measure reduction in CO₂ rather than the current tonnage basis of targets – which is actually encouraging collection of mixed glass for aggregate.

Plastics: Separately collected plastics have much higher value.

Material value

The value of materials is higher if separated at source than if sorted from commingled waste.

A useful comparative study has been carried out by Bryson Recycling in Northern Ireland.¹⁴ They receive recycled material from a number of districts with a source separated box scheme, and from a number of districts with commingled collections. They find the tonnage received per household is similar for commingled and source separated at 127kg per year. The commingled collection produces more paper but less aluminium, glass, steel cans, plastic and textiles. The difference is mainly explained by significant contamination of commingled paper with aluminium and plastic.

The result is they get £44 per tonne for commingled recyclables but £52 per tonne for separately collected materials. That would be a difference of £400,000 per year on a throughput of 50,000 tonnes.

In November 2006 the following prices were reported:¹⁵

- separated PET plastic can be sold for £175 per tonne, but mixed plastic gets only £40
- clear glass gets £30 per tonne, but mixed glass only £12
- white paper gets £170 per tonne, but mixed paper only £34

Collection and processing costs

The total cost of collection and processing together are lower in source separated systems than in commingled systems. Although higher tonnages are collected per shift in commingled systems, the compactor vehicles used have higher capital cost, higher fuel cost, higher mileage to more remote MRFs, and there are higher costs associated with separating the materials at the MRF.

Kerbside sorting requires much lower tech vehicles and lower fuel consumption compared to commingled collections. It also requires much less capital investment in local bulking depots and perhaps some low tech sorting (for example to separate aluminium cans from steel) compared to using MRFs. The main cost of kerbside sorting is local labour time.

A recent study by WRAP found that it is more cost-effective for councils to sort recyclables at the kerbside than to collect them commingled, once the costs of sorting at a materials recovery facility (MRF) are also taken into account.⁴

Other findings support this research. The case studies from Northern Ireland on page 7 compare the costs for kerbside sorting and commingled collections. They suggest that kerbside sorting provides a more cost-effective service, especially if contamination losses

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are taken into account.

Another study of kerbside sorting costs for Newport Wastesavers estimated net costs of approximately £61 per tonne for collection of kerbside sorted dry recyclables.¹⁶ Assuming that £60 per tonne is a typical net cost of a kerbside sorted collection, for a commingled collection to compete on cost, the cost of commingled collection plus the gate fee for a MRF would have to be below this.

The cost of collecting a tonne of commingled processed at a MRF has been found to be higher than the £60 cost of sorting a tonne of recycling at the kerbside. The cost only falls below £60 per tonne if the MRF runs two shifts each day and processes over 40,000 tonnes each year. The cost falls to around £40 per tonne if 85,000 tonnes are processed each year.¹⁷ A supply of 85,000 tonnes of recycling would require a population catchment of around 1 million people. In most cases this would mean very long transfer distances.

Public support

If materials are separated at the kerbside people are more confident that they will be recycled efficiently. They are therefore more likely to recycle their rubbish.

Some evidence suggests that the tonnages of waste actually recycled from commingled systems are less than from source separated collections. Box schemes eventually overtake commingled collections once people get used to them.

The Northern Ireland example on page 7 suggests that separate collection gets more recyclables.

Case study –‘SORT IT!’ scheme in Somerset

Somerset Waste Partnership rolled out a weekly kerbside sorted collection of dry recyclables in three districts over two years from October 2004, covering 155,000 households in Mendip, South Somerset and Taunton Deane.

Recyclables are collected in a 55 litre box and sorted into separate containers in a 12 tonne vehicle. Vehicles cover 650 – 700 houses per day in urban areas and 500 in most rural areas. Food waste is collected by the same vehicle from 25 litre lockable bins.

Dry recyclables collected include paper, glass bottles and jars, food and drinks cans, foil, textiles, shoes, and car batteries. Cardboard and plastic are not currently collected, but can be recycled at Household Waste Recycling Centres. If people put out waste which cannot be recycled it is left with a sticker to give instant feedback.

Rubbish which cannot be recycled is collected fortnightly, which is acceptable to residents as food waste is collected separately. Compaction vehicles are used, with a standard 140 litre wheelie bin, though people can ask for a smaller or larger bin.

There is also a paid-for fortnightly collection of garden waste in compaction vehicles. A wheelie bin costs £15-£25 per year and compostable sacks cost £5-£7.50 for 10. Charging for collection encourages home composting and keeps down costs.

By collecting garden waste separately from food waste, it can be treated more cheaply by

open-windrow composting. The food waste is mixed with 50 per cent green waste and in-vessel composted to comply with the Animal By-Product Regulations 2003.

In August 2006 the overall recycling rate was 39-47 per cent. It was estimated that the collections were on average, per household per year, 165kg dry recyclables, 90kg food waste and around 340kg residual waste.

The 90kg food waste collected per household per year compares to an estimated 200kg food in the waste stream before the food collection was added. It seems that people are now throwing out less food waste overall – either because the food collection is making them think more carefully about waste, or because people are composting more at home. Total waste arisings appear to have dropped by around 150kg per household per year initially.

Total collection costs have been estimated for Taunton Deane at £45.52 per household, or £39.99 net of recycling credits. This excludes disposal costs which will include landfill gate fee and landfill tax. Per tonne of recycled and food waste, the cost is £107.08 for collection, or £86.40 net of credits. The residual and garden waste together costs £40.07 per tonne for collection.

The *SORT IT!* collections have been rolled out in batches of 12,000 – 16,000 houses with carefully targeted public information. Follow-up questionnaires suggest 76 per cent of residents say the service is better than previously, and 87 per cent say it is easy to separate waste into the required categories. 79 per cent say one of the top benefits is more recycling and composting, and 72 per cent welcome weekly recycling.

Somerset's *SORT IT!* collections won the Best Local Authority Initiative at the National Recycling Awards 2005 and the Local Authority Award at the 2005 Annual Composting Association Awards. Visits from other local authorities are welcomed.

Details are available from David Mansell at Somerset County Council on 01823 356013 or dgmansell@somerset.gov.uk.

Case study – comparison of costs for kerbside sorting and commingled bins in Northern Ireland

In 2006, WRAP published two reports by ENTEC on behalf of ROTATE (the local authority recycling advisory service) reviewing the collection services in Castlereagh¹⁸ and Belfast.¹⁹ Both compared the costs of extending a kerbside sorted box collection or a commingled bin collection to the whole of the district.

Castlereagh

Part of Castlereagh was already served by a box sorted at the kerbside and part by a commingled 'blue bin'. Both areas had a residual waste collection and a separate green waste collection. The study compared the costs and benefits of rolling out each option to all 27,500 households in the borough.

It found that the lowest cost per tonne recycled would be achieved by the kerbside box. The next lowest would be for the commingled bin plus separate glass collection. The commingled bin would cost more to set up in the first year but less in subsequent years, and would collect

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less recyclable material.

If each service were provided to 27,500 households together with a separate green waste collection, the kerbside box system would collect 281kg per household per year for recycling/composting compared to 214kg for the commingled bin. These figures are based on established performance for each scheme. The commingled bin collection could be improved to 260kg by collecting glass as an additional separate collection, which would nearly pay for itself.

Moving all of the households to a kerbside box system would be £200,000 cheaper than the commingled bin plus glass collection to set up in year one, but £111,000 per year more to run after that.

The total cost of collection and disposal per household would be:

- for the kerbside box option, £59.85 in the first year, then £54.73 per year.
- for the commingled bin plus glass option, £67.13 in the first year, then £50.69 per year.

It should be noted that these costings do not include depreciation costs on vehicles, which would add more cost to the commingled bin option as it uses more expensive compaction vehicles.

The report also found that residents were reasonably happy with both existing services, so suggested that in the short term the disruption which would be caused by moving to one system was not advisable. In the longer term, it noted that as the costs of residual waste disposal will increase so there will be a need to maximise kerbside recycling yields as well as to promote waste minimisation. It was recommended that the performance of the two systems be further monitored before making a final decision.

Belfast

The Belfast study compared the costs associated with moving to a fortnightly residual waste collection together with a fortnightly recycling collection by either a kerbside 'black box' or a commingled 'blue bin' for 50,000 households.

It found that the kerbside sorted box would incur a one-off net cost of £174,000 in the first year but net savings of £183,000 per year after that. The commingled bin would incur a net cost of £522,000 in the first year and net increased costs of £188,000 per year after that. Both would have similar rates of recycling and avoided landfill costs.

The main reasons for the higher costs of the commingled bin (over £340,000 per year higher) were the higher vehicle costs for commingled bin and the lower marginal costs of expanding the box system.

The preferred option was therefore a fortnightly kerbside sorted box system, provided that it was supported by work to inform residents and gain their support for the box system. It was also recommended that a food waste collection be considered to improve acceptance of a fortnightly residual collection.

Case study – Mersea Trial

In 2000, a number of trials were started in Essex to test the feasibility of reaching a 60 per cent recycling and composting rate for household waste. One covered 4,500 households in Mersea which already had a good record in recycling.

The results for Mersea showed that in 2001, 56 per cent of household waste was being collected for recycling or composting. This included collection at Civic Amenity (CA) sites (excluding rubble and soil). The total cost of collection, including the CA sites, was £56.54 per household, or about £50 per tonne. This is in a fairly rural area.

The collection from households used four different vehicles visiting each house weekly on the same day:

- A large basketback truck collecting paper and card at one end and plastic at the other
- A 'Fame' flatback truck with stillages for glass colour-sorted at the kerbside, and cans sorted and baled locally to separate aluminium and steel
- A compactor truck for green waste, collected in re-usable sacks
- A compactor truck for residual waste, collected in black bags

The trial was monitored by Enviros Aspinwalls, which reported 82 per cent participation and 98 per cent public satisfaction. They estimated capture rates (including CA sites and bring sites), per household per year, as:

- Green waste - 358kg collected out of 360kg available
- Glass and cans - 78 collected out of 201kg available
- Paper and card - 176kg collected out of 319kg available
- Plastic bottles - 11kg collected out of 15kg available
- Textiles - 3kg collected out of 17kg available

By autumn 2002 Colchester's Recycling Officer reported that the trial had reached 60 per cent recycling at a cost of £53 per household. Costs could probably have been cut further as the scheme developed.

However, instead of rolling out the Mersea trial across the Borough, collections in split compactor vehicles were introduced. These could not cope with all the separated materials now being collected, resulting in some recyclables being collected with residual waste, as well as a huge overspend. Consultants have recommended buying back some of the former vehicles.

Conclusion

In Friends of the Earth's view separate collection is the best system for domestic waste collection. We have therefore joined with recycle reprocessors (including glass, paper, aluminium and textile) and community recycling groups to form the Campaign for Real Recycling (CRR).

This campaign promotes source separated collections through highlighting the financial and environmental advantages. It also explores the considerable potential in the UK for development of a secondary materials economy. More information can be found at www.realrecycling.org.uk/

This briefing was written by Becky Slater based on research by Nigel Lee.

Further reading

- Recycling – why its important and how to do it
www.foe.co.uk/resource/briefings/recycling.pdf
- Food waste collections
www.foe.co.uk/resource/briefings/food_waste.pdf

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