



Friends of the Earth (England, Wales and Northern Ireland)

Residual Waste Research Phase II – Policy options

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EXECUTIVE SUMMARY

The aim of Friends of the Earth's Reduce Resource Use campaign is to improve UK and EU resource efficiency and reduce climate impacts, through promoting waste prevention, reuse, recycling and composting and by phasing out residual waste.

This report sets out the results from a two phase research project aiming to identify what materials and products end up in residual wastes and how these can be phased out, resulting in increased resource efficiency and reduced environmental impact of consumption.

This research consisted of two parts:

Phase 1: the identification of what materials and products end up as residual waste and in what quantities; and

Phase 2: focusing on what policy measures could be used to create a zero waste policy framework for residual wastes and the identification of what tools and techniques could be used to quantify environmental costs and benefits and support policy making.

A number of ways were identified at the international, national and local levels for implementing a resource efficient approach to the top residual waste streams (i.e. those with the highest tonnages). This included identification of a need for new European legislation on product design and the extension of producer responsibility. The extension of a labelling scheme was also identified to inform consumers on the environmental performance or impact of products. Further work on the standardisation of carbon footprinting of products and services in the context of climate change was also identified.

At a UK level the setting of resource productivity targets is desirable although probably dependent on developments at EU level. Of particular importance in addressing the top residual waste streams identified in this research would be the introduction of a levy or VAT increase on disposable products, the extension and escalation of disposal taxes coupled with bans on disposal of recyclable and compostable materials.

The adoption of national targets or levy/VAT increases, raises the issue of funding for local authorities to deal with the collection and storage of these materials and products. Improving infrastructure at the local level, could be instrumental in phasing out some residual wastes including household hazardous wastes.

Key project recommendations, included:

European

- Develop European policy on product design, designed to phase out residual waste.
- Extension of producer responsibility to support the phasing out of residual wastes.
- Develop a labelling scheme for products which will provide information to consumers on the environmental performance or impact of products.
- Develop research on structural changes to current classification systems required to harmonise work on the carbon footprinting of products and services in the context of climate change.

National

- Set policy measures to get the prices right to encourage increased recycling of residual wastes.
- Consider an integrated materials and carbon levy with banding according to its material and carbon intensity, using indicators such as; Material Input per Service Unit (MIPS¹) and Carbon footprint.
- Setting a legislative framework for:
 - Banning the disposal of recyclable and compostable materials;
 - Setting long term targets for waste prevention and minimisation;
 - Extending producer responsibility (statutory and voluntary) to ensure adoption of best practice;
 - Increasing mandatory recycling targets e.g. packaging.
- Clarify the waste classification scheme so an integrated approach can be applied along the supply chain to the products and materials which eventually become residual waste.
- Improved market development including;
 - Improved procurement policies for the public sector;
 - Increased recycled product specifications.
- Waste minimisation through resource productivity policies and setting of waste reduction targets.
- Develop a national labelling scheme.
- Research should be commissioned on capture rates for the household waste collection system.
- Development of a communication campaign to improve awareness at a national level.

Local

- Use the adoption of national targets or levy/VAT increases to increase funding for local authorities to deal with residual waste e.g. increased provision of infrastructure for separate collection of household waste components.
- Extension of increased producer responsibility agreements (statutory and voluntary) at a local level.
- Development of a communication campaign to improve awareness at a local level.

¹ Wuppertal Institute. Calculating MIPS - Resource productivity of products and services. 2002.

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1. INTRODUCTION

The aim of Friends of the Earth's Reduce Resource Use campaign is to improve UK and EU resource efficiency and reduce climate impacts, through promoting waste prevention, reuse, recycling and composting and by phasing out **residual waste**.

This report sets out the results from a two phase research project aiming to identify what materials and products end up in residual wastes and how these can be phased out, resulting in increased resource efficiency and reduced environmental impact of consumption.

1.1 UK Resource Use

The UK consumes more than its fair share of the world's resources, creating environmental and social problems across the world, particularly in developing countries. The current model of development based on the erosion of natural resources and capital is unsustainable. One means of measuring the impact of resource consumption is the Ecological Footprint and if everyone in the world consumed as much as the UK population it would take the resources of over three planets to support them².

Many of these resources are literally wasted through the mainly linear process of material use in our economies. Materials are extracted, used or further processed into products where they are then disposed of to landfill and incinerators after use.

1.2 What is Residual Waste?

Not all materials and products are able to be reused, recycled or composted and these are the materials that end up in residual waste and drive the need for disposal technologies such as landfill and incineration. Even with an excellent doorstep collection of recyclable materials and products for households, provision of civic amenity sites and bulky waste collections, there are still residual wastes arising from households. A strategy to remove these materials and products from the waste stream needs to be underpinned by research, the first stage of which is the identification of what materials and products end up as residual waste and in what quantities, followed by identification of policies to phase out residual wastes.

1.3 Policy Context

A range of policies at European, national and regional levels provide the policy context for residual waste production and prevention and these are described below.

1.3.1 EU Policy Context

The EU has adopted a range of thematic strategies under the 6th Environmental Action programme, the Thematic Strategies on 'Sustainable Use of Natural Resources'³ and 'Prevention and Recycling of Waste'⁴ set the policy context for residual wastes. While the

² WWF Living Planet Report 2006

³ Commission of the European Communities. Thematic Strategy on the sustainable use of natural resources. December 2005

⁴ Commission of the European Communities. Communication towards a thematic strategy on the prevention and recycling of waste. May 2003

Thematic Strategy on Sustainable Use of Natural Resources does not refer specifically to residual wastes, it does set out as its overall objective *'to reduce the negative environmental impacts generated by the use of natural resources in a growing economy – a concept referred to as decoupling'*.

The Thematic Strategy on Prevention and Recycling of Waste refers to the potential of EU waste policy to contribute to reducing the overall negative environmental impact of resource use and states that the basic objectives of current EU waste policy – to prevent waste and promote re-use, recycling and recovery so as to reduce the negative environmental impact - are still valid and will be supported by this impact-based approach. The strategy recognises that this requires a combination of measures to promote waste prevention, recycling and re-use in such a way as to produce the optimum reduction in the accumulated impact over the life cycle of resources. Of the seven actions identified within the strategy, of particular relevance to this research is the introduction of life-cycle thinking into waste policy. The strategy states that:

'all phases in a resource's life cycle need to be taken into account as there can be trade-offs between different phases and measures adopted to reduce environmental impact in one phase can increase the impact in another. Clearly, environmental policy needs to ensure that negative environmental impact is minimised throughout the entire life cycle of resources.'

The adoption of life cycle thinking has implications for the entire product supply chain and this in turn impacts on EU product policy⁵ and the forthcoming Sustainable Consumption and Production Action Plan, which is due in spring 2008⁶. The European Union has also recognised the need to build on the evidence base for this approach through the funding of research into improvements to methodologies for Life Cycle Analysis under the Framework Programme Six for Research and Technological Development (see Section 5 for a detailed discussion of quantifying environmental costs and benefits).

1.3.2 UK Waste Policy

With the publication of Waste Strategy for England 2007, England and the three devolved administrations now have separate waste strategies.

Wales

'Wise about Waste: The National Waste Strategy for Wales'⁷ published in 2002 identified a range of potential mechanisms to increase participation in recycling schemes, including direct charging for the quantity of residual waste collected with segregated recyclables being collected for free or at a lower rate.

Scotland

Scotland adopted a national strategy, the 'National Waste Plan' in 2003, which states that *'treatment technologies for residual mixed wastes that further boost recycling and composting outputs and thereafter reduce the final amount of material going to landfill, are the preferred way forward.'*

⁵ European Commission. Integrated Product Policy. Building on Environmental Life-Cycle Thinking. June 2003

⁶ <http://www.score-network.org/score> [Accessed 16/04/08]

Northern Ireland

'Towards Resource Management. The Northern Ireland Waste Management Strategy 2006 – 2020'⁸, refers to household waste stating '*waste prevention will help us to meet our targets by reducing the amount of residual waste requiring recycling and recovery*', and sets out the following activities as examples of those that can reduce the amount of waste entering the collected waste stream:

- avoiding waste generation;
- reducing the quantity and hazardous nature of waste at source; and
- reusing products before they enter the waste stream.

England

Waste Strategy 2007.

In line with developing EU policy, WS 2007 adopts a life cycle approach to waste and resource management, which recognizes the links with other policy areas, stating:

This strategy recognises that successfully tackling the causes of waste generation requires a focus on the production and consumption of products and materials so that interventions can be targeted at the most significant environmental impacts across the life cycle. It forms an integral part of the Government's wider approach to tackling the environmental and economic impacts of wastefulness in our use of material resources, energy and water.

However, the commitments and EU and national levels to an integrated, life cycle approach to materials/product/waste and resource management, has yet to result in the integration of key policy programmes and in particular, in the adoption of management and classification systems which enable an integrated approach.

The England waste strategy sets a target to "*to reduce the amount of household waste not re-used, recycled or composted from over 22.2 million tonnes in 2000 by 29% to 15.8 million tonnes in 2010 with an aspiration to reduce it to 12.2 million tonnes in 2020 – a reduction of 45%. This is equivalent to a fall of 50% per person (from 450 kg per person in 2000 to 225 kg in 2020)*".

The Strategy includes the three new waste indicators for local authorities in England one of which is residual waste, and targets for its reduction:

Household residual waste reduction target (from 2000 levels)

- 2010: 29% reduction
- 2015: 35% reduction
- 2020: 45% reduction

⁷ Welsh Assembly Government. Wise about Waste: The National Waste Strategy for Wales. June 2002

⁸ Department of Environment for Northern Ireland. Towards Resource Management. The Northern Ireland Waste Management Strategy 2006 – 2020. March 2006

The strategy goes on to say that, due to lower than predicted levels of waste growth, the Government expects lower levels of residual waste than were previously assumed to be produced and that it is likely to review the targets in the light of this.

The Strategy identifies incentives as one of its key proposals for action, and within this, proposes to consult on removing the ban on local authorities introducing household financial incentives for waste reduction and recycling, through early legislative change. Local government would be free to introduce schemes where householders who recycle their waste receive payments funded by householders who do not recycle. The strategy states that this incentive could reduce the amount of annual residual waste landfilled by up to 15%, equivalent to 1.5 million tonnes or 130kg per household. The strategy also commits the government to setting targets for local government on residual waste, that which is not reused, recycled and composted.

The England waste strategy summarised the strategy objectives, action for different parts of society, the policy approach, and indicators and targets (Figure 1).

The range of policies set out to meet the targets, including those for reducing household residual waste, cover a range of areas including education and awareness, voluntary producer responsibility agreements, procurement, infrastructure provision and incentives. It also clearly states that if incentives are not sufficient, regulation is needed both upstream and downstream.

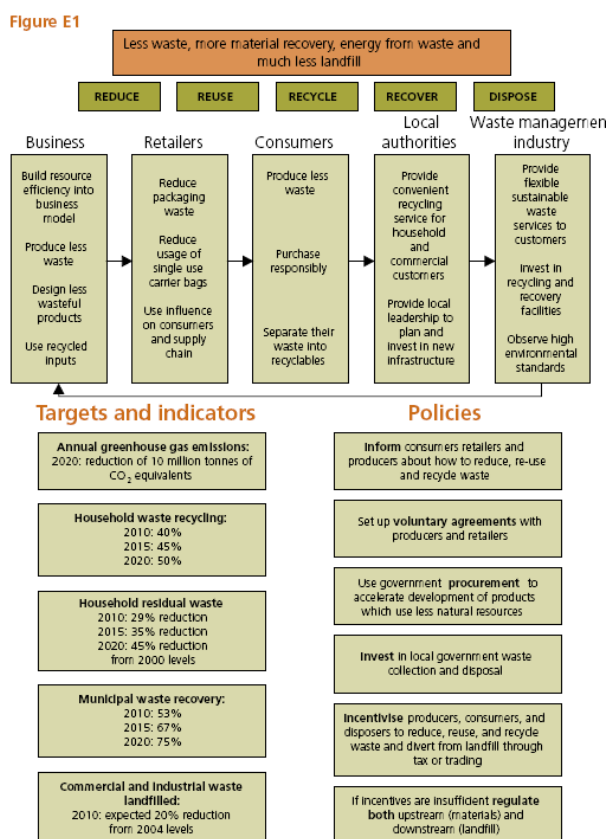


Figure 1. England Waste Strategy Schematic. Defra (2007)

1.3.3 Looking upstream

Even with an excellent doorstep collection of recyclable materials and products for households, provision of civic amenity sites and bulky waste collections, there are still residual wastes arising from households. Previous work on maximising recycling rates carried out by Eumonia Research and Consulting for the Community Recycling Network identified the level of recycling that could be achieved with extension of good practice as in the region of 62% and analysed the relative impact of residual waste treatment options and identified policy measures to improve recycling and reduce residual waste arisings⁹. However, more recent research carried out by the Green Alliance under the DEFRA funded project 'Closing the Loop', included a review of International Zero Waste Initiatives which included an example of recycling/reuse and composting rates of from Flanders of 71%¹⁰.

Recent work commissioned by Friends of the Earth on the climate change impacts of residual waste management options not only dispelled the myth that incineration can make a contribution to meeting climate change targets but highlighted that best thing to do with residual waste from an environmental view is to phase it out¹¹.

This research project has not considered what the best management options are for residual wastes in the UK, rather the approach has been to look upstream and focus on what policies

⁹ Community Recycling Network (2002) Maximising Recycling Rates: Tackling Residuals

¹⁰ Hill, J, Hislop, H, Shaw, B (2006) An International Survey of Zero Waste Initiatives

¹¹ Eunomia Research and Consulting (2006) A changing climate for energy from waste?

need to be in place to prevent the residual waste arising in the first place driving the need for disposal technologies such as incineration.

1.4 Objectives

This research consisted of two parts:

Phase 1: the identification of what materials and products end up as residual waste and in what quantities; and

Phase 2: focusing on what policy measures could be used to create a zero waste policy framework for residual wastes and the identification of what tools and techniques could be used to quantify environmental costs and benefits and support policy making.

2. RESIDUAL WASTE IN THE UK

2.1 Introduction

The starting point for the research was the need to identify what materials and products currently end up as residual waste, with a secondary aim of using the process of identifying/estimating the composition and quantities of the residual waste stream to review the quality of the data on waste quantities, composition and collection system capture rates required to provide an estimate of residual waste arisings. The full methodology is given in the Phase 1 report and summarised below.

2.2 Estimating residual waste arisings

The analysis of residual waste arisings aimed to identify what materials and products currently end up in residual household waste, not to provide a definitive estimate of UK residual waste arisings (see Section 2.7 Improving the evidence base). Different analyses will arrive at different estimates of the quantities of residual waste arisings depending on the starting assumptions on waste quantities and composition and collection system capture rates. Waste streams were categorised into collected household bin waste (i.e. including recycling, composting and residual waste uplifts), bulky household waste collections and civic amenity site waste.

The tonnage and composition of household residual waste was estimated based on two scenarios, hypothetical (100% recycling of recyclables) and practical (lower capture rates) resulting in estimates of between 5,364,000 and 10,188,000 tonnes for the hypothetical and practical scenarios respectively, from the most recent waste arisings data for each region of the UK. The estimates are broken down by waste/material type and by source to identify the most significant wastes types in tonnage terms in the Phase 1 report¹².

The difference between residual waste arisings in the hypothetical and practical scenarios demonstrates the potential reduction in residual wastes that could be achieved by improving capture rates. Under the practical scenario a recycling rate of 67.1% was achieved and under

¹²http://www.foe.co.uk/resource/reports/residual_waste.pdf

the hypothetical 82.7%. The practical scenario highlights those wastes that currently end up in the residual waste stream such as paper/card and plastic packaging which could be removed with improved capture rates and emphasis on segregation to prevent contamination.

2.3 What ends up in residual waste?

The main waste streams that enter residual waste, even under conditions of high recycling create the need for disposal technologies such as incineration, MBT and landfill. Table 1 shows the top waste streams by quantity from the hypothetical and practical scenario and these are the focus of Phase 2. Three of the top waste streams by quantity identified in the practical scenario were kitchen waste, newspapers and magazines and cardboard boxes and containers, although these can be removed from residual waste with improved segregation and collection systems and so are not addressed further in this report they have been included in Table 1.

Table 1: Top residual waste streams even under conditions of high recycling

Waste Category	Scenarios	Estimated tonnage of residual waste arisings from household sources			
		Collected waste	Civic amenity site waste	Bulky waste	Total
Other paper and card	Hypothetical	1,260,640	3,437	0	1,264,077
	Practical	1,260,640	10,310	0	1,270,950
Cardboard boxes/containers	Hypothetical	0	4,648	341	4,989
	Practical	419,932	13,945	1,023	434,899
Newspapers and magazines	Hypothetical	0	4,768	0	4,768
	Practical	432,615	14,303	0	446,917
Kitchen waste	Hypothetical	0	262	0	262
	Practical	639,544	656	0	640,200
Plastic packaging (excluding dense plastic bottles)	Hypothetical	724,458	1,331	341	726,130
	Practical	1,194,636	18,367	2,250	1,215,253
Disposable nappies	Hypothetical	922,420	397	0	922,817
	Practical	922,420	397	0	922,817
Other miscellaneous combustibles	Hypothetical	360,512	68,943	78,108	507,563
	Practical	403,559	77,175	87,434	568,168
Other organic wastes	Hypothetical	468,897	13,111	0	482,008
	Practical	468,897	13,111	0	482,008
C&D wastes	Hypothetical	0	447,996	2,741	450,737
	Practical	84,043	501,488	3,068	588,599
Mixed bagged waste	Hypothetical	0	202,780	10,124	212,904
	Practical	0	368,692	18,407	387,099
Other non-combustible material	Hypothetical	193,990	1,112	491	195,593
	Practical	217,153	2,781	1,227	221,161
Furniture	Hypothetical	0	45,133	101,308	146,441
	Practical	10,300	151,195	339,380	500,876
Carpet and underlay	Hypothetical	38,434	38,935	17,725	95,094
	Practical	96,085	97,338	44,314	237,737
Non-packaging glass	Hypothetical	115,302	1,828	205	117,335
	Practical	115,302	5,483	614	121,399
Other potentially hazardous	Hypothetical	69,181	1,212	102	70,495
	Practical	69,181	4,847	409	74,438

Definitions

Some related waste categories have been combined. Plastic packaging is a summary of other packaging, packaging film, other plastic film, refuse sacks and carrier bags.

Other paper and card - Wall paper removed from walls, photos, facial and toilet tissues, kitchen paper.

Plastic packaging (excluding dense plastic bottles) - Including expanded polystyrene, margarine tubs, freezer containers, yoghurt pots, clear egg boxes, cosmetic packaging, cassette boxes and bottle crates. Cling film, sandwich bags, frozen food packets and biscuit wrappers. Bin liners and cellotape. Plastic refuse bags and carrier sacks.

Other miscellaneous combustibles - Combustible flooring, combustible tiles, other sanitary products, other combustible items that do not fall easily into other categories.

Other organic wastes - Pet excrement, bones (non-catering), dead animals.

C&D wastes - DIY rubble (bricks etc), sand, gravel, non-combustible tiles, ceramic toilets, ceramic wash basins, kitchen units and worktops, stones.

Other non-combustible material - Crockery, flowerpots, cinder and soil.

Furniture - All furniture excluding kitchen units and work-tops.

Non-packaging glass - Mirrors, reinforced glass, non fluorescent light bulbs etc.

Other potentially hazardous - Paint cans: with or without paint contained; other batteries (including household batteries, household rechargeable batteries); Pesticides: items containing pesticides, liquid or solid; Other: Asbestos, fluorescent light bulbs, other household hazardous waste, identifiable hazardous items that do not fall readily into the above categories.

2.4 Other recent research into residual wastes in the UK

Following completion of Phase 1 of the project, a report was published by Defra on residual waste composition, carried out by Be Environmental. The report 'National Waste Composition Estimation - Methodology & Approach'¹³ comprised a detailed waste composition review and analysis leading to a revision of the national estimate of municipal solid waste composition previously undertaken by Dr Julian Parfitt of WRAP. The report also highlighted the range of classification systems used and estimated residual waste arisings at 14,616,000 tonnes. The top waste categories by weight differed from the results of Phase 1 of this research due to the different classification systems used. However, similar materials and products ended up in large amounts in residual waste namely kitchen wastes, non-recyclable paper, disposable nappies and plastic packaging and film. The study aggregated data from a range sources to provide national estimates for the composition of municipal waste, which is shown in Figure 2.

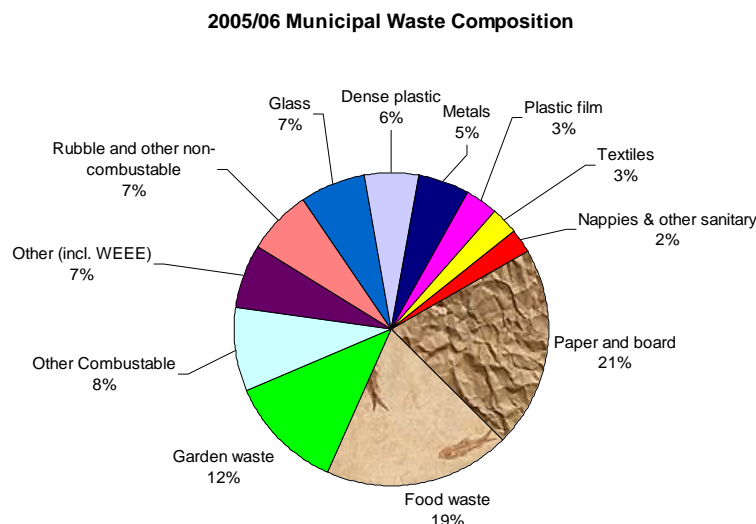


Figure 2. Estimated national municipal waste composition 2005/06 (from Be Environmental (2007))

¹³ Be Environmental. National Waste Composition Estimation - Methodology & Approach'. July 2007

2.5 Conclusions and recommendations from Phase 1

One of the key outputs from Phase 1 of the research was a series of recommendations on improving the evidence base for estimating the quantities and composition of residual wastes, in particular the need for additional research. This included the need for a review of waste compositional analysis work carried out in the UK over the last 5 years, the commissioning of a representative national survey of the full range of household wastes arisings (household collected, civic amenity site and bulky wastes), integration of waste/product/material classification systems and a review of capture rates research to date.

2.6 Phase 2 of the research

The clear need to improve the evidence base fed into Phase 2 of the research which comprised of two stages:

- Facilitated workshops to seek the views of stakeholders on policies and actions to improve the evidence base for residual waste management and forecasting; and
- Follow-up research to identify best practice and make policy recommendations to form the basis of a zero waste framework for residual wastes.

2.6.1 Stakeholder workshops

As set out in Section 2.5, the outputs of Phase 1 included a series of recommendations on improvements to the evidence base, focused principally on improvements to data on waste quantities, composition and capture rates. As a result of the clear delineation between the data and evidence focus of Phase 1, and the policy focus of Phase 2, it was decided to deliver two half-day workshops, targeted at the data and policy communities. In addition to seeking the views of stakeholders on policies and actions to improve the evidence base for residual waste management and forecasting, the workshops were also intended to inform the choice of priority residual waste streams for the identification of policies and best practice case studies.

This was achieved by asking participants to select their 'Top Three' residual waste streams in terms of priorities for action at the beginning of the each workshop and then revisiting the selection of priorities at the end of the workshop following discussion.

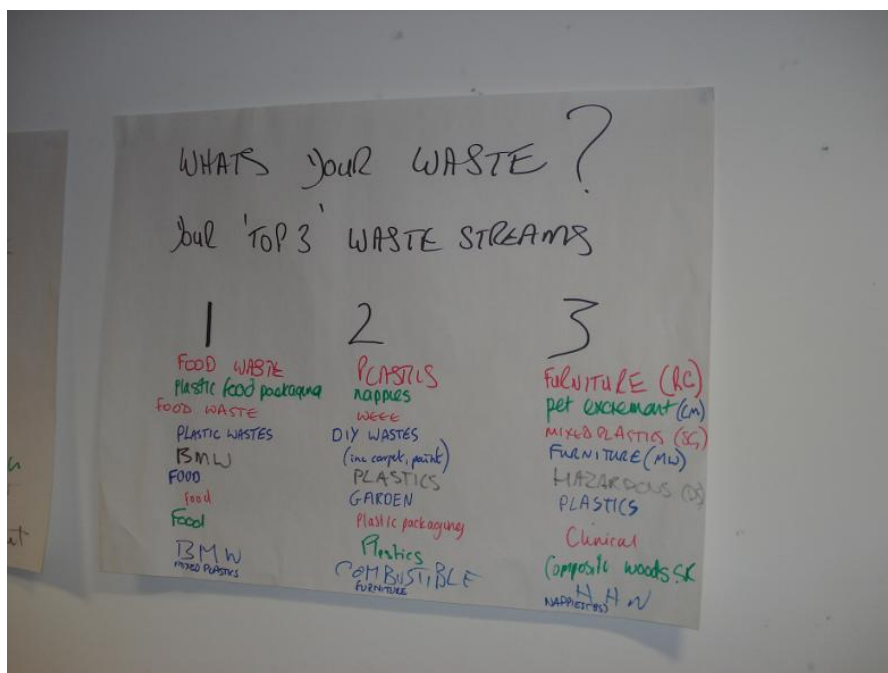


Plate 1. Priority waste stream choices from the stakeholder workshops.

As a result of the workshop discussion and the analysis carried out in Phase 1, the priority residual waste streams were identified as:

- DIY wastes
- Plastic packaging
- Furniture
- Nappies

As mentioned above, the decision was made to exclude food waste as this can be removed from the residual waste stream with improved segregation and collection.

2.7 Improving the evidence base

The workshop brought out a wide range of issues that need to be addressed to improve the evidence base for robust policy and decision making on residual wastes.

2.7.1 What level of information is needed?

One of the first questions to be considered was what level of information is needed. There was consensus that for waste management purposes the data on waste quantities is sufficient for current needs, but for informing decisions on key residual wastes and product/material specific policies the evidence base needs to be improved. The recommendations below are derived from the analysis of data quality carried out as part of Phase 1, which highlighted the sensitivity of the estimates to the starting assumptions on waste composition and collection system capture rates, and the results of the inputs of waste data experts as part of the data stakeholders workshop.

2.7.2 Definitions and categories

- 1. Residual waste.** Definition of residual waste, for example, whether it is by composition or by source/collection. Defra does not currently count home composting with respect to the biodegradable waste diversion targets under Landfill Allowance Trading Scheme (LATS), however, the Waste and Resource Action programme (WRAP) are currently working on an estimation methodology which will allow home composting of organic material to count towards the targets.

- 2. Zero waste.** Zero waste with respect to residual wastes was defined as zero waste to disposal (landfill or energy recovery).

- 3. Categorisation.** As policies on waste develop into policies on resource management and these are underpinned by life cycle and supply chain thinking, the categories used for waste composition wastes become a barrier to integrating waste and resource management and product policy. Phase 1 of the research recommended, as a first step, the mapping of waste categories to the appropriate PRODCOM product categories. The eventual harmonisation of the waste/product/material classification systems will be required to underpin an integrated approach. Categorisation is a big issue as more aggregated categories mean better correspondence between different studies and approaches but disaggregated categories are more useful for policy development targeted at specific material streams. The recent research by Be Environmental has highlighted a lack of standardised categories for the waste compositional analysis work carried out by local authorities in recent years, particularly when disaggregated into a larger number of categories. A need for consistent guidance and definitions is required, particularly at the sub-category level.

2.7.3 Capture rates

The methodology used for estimating residual waste quantities in Phase 1 was chosen to highlight the sensitivity of the estimates to assumptions on the capture rates achievable for the collection systems. This issue was raised in the workshop discussions with data stakeholders, which highlighted the wide ranges of capture rate assumptions currently being employed for both kerbside collection and CA site systems. Phase 1 of the research made recommendations for further research on capture rate estimates and this was reinforced by the data stakeholder group, which pointed out that the range of assumed capture rates employed for the practical and hypothetical scenarios in Phase 1 could have been widened further. The research could have employed 3 scenarios – with the practical scenario being viewed by some stakeholders as still being hypothetical. A third scenario should reflect reality and incorporate behaviour. This would give a better demonstration of sensitivity and scenario outputs could be presented as bands.

Estimating the capture rates for CA sites was highlighted as a particular problem, as the design and management of these sites has changed dramatically in recent years, leading to increases in the range of materials collected.

2.7.4 Waste composition

The starting point for estimates of residual waste quantities in Phase 1 was data on the composition of the household waste stream (grey bin, kerbside collection, CA site and bulky waste). Recent research by the Open University into the composition of municipal solid waste has drawn attention to the limited nature of previous surveys of household waste composition and concluded that the only systematic survey of the entire household waste stream covering all seasons of the year has been undertaken for Wales¹⁴.

2.7.5 Further research needs

Household waste composition – the Welsh Model

Phase 1 of the research employed the Wales compositional analysis as the basis of the scenario projections, as this was the only compositional analysis programme that systematically addressed all parts of the household waste stream (Household collected, CA site and bulky/other wastes). Phase 1 recommended a national waste compositional analysis programme, based on the methodology used in Wales, and incorporating:

- Seasonal variation;
- Geographical spread (local, regional, national);
- Waste collection systems covered (e.g. household recycling, composting and residual waste collections; civic amenity sites; bring recycling points; bulky uplifts);
- Level of detail of classification (i.e. no. of waste/material categories used); and
- Classification system employed (compatibility of classification systems for different waste streams).

Input from the Open University research team highlighted how this could be achieved cost effectively if centrally coordinated and carefully designed to avoid duplication.

Key material streams

There is a need for further research into key material streams and this could be delivered via a series of focused studies on material streams such as biodegradable wastes, household hazardous wastes and mixed plastics.

Activity based analyses

The priority areas for residual wastes are often related to activities which do not fit with traditional waste/material or even product categories or classification systems i.e. DIY waste and having children (nappies, tissues, wipes). As highlighted in Section 3.6, policies to address residual wastes from these activities need to be targeted to specific materials or products, for example, paint.

Displacement

The issue of displacement is poorly understood and there is a need to get an estimate of how much household waste is ending up in other waste streams, in particular CA sites and charity shops.

¹⁴ Burnley *et al.* (2007) A review of municipal solid waste composition in the United Kingdom. Waste Management 27:1274-1285.

Climate change

Climate change may influence waste composition in the future whether through changing behaviour or climate related events. An example of this was the massive increase in plastic bottles that entered the waste stream after the flooding events in England during 2007.

3. PHASING OUT RESIDUAL WASTES

3.1 Policy challenges

The development of policies to remove these materials and products from the waste stream needs to be underpinned by research which provides a robust evidence base for these policies, both in terms of accuracy of data and the effectiveness (or not) of the various policy options. Residual waste arisings depend on policy decisions taken at local, UK and EU levels, and there is scope to reduce residual waste arisings through new policy packages.

One of the challenges of developing a zero waste policy framework for residual wastes is the policy classification system. As outlined in Section 1, as waste strategies at national and European levels increasingly acknowledge that a life cycle approach is needed to address the underlying causes of residual wastes, the 'traditional' waste classification systems increasingly become a barrier to this approach. Phase 1 of the research made recommendations on an integrated approach to waste/product/material classification systems to facilitate the linking of residual waste categories to policy levers for materials and products. This need for a harmonised classification system is further emphasised by the criteria and classifications set out in Table 2.

Table 2. Classifying waste prevention methodologies and strategies

Criteria	Classification
Waste stream	Material (paper, hazardous waste)
	Product (packaging, nappies)
	Source of generation (household, industry)
Target group	Households
	Retail (commerce and service)
	Industry
Instruments	Regulatory instruments (regulations, product standards)
	Economic instruments (subsidies, taxes, charges)
	Collaborative agreements (certifications and labels)
	Service and infrastructure (reuse and repair systems, second-hand shops)
	Communication and information (advertising campaigns)
Purpose	Reduction at source (complete avoidance, reduction by optimisation of manufacturing processes)
	Substitution (disposable by refillable packaging)
	Reuse
	Recycling (substitution for original material/product)
	Downcycling (substitution for lower value material/product)

Depending on which approach is taken e.g. focusing on a particular waste stream or a particular target group, this will determine what policy instruments are employed and for what purpose.

3.2 Creating the right framework

The policies that will be needed to phase out residual wastes can be divided into two categories. Firstly those that are necessary to create the framework conditions under which high re-use, recycling and recovery can be achieved and residual wastes can be phased out and secondly, those that specifically address the materials and products that end up in residual waste. There is a wide range of evidence from other countries that can be applied to the UK without reinventing the wheel¹⁵ and the range of policies that will create the right framework for phasing out residual wastes are categorised and summarised in Table 3.

This range of policies are targeted both upstream and downstream, with the upstream ones aiming to prevent residual waste through the legislative framework and changing consumption patterns with downstream policies aimed at ensuring materials and products don't end up in the residual waste stream but are captured by effective collection systems and go for reuse and recycling.

¹⁵ Green Alliance (2002) Creative policy packages for waste: lessons for the UK (www.green-alliance.org.uk/publications/PubCreativePolicyPackWast/)

Table 3: Policy measures need to achieve the right framework conditions

Getting the prices right	<ul style="list-style-type: none"> • Escalation of landfill tax • Introduction of incineration tax • Removal of economic incentives for incineration • Local authorities have power (but not requirement) to introduce variable household charging once doorstep systems in place (could take form of discounts on council tax, financial incentives and reward schemes, direct and variable charging) • Increased VAT on disposable goods
Legislative framework	<ul style="list-style-type: none"> • Ban on disposal of recyclable and compostable materials • Ambitious, long term mandatory targets including those for waste prevention and minimisation • Extended producer responsibility (manufacturers responsible for minimising waste, reusing materials and recycling) • Increasing mandatory recycling targets e.g. in packaging
Better systems	<ul style="list-style-type: none"> • Improved segregated collection systems • Increased civic amenity site provision • Increased bulky waste recycling • Deposit-refund schemes for bottles and cans • Sufficient funding for Local Authorities to put in place effective doorstep systems
Market development	<ul style="list-style-type: none"> • Improved procurement policies across the board with the public sector showing leadership • Recycled product specifications
Waste minimisation	<ul style="list-style-type: none"> • Resource productivity policies • Production waste reduction targets
Information and awareness	<ul style="list-style-type: none"> • Communication campaign underpinned by real Government leadership at both national and local levels

Even with the right framework in place, it will be challenging to phase out or substantially reduce residual wastes and measures that specifically address individual waste streams will also be needed. In this research we have focused in particular on the priority waste streams identified in Section 2.6.1.

3.3 Priority waste streams for action

The following waste streams have been chosen as priority areas for action, based on the outputs of Phase I of the research and the stakeholder workshops. Each waste/material stream is discussed as follows:

- (i) Description of the waste stream;
- (ii) Methods of removing this waste stream from residual waste (includes case studies);
and
- (iii) Conclusions and policy recommendations, divided into local/UK/EU.

The case for food

Recently the issue of food waste has received increasing attention. Kitchen wastes were one of the top waste categories by tonnage in the practical scenario calculated in Phase 1. However this is due to the low capture rates of kitchen wastes rather than the lack of an identified policy solution. The rolling out of source separated collection of food waste for composting or anaerobic digestion would remove this material from the residual waste stream¹⁶. WRAP have undertaken research on food waste¹⁷ and potential solutions to prevent food being wasted and are currently running a campaign aimed at reducing food wastes¹⁸. Therefore food wastes were not considered further in Phase 2 of this research.

3.4 Plastic packaging

3.4.1 Introduction

Plastic packaging is a summary of a number of waste categories, namely, other packaging, packaging film, other plastic film, refuse sacks and carrier bags. This includes expanded polystyrene packaging, various plastic bags and bin liners, margarine tubs, packaging trays, and cosmetic packaging (see Table 1 for full list).

These items end up in the residual waste stream for a number of reasons, they may not be made of recyclable plastic e.g. cellophane or a plastic for which there are not markets e.g. PP, LDPE, or are made of composite materials e.g. biscuit wrappers; or the collection and reprocessing infrastructure is not in place. Food packaging in particular may be made of recyclable plastic (e.g. PET) but may not be collected by a local authority due to potential contamination, i.e. a decision to only collect plastic bottles.

There are a range of policies that could be used to phase out these materials and products. A wide range of plastics are used in packaging and reducing the number of plastics used and only using plastics that can be recycled and/or composted for packaging would be a major step in reducing the amount of plastic ending up in residual waste.

Legislative measures that would provide an incentive to do this include the introduction of a landfill ban on materials such as extruded polystyrene and any materials that can be recycled or composted, the introduction of product taxes/variable VAT on hard to recycle materials and industry standards. The Packaging Recovery Note (PRN) system already has different targets for different material groups i.e. plastics. There is a perception among the public and policy and decision makers that foodstuffs in particular cannot be effectively packaged without plastics; however the upstream intelligent design approach demonstrates that in most cases, it is possible to design out plastics from packaging or ensure that those used are single polymer.

¹⁶ Friends of the Earth (2007) Food Waste Collections Briefing

¹⁷ WRAP (2007) Understanding Food Waste.

¹⁸ See www.lovefoodhatewaste.com for details on Wrap's campaign and research

Case Study 1 Compostable Packaging in the UK

Green Alliance

Green Alliance as part of their Closing the Loop project have been working on food packaging, in particular compostable packaging. The expansion of the use of compostable packaging in place of plastic food packaging offers a solution to phasing plastic food packaging out of residual waste and the stated aim of this project, creation of a policy framework for zero residual wastes. There is a need to reduce and recycle packaging waste, consumers want less and better packaging and local authorities need to be able to put the appropriate infrastructure in place. Compostable packaging can be used to replace plastic packaging on fresh produce (trays, films, nets, punnets), short shelf life foods, non-moisture sensitive products like pasta. It can also be used for bin liners and carrier bags, all components of the current residual waste stream.

Green Alliance identified a number of pre-conditions that must be met to ensure that environmental benefits from compostable packaging are maximised. These include ensuring the consumer is clear about what can be composted and how, the separate collection of compostable waste by local authorities, and the availability of appropriate technologies and end markets for composted materials. Fulfilling these pre-conditions requires the input and cooperation of a wide range of stakeholders - from packaging manufacturers and retailers to local authorities and the waste industry. Green Alliance joined forces with the National Non Food Crops Centre (NNFCC) and WRAP to hold a workshop bringing together all the players in the packaging supply chain in March 2007 which resulted in the publication of a guidance document for compostable packaging applications¹.

The purpose of the guidance is to illustrate the kind of considerations that should be taken into account in choices for compostable packaging applications and is linked to work on labelling, logos and standards currently being carried out by WRAP¹ and the Composting Association.

It is essential that clear labelling and instructions are given on the packaging to enable consumers to differentiate it from conventional plastic packaging and that it is home compostable. Further work will consider in detail the downstream treatment of packaging in terms of local authority infrastructure and the problems in responding to retailers' changes in material use, given the inflexibility of current contracting arrangements for waste infrastructure. Other key points identified from this work included; to ensure compostable plastics are not used for applications where easily recycled alternatives are available – e.g. bottles. Also, to not focus on compostable plastics already on the market such as carrier bags, but instead to focus on the application of compostable packaging for food products, thereby partnering compostable packaging with compostable products.

¹Green Alliance (2007) Applications for compostable packaging: a guidance document

3.4.2 Conclusions and policy recommendations

Compostable packaging could play an important role in phasing out plastic packaging, particular food packaging from residual wastes. To enable it to do so a long term view is

needed and initiatives such as this one from Green Alliance should be built on, bringing together industry and leading retailers with Government support. The Government can also play a role in driving this process through procurement policies and putting in place policies that provide the economic incentives to make the shift from plastic to compostable packaging which include extension and escalation of disposal taxes.

Until such times, compostable plastics will remain a niche, with many plastics continuing to be derived from petrochemical sources, which will mean recycling is likely to remain the focus in the short to medium term. Therefore, the push will be towards higher packaging recycling targets and increase mixed plastic recycling. WRAP has recently published a study of mixed plastics recycling which demonstrates that mechanical recycling is environmentally preferable¹⁹ set a target to develop 500,000 tonnes of mixed plastics reprocessing capacity in the UK by 2018 by funding a 40,000 tonne capacity plant²⁰

Policy recommendations

European Union

- Further development of policy within existing environmental tools, such as packaging and labelling. Packaging policy could include higher recycling targets, focusing on plastic and polymer specific targets, while labelling policy could improve labelling for compostable and non-compostable packaging.
- Development of policy for investment in research on zero waste packaging recycling systems.

United Kingdom

- Development of higher packaging recycling targets, focusing on plastics and polymer specific targets.
- Inclusion of increased targets for recycled content in public procurement policy.
- Direct national research programmes towards plastics recycling and investment in developing markets for mixed plastics.
- Financial support for the development of recycling infrastructure at local level.
- Establish framework for voluntary agreements to increase recycling.
- Promote the development of the use of the European Eco-Label.

Local

- Revise public education and campaigning policies to improve public education on different types of plastic and campaigning against packaging.
- Review plastic bottle collection plans and seek support from national recycling schemes/WRAP.
- Establish householder and market demand in local area and develop policy to improve collections and utilise mixed plastic markets if found.

¹⁹ WRAP (2008) Domestic Mixed Plastics Packaging Waste Management Options

²⁰ Lets Recycle (2008) WRAP to boost market for mixed plastic waste

(http://www.letsrecycle.com/do/ecco.py/view_item?listid=37&listcatid=217&listitemid=10064)

3.5 Furniture

3.5.1 Introduction

Furniture was one of the top residual wastes identified in Phase 1, primarily arising via the bulky waste and CA collection systems. Input from stakeholders suggested that furniture was one of the areas where significant improvements to collection systems could be achieved by a more uniform implementation of best practice. The Furniture Re-use Network has published guidance on optimising the design and operation of collection systems for furniture re-use and recycling²¹, which describes best practice for CA sites and bulky collections (see below) and DEFRA has also published the Bulky Waste Toolkit in conjunction with Network Recycling and the Furniture Reuse Network²². However, as outlined in Section 3.2, once collection systems are operating at an optimal level, then the upstream options of design and disassembly need to be addressed if the zero waste goal – diversion of all furniture residual waste from disposal – is to be achieved.

3.5.2 Collection case studies

Case Study 2 Re-use sheds on CA sites

Keynsham Recycling Centre, Bath & North East Somerset

The Keynsham re-use collects reusable items that are subsequently sold at a separate sales location by a community based organisation. The items collected are redistributed to disadvantaged people in the Bristol and Bath areas by the SOFA project, a large furniture recycling project whose headquarters are in Bristol.

The project utilises a purpose built unit where reusable items are stored before finally being collected by the SOFA project. Staff at the Keynsham CA site coordinate the project, although they find it requires a minimal level of support.

²¹ Lee-Smith, C. Bulky Basics. May 2006

²² DEFRA/Network Recycling/FRN. (2005) BULKY WASTE COLLECTIONS Maximising Re-use & Recycling. A step-by-step guide

Case Study 3 Mattresses

SpringBack

SpringBack¹ is the mattress recycling facility operated by FEAT Enterprises in Scotland. From 2005 to 2007 FEAT provided 180 good-quality mattresses suitable for reuse (based on condition, cleanliness and complying with health and safety standards) to four furniture charities in Fife and Falkirk. However, it became apparent that at least 95% of the mattresses uplifted were not suitable for reuse.

The manual deconstruction process was expensive and did not allow processing sufficient units to meet demand. FEAT therefore secured funding from Transforming Waste and the INCREASE Programme to work with a private sector company Ardmel Automations in Fife to develop the "world's first non-shredding deconstruction machine," that would "fillet" the mattress and give 99% recyclability. It would significantly increase capacity whilst reducing costs. This was expected to make the cost of recycling mattresses as economically competitive as landfill, which would increase customer numbers, and it would allow a move to a two-shift working system, increasing employment.

By 2007 SpringBack had recycled 36,603 units diverting 800 tonnes from landfill, hoping to reach the original target of 54,300 units as they were still only operating at 75% of capacity. However, even 100% capacity would not achieve the original tonnage aim of 3,300. This was based on whole beds (mattress and base) with average weights of 35 kg single/ 55kg double. In reality most of the units processed were mattresses only, with average weights of 18kg single/ 25kg double. At 100% capacity over 1,000 tonnes per annum would be recycled. By 2007 SpringBack had 7.5 employees - 30% with disabilities, and others disadvantaged in other ways. The project offered generic employability skills and other training to 35 New Deal clients over 3 years.

An unforeseen outcome was the development of a wood project to deal with bed bases, despite the small number involved. The wood was ideal for making kindling for wood stoves etc. and was taken by a major fuel distributor. FEAT also began to produce prototype biomass products - a briquette from the flock in mattresses (with a calorific output rating of 6.5) and coir/wood pellets (with an output rating of 7.5).

¹ <http://www.morethanwaste.com/Site/Default.aspx/18E20989B6CD55CA9285> [Accessed 17-04-08]

Case Study 4 Charity re-use shops on CA sites

Burton Farm Recycling Centre, Stratford, Warwickshire

During refurbishment to the site in 2002, it was decided to construct a storage/sales facility on site for the purpose of a re-use project. The facility consists of a large open plan space, measuring 980 sq ft, and features roller doors enabling a vehicle to enter to collect items, if required. The tender for this project was awarded to a local hospice in 2003.

During their first year of operation, 2004-2005, total sales at this shop equalled £103,420.17 and 250 tonnes of waste were re-used, equivalent to 40 skip-loads. The shop estimates that it receives an average of 150 transactions per day. At present the shop employs one full-time coordinator and a part-time electrician, responsible for testing all electrical items for resale. The shop also relies on various voluntary staff. On an average day the shop has three staff coordinating the project – two paid staff and one volunteer. The shop accepts any reusable materials donated to the facility, this includes assorted bric-a-brac, books, video tapes, toys, etc. and an assortment of small electrical items.

A service level agreement was established between the project coordinator and Warwickshire County Council. This shop was used as a 'template' for a further shop opened in Jan 2006 at the Prince's Drive Recycling Centre.



3.5.3 Upstream: design for disassembly or Intelligent Product Systems

Ultimately, a zero waste target for residual waste furniture can only be achieved through upstream approaches which include innovative closed-loop approaches such as design for disassembly, product leasing, or intelligent product systems²³, developed by Dr Michael Braungart, which classifies products as service goods, consumer goods and unmarketable products. A concept recently pioneered by Michael Braungart and William McDonough is the 'Cradle-to-Cradle' approach²⁴, who advised on the furniture design case study set out below²⁵.

²³ Braungart, M and Engelfried, J. (1993). Intelligent product systems

²⁴ McDonough, W and Braungart, M. Cradle to Cradle.

²⁵ DEFRA Waste Strategy Division. International Waste Prevention and Reduction Practice. October 2004

Case Study 5 Intelligent Design

Private Sector Furniture Take Back and Refurbishment, Germany and USA.

Two large American furniture manufacturers, Herman Miller Inc. and Steelcase Inc., and Wilkhahn, a German manufacturer, have developed comprehensive environmental programs aimed at minimizing life cycle impacts of their products. All three companies design for disassembly so that usable parts can be extracted and reused in new or refurbished furniture. This also facilitates service and repair programs.

Wilkhahn puts strong emphasis on durability, recycled content, and straightforward product repair and disassembly. Herman Miller and Steelcase both formed subsidiaries, Phoenix Design and ReVest respectively, to buy back and remanufacture their products. Both combine parts of used furniture with new pieces so that they can be offered at a substantial discount.

When a Wilkhahn chair is no longer useable, they take it back at zero cost, refurbish and reuse components and recycle the residual materials.

3.5.4 Conclusions and policy recommendations

Given the amount of furniture that ends up in the residual waste stream, there seems to be a wide gap between what has been demonstrated to be achievable and what is actually happening. Phasing furniture out of residual wastes will require a rolling out of best practice across the UK. Any programme aimed phasing out furniture from the residual waste stream will need incorporate upstream policies on producer responsibility and design for disassembly, with improvements to the collection system to ensure that best practice (for example, the procedures for bulky waste collections set out in Bulky Basics, such as collecting from inside houses rather than leaving items outside) is adopted uniformly.

Policy recommendations

European Union

- Development of producer responsibility measures, and encourage Life Cycle Thinking for furniture manufacturers.
- Develop policies to reward companies developing green furniture.
- Set Product Design Obligations, to include ecodesign requirements for furniture.

United Kingdom

- Development of producer responsibility measures to ensure adoption of best practice.
- Develop tools to encourage Green Corporate Purchasing (perhaps through promotion of Environmental Management Systems).
- Green public procurement policy to include furniture.
- Promote the uptake of eco-design and Life Cycle Analysis.

Local

- Setting up bulky waste reuse system (e.g. with charities).

- Promotion of freecycle²⁶ recycling parks, closer Local Authority working with charity shops and jumble sales.

3.6 Household DIY wastes

3.6.1 Introduction

The boom in household DIY in recent years has led a huge increase in household DIY wastes. In 2005 £11.3 billion was spent on home improvements, compared to £6.4 billion 10 years ago. In 2006, two thirds of people planned to redecorate their homes with new paint and wallpaper²⁷. As set out in Section 2.7.5, DIY wastes are not a waste stream as such, but an activity which leads to the generation of a range of materials/products and wastes.

However, there is no agreed definition for household DIY wastes and this waste stream tends to be a combination of the construction and demolition waste category, combined with other waste categories related to DIY activities such as carpet and underlay and paints. In practice, this means that best practice case studies for household DIY wastes tend to be product or material specific.

The majority of this arises through CA sites (waste furniture is often linked to household DIY and this comprises 37% of bulky waste collections, however, furniture has been treated as a separate case study). The compositional breakdown of CA site wastes used in Phase 1.

Burnley et al²⁸ estimated that C&D wastes account for 16% of CA site wastes, however, carpet and underlay accounts for 5%. Many Local Authorities have guidance on the acceptance of household DIY waste at their sites. The following materials and wastes can be considered to be household DIY wastes:

- Carpet and underlay;
- Mattresses;
- Paint;
- Garden chemicals;
- Bathroom suites i.e. baths, sinks and toilets;
- Fitted kitchen cupboards and work surfaces;
- Plasterboard and room partitions;
- Garden sheds;
- Fence panels and posts;
- Internal and external doors;
- Radiators;
- Garden stone, paving and ornamental; and
- Wall paper.

²⁶ <http://www.freecycle.org/> [Accessed 19.05.08]

²⁷ http://www.recyclenow.com/what_more_can_i_do/top_tips_for_DIY.html

²⁸ Burnley, S et al (2007). Assessing the composition of municipal solid waste in Wales. Resources, Conservation and Recycling. Vol 49, 264–283

A number of the materials/products generated as a result of DIY activities fall into the category of Household Hazardous Waste (HHD), and the Case Studies have been categorised between 'ordinary' and HHD DIY wastes.

Good practice at CA Sites

It is clear that a great deal more could be done to both educate householders on what household DIY items can be recycled, the need to plan ahead to maximise reuse and recycling and the provision of a greater range of collection options at CA Sites.

There is clearly potential to develop increased recycling of these materials. For example, a new carpet recycling alliance has recently been established²⁹, which aims to boost carpet recycling rates. Carpet manufacturers, retailers and recyclers from across the UK have teamed up for the first time to form an alliance called Carpet Recycling UK, which has 15 founding members, including the UK's first carpet recycler, Swindon-based Greenback Recycling.

Case Study 6 HHD DIY Wastes: Paint

Community RePaint. <http://www.communityrepaint.org.uk/>

Community RePaint is a national network of paint reuse schemes primarily operated by community groups (and also some local authorities). Schemes are generally focused on collecting "half-tins" of leftover domestic paint which members of the public donate in designated containers at household waste recycling centres (HWRCs). Schemes will also collect end-of-line and damaged tins of paint from manufacturers and retailers. Approximately 50% of paint donated to Community RePaint schemes is from domestic sources, while 50% is from trade sources. Collected paint is redistributed to local charities, community and voluntary groups, and individuals in social need.

There are 60 schemes in operation across the UK, ranging from Cornwall to Belfast to Shetland. In 2004, the network collected 195,000 litres of paint in total. Of this, 132,000 litres (worth over £500,000) was redistributed to over 7600 community groups and individuals. Operation of the network also supports employment of 45 part- and full-time workers and provides opportunities to 130 part- and full-time volunteers, while delivering over 170 training initiatives, often to the long-term unemployed and people with learning difficulties.

²⁹ http://www.letsrecycle.com/do/ecco.py/view_item?listid=37&listcatid=217&listitemid=9894 [Accessed 19.05.08]

Case Study 7 Local authority collection of household DIY wastes

Norfolk County Council

It is clear that levels of materials recovery from DIY activities is far from optimal. One of the keys to maximising recovery from household DIY wastes is ensuring that householders plan ahead and are able to assess what waste is likely to be generated by their activities and that they are able to access good quality advice on how this can be prevented, reused or recycled. Under current government legislation, DIY waste is not classed as household waste so by law local authorities do not have to accept it at household waste recycling centres. However, many do accept DIY wastes in small quantities to ensure that these materials do not end up being fly-tipped, for example Norfolk County Council offers a service which combines acceptance of a one free 80 litre bag of DIY wastes per week, combined with a pay-as-you-throw service. However, this does not necessarily guarantee additional DIY waste is recycled. Options for increasing levels of recycling and recovery from household DIY activities, include:

- Variable charging based on levels of segregation;
- Education and guidance to householders on predicting what materials will be produced by the DIY activities, to maximise segregation and recovery; and
- Integration with bulky waste collections.

Guidance on optimising recovery of materials from bulky waste collections could also be applied to DIY wastes being delivered to CA sites, for example, call centre guidance on what materials can be recovered and how best to store and transport these.

3.6.2 Conclusions and policy options

An activity-based source of residual wastes such as household DIY needs to be targeted with specific actions. Prevention, reuse and recycling of household DIY materials could be dramatically improved by a range of simple actions and a recommendation for the development of a protocol to facilitate adoption of best practice is set out below:

DIY Waste Prevention Protocol

A user-friendly DIY Protocol should be developed to inform householders of waste materials and products that will be used by various household DIY activities, what materials/waste will be produced and the best options for prevention, reuse and recycling. Suggested contents:

- Audit/checklist linking household DIY activities to materials and products consumed and materials/waste produced; and
- Guidance on prevention, reuse and recycling.

This could be funded by WRAP to sit alongside its other guidance and programmes on best practice in recycling. Waste Strategy 2007 commits the Government to further strengthening WRAP's role in this area, however, this commitment has been undermined by the recent major cuts in WRAP's budget.

Policy recommendations

European Union

- Develop policies to develop voluntary agreements and standardisation for companies providing DIY materials.

United Kingdom

- Develop national support programmes for householders, which encourage public education and collection infrastructure for schemes like RePaint.
- Continue support for national programmes identifying opportunities for reducing waste in DIY products e.g. improving packaging and making it easier for consumers to recycle.
- Provide benefits to companies reducing packaging, wastage etc in DIY products.
- Improve data on waste arising from household DIY, to improve support at local level (similar to approach for other waste streams)
- Support development of markets for DIY waste e.g. changes to legislation have impacted the recycled timber market. Dirty timber from DIY projects (e.g. treated, with nails etc) was classed as recycling when it was chipped and used on landfill restoration, and is now classed as disposal.
- Support local markets to ensure recycling remains a financially viable option.

Local

- Encourage householders to take DIY waste to CA sites and provide better support at CA sites for DIY waste.
- Offer disposal at a CA site at a cost that is less than hiring a skip (providing the CA site has recycling opportunities for DIY waste).
- Promotion of schemes like freecycle for left over DIY materials.
- Work with community schemes to link markets for DIY wastes.

3.7 Nappies

Nappies are a product which seems to polarise debate between two groups; those advocating reusable nappies and a perception in some of the public that this is impractical and inconvenient. The Case Study describes the Environment Agency Life Cycle Study of Used Nappies and the criticisms of the LCA methodology and assumptions used.

Case Study 8 Environment Agency Life Cycle Assessment of Disposable and Reusable Nappies in the UK¹.

Published in May 2005, this major LCA study aimed to assess the life cycle environmental impacts associated with using disposable nappies and reusable nappies in the UK for 2001-2002. Three different nappy types were assessed:

- disposable nappies;
- home laundered flat cloth nappies; and
- commercially laundered prefolded cloth nappies delivered to the home.

The study concluded that:

'For the three nappy systems studied, there was no significant difference between any of the environmental impacts – that is, overall no system clearly had a better or worse environmental performance, although the life cycle stages that are the main source for these impacts are different for each system.'

The study came in for major criticism from the Women's Environmental Network, based on the quality and range of data sources used for the LCA and the assumptions on the environmental performance of the nappy reuse system². This has led to a growing recognition that if LCA is to be used to support policy development and decision making, much more needs to be done to improve the transparency and credibility of the modelling process, and most importantly, its usefulness to decision makers. Recent research in LCA has attempted to do this. In the UK the Waste and Resource Action programme (WRAP) recently published an international review of life cycle comparisons for key materials in the UK recycling sector³, which concluded:

'The review recognises that a key issue with LCA work on complex products and waste management systems is that it often produces contradictory findings in attempting to analyse similar systems. This is due to differences in the assumptions made, the system boundaries that are set and the interpretation of the results. By conducting a large scale international review, and using rigorous criteria to 'sift out' those studies with less robust methodology and assumptions, the result is a far more objective review of the environmental impacts of different waste management systems for those key materials than any one individual study can deliver. The results are clear. Across the board, most studies show that recycling offers more environmental benefits.'

¹Environment Agency. Life Cycle Assessment of Disposable and Reusable Nappies in the UK. May 2005

²Women's Environmental Network. Environment Agency nappy report is seriously flawed [Accessed 16.04.08]

³Waste and Resource Action Programme (WRAP). Environmental Benefits of Recycling. An international review of life cycle comparisons for key materials in the UK recycling sector. May 2006

Case Study 9 Nappy collection

Real Nappies for London

Real Nappies for London brought together Women's Environmental Network (WEN) with the Bexley Council and the GLA to encourage a pan-London approach to the promotion of cloth nappy use. Thorough independent research to evaluate and compare three different promotional pilot schemes in six London boroughs was commissioned.

Findings from this research are being used to devise the most effective incentive scheme to encourage the take-up and continued use of cloth nappies. This will then be refined and made available to all London boroughs.

Real Nappies for London is tailored to maximise learning and to provide reliable comparative data which will inform the development of a pan-London real nappy scheme. London was a good location for such comparative work to be done. It provides such a variety of demographics that data can be generated which may be generalised for use across London and even nationally.

The Women's Environmental Network has been at the forefront of an evidence-based approach to nappy re-use, which considers both collection systems and design options to facilitate collection and reuse.

3.7.1 Conclusions and policy options

It is clear that much more could be done to divert nappies from the residual waste stream and sources of good quality advice are available, such as the Real Nappy Campaign³⁰. Relatively minor changes to the current design of disposable nappies could enable the diversion of these from the residual waste stream. This could be achieved by designing a reusable outer nappy, with a compostable disposable inner. Recommendations for implementing these design changes and ensuring uptake are set out below.

Disposable nappies are an excellent example of a product that should have a levy applied raising funds to implement policies that encourage a shift away from their use leading to decreased residual waste arisings. A levy could fund a subsidy for reusable nappies and research into compostable nappies and collection infrastructure and development of an industry standard. Even with effective and convenient reusable nappies, there is still a need to increase public awareness and encourage behavioural change. This would involve a wide range of stakeholders and would require the involvement of midwives and health visitors in the campaigns.

Policy recommendations

European Union

- Provide funds for research into nappy design and alternative materials.

United Kingdom

- Fund research and collection/reuse demonstration programmes based on a range of alternative designs.
- Increase resources to promote real nappies, including a national programme for midwives and health visitors and packs for newborns.
- Subsidy for reusable nappies funded by increased taxation of disposable nappies.
- Standardise local subsidy schemes for real nappies.
- Provide support for development of social enterprises providing real nappy services.

Local

- Local Authorities work to adopt best practice through engagement with the Real Nappy campaign and local community groups.
- Expand local subsidy schemes to parents who use real nappies.

3.8 Other paper and card

This residual waste is comprised of a mix of products including wallpaper removed from walls, photos, tissues and kitchen paper. They end up in the residual waste stream as they are not included in paper recycling due to contamination issues. Some of these materials can be composted and some cannot so there is a need to clearly distinguish between compostable and non-compostable materials. This labelling could be combined with industry standards such as the approach taken for compostable packaging. Procurement also has an important role to play here to drive a shift towards the use of compostable and recyclable wallpaper.

3.8.1 Conclusions and policy options

The key options for improving recovery and recycling of other paper and card can be limited due to contamination, however management options need to be developed, with Government support to develop an outlet for this waste. Similarly, householders need to be made aware of potential options for these other paper and card waste streams, and how to determine what is contaminated and what can be segregated into a recyclable waste stream.

Policy recommendations

European Union

- Further development of policy on residual paper and card waste, including packaging and labelling.
- Funding of increased research on segregating and recycling residual paper and card waste.

United Kingdom

- Direct national research programmes towards residual paper and card, including product development e.g. compostable wallpaper and options for contaminated residual paper and card.
- Inclusion of increased targets for segregation and recycling within public procurement policy.
- Promote the development of the use of the European Eco-Label.

³⁰ <http://www.realnappycampaign.com/> [Accessed 19.05.08]

Local

- Develop residual waste campaigns, focusing on paper and card designed to educate the public.
- Seek support from national recycling schemes.

3.9 Household hazardous waste

Household hazardous wastes have the potential to contaminate other components of the waste stream making it impossible to segregate and remove them from residual waste. Some types of household hazardous waste have been covered in Section 3.6 however there are others such as nickel-cadmium batteries which can successfully be removed from the residual waste stream through mandatory separation and collection, with the introduction of policies such as higher VAT reducing their use.

3.9.1 Conclusions and policy options

Household hazardous waste can put human health and the environment at risk, therefore it is important to develop measures to ensure these wastes are disposed of properly.

Policy recommendations

European Union

- Further development of policy on various household hazardous wastes, for example incentives (e.g. in chemicals policy and product policy) to move away from hazardous materials.
- Provision of funding for investment of research on household hazardous waste and options for recycling.

United Kingdom

- Work with industry to develop standardised schemes which will ensure hazardous waste is segregated e.g. national programme for medicines which provides information in pharmacies and provides special bins.
- Develop hazardous household waste recovery and recycling targets.
- Develop standardised guidance on hazardous household waste.

Local

- Provide facilities to accept hazardous household waste with clear signage and information.
- Develop education and awareness campaigns focusing on hazardous household waste, including a definition of what hazardous household waste and how it can be managed.
- Seek support from national recycling schemes.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

European Union

The overarching aim must be to increase resource efficiency and in both the Lisbon strategy and renewed Sustainable Development Strategy, the European Union recognised that using resources more efficiently is vital for both economic development and the environment.

Increasing resource efficiency can:

- increase competitiveness;
- create jobs;
- result in innovation, and
- improve the environment.

There are no specific regulations or directives that specifically address resource efficiency at a European level and the EU Natural Resources Strategy has not yet defined a resource efficiency target or identified which resources need to be addressed and how.

A recent report on greening products³¹ stated 'it is unlikely that any policy tool at EU level will deliver direct product design requirements in the near future. Indirect product design requirements exist in some product sectors that have been a priority for waste management. It is difficult to foresee design for resource efficiency coming from the producer responsibility mechanism as there are probably little or few 'resource scarcity' or 'resource use impact' economic signals coming back from the end-of-life phase as yet.'

While this may be the case at present, there is a clear need for the creation of new legislation on product design at an EU level whether this is in the form of a comprehensive framework or sectorally focused legislation.

From the perspective of phasing out residual wastes, many of the materials and products that were identified in Phase 1 could be removed from the waste stream through extended producer responsibility³². While this may not act as a driver for improved product design in terms of resource efficiency, it has a vital role to play in the end-of-life phase and should be extended from energy using products to products such as furniture and those that end up in household DIY wastes (see Section 3.6.2).

The need for a labelling scheme for products was raised by stakeholders and the provision of information to consumers on the environmental performance or impact of products is essential if there is to be a shift towards more sustainable consumption. There is increasing interest in the carbon footprinting of products and services in the context of climate change. Work is ongoing to establish a standardised method of doing so (see Section 5.2).

³¹ Swedish Society for Nature Conservation (2007) Forcing products to go green? Opportunities for strengthening EU ecodesign legislation

³² Producer responsibility can be defined as a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the product's life cycle and especially to the take-back, recovery and final disposal of the product.

United Kingdom

While the ultimate goal is to phase out residual wastes through an upstream policy approach, a large proportion of materials and products that could be reused, recycled and composted are ending up in the residual waste stream because they are not captured by effective source separated collection systems and associated infrastructure. There are a range of policies that could be implemented at national level which would contribute to the phasing out of residual wastes. These are set out in Table 3 and so are not repeated in full here.

Residual wastes are a product of consumption and it is only through information provision that informed decisions can be taken on purchasing and more importantly procurement. It was outside the scope of this research to make specific recommendations on an EU labelling scheme. However a national scheme should be developed as it is only with the involvement of people and increased public awareness of the problem that political pressure for solutions will be generated. Information is also needed to inform procurement policy which has a vital role to play in not only developing markets for reuse and recycled products but also a shift in production towards those products that are durable, designed for disassembly and have lower environmental impact over their life cycle.

A major barrier to this is the different classification systems. These need to be revised so that an integrated approach is taken which can be applied along the supply chain to the products and materials which eventually become residual waste. This would enable the development of an integrated policy cascade starting from materials to products and through to waste processing and infrastructure. This would enable policy and decision makers to choose what the best point to intervene is for different residual wastes. Depending on the waste in question, intervention to phase it out may occur through minimising waste in production through product design or cleaner processing/manufacture; material substitution and removal of hard to recycle materials from products; or by ensuring it is captured in collection and reprocessing systems.

At a UK level the setting of resource productivity targets is desirable although probably dependent on developments at EU level. Of particular importance in addressing the top residual waste streams identified in this research would be the introduction of a levy or VAT increase on disposable products, the extension and escalation of disposal taxes coupled with bans on disposal of recyclable and compostable materials.

The England waste strategy identifies voluntary producer responsibility agreements, procurement, education and awareness, infrastructure provision and incentives as key to meeting the targets. Voluntary producer responsibility is unlikely to deliver in the same way that mandatory producer responsibility agreements do. The England strategy states that regulation will be introduced if incentives are not enough. Regulation upstream in terms of producer responsibility agreements, coupled with regulation downstream in terms of landfill bans, product levys and increase in disposal taxes will create economic incentives to phase out residual wastes while providing an income stream to put infrastructure in place and support the roll out of best practice.

Local

The adoption of national targets or levy/VAT increases raises the issue of funding for local authorities to deal with the collection and storage of these materials and products. In Flanders the Government has agreed 'environmental covenants' with local authorities that cover a range of environmental goals including waste. In exchange for subsidies towards selective collection infrastructure including doorstep and bring systems, local authorities agree to achieve a series of environmental goals which go beyond the minimum legal requirements. This has made a crucial difference to the provision of infrastructure for the separate collection of household waste components. This could be instrumental in phasing out some residual wastes including household hazardous wastes. Such subsidies could also be provided through the levy on disposable products.

In Ireland, revenues from the levy on plastic shopping bags (and landfill tax) are paid into the Environment Fund which is managed and controlled by the Minister for the Environment and Local Government. The fund is used to finance a range of activities³³ including schemes to prevent/reduce waste, waste recovery activities, research and development into waste management, production, distribution or sale of products deemed to be less harmful to the environment than other similar products and development of producer initiatives to prevent/reduce waste arising from their activities. Such a fund could provide the necessary financial support to local authorities and other organisations. It is clear that for some products that end up in residual waste such as furniture, new policy solutions are not needed, what is lacking is the political support to roll out best practice.

4.2 Recommendations

The recommendations are classified in terms of the cascade of policy responsibility from EU, national to local, followed by specific recommendations for individual residual materials.

4.2.1 European Union

Recommendations at a European level include:

- Develop European policy on product design, designed to phase out residual waste.
- Extension of producer responsibility to support the phasing out of residual wastes.
- Need for a labelling scheme for products which will provide information to consumers on the environmental performance or impact of products.
- Research should be commissioned into the structural changes to current classification systems required to enable eventual harmonization of work on the carbon footprinting of products and services in the context of climate change.

Plastic packaging

- Packaging policy could include higher recycling targets, focusing on plastic and polymer specific targets to help increase capture (although it will be difficult to have an impact on the use of less recyclable polymers).
- Labelling policy could improve labelling for compostable and non-compostable packaging.

³³ See <http://www.environ.ie/en/Environment/Waste/EnvironmentFund/> for full list of activities funded.

- Development of policy for investment of research on zero waste packaging recycling systems.

Furniture

- Development and encourage Life Cycle Thinking for furniture manufacturers.
- Develop policies to reward companies developing green furniture.
- Set Product Design Obligations, to include ecodesign requirements for furniture.

Household DIY wastes

- Develop policies to develop voluntary agreements and standardisation for companies providing DIY materials.

Nappies

- Provide fund research into nappy design and alternative materials

Other paper and card

- Further development of packaging and labelling policy and policy for increased research.

Hazardous waste

- Further development of packaging and labelling policy and policy for increased research.

4.2.2 United Kingdom

Recommendations at a national level include:

- Setting policy measures to get the prices right to encourage increased recovery of residual wastes e.g. escalation of landfill tax, introduction of an incineration tax and increasing VAT on disposable goods.
- It is recommended that the option of an integrated materials and carbon levy be considered. The levy should be banded according to its material and carbon intensity, using indicators such as:
 - Material Input per Service Unit (MIPS³⁴)
 - Carbon footprint.
- Setting a legislative framework for:
 - Banning the disposal of recyclable and compostable materials;
 - Setting long term targets for waste prevention and minimisation;
 - Extending producer responsibility (statutory and voluntary) to ensure adoption of best practice;
 - Increasing mandatory recycling targets e.g. packaging.
- Clarify the waste classification scheme so an integrated approach can be applied along the supply chain to the products and materials which eventually become residual waste.
- Improved market development including:
 - Improved procurement policies for the public sector;
 - Increased recycled product specifications.
- Waste minimisation through resource productivity policies and setting of waste reduction targets.
- Develop a national labelling scheme.

³⁴ Wuppertal Institute. Calculating MIPS - Resource productivity of products and services. 2002

- Research should be commissioned on capture rates for the household waste collection system e.g. a that a national household waste analysis programme be implemented, based on the Welsh model, and incorporating:
 - Seasonal variation;
 - Geographical spread (local, regional, national);
 - Waste collection systems covered;
 - Level of detail of classification; and
 - Classification system employed.
- Development of a communication campaign to improve awareness at a national level.

Plastic packaging

- Higher packaging recycling targets, focusing on plastics and polymer specific targets.
- Direct national research programmes towards plastics with the aim of assessing the viability of phasing out non-biodegradable plastic packaging and replacing this with fully compostable substitutes.
- Financial support for the development of plastics recycling infrastructure, including investment in developing markets for mixed plastics.

Furniture

- Develop a national Producer Responsibility Take Back Obligation be introduced for furniture, to promote design for disassembly and material efficiency.
- Develop green furniture procurement in the public sector and encourage Green Corporate Purchasing (perhaps through promotion of Environmental Management Systems).
- Promote the uptake of eco-design and Life Cycle Analysis.

Household DIY wastes

- Develop a national user friendly DIY Protocol to inform householders of waste materials and products will be used by various household DIY activities, what materials/waste will be produced and the best options for prevention, reuse and recycling.
- Support development of markets for DIY waste, including support for national programmes identifying opportunities for reducing waste in DIY products.
- Improve data on waste arising from household DIY, to improve support at local level (similar to approach for other waste streams).

Nappies

- Fund research on a range of alternative designs;
- Increase resources to promote real nappies;
- Develop standardised subsidy schemes for reusable nappies; and
- Provide support for development of social enterprises providing real nappy services.

Other paper and card

- Direct national research programmes towards residual paper and card, including product development.
- Introduce labelling for compostable and non-compostable wallpaper, tissues and wipes. The label should indicate if the materials are suitable for home composting.

Hazardous waste

- Implement a policy for mandatory separation and collection of hazardous household wastes.
- Work with industry to develop standardised schemes which will ensure hazardous waste is segregated.
- Develop standardised guidance on hazardous household waste.

4.2.3 Local

Recommendations at a local level include:

- Use the adoption of national targets or levy/VAT increases to increase funding for local authorities to deal with residual waste e.g. increased provision of infrastructure for separate collection of household waste components.
- Extension of increased producer responsibility agreements (statutory and voluntary) at a local level.
- Development of a communication campaign to improve awareness at a local level.

Plastic packaging

- Review plastic bottle collection plans and seek support from national recycling schemes/WRAP.
- Establish market demand in local area and develop policy to improve collections and utilise mixed plastic markets if found.

Furniture

- Setting up bulky waste reuse system (e.g. with charities).
- Promotion of freecycle³⁵ and recycling parks.
- Closer Local Authority working with charity shops and jumble sales.

Household DIY wastes

- Link the design of CA sites and bulk waste collections to household DIY waste e.g. encourage householders to take DIY waste to CA site through a mix of educational and financial incentives and provide better infrastructure support at CA sites for DIY waste.
- Promotion of schemes like freecycle for left over DIY materials.
- Work with community schemes to link markets for DIY wastes.

Nappies

- Local Authorities to work adopt best practice through engagement with the Real Nappy campaign and local community groups.
- Expand local subsidy schemes to parents who use real nappies.

Other paper and card

- Develop residual waste campaigns and seek support from national recycling schemes, focusing on paper and card designed to educate the public e.g. on national labelling schemes.

Hazardous waste

³⁵ <http://www.freecycle.org/> [Accessed 19.05.08]

- Provide facilities with clear signage and information to accept hazardous household waste.
- Develop education and awareness campaigns focusing on hazardous household waste.
- Seek support from national recycling schemes.

4.2.4 Further research needs

Key material streams

It is recommended that further research be carried out into key material streams (biodegradable wastes, household hazardous wastes and mixed plastics), to assess the options for diverting these materials from the residual waste stream.

Activity based analysis

It is recommended that further research be carried out into activity based waste generation activities (DIY and nappies) to assess the options for diverting these materials from the residual waste stream.

Climate change

No systematic assessment of the impacts of overall waste management, recovery and reprocessing activities has been carried out to assess greenhouse gas impacts associated with all of the technologies and processes. It is recommended that a research programme be commissioned to assess greenhouse gas impacts associated with waste management, recovery and reprocessing activities.

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