



SID 5 Research Project Final Report

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Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

This study was undertaken to provide a more informed understanding of the local authority level factors that influence trends in *household waste arisings*. Through the development of a set of detailed case studies it has sought to address a major gap in the understanding of national household waste trends: what role do local policies play in influencing local waste trends and how might these have influenced the national situation over recent years?

These case studies contrast the situation between areas reporting waste increases and those reporting waste decreases, with a focus on the period 2000/01-2007/08. Whilst the report touches on a number of issues that are known to affect waste growth, such as changes in lifestyle, socio-demographic make-up, consumer spending, purchasing trends and product packaging trends, the principal aim of this study was to focus on the effect that *local waste policies* have in influencing household waste growth. Twenty eight local authorities were selected and recruited from across the UK, twenty from England, four from Wales and two from both Scotland and Northern Ireland.

Fourteen local authorities were selected that exhibited a growth in household waste arisings and fourteen where waste had decreased. Selection was based on overall household waste trends during the time series and not on individual average yields per resident or per household. The data gathered for this study were largely collected through the completion of 'Information Capture Templates' complemented by visits to each of the 28 case study authorities. The consolidation and subsequent analysis of this information has led to some interesting findings with important waste policy implications.

Summary of key findings

The case studies have provided evidence of the role that different factors can play in influencing household waste trends:

Data Collection: waste data recording has improved significantly since the introduction of WasteDataFlow¹ and the need to closely monitor municipal waste streams in order to evaluate performance against Landfill Allowance obligations. It would seem that wastes that are not strictly municipal² in origin are now less likely to be misrepresented in waste data returns, following guidance from central government in 2005. There appeared to be a relatively high degree of confidence in the overall collected household waste throughout the case studies, although there is still scope for improvement in the data.

Population Growth: it was apparent that where there was significant population growth, there was also growth in overall household waste arisings. However, where there was marginal population growth there were a number of cases where this was coupled with a decrease in household waste arisings.

Local Authority Policies: an analysis of the impact of particular policies, in as far as they could be isolated from one another, was carried out for HWRC trade waste controls and the introduction of AWC refuse systems. This involved a review of all case study data and collation of the timing of policy initiatives alongside the relevant time series data on waste arisings. Analysing policy impacts in this way found that:

- pre- versus post- comparisons around AWC roll-out in case study authorities suggested reductions in household waste arisings (wastes collected at the kerbside from householders and wastes at bring sites³) of 120 kg per household per year in areas with charged garden waste collections;
- the same assessment for AWC roll-out in areas with free garden waste collections was an order of magnitude less (13- 30 kg per household per year);
- these conclusions involved more than just the garden waste issue: in most cases there were other specific policies, simultaneously launched or longer-standing, that were likely to have contributed (e.g. support for home composting, one case with separate collection of food waste, restrictions on the presentation of side waste⁴, etc);
- HWRC controls, designed primarily to address abuse of sites from commercial waste appear to have had a similar order of magnitude reduction on the household waste stream as AWC in areas with charged garden waste collections (80-100 kg / household /year);
- the analysis was made more complex by the fact that the introduction of HWRC controls coincided with the roll-out of AWC systems in half of the policies analysed. In these cases, there was a 'knock-on' effect, probably due to the transfer of material from the kerbside (householders taking more 'black sack' residual waste to HWRC as a response to the reduced frequency of kerbside residual waste collection, although some case studies suggested that this was a temporary phenomenon).

The apparent downward trend in household waste arisings comes at a time when there has been a lot of change in the way waste is collected in the UK. The introduction of collection methods that combine a 'carrot' (effective communication and householder engagement, provision of greater capacity in dry recycling systems) and 'stick' approach (charged collections for garden / bulky waste, HWRC trade waste and side waste policy enforcement) appear to result in a 'constraining' effect on household waste arisings. If we assume that these factors continue to have an effect on waste arisings, as these policies become more widespread, then we would expect household waste arisings to continue to decrease in the near future.

An indication of how the case study findings might translate into the wider national picture was based on a simple classification of English districts into four different policy groups identified by the case studies, followed by an extrapolation exercise in which HWRC controls and kerbside collection policies were superimposed on national data:

- although extrapolations of this kind are over-simplistic (as there are likely to be further factors in the wider population of local authorities not revealed in the case studies), in total it was estimated that a reduction in reported household waste of about 0.85 million tonnes was possible from further exclusion of trade waste collected as household at HWRCs (about 16% of the current total household waste arising at HWRC, excluding inert materials such as rubble);
- based on an indicative calculation in which 50% of the 5.14 million households currently served by AWC refuse systems with free garden waste collections were converted to 'charged-for' garden waste

¹ The web-based system for municipal waste data reporting by UK local authorities to government

² "Collected municipal waste" means waste which "comes into the possession or under the control of (a) a waste disposal authority, or (b) a waste collection authority within the area of the disposal authority, whether or not the waste is in possession or under the control of that authority under or by virtue of the Environmental Protection Act 1990" (regulation 2(1) of both the LATS and the LAS Regulations).

³ Bring sites are local facilities, such as bottle and paper banks, to which householders can bring recyclable materials.

⁴ 'Side waste' is waste which is presented by householders for collection but is not placed within the containers provided.

collection systems, a reduction in a third of a million tonnes in household waste arisings was estimated (again, with the same caveats applying as described above);

- although this extrapolation was simplistic (local policies of authorities in Group 1 case studies, described in Section 4.3, involved more than just the introduction of AWC and charging for garden waste), it does provide an important example of how different household waste trends have resulted in part from the influence of local collection system characteristics.

The evidence from the case studies suggests that the influence of local waste policies on trends has been a significant factor in affecting national levels of waste arisings over recent years. Other factors, such as consumer behaviour and population growth, cannot on their own explain the recent changes in overall household waste quantities. This is because municipally collected household waste can include materials drawn in from non-household sources (e.g. waste taken from the work-place) and from non-consumer origins (such as garden waste). Collection system design, kerbside containment capacities (the balance between residual and recycling/composting capacity), enforcement and charging policies (kerbside and HWRC), communications campaign and waste prevention initiatives: all have a part to play in influencing this dynamic.

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:

- the scientific objectives as set out in the contract;
- the extent to which the objectives set out in the contract have been met;
- details of methods used and the results obtained, including statistical analysis (if appropriate);
- a discussion of the results and their reliability;
- the main implications of the findings;
- possible future work; and
- any action resulting from the research (e.g. IP, Knowledge Transfer).

1. Aim of the project

The principle aim of this study was to inform a more fundamental understanding of the factors that influence growth in Municipal Solid Waste (MSW) by developing a set of detailed case studies. These case studies acted to contrast the situations between different areas, those that have reported falling quantities of waste and those where waste arisings have continued to rise. The focus of the research was on the 'household' element of the municipal waste stream, with a lesser focus on the non-household elements (e.g. commercial waste). This was largely due to the more unpredictable nature of the factors that affect non-household municipal waste streams.

2. Approach

The case studies were selected to represent an appropriate mix of local authorities in terms of region and area types. A range of further factors were considered in selecting these case studies, including:

- waste growth trends;
- policies implemented by the local authority (e.g. charging for garden waste collection etc);
- the availability and robustness of data which would allow analysis of the effect of different policies (e.g. cases where it was possible to correlate data to the introduction of a new collection scheme);
- the availability of data and knowledge on demographic changes.

In total, twenty eight local authorities were selected and recruited from across the UK, twenty from England, four from Wales and two from both Scotland and Northern Ireland. The basic rationale used for the selection of the case study local authorities was to:

- spread the case studies by region and Office of National Statistics (ONS) local authority area type;
- short-list areas with reasonable time series data for the period 2000/01 to 2007/08;
- short-list a mix of Waste Collection Authorities (WCAs) and Unitary Authorities.

In total, 14 local authorities broadly exhibited growth in household waste arisings while 14 demonstrated a decrease in household waste arisings. It is important to note that this classification was based on overall household waste trends during the time series and not individual average yields per resident or per household.

3. Results

This section provides a summary of the key results drawn from the case studies. See the full technical report for further details of the case study results and the Report Addendum for full details of each individual case study.

3.1 Socio-demographic influences

It was apparent that where there was significant growth in a resident population there was a growth in household waste arisings. However, where there was marginal population growth there were a number of cases where this was coupled with a decrease in household waste arisings:

- The three local authorities that demonstrated the highest population growth between 2000/01 to 2006/07 (Birmingham – an increase of 21,400 persons, East Riding of Yorkshire – an increase of 16,000 persons and Milton Keynes – an increase of 12,100 persons) all exhibited a growth in household waste arisings. Both Birmingham and Milton Keynes experienced high levels of new build housing growth, as had Wakefield, yet the overall resident population increase was less pronounced in the latter.
- In all but three cases (Gateshead, West Dunbartonshire and Belfast) the case study local authorities all exhibited net increases in resident populations between 2000/01 and 2006/07. Interestingly, of these three local authorities West Dunbartonshire continued to witness an increase in overall household waste arisings despite a continued reduction in the resident population and the average household size.

In all case studies, there was a distinct reduction in average household size, reducing from an average of 2.40 persons per household in 2000/01 to 2.33 persons per household in 2006/07. However, there was no correlation between a reduction in household size and a reduction in household waste arisings. In particular:

- The local authorities exhibiting the highest decreases in average household size over this time period (Gateshead MBC [-0.24] and Ribble Valley BC [-0.17]) witnessed decreasing and increasing household waste trends respectively.

In some case studies respondents felt that ONS mid-year population estimates tended to under-estimate populations as they failed to take account of factors such as seasonality in tourism and transient populations (such as students). However, when the methodology for calculating mid-year population estimates was examined it suggested that such issues are in fact taken into account.

It was apparent that where there was significant growth in a resident population there was a growth in household waste arisings. However, where there was marginal population growth there were a number of cases where this was coupled with a decrease in household waste arisings. The following sections aim to explain some of the reasons for this apparent reduction in household waste.

3.2 Waste data collection and recording

As a general observation across the local authority case studies, data collection and reporting has dramatically improved since the advent of Waste Data Flow (WDF) and, in almost all cases, local authority confidence in waste data has increased since 2000. In most cases, local authorities had systems and procedures in place to adequately collect and record waste outturn data that could then be inputted directly into WDF. A number of key waste data collection and reporting issues that related directly to household waste arisings appeared in the case study examples. Other cases related to non-household municipal waste, which are not the main focus of the report. Some interesting data issues relating to household wastes findings were uncovered which are summarised below:

- **Co-collection of commercial and household wastes**. Accounting for commercial waste tonnages had, in a number of cases, been based on estimates, given that much of this waste was co-collected with domestic waste in Refuse Collection Vehicles (RCVs). Some local authorities used existing bulk density data (and average bin weights) to calculate the proportion of commercial waste appearing in the domestic waste tonnages. In some instances, these ratios have been used over a number of years and are considered out of date. In cases, particularly in the devolved administrations, no attempt had been made to distinguish between the two waste streams until the advent of WDF. There were a number of cases where domestic and commercial waste was co-collected in the same vehicle due to it being uneconomic to deploy a separate vehicle for a comparatively small waste stream or, in the case of remote areas, impractical to deploy two vehicles to service properties (commercial and household) over a wide area. This was an issue reported by eight of the twenty eight case studies although it was particularly apparent in the Welsh case study authorities. For example:

- In the case of Cardiff City Council, commercial waste arisings were estimated at 20% of total MSW. This same ratio was adopted by Powys County Council - largely due to the rural nature of the authority. Powys County Council was able to substantiate this claim by providing data from a trade waste survey that was used to derive this apportionment. For the other Welsh authorities the basis upon which this calculation was made was not known; therefore the confidence in the domestic / commercial data split for these authorities was low. For Rhondda Cynon Taf Council, the commercial waste was collected on the same rounds as household residual waste (so was not readily identifiable in tonnage terms) but the commercial recyclables were collected separately by two vehicles.
- The London Borough of Islington (LBI) used survey information to determine the proportion split of co-collected trade and domestic waste. North London Waste Authority (NLWA) used a 72:28 (domestic / commercial ratio based on a 1995 survey); this was criticised by the Audit Commission for being inaccurate. As from 2004/05, LBI used new NLWA / AEA survey data which apportioned the ratio as 63.5:36.5 (hhld/trade). Since LBI considered that this method of apportionment was more accurate than the one used previously, it would suggest that up to 2003/04 the amount of kerbside household residual waste was somewhat overstated (and commercial residual likewise somewhat understated).
- In 2004/05 Surrey County Council introduced a new formula for accounting for the proportion of potential trade waste in household collections across the county, which caused a big increase in commercial arisings reported by Mole Valley District Council – a jump from 200 tonnes/ year to 4,000 tonnes/ year. However, in 2005/06 the actual level became evident with the sale of the trade waste collections business. This led to a big drop in commercial waste arisings (from 4000 tonnes/ year to only 1,600 tonnes).

Contractor reporting. Reported waste collection data from contractors was, in some cases, regarded as questionable by some local authorities, although better systems and procedures had since been put in place for WDF reporting purposes. For instance, there were instances of mis-classification of some vehicle consignments when passing a weighbridge – waste consignments which may have contained flytipped waste had been wrongly consigned as bulky wastes and vice versa. While it was felt that overall MSW tonnages were fairly accurate, there was less confidence in these authorities (certainly prior to WDF) in the accuracy of apportionment of individual household wastes such as bulky, flytipped and street cleansing wastes. However, as many of these wastes are still classified as household residual waste, as (for example) they may still be collected co-mingled on the same vehicle.

This is a common issue amongst UK authorities and one that continually poses a problem where different waste types may be co-mingled on the same vehicle, in a similar way to the point raised regarding the domestic / commercial waste split. For example:

- In Milton Keynes, there was a difficulty in classifying the type of material that was collected, because many of the Council's vehicles had a number of purposes depending on the day of the week (i.e. flytipping, bulky, street sweepings). An example being that in one year bulky waste decreased from 400 tonnes / year to only 100 tonnes / year, yet in the following year it went up to 600 tonnes. This difference in tonnages was largely due to the type of vehicle deployed to collect this material and how it was classified upon receipt at the weighbridge. The significant issue tended to be the relationship between driver and weighbridge operator. In most cases, loads delivered could only be categorised under one heading, and mixed loads were categorised as one or the other - but not both.

Apportionment of HWRC waste quantities. With regards to HWRC waste the accounting of arisings from 2000/01-2007/08 at a district level presented a particular problem in the case of two-tier English authorities because data were primarily reported at the Waste Disposal Authority (county) level. In preparing the time series data for the Information Capture Templates it had been necessary to apportion arisings between districts where district-level data weren't available. Although this was necessary in order to be able to discuss total household waste trends (kerbside and HWRC), it introduced an element of uncertainty in the data. Equally, cross border usage of HWRCs represented a potential distortion and the apportionment of tonnages delivered to a particular HWRC within the confines of a district boundary will always be difficult to quantify unless accompanied by comprehensive HWRC user profiles.

The cases studies raised a number of issues that relate to the way in which waste data was collected and recorded. Given that the case studies only represented 28 local authorities from across the UK, there are bound to be further nuances that feature in other authorities that have not been captured as part of this study. It has not been possible to quantify the impact of waste data collection issues in any great level of detail – particularly what contribution it has made to a perceived 'increase' or 'reduction' in an authority's household waste arisings but the analysis has identified a number of issue which need to be considered when quantifying individual household waste streams.

3.3 Waste prevention and householder communications work

In an attempt to quantify the nature of the communications activity undertaken by each of the case study authorities, the respondent at each of the authorities was requested to complete a self-assessment of their activities. This exercise suggested that where there had been noticeable reduction in household waste arisings, there appeared to have been a relatively large investment and belief in widespread householder waste awareness raising activities. This is not to suggest that such activities, in isolation, have been instrumental in decreasing household waste arisings per se – instead they have been used as a means of assisting the transition to a new waste collection regime.

Many of the respondents stated that such activities were crucial to the success of the transition as particularly evidenced in Hyndburn and Belfast. The latter only received 6 formal complaints city-wide following the introduction of Alternate Weekly Collections (AWCs). In the case of Hyndburn Borough Council, whilst they exhibited the lowest collected household waste per head of population in the country, this was achieved through a combination of waste policy changes and householder engagement. They regularly dispatched calendars to residents informing them of waste collection arrangements and recycling guides / leaflets to not only inform residents of waste recycling / minimisation measures but to also raise awareness of waste presentation restrictions, in particular the 'no side waste' policy.

Whether a Council adopted a 'carrot' or 'stick' approach, or indeed both, to improve waste diversion performance, it was felt by all the respondent local authorities exhibiting downward trends, that effective communications were key to successful step changes. Also effective planning and staged communications was an effective means of maximising householder buy-in to schemes.

3.4 Enforcement activity

Section 46 of Environmental Protection Act 1990 'requires an occupier to place waste for collection in receptacle of a kind and number specified'. Section 48 of the Clean Neighbourhood Act 2005 inserted new sections to the 1990 Act, giving authorised officers power to issue Fixed Penalty Notices. A number of local authorities operated a 'no-side-waste' policy with regards residual waste where alternate weekly collections were in place to encourage residents to recycle more. The use of such powers across the case studies has been mixed. Some authorities used these powers to full effect whilst others felt that the use of incentives was more appropriate than enforcement approaches.

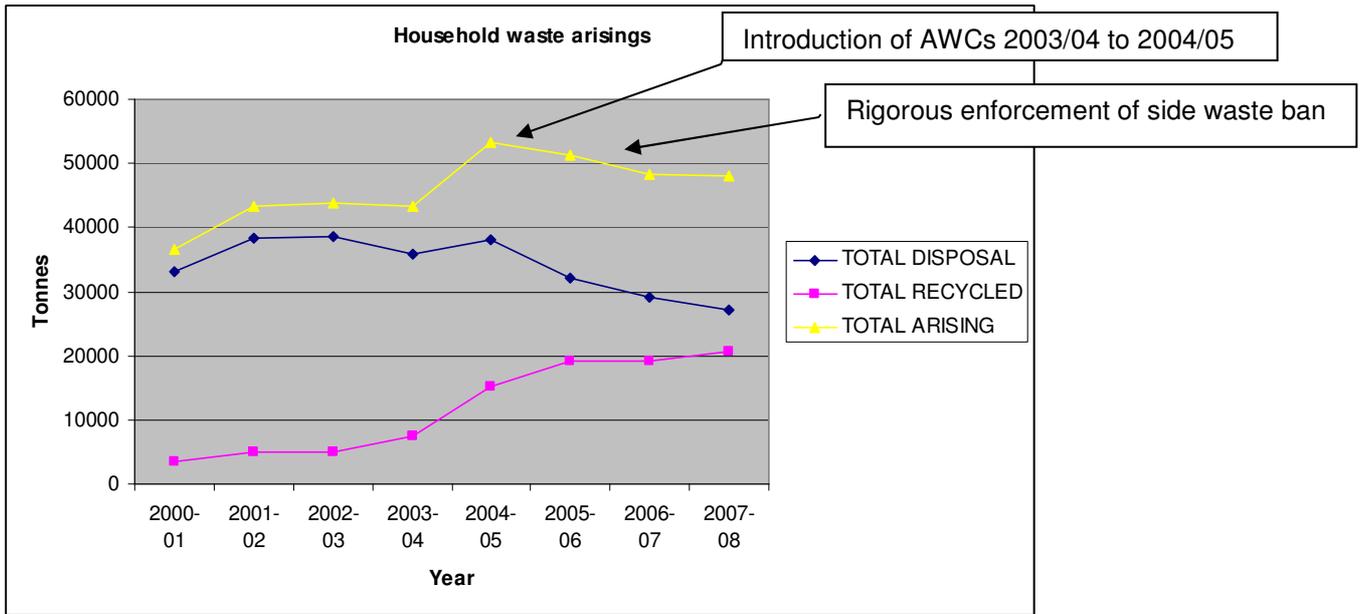
Clearly, such procedures only work effectively when householders are issued with a set sized receptacle in which to present their waste. Where residual waste was presented in a black sack, the restriction of the presentation of side waste was more difficult to enforce. Such policies could only be successfully administered when they were accompanied by effective communication and an ability to regulate / police the measures in hand.

It was acknowledged in a Waste Improvement Network (WIN) survey conducted in 2008 that the successful introduction of a well enforced side waste policy had a genuine 'minimising' effect on household residual waste. However, it is how rigorously enforced such policies are that determines the success or otherwise of such measures.

An assessment was conducted to evaluate the level of enforcement that has been adopted by the case study authorities. The results suggest that authorities with increasing waste arisings adopt a less rigorous approach to enforcing a side waste presentation ban. Such policies generally accompany the introduction of AWCs which, in their own right, impose a 'downward' effect on waste arisings; and so suggesting a strict correlation solely between the level of enforcement and waste trends would be unfounded. For example:

- Stirling Council enforced a strict excess waste enforcement policy. Frequently, excess waste resulted when people did not recycle as much as possible. Over the past year, the waste services successfully rolled out excess waste enforcement campaigns across the area. Excess waste dropped from 10% to less than 1% after only a few weeks in the enforcement areas. Even wheeled bins that were overly full would not be collected. Continued non-conformance led to a £50 fixed penalty notice. In one housing estate, before the 'Bins Lids Down' initiative, the yield was 0.58 tonnes / hhld and after the introduction of the policy the yields reduced to 0.55 tonnes / hhld (a reduction of 36 tonnes – a 5% reduction). Interestingly, there was no noticeable increase in flytipping (approx 22 incidents per month for the entire Stirling Council area) nor the amount of waste disposed of at the HWRCs. Figure 1 plots the introduction of the AWCs and the subsequent enforcement policy.

Figure 1: Impact of the introduction of AWCs and enforcement of side waste ban (Stirling Council)



- Hyndburn Borough Council similarly introduced a strictly enforced side waste ban in 2006. The “no side waste” policy could not be enforced until after the introduction of plastic bottles and cardboard recycling, as the bulky nature of these materials in the residual collection contributed to the side waste issue. Following this, enforcement of the side waste policy was effective; residents tended to exhibit improved behaviour after being exposed to the enforcement regime. Problem areas needed to be tackled repeatedly. The authority reported that the enforcement process was time consuming and required the necessary resources to make it effective.

3.5 Classification of Schedule 2 wastes

Schedule 2 wastes (as defined by Schedule 2 of the Controlled Waste Regulations) are materials for which WCAs can administer a collection charge, but for which the disposal costs still need to be met by the WDA. The sorts of premises that might be classified as Schedule 2 household wastes include schools and other educational establishments, care homes, charities, hospitals and self-catering accommodation. There appears to be a high degree of variance in the approach to Schedule 2 wastes adopted by local authorities across the UK and it should be noted that Defra is currently undertaking work to understand this further. It was not the aim of this study to provide an in-depth analysis of how such wastes are classified, but to gauge whether the issue might impinge on the interpretation of household waste trends. For this reason an understanding of the current / past approaches adopted for such waste streams by the case study authorities was required to ensure that all of the influences that impact on MSW arisings and, in particular, household waste were being considered. Each of the case study authorities were asked to provide an indication of whether they collected Schedule 2 waste, how much typically it amounted to per year, and whether there had been any policy changes with regards the treatment of such waste over course of the time series.

Based on the study findings across a limited number of cases, it was apparent that local authorities were classifying Schedule 2 wastes in different ways. In the eight case studies carried out in devolved administrations, wastes from these types of premises were mainly classified as commercial waste, with self catering accommodation considered household waste in all cases. In England, the picture was a little less clear, with the majority of cases including waste from these types of premises as household, although it is unknown whether they were charged for as Schedule 2 wastes. Most of the case study authorities reported little change in the collection policy or classification of such waste over the time series. However, there were some instances where changes were noted.

It has not been possible to quantify the overall impact that Schedule 2 wastes had on the household waste streams associated with the case study authorities in any level of detail or confidence. However, for those *three* authorities that were able to provide an indication of the annual quantities that such wastes typically represent, they accounted for as little as 1% to 2% of household waste arisings per year. *Clearly, these figures would have to be substantiated with further research (note that Defra is currently undertaking further research on Schedule 2 wastes⁵).* For the purposes of this study, however, it is not considered that such waste streams significantly

⁵ Note that Defra is currently conducting further research on the issue of Schedule 2 waste classification (project ref: WR0308). ⁵ For further information regarding this project refer to: <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16451&FromSearch=Y&Publisher=1&SearchText=schedule%20%20waste&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>

contribute to household waste arisings; moreover what is apparent is a diversity of practice in how such wastes are classified. This factor will have an effect, albeit probably a small one, on the levels of waste recorded as household or non-household MSW.

3.6 Other considerations

This section considers other findings that have been gathered during the course of this study. While anecdotal, and very much based on the opinions of the respondents, it is felt that they may play an instrumental role in determining the size, seasonality and composition of specific household waste streams. Each of the issues is detailed below.

- **Economic downturn** – A number of local authority representatives (including Birmingham, London Borough of Sutton, Belfast and Derby) felt that the recent economic downturn will have an affect on MSW in a number of ways. Some suggested that as residents 'tighten their belts' they will become more frugal and there will be a tendency to waste less. It was felt that this would be particularly true for food and electrical consumer products and paper. In Derby, circumstantial evidence at Household Waste Recycling Centres (HWRCs) supports this theory with a marked decline in deposited TVs and electrical equipment. Conversely, one respondent speculated that as redundancies increase then householders will spend more time at home and thus generate more waste within the household – thus transferring waste that would ordinarily appear in the commercial waste stream into the household waste stream.
- **Chipped bins**⁶ – South Norfolk trialled chipped bins some time ago. The Council experienced data collection problems due to errors associated with the on-vehicle weighing systems. This will have affected outturn data but it is not known the scale of the impact. It is unlikely that South Norfolk is alone in this experience and that some other local authorities will have had similar experiences.
- **The 'Ikea effect'** – In 2006, Milton Keynes experienced a large growth in MSW which they partly attributed to the 'Ikea effect' – this was the introduction of a series of new budget furniture stores, including a large Ikea store, within the area which led to a one-off influx of furniture / office equipment being thrown out by local residents.
- **Weather** – It is widely acknowledged that climatic conditions can influence the generation of waste streams, in particular the generation of green waste. During a dry summer the amount of green waste can dramatically drop. Conversely, a wet summer can lead to large amounts of green waste entering HWRCs, which was noted by both Wakefield and Milton Keynes. Indeed, if the wet spell continues for a prolonged period (as was the case in 2007) then this can affect the seasonality associated with the material entering the waste stream – gardeners are not able to prune foliage until later during the season.
- **Other transient populations** – Another impact is that associated with tourism and the impact that it has on street cleansing and household waste streams. With the economic downturn, it was felt by some respondents that the number of UK tourists holidaying in the UK would increase (the 'staycation'). In turn, this would have an impact on the number of guests residing at B&Bs (with waste from these sources quite commonly entering the domestic waste stream).

While this study aims to focus on the impacts that waste policies have on household waste arisings, these anecdotal findings suggest that the overall factors influencing waste growth are complex.

4. Analysis of policy impacts

4.1 Approach to analysis

This section describes the approach to the assessment of the impact of particular waste collection policies through 'pre-' and 'post-' comparisons on targeted household waste streams. The fundamental difficulty encountered with this type of analysis was that it was difficult to isolate particular policies from one another or from demographic changes and other external influences. To improve the prospects of quantifying individual policy impacts and their influence on waste trends, all arisings data from the 28 case studies were standardised (as much as possible) and converted to 'kg per household' to permit cross-comparisons to be made.. A number of policy measures were identified as potentially easier to isolate from others:

- Introduction of HWRC controls / trade waste permitting systems.
- Introduction of AWC for refuse.
- Free collections for garden waste.
- Side waste bans.

⁶ The term 'chipped bins' refers to micro-chips that are fitted to wheelie bin to allow local authority refuse collection vehicles to monitor the amount of waste collected from an individual household.

- Policies to restrict bin capacities and balance the available recycling and residual capacities available to householders.

4.2 Impacts of AWC and HWRC controls

The most successful impact assessments were for two policy areas: ‘HWRC controls’ and a combination of ‘alternate week refuse collection and garden waste policies’. Table 1 shows the summary results for pre- and post- introduction of trade waste permitting at HWRC sites, taken from fifteen case studies with complete time series data either side of the policy intervention and from a further six where no specific policies were introduced between 2000 and 2007.

Of the majority of case study local authorities that did implement HWRC controls to counter trade waste abuse during this period, half coincided with the roll-out of AWC for refuse and half did not.

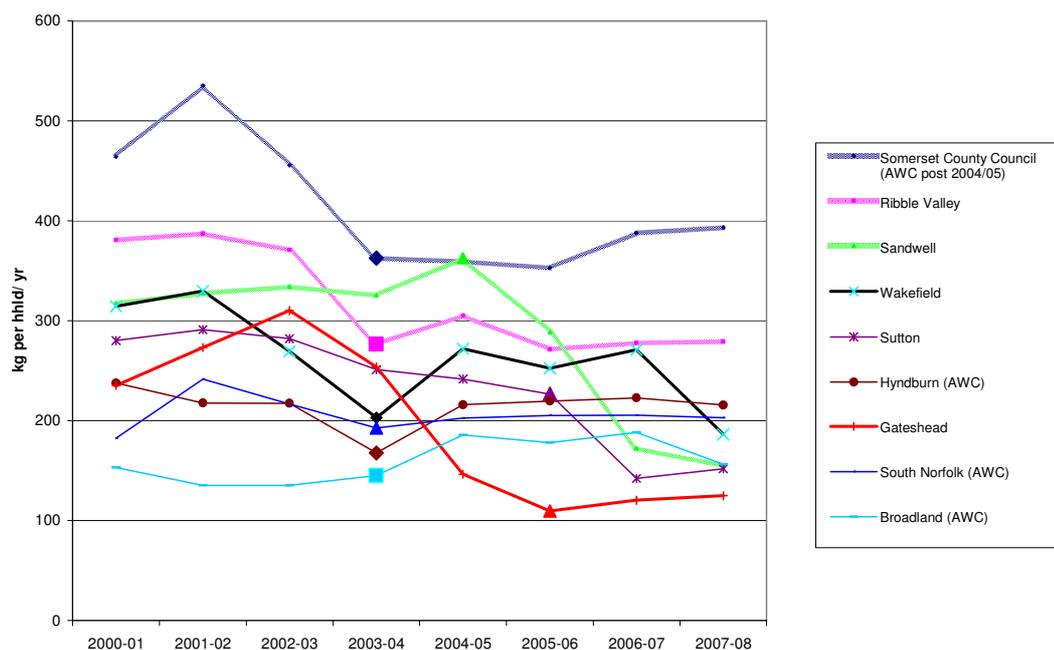
Based on the case study findings, HWRC controls, on average, reduced arisings by nearly 90 kg per household per year in areas where AWC was not a confounding variable.

In areas where AWC roll-out overlapped, there was a marginal net increase in HWRC arisings, probably due to the transfer of material from kerbside (householders taking more material to a HWRC as a response to restrictions introduced on kerbside residual waste). This knock-on effect was particularly pronounced in the case of Somerset, Broadland and South Norfolk (Figure 2).

Table 1: Pre and post comparisons of total weight of HWRC materials (kg/ hhd / year)

	pre	post	difference
HWRC controls introduced at a time without AWC introduction as a confounding variable	317.4	228.5	-88.9
HWRC controls introduced at the same time as AWC refuse and charged kerbside garden waste collections	193.1	199.8	6.8
No HWRC controls specifically relating to study time frame (2000/01 compared with 2007/08)	285.1	311.0	25.9

Figure 2: Introduction of HWRC controls, selected time series for total HWRC arisings (kg /hhld/year) comparing influence of areas also rolling out AWC for residual waste



The introduction of AWCs for refuse can take place over an extended time period (in some case studies, phased introductions lasted 3 or 4 years). In the case study authorities, changes to the frequency of residual waste collection were also often accompanied by other linked policies, such as towards garden waste collection and side waste bans.

Table 2 below shows average 'pre-' and 'post-' differences across 5 areas with charged garden waste collections and AWC for refuse (1) and 5 areas introducing AWC with free garden waste collections (2). Differences in total waste arising (residual and recyclables) have been compared for both kerbside arisings alone and combined with bring site arisings (as there are potential interactions). The results suggested that the impact of AWC in reducing waste arisings was more pronounced in areas with charging regimes for garden waste, even taking into account the 'push' of extra material to HWRCs indicated.

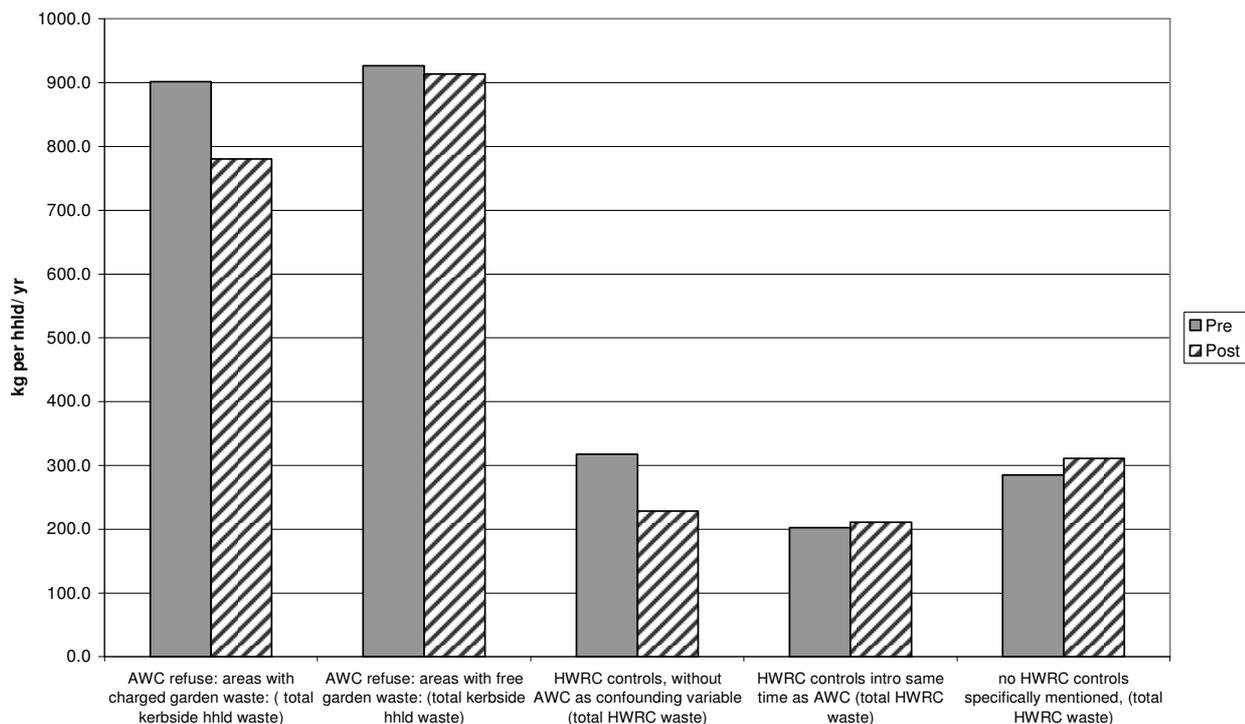
Table 2: Impact of AWC for residual waste: comparison of areas with charged and free garden waste collections (kg per hhld / year)

	Pre	Post	difference
1. AWC refuse: areas with charged garden waste: kerbside hhld waste	901.9	780.9	-121.0
1. AWC refuse: areas charged garden waste: kerbside + bring hhld waste	939.1	820.1	-119.0
2. AWC refuse: areas with free garden waste: kerbside hhld waste	926.6	913.4	-13.1
2. AWC refuse: areas with free garden waste: kerbside + bring hhld waste	1140.4	1148.1	-29.6

Figure 3 compares the relative impacts of these two policy areas in driving down quantities of waste per household. HWRC controls, designed primarily to address abuse of sites from commercial waste, appear to have had a similar order of magnitude reduction on the household waste stream as AWC with charged garden waste collections (80-100 kg / household /year). However, these conclusions conceal possible influences of other policies, such as the promotion of home composting and charging for bulky waste.

Figure 3 indicates that from the evidence of the 28 case studies, AWC for refuse and trade waste controls at HWRCs can have an important influence on household waste trends. Even with these more easily isolated policies, simple 'cause and effect' cannot be claimed, due to the wider interactions elsewhere in the collection systems that were not taken into account (for example, policies themselves that are highly associated with AWC: such as wheeled bin capacity restrictions, side waste policies or the influence of separate food waste collections).

Figure 3: Impact of introduction AWC for refuse and HWRC trade waste controls: comparison of pre- and post- mean weight of waste arising (kg/ hhd/ year)



The next section attempts to cut-through the sorts of complexity demonstrated by the AWC and HWRC policy assessments, by grouping authorities together on the basis of different combinations of household waste collection services and controls encountered across the case studies.

4.3 Policy groupings

Table 3 summarises the frequency of different waste policies across the 28 case studies. Overall, the two most common policies encountered were: the introduction of HWRC controls and charging systems for bulky waste collections (found within 19 and 16 case studies respectively). The least encountered policy was the one whereby residents were restricted as to the amount of garden waste they could present for collection or where residents were charged for the use of a garden waste collection service.

Table 3: Frequency count - number of local waste policies implemented across case-study authorities

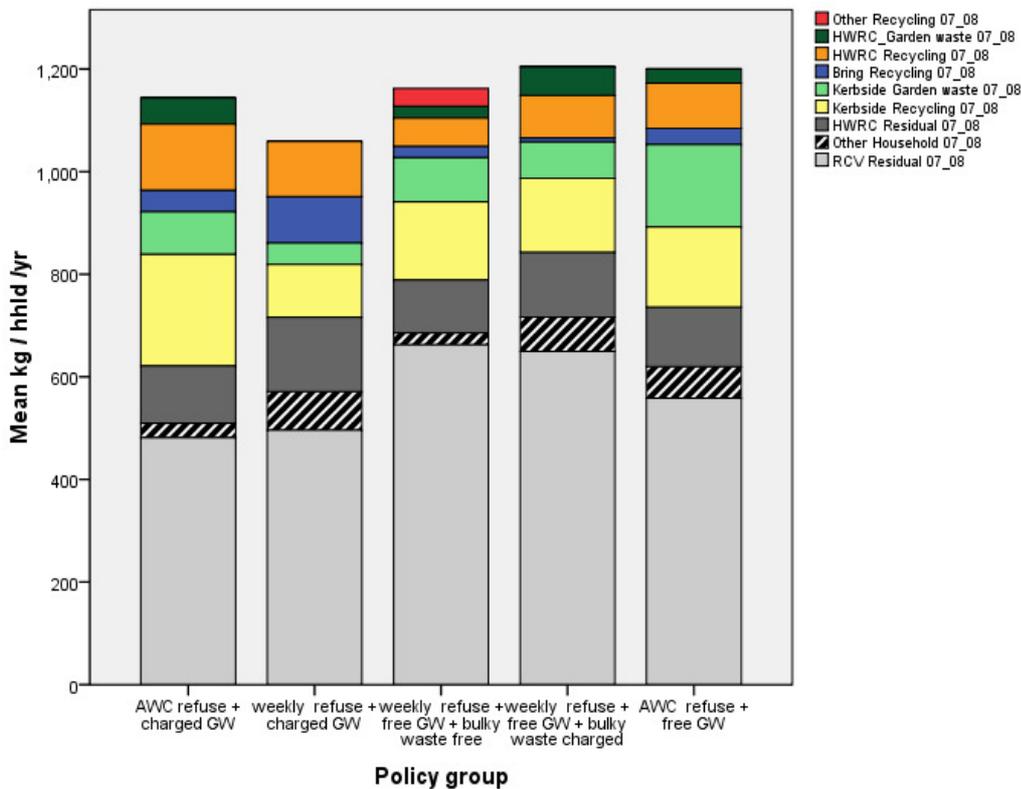
Policy	Responses		
	N	Percent	Percent of Cases
Refuse AWC	12	16.2%	46.2%
Side waste restricted	12	16.2%	46.2%
Bulky waste charged	16	21.6%	61.5%
Garden waste restricted / charged	7	9.5%	26.9%
HWRC controls enforced	19	25.7%	73.1%
Home composting participation above 45% of households	8	10.8%	30.8%
Total	74	100.0%	284.6%

In order to understand how these policies worked together to result in waste increases or decreases, a number of policy variables were chosen as the basis of a simple classification. As the main focus of the case studies was at district level, collection-related factors were chosen in preference to HWRC related variables (generally compiled at county level in two-tier areas):

1. Whether or not AWC had been introduced for refuse
2. Bulky Waste (BW) collected free of charge
3. Garden Waste (GW) collected free of charge
4. Side waste policy

These policy differences between groups in turn influence the split of arisings between the different household waste streams (Figures 4 and 5), with Groups 1 and 2 having the lowest levels of residual arisings in 2007/08.

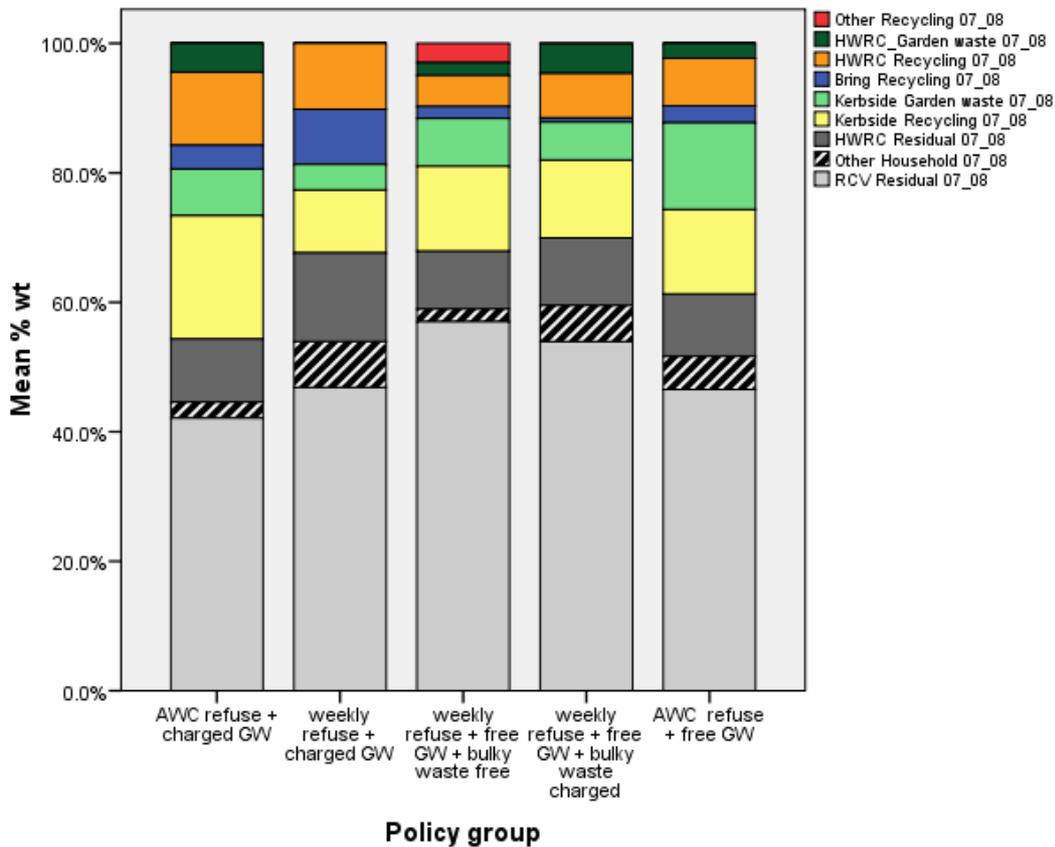
Figure 4: Policy groups: mean household waste arisings by waste stream (kg/ hhd /year) in 2007/08



The two groups with charged garden waste had the highest levels of home composting participation (WRAP 2005 Exodus Survey) and the lowest levels of social deprivation (mean IMD score). Conversely, Groups 3 and 4 had

the highest levels of socio-economic deprivation and lowest levels of home composting participation. Differences were also apparent in the mean segregation efficiency at HWRCs across the groups, with higher rates in the areas with charged garden waste collections (Groups 1 and 2, 64% segregation efficiency). There were no significant differences in population growth and rate of growth in household numbers between the groups.

Figure 5: Policy groups: % arisings by waste stream in 2007/08

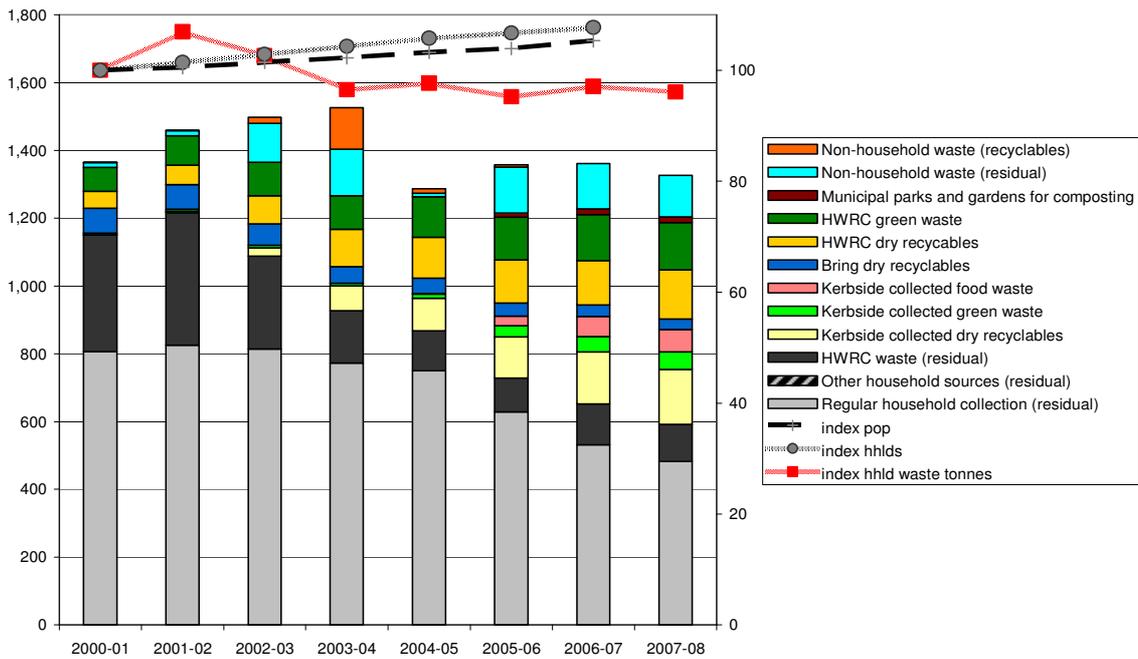


The Figures below show the change in the amount of household waste reported between 2000/01 and 2006/07 by each of the case study authority groups. While there are a number of case study authorities that fall within each group, it has only been possible to provide a single graphic illustration for each group. The two groups with AWC for refuse showed the largest increases in recycling (Groups 1 and 5), but it was the authorities that had introduced AWC for refuse and charging for garden waste that exhibited the largest declines in total household waste arisings. However, the different policies pursued by local authorities since 2000/01 were also an outcome of the situation they were starting from, and the type of population they serve. Generally, case study areas that were found to have the greatest array of charging policies were also the most affluent areas.

Groups 1 and 2: Garden waste collections charged, with and without AWC for residual waste (examples Somerset Waste Partnership, Hart, South Norfolk and Rother)

These authorities tended to exhibit the biggest net declines in household waste and a significant AWC ‘squeeze’ of material from residual waste streams to recycling. It should be noted that Group 1 had the highest average arisings in 2000/01. In the Somerset example, Figure 6, HWRC controls made a major contribution to the decline in household waste arisings from 2002/03. During the period 2004/05 – 2007/08, kerbside residual waste was reduced through weekly recycling (including food waste, but with charged garden waste) and alternate week residual waste collections. The result was an improvement in recycling performance, whilst not contributing to waste growth (absolute tonnes or per household), despite the demographic trend with population and household numbers increasing steadily over the time period.

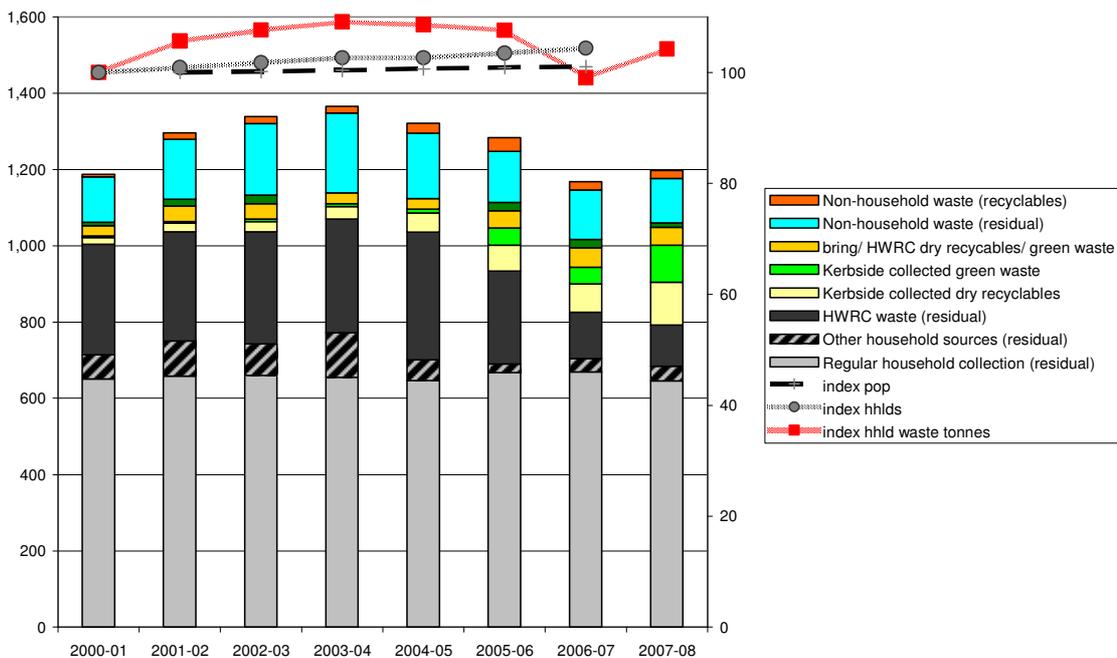
Figure 6: Somerset Waste Partnership trend in municipal waste arisings (kg/ hhd /year)



Groups 3 and 4: weekly refuse + free garden waste collection (examples Sutton, Islington, Wakefield, Cardiff, Sandwell, Gateshead)

Overall waste declines were generally more limited than was the case with Groups 1 and 2, with less reduction in residual waste and little overall change in household waste arisings per household during the period. The example of Sandwell Metropolitan Borough Council, (Figure 7), shows the important influence of HWRC trade waste controls and more accurate recording of trade waste on site. The reduction in household waste that has been achieved through these policies has been offset by increased collection of garden waste through free collections, without any decline in kerbside residual waste arisings.

Figure 7: Sandwell MBC trend in municipal waste arisings (kg/ hhd /year)

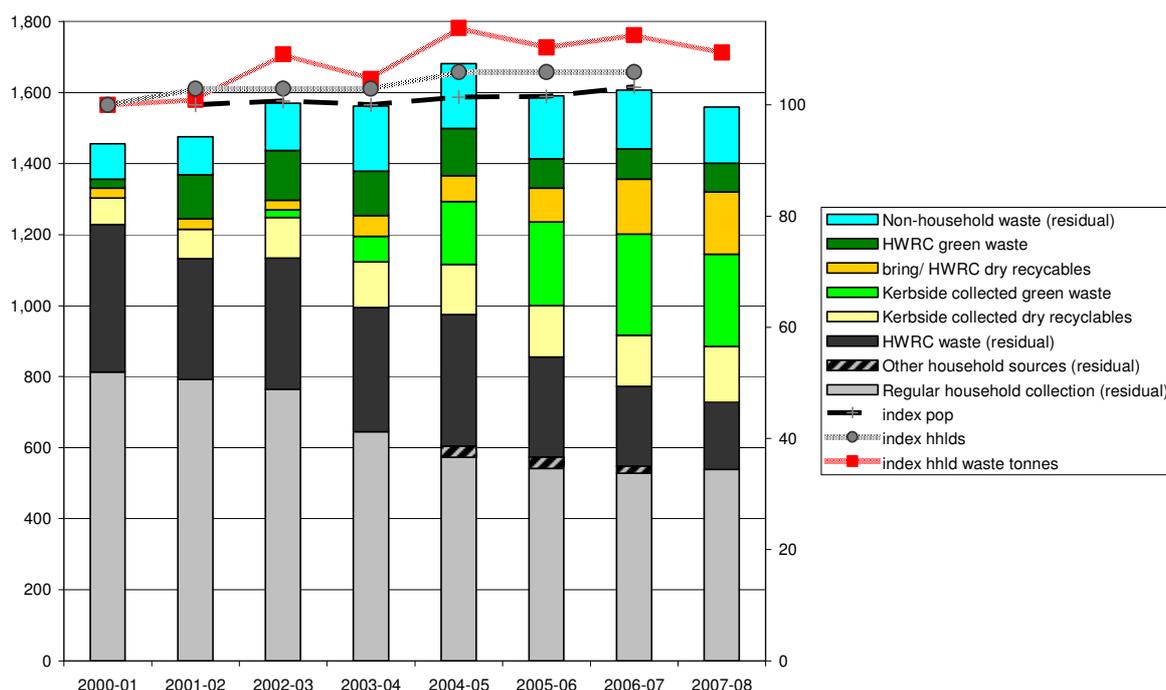


Group 5: AWC refuse and free garden waste collection, no bin capacity restrictions (examples, Hambleton, Tonbridge and Malling, Derby, Belfast)

The combination of introducing AWC for refuse and free garden waste collections resulted in large increases in recycling, but not matched by an equal decrease in residual waste arisings. This phenomenon was associated with wheeled bin collection systems where policies did not restrict bin capacities (although the majority did implement side-waste bans). This group was the only one to show an average net growth in waste per household and also registered the greatest increase in absolute tonnes per annum.

The example of Hambleton District Council (Figure 8), showed strong improvement in recycling performance from 2005/06 with the expansion of the free garden waste collection. Segregation at HWRCs also improved during this period. A combination of modest population increase, slightly faster rate of growth in household numbers and the local waste policies produced an increase in total household waste arisings and arisings per household (compare 1,400 kg /household /year with less than 1,200 kg for Somerset Waste Partnership, Figure 6).

Figure 8: Hambleton District Council

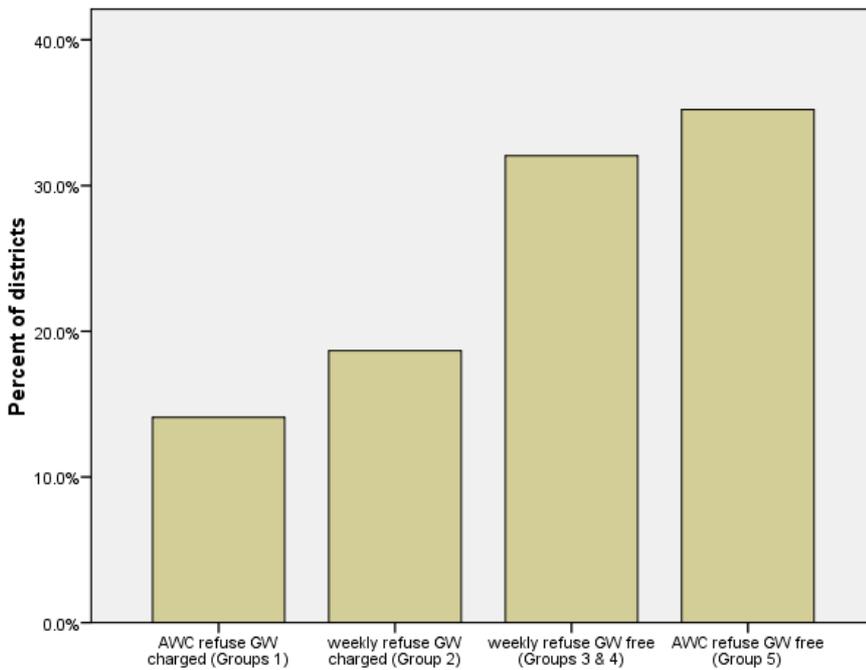


4.4 Analysis of household waste trend by policy groupings - case study results in the national context

The overall trend in national household waste arisings results from macro-economic factors, demographics, consumer behaviour and the influence of local waste policies. Trends in municipal waste arisings, and the element attributable to post-consumer household waste in particular, will partly respond to macro-level drivers (such as light-weighting of packaging), but local policies have a strong influence on whether or not a system attracts in material from non-household sources, or attracts material from households, such as garden waste, that might otherwise have been left *in situ*.

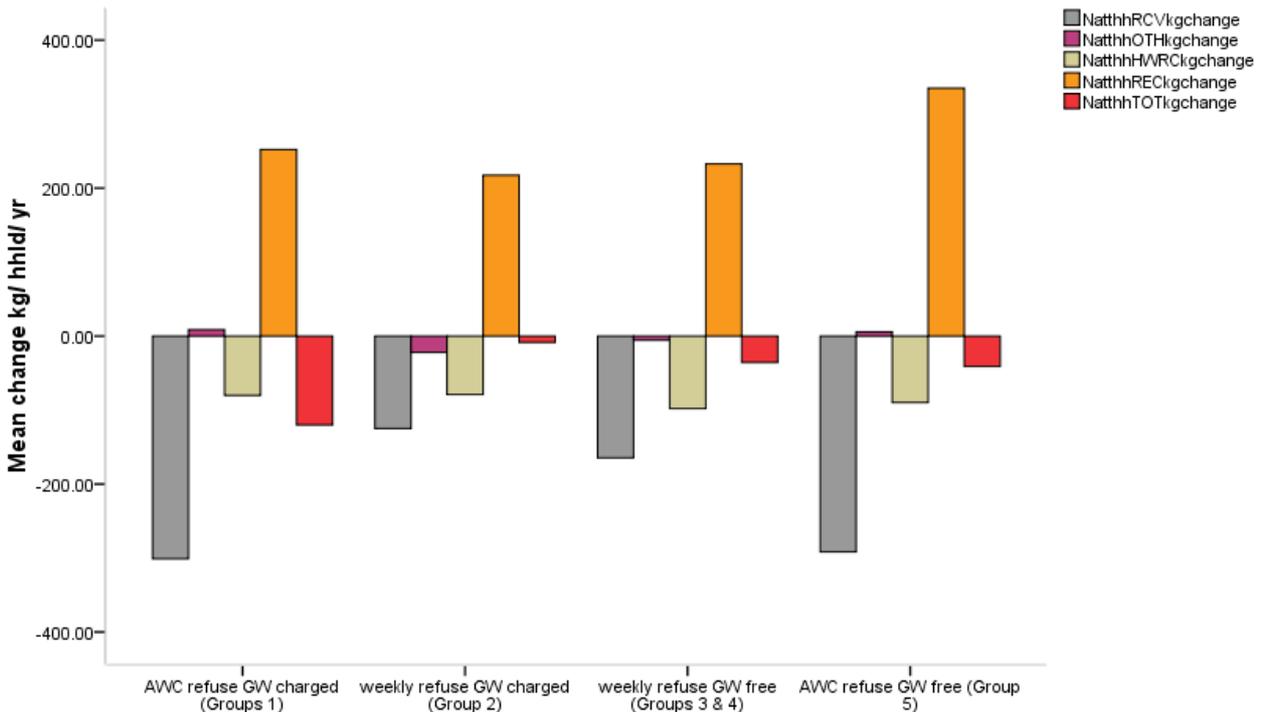
The local authorities recruited as case studies were chosen to provide a cross-section of authorities that either reported waste increases or decreases. Some of the local waste policy variables that were associated with trends in arisings were determined by the case studies, whereas others can be generated from national datasets and therefore are available for all non-case study authorities. In the case of authorities in England, data on garden waste and refuse collection policies (e.g. AWC systems) have been compiled by WRAP for use in their on-line recycling information system 'ORIS'. Taking the policy groups used to explore the case studies, it was possible to reproduce a closely related four-element classification for all English districts. Groups 3 and 4 of the case-study generated classification have been combined as there are no nationally available data on local bulky waste charging policies to provide the split. The proportion of districts falling into these groups (Figure 9) shows that Group 5 districts are the most frequent (35% of English districts), whereas districts with AWC for refuse which also charge for garden waste (Group 1) are the least frequent (14%).

Figure 9: Proportion of overall English districts assigned to four policy groups



Comparing trends for the same time period as the case study data, Figure 10 illustrates the changes in national level household waste arisings (kg/household/ year) between 2000/01 and 2007/08, using time series data derived from Defra’s municipal waste management survey and from WasteDataFlow. A noticeable difference to the case studies was that none of the averaged values across the groups using national data exhibited a net increase in total household waste over the time period. The current study sought out 28 authorities that contained an equal number of increasing and decreasing trends, whereas across the wider group of authorities, only 38% of districts in England reported increases. Hence, the case studies necessarily over-represented authorities with waste increases.

Figure 10: English districts, change in household waste arisings by waste stream and policy group (2000/01 compared against 2006/07 values) source: Defra municipal waste management survey 2000/01-2003/04 and WasteDataFlow 2004/05-2006/07 time series reconstructed for this project



Tables 4 and 5 compare the characteristics of the four groups at a national level. In Table 4, HWRC segregation efficiencies, home composting participation and IMD scores are compared for the national groupings. Overall, these show a similar ranking to those of the case study areas, but with less contrast between groups. For example, average IMD scores for Groups 3 and 4 were lower in the case studies compared with the national equivalents.

The case studies suggested that in Groups 1 and 2, with charged garden waste collections, authorities were more likely to exhibit a decrease in household waste per household. However, the national profile of increasing and decreasing authorities is somewhat different. Table 5 shows that 15% of Group 1 authorities reported waste increases (per household), whereas in the three other groups the proportion was around 40%.

Table 4: Policy groups - descriptive statistics for national level groupings

Group	HWRC segregation efficiency '07	Home composting participation % 2005	IMD score 2006
AWC refuse GW charged (Groups 1) - Mean	55%	41%	227.5
Weekly refuse GW charged (Group 2) - Mean	53%	43%	219.5
Weekly refuse GW free (Groups 3 & 4) - Mean	48%	34%	151.9
AWC refuse GW free (Group 5) - Mean	53%	36%	173.4
Total Mean	52%	37%	182.6

Table 5: Policy groups – analysis of districts reporting waste increases / decreases between 2000/01 and 2007/08 by policy group

	AWC refuse, GW charged (Group 1)	Weekly refuse, GW charged (Group 2)	Weekly refuse, GW free (Groups 3 & 4)	AWC refuse, GW free (Group 5)	Total
Districts reporting household waste decreases	33	30	51	59	173
	84.6%	58.8%	56.7%	59.6%	62.0%
Districts reporting household waste increases	6	21	39	40	106
	15.4%	41.2%	43.3%	40.4%	38.0%
Total	39	51	90	99	279
	100.0%	100.0%	100.0%	100.0%	100.0%

The ONS classification of local authority area types (Table 6) shows that some of the different policy groups are associated with particular area types. As was established within the case studies, more prosperous areas are more likely to introduce charging systems. In accordance with this logical association, a high proportion of those areas that charge for garden waste collections are classified as 'non-London prosperous authorities'. Conversely, 88 % of 'Mining / industrial authorities' offer free garden waste collections.

Table 6: Policy groups by local authority area type classification (ONS)

ONS area type: Super Groups	AWC refuse, GW charged (Group 1)	Weekly refuse, GW charged (Group 2)	Weekly refuse, GW free (Groups 3 & 4)	AWC refuse, GW free (Group 5)	Total
London suburbs & periphery	1	1	3	2	7
	2.5%	1.9%	3.3%	2.0%	2.5%
Non-London prosperous authorities	28	34	41	50	153
	70.0%	64.2%	45.6%	50.0%	54.1%
Other urban centres	2	6	17	12	37
	5.0%	11.3%	18.9%	12.0%	13.1%
Rural and coastal authorities	5	10	6	13	34
	12.5%	18.9%	6.7%	13.0%	12.0%
Mining / industrial authorities	4	2	23	23	52
	10.0%	3.8%	25.6%	23.0%	18.4%
Total	40	53	90	100	283
	100.0%	100.0%	100.0%	100.0%	100.0%

In order to provide an indication of how case study policy findings might translate into the wider picture, an extrapolation exercise on HWRC controls and kerbside collection policies was carried out based on the national level policy groups. Although there were no national data to directly assess attempts to control trade waste abuse at HWRC sites, there was a strong link between site segregation efficiency and the probability that controls have been implemented⁷. Those case studies with strong evidence that controls were in place also achieved higher levels of material segregation at HWRCs than those without (segregation efficiency averaged 55% versus 44%). Using the segregation efficiency variable from 2007/08 WDF statistics, an indicator variable was constructed for the further potential to reduce HWRC household waste. 40% of districts in England were found to have efficiencies below 50% (excluding inert materials), corresponding to 11.3 million households.

Table 7 provides indicative calculations of the potential impact of controls similar to those implemented across the case study areas, based on the mean 28% reduction across the case studies. The proportion of site inputs from trade sources is probably on the high-side, although this issue is difficult to independently assess⁸. In total, this would represent a reduction in reported household waste of about 0.85 million tonnes per annum if implemented (about 16% of the current total HWRC arisings, excluding inert materials). Of course, this raises issues about how to better manage these wastes were they to be excluded from the household waste stream: whether at municipally run sites accepting trade waste or elsewhere.

The 'pre-' and 'post-' assessment of AWC introduction in Group 1 areas (charged garden waste) was also extrapolated to a national level for illustrative purposes. Group 1 areas tend to be affluent, whereas Group 5 areas are more mixed. However, 50% of Group 5 areas are in the same 'Prosperous' area type as the five Group 1 case studies. If 50% of the 5.14 million households currently served by AWC refuse systems with free garden waste collections were converted to Group 1 systems, this would reduce household waste arisings by a third of a million tonnes.

This extrapolation is simplistic and the individual local policies of authorities in Group 1 case studies involves more than just charging for garden waste (separate collections of food waste in one, higher levels of home composting, weekly recycling collections, campaigns and promotional work aimed at waste prevention and so on). However, it does not alter the conclusion, however, that when Group 1 and Group 5 areas that are of a similar type are compared, very different household waste trends have resulted in part from the influence of collection system characteristics. These differences are part of the explanation of why some authorities reported increases between 2000/01 and 2007/08 and others did not.

⁷ 'Trade Waste Inputs to Civic Amenity Sites', Network Recycling and Future West (2002)

⁸ 'National Assessment of Civic Amenity Sites', p.152, Network Recycling and Future West (2004)

Table 7: Estimation of impact on household waste of local policy interventions on HWRC trade waste controls and AWC for refuse: England, 2007/08 (source: extrapolations based on 2007/08 WasteDataFlow statistics)

	Pre- kg per hhd / year	Post- kg per hhd / year	Difference
Trade waste controls at HWRCs			
Case studies: HWRC controls introduced at a time without AWC introduction as a confounding variable	317.4	228.5	-88.9
Districts with segregation efficiencies below 50% ('pre-' estimate based on 2007/08, WasteDataFlow)	270	195	-75
11.3 million households in areas <50% segregation: tonnes per year, HWRC trade waste control introduced, extrapolated benefit to similar controls introduced (~16% of HWRC arisings)			-847,500
Conversion of Group 5 authorities to Group 1 authorities: AWC, with charged garden waste collections			
Case studies: AWC refuse: areas with charged garden waste: kerbside hhd waste: total kerbside household waste	901.9	780.9	-121.0
Districts currently in Group 5 (AWC with free garden waste): total kerbside household waste	910	788	-122
2.57 million households currently in Group 5 areas, extrapolated benefit of conversion to Group 1 policies: tonnes / year (~13% of kerbside arisings for Group 5 authorities)			-313,540

5. Conclusions and key findings

The key findings from this study have been categorised under a series of headings, as detailed below:

5.1 Socio-demographic influences

- Locally held data and the collation of centrally held statistics suggest there is no notable correlation between a local authority's ONS area classification, (i.e. a distinction between urban and rural classification) and household size. In all cases, there has been a distinct reduction in average household sizes, yet there is no correlation between a reduction in household size and a reduction in household waste arisings.
- It would appear across the case studies that, where there was significant growth in a resident population, there was a coupled growth in household waste arisings; however where there was marginal population growth there were a number of cases where there was a coupled decrease in household waste arisings.
- The accuracy of centrally held ONS population statistics was questioned by a number of respondents – in particular, there was a feeling that mid year population estimates did not take into account seasonal fluctuations such as those associated with tourism, second homes, MOD residents and transient student populations. However, when the methodology for calculating mid year population estimates was examined, these issues were in fact considered.

5.2 Waste data collection and reporting by local authorities

- As a general observation across the local authority case studies, data collection and reporting has dramatically improved since the advent of WDF and, in almost all cases, confidence in waste data has increased since 2000.
- Accounting for commercial waste tonnages have, in a number of cases, been based on estimates, given that much of this waste has been and continues to be co-collected with domestic waste in RCVs. In some instances, these ratios have been used over a number of years and are considered to be out of date. In other instances, particularly in the devolved administrations case studies, no attempt had been made to distinguish between the two waste streams until the advent of WDF.
- In a number of the case studies reported data from contractors has, in some cases, been questionable: although improved systems have now been put in place to feed improved data into WDF quarterly returns. The classification of some vehicle consignments when passing a weighbridge has in the past been misleading – waste consignments that may contain flytipped waste have been wrongly consigned as bulky wastes and vice versa. While it is felt that overall MSW tonnages are fairly accurate, there is less confidence

in a number of cases (certainly prior to WDF) in the apportionment of individual household waste streams such as bulky, flytipped and street cleansing wastes.

- The apportionment of HWRC waste quantities at district level presented a particular problem in the case of two-tier English authorities because data were primarily reported at the Waste Disposal Authority (county) level. In preparing the time series data for the study it was necessary to apportion arisings between districts where district-level data weren't available. Although this was necessary in order to be able to discuss total household waste trends (kerbside and HWRC), it introduced an element of uncertainty in the data. Equally, cross border usage of HWRCs represented a potential distortion and the apportionment of tonnages delivered to a particular HWRC within the confines of a district boundary will always be difficult to quantify unless accompanied by comprehensive HWRC user profiles.

5.3 Waste prevention and householder communications work

- In an attempt to quantify the nature of the communications activity undertaken by each of the case study authorities, each respondent was requested to complete a self-assessment of their activities. This exercise suggested that where there has been noticeable reduction in household waste arisings, there appeared to have been a relatively large investment in widespread householder waste awareness raising activities. This is not to suggest that such activities have been instrumental in decreasing household waste arisings in isolation— instead they have been used as a means of assisting the transition to a new waste collection regime.

5.4 Enforcement activity

- The use of Fixed Penalty Notices under Section 46 of EPA 1990 across the case studies has been mixed. Some authorities used such powers to full effect, whilst others felt that the 'carrot' approach is more appropriate than the use of a 'stick'. However, such policies can only be successfully administered when they are accompanied by effective communication and an ability to regulate / police the measures in hand.
- An assessment was conducted, to evaluate the level of enforcement that has been adopted by the case study authorities. The results suggest that authorities with increasing waste arisings adopt a less rigorous approach to enforcing a side waste presentation ban. Such policies generally accompany the introduction of AWCs which in their own right impose a 'downward' effect on waste arisings; and so suggesting a strict correlation between the level of enforcement and waste trends would be unfounded.

5.5 Classification of Schedule 2 wastes

- The classification of Schedule 2 wastes are currently the subject of a separate Defra research project⁹. It was not the aim of the current study to provide an in-depth analysis of how such wastes are classified, but to gauge whether the issue might impinge on the interpretation of household waste trends
- Based on the limited amount of data collected across the 28 case studies it was concluded that local authorities classify Schedule 2 wastes in a number of different ways. In all the devolved administrations, these waste streams were mainly classified as commercial waste. The situation across the English case studies was more varied.
- Most of the authorities reported little change in the collection policy or classification of such waste over the time series and the very limited data available on Schedule 2 wastes suggested that they accounted for as little as 1% to 2% of household waste arisings per year.
- Overall, it was not considered that such waste streams significantly contributed to household waste arisings trends in the case study authorities.

5.6 Waste collection policy implications

Although it was difficult to isolate the impact of different policies from one another, an analysis of the impact of particular policies was carried out for HWRC trade waste controls and the introduction of AWC refuse systems. This policy impact assessment was quite complex. Overall, case study findings indicated that the introduction AWCs for refuse, free garden waste collections, home composting promotion and provision of (charged) bulky waste collections have all had a noticeable effect on kerbside household waste arisings trends.

The main points were:

⁹ For further information regarding this project refer to:
<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16451&FromSearch=Y&Publisher=1&SearchText=schedule%20%20waste&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>

- Conclusions drawn from the analysis of the introduction of AWCs for refuse established that case study areas with free garden waste collections had different overall household waste trends than those without free garden waste collections. More specifically:
 - For areas with charged garden waste collections, pre- versus post- comparisons around AWC roll-out suggested average reductions in household waste arisings (kerbside, bring) of 120 kg per household per year.
 - The same assessment for AWC roll-out in areas with free garden waste collections was an order of magnitude less significant (13 - 30 kg per household per year).
 - It is important to note, however, that this analysis involved more than just the garden waste issue: there were other specific policies, simultaneously launched and longer-standing, that were likely to have contributed to this trend (support for home composting, one case with separate collection of food waste, side waste policies etc.);
- HWRC controls, designed primarily to address abuse of sites from commercial waste appear to have had a similar order of magnitude reduction on the household waste stream as AWC in areas charging for garden waste (80-100 kg / household /year).
- The analysis was made more complex by the fact that the introduction of HWRC controls coincided with the roll-out of AWC systems in half of the policies analysed. In the cases where the policy changes coincided, there was a 'knock-on' effect with extra waste arising at HWRCs. This was probably due to the transfer of material from kerbside - in some authorities this was reported to be a temporary phenomenon.

In order to quantify and categorise the results, the local authority case studies were placed into a series of groups that effectively consolidate the waste collection policies that coincide with the prevailing household waste trend. These are detailed below:

Groups 1 and 2: Garden waste collections charged, with and without AWC for residual waste

These authorities exhibited the biggest net declines in household waste (per household and in absolute tonnes) and a significant AWC 'squeeze' of material from residual waste streams to recycling. A combination of HWRC controls, carefully managed roll-out of AWC's and charging for garden waste have contributed to the declines. Group 1 authorities, on average, started the period with higher arisings than others.

Groups 3 and 4: Weekly refuse collection and free garden waste collection

Results from this group are less impressive in terms of waste declines compared with Groups 1 and 2, with less reduction in residual waste over the time period and little overall change in household waste arisings per household during the period. Those that did achieve a downward trend were cases with initiatives to address HWRC trade waste controls. However, in a number of cases, these reductions have been offset by increases linked to free garden waste collections, without any significant decline in residual waste arisings.

Group 5: AWC refuse and free garden waste collection, no bin capacity restrictions

The combination of AWC for refuse and free garden waste collections results in large increases in recycling, but not equally matched by decreases in residual waste arising. This is associated with wheeled bin collection systems where policies do not restrict bin capacities (although the majority do implement side-waste bans). This group was the only one to show an average net growth in waste per household and also registered the greatest increase in absolute tonnes per annum.

An indication of how the case study findings might translate into the wider national picture was based on a classification of English districts, following an extrapolation exercise in which HWRC controls and kerbside collection policies were superimposed on national data.

- Using a surrogate variable for whether or not HWRC controls had been implemented (based on HWRC segregation efficiency) indicative calculations were carried out for the potential impact of similar controls in areas with lower segregation efficiencies. 40% of districts in England were found to have HWRC segregation efficiencies below 50% (excluding inert materials), within areas serving 11.3 million households. In total the scaled-up calculation estimated that a reduction in reported household waste of about 0.85 million tonnes was possible (about 16% of the current total HWRC arisings, excluding inert materials).
- The 'pre-' and 'post-' assessment of AWC introduction in Group 1 areas (charged garden waste) was also extrapolated to a national level for illustrative purposes. Based on 50% of the 5.14 million households currently served by AWC refuse systems with free garden waste collections being converted to Group 1 systems (charged garden waste collections), this would reduce household waste arisings by a third of a million tonnes.

- Although this extrapolation was simplistic (local policies of authorities in Group 1 case studies involves more than just the introduction of AWC and charging for garden waste), it does provide an important example of how different household waste trends have resulted in part from the influence of collection system characteristics. With 35% of English districts embarked on Group 5 type policies and 14% on Group 1, the contrast in policies between these two has influenced the overall household waste trend at a national level. 85% of Group 1 districts reported a decline in household waste per household (2000/01 -2007/08), whereas 60% of Group 5 authorities did likewise.

Overall, the evidence from the case studies suggests that the influence of local waste policies on trends has been a significant factor in affecting national levels of waste arisings over recent years. Other factors, such as consumer behaviour and population growth, cannot on their own explain the recent changes in overall household waste quantities. This is because municipally collected household waste can drawn in materials from non-household sources (e.g. waste taken from the work-place) and from non-consumer origins (such as garden waste formerly dealt with by householders in their gardens). Collection system design, kerbside containment capacities (the balance between residual and recycling/composting capacity), enforcement and charging policies (kerbside and HWRC), communications campaign and waste prevention initiatives: all have a part to play in influencing this dynamic.

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References to published material

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

The following references were made in this report:

- WIN local authority survey (December 2008) - <http://www.win.org.uk/>
- RPS residual waste analysis work - An article describing this project featured in *Resource Magazine, Issue 45, January to February 2009*
- 'Trade Waste Inputs to Civic Amenity Sites', Network Recycling and Future West (2002) - <http://www.networkrecycling.co.uk/downloadable-reports.htm>
- 'Modelling Impacts of Lifestyle Changes on Household Waste Arisings' and 'A Model of Household Waste Composition' (WR0107)