

“EUROCHARGE”

Waste Collection: To Charge or not to Charge?

A Final Report to IWM (EB)

Chartered Institution of Wastes Management
Environmental Body



Supported by



Foreword



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All work other than the survey work was undertaken by **Eunomia Research & Consulting Ltd.** Eunomia is a consultancy specializing in waste policy, strategy and economics issues. The company carries out leading-edge research in discharging challenging projects intended to investigate how best to manage resources in a more sustainable manner.



Waste Watch is a leading environmental organisation promoting sustainable resource management in the UK by campaigning for all areas of society to: **reduce** resource consumption, maximise resource **reuse**, and increase the percentage of waste they **recycle**. The support provided to this project was in undertaking the survey with local authority representatives, delivered by the Policy, Research and Information team. The team aims to provide strategic analysis of information in support of the organisation's objectives.

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**Charging Schemes for Waste
Management and the Barriers to their
Introduction in the UK**

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1.0 Introduction

Eunomia Research & Consulting Ltd. was asked by the Chartered Institution of Wastes Management Environmental Body (IWM (EB)) to carry out the Eurocharge project. Research support for the study was provided by Waste Watch. This project was intended to identify the barriers to direct charging of UK householders for waste collection and disposal based upon a comparative analysis of European practice and feedback from local government members and officers.

This piece of research was given greater relevance through the involvement of both the Local Government Association and the Chartered Institution of Wastes Management. At a time when the UK stands at a turning point in terms of the management of materials in the waste stream, the lack of a mechanism to incentivise householders to take greater responsibility for their wastes potentially constitutes an obstacle to more sustainable waste management. This work seeks to compare experience in Europe with UK opinion regarding the obstacles to the introduction of direct charging at the local level, and to understand whether or not the effect of charging can be mimicked through appropriate design of collection systems.

This report is a summary of more extensive research which can be found on the CIWM website under 2003 reports at <https://www.ciwm.co.uk/ciwm/knowledge/>.

1.1 Objectives

The objectives as set out in the Tender Document are:

1. To identify the barriers to implementation of direct charging in the UK and to make recommendations that can be used in the development of policy enabling this or some similar mechanism to be used to increase the participation of householders in recycling and to contribute to waste minimisation.
2. To identify ballpark revenue/administrative costs for direct charging relative to current collection costs.
3. From European experience, to highlight the perceived and actual benefits of direct charging.
4. To draw comparisons with the results of revised collection practice (e.g. reduction in bin size/alternate week collection of residual household waste) in the UK.

1.2 Defining DVR Charging Schemes

The concept of ‘direct charging’ is usually used, in English-speaking countries (and especially in the UK), to denote a form of charging in which refuse is charged for in relation to some measure – weight, volume, number of containers, or a combination of these – of the quantity put out for treatment / disposal.

Direct *charging* could, however, be used to refer to a situation in which citizens were simply billed directly for their waste collection and treatment / disposal independently of other services. There might be no variation in the fee with the level of service use. Although some levies of this nature do vary (for example, on the basis of house value, or on the basis of the number in the household), the service provided may not bear any relation to these. These are, however, user fees in that they are ear-marked for the service provided, and in this work, we allow these to fall within the definition of the term ‘charge’.

More commonly, the term ‘direct charging’ is synonymous with the terms ‘variable charging’, ‘unit pricing’, and ‘pay-as-you-throw’. Where charging schemes are designed so as to provide incentives for changes in household behaviour whilst retaining the goal of cost recovery, they usually do so by providing *differential* unit charges across the different parts of the overall collection system.

In this report, to describe this type of system, we use the term **Differential and Variable Rate (DVR) charging**. The rationale for this choice is to capture exactly what these schemes typically seek to achieve. They seek to ensure that the charge for refuse collection is varied in accordance with what is produced. They also seek to apply differential charges across the components of the collection system. The net effect is to:

- a) encourage a reduction in waste set out for collection (through source reduction, home composting etc); and
- b) to incentivise improvements in separation (and hence to encourage a more efficient utilisation of the separate collection infrastructure).

This term serves to convey the fact that the charge differentiates between unseparated and separated fractions (which is not always conveyed in the terminology used). Since this study seeks to identify and understand the barriers to the implementation of such systems, it is as well to ensure that the language used does not itself constitute an obstacle by conveying an impression that all waste, irrespective of how it is presented, will be charged for at the same variable rate. Whilst this is one possible design of a charging mechanism, it is not often employed.

1.3 Where Does it Happen?

DVR charging is becoming more widespread. The number of municipalities introducing variable rate schemes increases each year. The ‘increasing trend’ can be found in a number of countries, including the United States, Wallonia (Belgium), Italy, and the Netherlands. Municipalities in other countries have already introduced such schemes on a widespread basis. These include Germany, Austria, Luxembourg and Flanders (Belgium).

One Flemish report estimated the coverage of variable charging in 1999 for several countries / regions.¹ These were:

- Flanders: more than 50 % of municipalities;
- Brussels: 14 % of municipalities;
- The Netherlands: 22 % of municipalities²;
- France: less than 10 % of municipalities;
- Luxembourg: 4 % of municipalities.

The widespread nature of charging schemes in Flanders has been assisted in part by attempts by the Flemish government to formulate recommendations for municipalities in respect of a uniform charging system. This is intended to avoid illegal dumping in neighbouring municipalities.

Proietti noted that DVR charging is already well established in Austria, Belgium, Finland, Germany, Luxembourg, Sweden and Switzerland:

1 BECO (1999) *Benchmarking of Flemish Waste Management Policy Compared with Neighbouring Waste Markets*, Study Commissioned by OVAM, May 1999.

2 In the Netherlands, 58 % of municipalities levy a fee for household waste services, which is calculated on the basis of the number of persons in a household.

- *‘in some countries (Austria, Finland, Germany, Luxembourg, Sweden, Switzerland) Pay-as-you-throw systems are stable and largely applied with increase of electronic systems and adaptation of tariffs to encourage waste prevention*
- *Belgium and Italy are experiencing a very fast evolution in applying of fees;*
- *other countries (Denmark, France, Ireland, Netherlands) are evolving slowly, but the Ministers of Environment (France and Ireland) are in favour of larger application of fees;*
- *other countries are not applying fees, but this may change soon (United Kingdom and Portugal).³*

A US study reported a fivefold increase in the number of municipalities adopting ‘variable rate programs’ between 1990 and 1996. By 2000, it was estimated that around 6,000 communities in the US were using variable charging and only 4 states in the US reported no such activity. It was estimated that the 6,000 communities covered 20% of the population.⁴

The Netherlands Waste Management Council (AOO) suggested that the number of municipalities adopting the ‘DIFTAR’ system (differential tariff) grew from under 20 in 1995 to over 120 in 2001, with the increase being 20% in the year 2000-2001. Currently, coverage is 25% of municipalities and 20% of households nationwide.⁵

The UK appears to be unique in preventing these systems through existing legislation (see Table 1), although some exceptions to the rule apply. For example, many local authorities make charges for bulky waste collection. Furthermore, to our knowledge (which is extensive with regard to landfill taxes), the UK is the only country with a landfill tax in place where DVR schemes are prohibited. This acts as a barrier to the effectiveness of the tax since the incentive to improve waste management performance can be conveyed to local authorities, but not to householders. Consequently, to the extent that this restricts the degree to which local authorities can influence household behaviour, the tax tends to operate more on the choice of disposal route made by the local authority than on the behaviour of households.

One might consider the existing state of affairs vis a vis financing systems for waste as an indicator of the ‘maturity’ of waste legislation. Although for many countries, the switch to DVR schemes today implies a switch from a specific fee which is paid to cover waste management costs, this might not always have been the case. It is interesting to note that the only countries where any municipal waste management services are financed through general municipal taxes are France, Greece, Portugal, Spain and parts of the United States. In each of the last two, this varies regionally, and indeed, in Spain, the first DVR schemes in the country are now in place. With the exception of the United States, if one adds the UK, these countries resemble ‘a club’ of the worst performers in respect of source separation in Europe. It is worth considering whether the lack of any DVR charging schemes is, if not a key explanatory variable in the poor performance of these countries, symptomatic of it. Other countries are increasingly *requiring* municipalities to ensure that fees for waste management encourage waste minimization and source separation. Sometimes, legislation explicitly refers to the Polluter Pays Principle. The UK legislation looks strangely at odds with this, the more so since it actually appears in the very place where one would have thought the Polluter Pays Principle would hold some sway, the *‘Environmental Protection Act.’*

³ Stefano Proietti (2000) *The Application of local Taxes and Fees for the Collection of Household Waste: Local Authority Jurisdiction and Practice in Europe*, Report for the Association of Cities for Recycling, Brussels: ACR

⁴ See Lisa Skumatz (2002) *Variable Rate or ‘Pay-as-you-throw’ Waste Management: Answers to Frequently Asked Questions*, Los Angeles: Reason Foundation, July 2002.

⁵ AOO (2001) Informatiebulletin 02: Afval Informatief, June 2001.

Table 1: Local Authority Competence for Levying Fees Directly for Waste Collection Services

Country	Competence	Legal basis
Austria	Yes	Article 8, paragraph 5 of the Constitutional Finance Law of 1948 (amended in 1966): the legislation of the <i>Länder</i> may authorise municipalities to charge certain fees; this legislation stipulates the essential elements of these fees, and especially their upper limit.
Belgium	Yes	Constitutional provisions supplemented by regional legislation.
Denmark	Yes	Article 48 of the “Environmental Protection Act” of 1998: “The local council can fix fees to cover costs in respect of: [...] collection of waste [...]”.
Finland	Yes	Articles 28 and 29 of “Waste Act” 1072 of 3 December 1993: “Municipalities have the right to collect a waste tax to cover the costs of waste management and related tasks organised by them”; “The general grounds for setting the waste tax are the type, quality and quantity of the waste”.
France	Yes	Article 14, paragraph 2, of Law no. 74-1129 of 30 December 1974: “Municipalities, groupings of municipalities and local public establishments responsible for collection of rubbish, waste and refuse may institute a fee based on the scale of the service provided.”
Germany	Yes	Constitutional provisions supplemented by legislation of the <i>Länder</i> .
Greece	Yes	Article 1, paragraph 1 of Law 25/1975: taxes for management of waste and for electricity are calculated on the basis of the area occupied by each household multiplied by factors established by municipal councils.
Ireland	Yes	Article 2 of the “Local Government (Financial Provisions) Act” of 1983: local authorities may impose fees for services provided, and Article 33 of the “Waste Management Act” of 1996 states that “Each local authority shall collect, or arrange for the collection of, household waste within its functional area”.
Italy	Obligation	Article 49 of Legislative Decree no. 22 of 5 February 1997: the costs of management of municipal waste are covered by municipalities by means of the institution of a fee comprising a fixed portion in relation to the essential components of the service (investment and depreciation) and a variable portion based on the quantity of waste produced, the service provided and management costs, so as to cover all investment and operating costs.
Luxembourg	Obligation	Article 15 of the Law of 17 June 1997: “The cost of elimination of waste must be paid by [...] the owner [of the waste]” and Article 17, paragraph 3: “[In relation to the management of household waste, bulky waste and comparable waste], taxes for services provided must correspond to actual production of waste and in particular to the type, weight and volume of waste. Moreover, they are based on the costs of the infrastructure to be introduced”.
Netherlands	Yes	Article 15.33, paragraph 1, of the “Environmental Management Act” of 1993: “To cover the costs it incurs in connection with disposal of household waste, each municipality may institute a levy which may be imposed on persons who, [...], actually use premises in respect of which an obligation to collect household waste applies [to municipalities]”.
Portugal	Yes	Article 20 of Local Finance Law no. 42/98 of 6 August 1998: municipalities may charge fees for the collection of municipal waste. These fees may not, in principle, be lower than the direct and indirect costs of the services provided.
Spain	Yes	Article 25, paragraph 1 of Law 10/1998 of 21 April 1998: Public authorities may establish economic, financial and fiscal means to promote the prevention, reuse, recycling and other forms of recovery of waste.
Sweden	Yes	Article 27 of the Environmental Code of 1998: Municipalities may establish regulations that set fees for the collection [...] of waste within their jurisdiction (paragraph 4). Fees may not exceed the total sum necessary to cover the costs of planning, investment and operation. The fee may be defined in such a manner as to promote reuse, recycling or other environmentally friendly ways of managing waste (paragraph 5).
Switzerland	Compulsory	Article 32a (introduced in 1997) of the federal Law on Environmental Protection of 1983: “The cantons shall ensure that the costs of disposal of municipal waste [...] shall be charged, by means of emoluments or other taxes, to those who generate this waste”.
United Kingdom	Prohibition	Article 45 of the “Environmental Act” of 1990: “No charge shall be made for the collection of household waste, except in cases prescribed in regulations made by the Secretary of State”.

Source: Stefano Proietti (2000) *The Application of local Taxes and Fees for the Collection of Household Waste: Local Authority Jurisdiction and Practice in Europe, Report for the Association of Cities for Recycling, Brussels: ACR.*

2.0 CASE STUDIES FROM EXISTING LITERATURE

The following Section highlights some key findings from previous analysis of DVR schemes, described in greater detail in the full report. The figures below concentrate on some of the ‘headline figures’ associated with schemes implemented, these tending to be the effects on separation and on source reduction. The literature tends to be less comprehensive regarding issues of costs, and frequently, the collection systems are described only partially.

2.1 Belgium

A 1999 study carried out for the Flemish Waste Management Agency, OVAM, found that a variable household tax has a significant impact on the amount of residual household waste offered.⁶ It was found that the introduction of a payment of €0.50 (£0.33) per grey waste bag purchased would lead, in an average commune, to a decrease in the amount of residual household waste offered of approximately 30 kg per inhabitant.

There are two avenues through which the residual waste collected is reduced:

1. Firstly, the charges for the bags leads householders to improve separation of materials. This means that the amount of waste which is separately collected increases significantly. This is called the separation effect. The separation effect is responsible for about 30% (or 9 kg) of the decrease in the amount of residual household waste offered; and
2. Secondly there is a reduction in waste set out for collection either through genuine preventative behaviour or through evasion. This is believed to account for, on average, 70% (or 21 kg) of the decrease in the quantity of residual waste.

The variable household tax (or retribution) does not simply reduce the amount of residual household waste offered, but there is some inverse correlation with the amount of bulky waste offered for collection. This conclusion arose from a model that looked for the correlation between the variable element of the waste fee and the amount of bulky waste offered for collection. Other parameters, such as whether or not municipalities had a strong policy on bulky waste, were not included in this model. It may be, therefore, that municipalities with higher fees for grey bags were also the ones that were more severe on the bulky waste fraction (for example, no door-to-door collection of bulky waste). Alternatively, it may be that there is a greater awareness amongst householders of the issues involved, or more bulky waste may be sent to re-use centres.

The effect of the introduction of a contribution scheme of €0.50 (£0.33) per grey waste on the total amount of municipal waste (= selective fractions + non-selective fractions) offered lies somewhere between 40 and 50 kg per inhabitant.⁷ This is the net preventative and evasive-effect. This is equivalent to approximately 10% of waste per inhabitant in Flanders.

2.1.1 Dilbeek

A study of the municipality of Dilbeek was presented in a report by the Oko Institut for the European Commission.⁸ Inhabitants of Dilbeek used to pay a general tax for the collection of their household

⁶ The rest of this section is taken from D. Hogg (ed.) (2002) *Financing and Incentive Scheme for Municipal Waste Management: Case Studies*, Final Report to DG Environment the European Commission

⁷ OVAM (1999) *The Effect Of Household Waste Taxes And Retributions On The Amount Of Household Waste Offered*, February 1999.

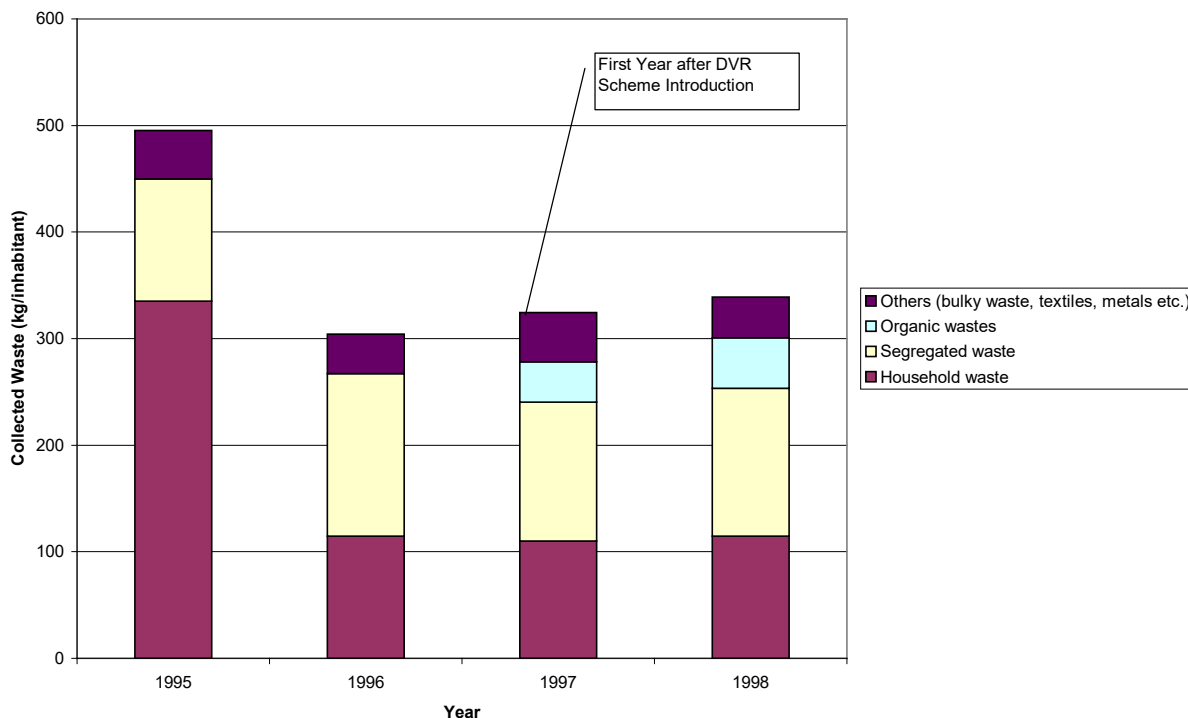
⁸ Oko Institut et al (1999) *Waste Prevention and Minimisation*, Final Report to DGXI, European Commission, 29 July 1999.

wastes that did not correspond to the individual amount of waste produced by each household. Upon implementation of the new waste management system, the general tax for household wastes was replaced after a transition period of two years (1996-97) by a payment referring to the individual amount of waste produced by each household.

Since 1998, inhabitants of Dilbeek have paid an individual fee which varies according to the wastes that are collected by the municipality. In practice, the municipality of Dilbeek sells two kinds of plastic sacks, one for household waste and one for recyclable packaging waste. Each plastic sack costs between £0.56 and £0.72 according to its size and volume. The costs for the waste collection are included within this amount. The total waste disposal cost for each household varies according to the number of plastic sacks they need to get their waste collected.

Dilbeek reduced its quantity of residual waste from households by more than 60 % within only six months, in 1996. In total, the average household waste generated in Dilbeek fell from 495 kg/inh. in 1995 to 304 kg/inh. in 1996, implying a reduction of 39%(see Figure 1). At the same time, the Flemish average was around 490 kg/inhabitant. It should be remembered that Dilbeek is a high-income area of Belgium.

Figure 1: Waste Minimisation in Dilbeek



Source: Municipality of Dilbeek

The financial gains for the municipality of Dilbeek due to the lower amount of waste are impressive. In 1995, the costs of municipal waste management were €1.77 million (approx. £1.14 million), whereas in 1996, total costs fell to €1.25 million (approx. £0.81 million). A further reduction to €1.24 million (approx. £0.80 million) was observed in 1997. Without the measures the costs are estimated to have been between €2.23 and €2.48 million (approx. £1.44 - £1.60 million). Also the collection fees paid by the population decreased with the waste prevention actions. In 1995, the inhabitants of Dilbeek paid €1.22 million (approx. £0.79 million), an average of €32.5 /inhabitant (approx. £20.97 / inhabitant). The costs dropped to €1.12 million (approx. £0.72 million), or €29.8 /inhabitant (approx. £19.23 / inhabitant), in 1996 and went further down to €1.08 million (approx. £0.70 million), or €28.8 /inhabitant (approx.

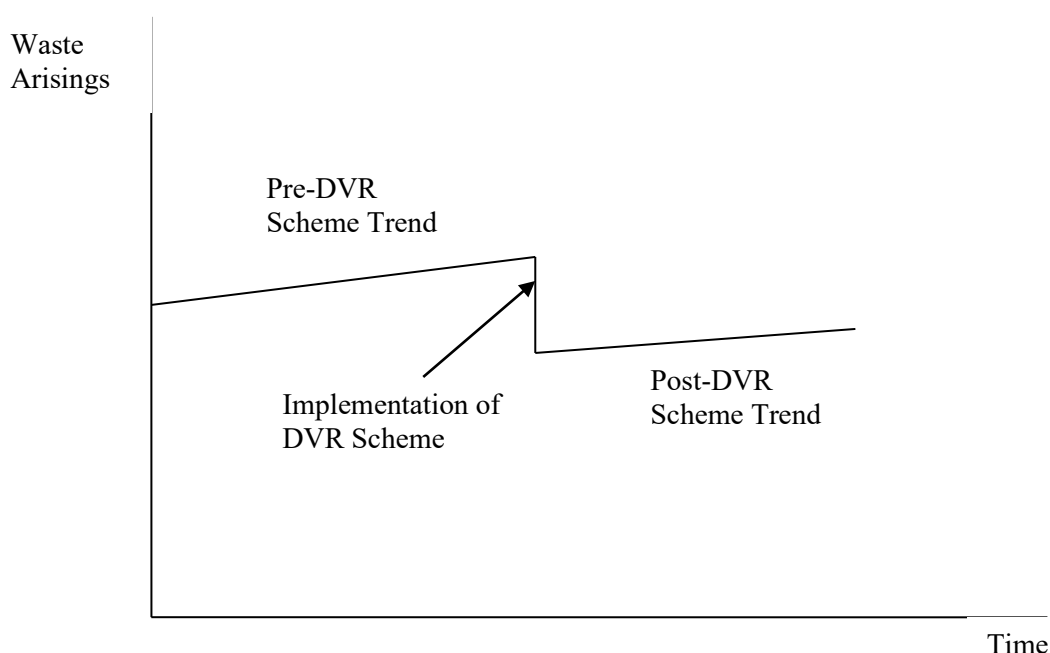
£18.58 / inhabitant), in 1997. This means that the average costs per inhabitant decreased from €32.5 to €28.8, or from £20.97 to £18.58, between 1995 and 1997.

This study has been reported elsewhere as an example of how DVR charging schemes can work. Yet it is not clear, least of all, from the above figures, that it was the charging mechanism itself that played a pivotal role in the changes observed. Many changes were made either before, or during the period in which the new charge system was introduced. This makes it difficult to disaggregate the effects of the DVR scheme from the wider changes which were implemented.

The most significant changes occurred in the first year of full implementation of a number of measures which preceded the DVR scheme's introduction (i.e. change in collection system, education / PR measures etc.). As such, rather than illustrating a significant impact of charging *per se*, the study appears to show the role which charging can play in supporting and sustaining a more comprehensive package of measures designed to incentivise more sustainable behaviour in respect of waste management. It would be interesting to speculate, for example, upon the degree to which performance would have been maintained in the absence of charging, or equivalently, whether additional expenditure on PR etc. would have been needed to maintain the level of performance over time observed under the new DVR charging scheme.

Note that even with the scheme, total waste arisings have crept up in the 1996-98 period. This suggests that DVR schemes may have a 'one-off' effect on arisings in which these effectively ratchet downwards. It may also be that they reduce the rate of growth which occurs following this one-off downward ratcheting in arisings. Figure 2 shows a hypothetical illustration of the effect of DVR schemes.

Figure 2: Hypothesised Effect of DVR Schemes



2.2 Denmark

One study looked at 5 municipalities that had introduced weight-based collection schemes and compared these to 5 municipalities without weight-based schemes.⁹ Two different approaches, one based upon comparative data analysis and the other based upon a questionnaire, were used. Figure 3 shows the results

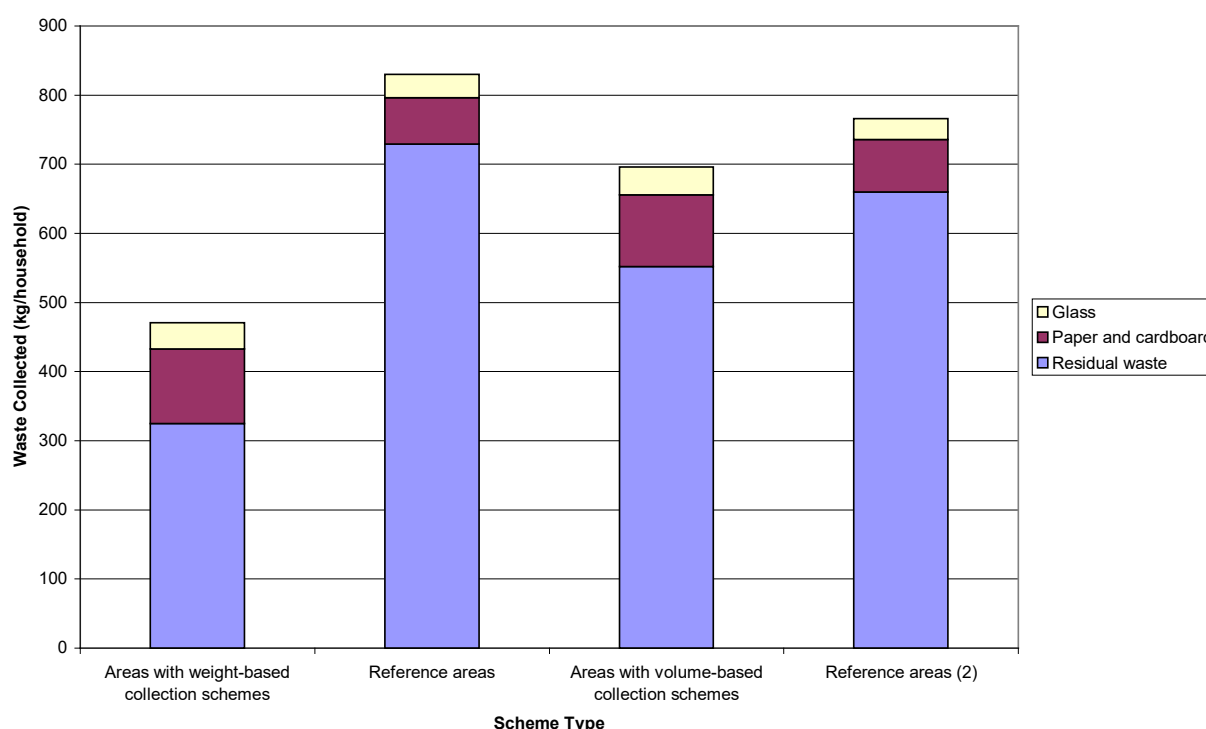
⁹ Danish Environmental Protection Agency (2000) Fordele og ulemper ved gebyrdifferentierede indsamlingssystemer for husholdningsaffald. *Miljøprojekt nr. 576*, 2000. (Study on the advantages and disadvantages of fee-differentiated waste collection schemes for domestic waste from households).

from these systems. It is unusual for DVR schemes to be implemented in the absence of collections for biowaste. The Danish experience, which shows DVR schemes being implemented in the presence of relatively poor systems for separate collection, has produced some effects which are difficult to explain.

In local authority areas with weight-based schemes, the amount of domestic waste collected annually from each household averages 359 kg less than in the reference areas. The difference drops to 279 kg per household a year when allowance is made for there being a higher level of home composting in local authority areas with weight-based schemes than in reference areas.

59% of households in local authority areas with weight-based collection schemes say that they home compost virtually all fruit and vegetable remnants. The corresponding percentage in the reference areas is 21%. The total response rate of the questionnaire was 41%.

Figure 3: Collected Amount of Waste (calculated in kg per household in 1999).



The above study led to further questions being asked concerning the effects of weight-based schemes in Denmark. The second report incorporated information from three sub-studies carried out in the municipalities of Tinglev and Norre Rangstrup. The aim was basically to shed more light upon the issue of the fate of waste which the above study suggested appeared to ‘disappear’ in the case of weight-based schemes. Table 2 lists under various headings the amount of waste recorded in 2000 (up-scaled for one year).

Table 2: Amount of Waste Recorded per Household

Category	Tinglev	Norre Rangstrup
Remaining waste (recorded by the waste analysis in 2001)	318 kg	532 kg
Paper and cardboard (2000)	106 kg	105 kg
Bottles and household glass (2000)	34 kg	32 kg
Remaining waste + paper and glass	458 kg	669 kg
Difference in amount of vegetable food waste and	36 kg	-

garden waste (0.593 kg + 0.093 kg) x 52 weeks		
Total refuse	494 kg	669 kg
Refuse in civic amenity container labelled "combustible" (up-scaled for one year)	74 kg	17 kg
Total	568 kg	685 kg

Source: Danish EPA

This study probably raises as many questions as it answers. Firstly, one has to ask whether the approach – a comparison of two authorities – is really an adequate one from which to draw general conclusions. Secondly, the overall analysis of waste collection (see Table 2) suggests that the separate collection infrastructure is not well-developed in either community. Only paper and card, and glass are collected separately. Thirdly, the attempt in Denmark to have households differentiate between materials which are ‘combustible but not for recycling’, and refuse, is one which seems likely to generate problems since who is to differentiate what should happen to mixed waste, and if the waste is not mixed, why is it ‘combustible’ rather than ‘recyclable’? Presumably, the residual waste is also being incinerated, so it remains unclear as to why it is a problem for the overall system to have material arrive at a civic amenity container or at the doorstep when its ultimate fate is the same.

It might reasonably be asked, therefore, whether the issues being highlighted in the study are not ones which illustrate the shortcomings of the approach to waste collection and of the charging scheme in these areas rather than purporting to show possible problems with weight-based charging. These no doubt exist, but they are likely to be much greater where charges are applied with little scope for their avoidance as appears to be the situation in these cases.

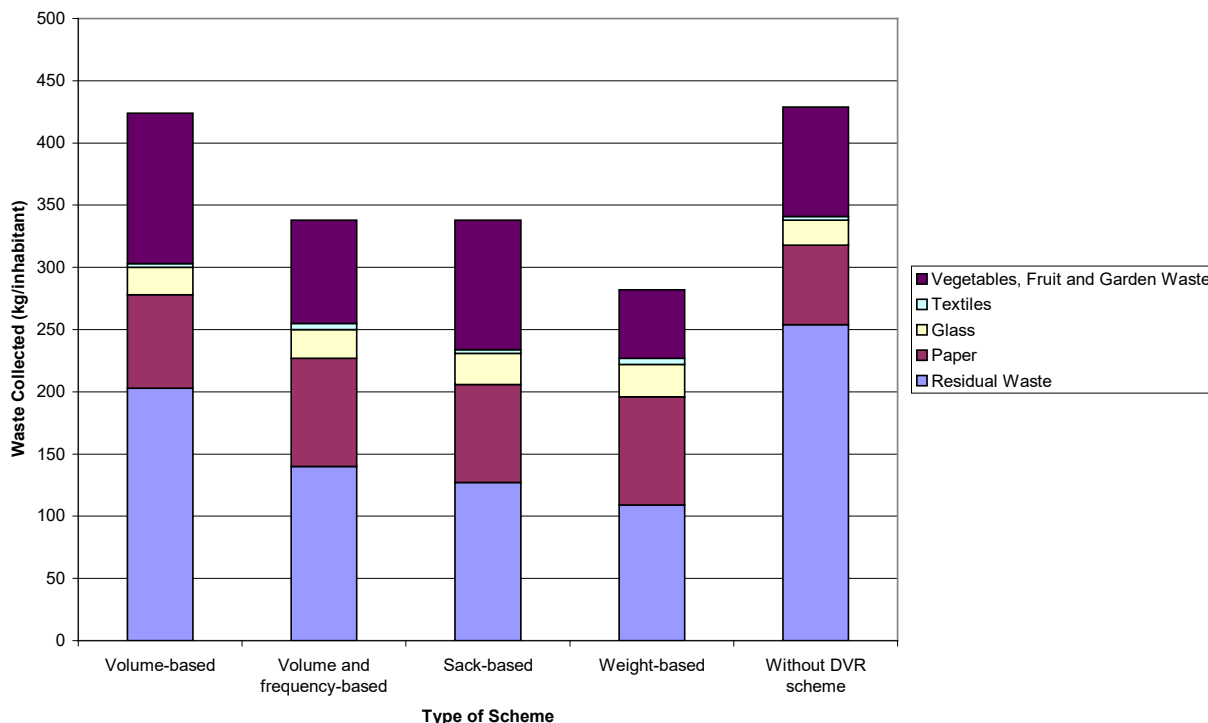
2.3 Netherlands

A study was undertaken for VROM by KPMG in 2001.¹⁰ The principal objectives of the study were to understand the fate of the materials diverted from the residual waste stream, in particular, to understand the degree to which the reduction in refuse collected was due to a) ‘positive’ changes (in respect of genuine waste reduction) and b) ‘negative’ changes (in respect of evasive activities / illegal disposal).

3 types of each of 4 different DVR schemes were examined. Comparative results across the system types were reported in an AOO publication and are shown in Figure 4.

¹⁰ KPMG Bureau voor Economische Argumentatie (2001) Gedragseffecten van Tariefdifferentiatie. The Hague: KPMG.

Figure 4: Quantities of Separated Waste and Refuse by Charge System Type, 1999



Source: AOO (2001) *Afval Informatief, Informatiebulletin, 06, Juin 2001.*

2.4 United States

Several studies of DVR charging schemes (usually referred to in the USA as variable rate pricing, unit pricing, or pay-as-you-throw) have been undertaken. Some of these look to assess householder response in terms of elasticities of demand for refuse disposal services with respect to changing price, and others have been undertaken on a cross-sectional basis, though frequently without reference to the degree to which ‘responses’ are based upon relative prices of the different collection routes (i.e. refuse and source separation).

One of the most recent studies was that carried out by Skumatz.¹¹ The results are shown in Table 3. These effects are not as great as one finds in many cases where DVR schemes are implemented in Europe. Specifically, many weight-based schemes report much higher reductions in waste collected. Skumatz reported in 2002 that no full-scale weight-based programmes were operating in the USA.

¹¹ SERA (2000) *Measuring Source Reduction: Pay as you Throw / Variable Rates as an Example*, Seattle: Skumatz Economic Research Associates.

Table 3: Source Reduction Estimates from Variable-rate Waste Disposal Programmes from Two Estimation Methods

	Community Comparison Method	Time Series Method
Total effect of variable-rate programme	16 %	17.3%
Minus recycling effect for variable rates	5-6%	6.9%
Minus garden-waste effect for variable rates	4-5%	4.6%
Leaves estimate of source-reduction effect attributable to variable rate programs	5-7% from source reduction	5.8% from source reduction

Source: SERA (2000) Measuring Source Reduction: Pay as you Throw / Variable Rates as an Example, Seattle: Skumatz Economic Research Associates.

The above analysis does not illustrate the effect of higher differentials. The Flemish study above illustrated how higher rates payable per bag can have an effect on the response of householders, and economic studies suggest the same. SERA have estimated that a \$1 increase in rate differentials for 30 gallons of service (approx 65p per 140 l) increases recycling by 0.3%. A \$4 (approx £2.50) differential was estimated to lead to an increase in recycling of approximately 3%.

In addition, estimates of how the structure of charges for different container capacities would affect behaviour were made. This form of ‘tariff escalation’ (proportionately higher rates for larger volumes) has been shown to be effective in cities such as Seattle. It is estimated that in systems where the unit payment increases by 10% for higher use rates, so recycling increases by 0.2%. This is an average figure. When communities employing high rates of tariff escalation (those with first containers priced 80% higher than second ones) were examined, this suggested a 4.4% increase in recycling.

3.0 NEW CASE STUDIES

Six case studies were carried out specifically for this study. These studies show a range of technologies and a range of experiences. They were:

1. Gent and Destelbergen (Flanders, Belgium) – a system based upon expensive sacks in the urban centre, and an identification-based system in the suburban area, where households are charged ‘per emptying’ of the bin;
2. Comuni de Navigli (Italy) – a system using a fixed fee and a variable element based purely on expensive sacks;
3. Treviso District (Italy) – where a fixed fee is paid in addition to a fee per emptying of the bin (using an identification system);
4. Landkreis Schweinfurt (Germany) – a system using identification and weight to levy a fee composed of a fixed element (though varying with the choice of bin size), a fee per emptying of the bin, and a weight based charge for the refuse and biowaste systems;
5. Nijmegen (Netherlands) - based upon expensive sacks; and
6. Fingal County (Ireland) – in which a tagged bin scheme is operating.

In the six systems operated above, it is important to understand the way the charge system operates on biowaste. In Nijmegen, there is no charge for biowaste collection. In Gent and Schweinfurt, there are charges. In Treviso and Comuni de Navigli, there is no charge, but discounts are applied for home composters. This is significant since when considered alongside the nature of the biowaste collection system, it appears to have a bearing on the potential for source reduction in the schemes. For example, in both Gent and Schweinfurt, a significant factor explaining source reduction is the reduction in biowaste collection achieved through the application of the DVR scheme. There appears to be an effect in Treviso also, but this is due to a discount applied for home composters. The Treviso scheme differs from that in Comuni de Navigli in that the latter never sought to include garden waste in the doorstep collection system. Hence, even though the Comuni de Navigli also seeks to offer discounts for home composters, the impacts of this incentive on tonnages collected is much less, more or less non-existent, in the area. This merely illustrates the significance of the pre-existing collection scheme in determining the level of dynamic effect one can expect from DVR schemes.¹²

Slightly less significant is the charging regime for other materials. In Gent, packaging waste collections are also charged for, albeit at much lower rates. Indeed, the Gent system uses a mix of tariffs depending upon the area of the City (inner or outer zone – see Table 4). On-vehicle identification systems are used to charge householders per emptying of a given bin in the outer areas, whilst in the inner area, an expensive sack system is used.

Table 4: Structure of Charging System Applied in Gent

Type of waste	Recipient	Volume	Price in BEF (£)
Refuse waste	Sack	15 l	15 (£0.24)
		60 l	25 (£0.40)
		60 l	50 (£0.81)
	Waste bin	40 l	35 (£0.56)
		60 l	50 (£0.81)
		120 l	100 (£1.61)
OSW	Biodegrad. sack	240 l	200 (£3.23)
		15 l	10 (£0.16)
		30 l	20 (£0.32)
	Waste bin	40 l	25 (£0.40)
		60 l	40 (£0.65)
		120 l	80 (£1.29)
PMD	Blue sack	240 l	160 (£2.58)
		60 l	5 (£0.08) max. 3 sacks
Paper/cardboard	-	-	No charge
Glass	-	-	No charge

Some charges are also levied at containerparks (the equivalent of CA sites). Whilst most fractions are accepted free of charge (no residual waste is accepted), bulky fractions and rubble are charged for.

¹² It also re-affirms the significance of the issue of biowaste collection in cost-optimisation of collection schemes, and in constraining growth in waste arisings. We have alluded to this elsewhere – see, for example, D. Hogg (ed.) (2002) *Costs for Municipal Waste Management in the EU*, Final Report by Eunomia Research & Consulting to DG Environment, European Commission; D. Hogg, D. Mansell and Network Recycling (2002) *Maximising Recycling Rates: Tackling Residuals*, Research for the Community Recycling Network by Eunomia Research & Consulting, Avon FoE and Network Recycling; D. Hogg and J. Hummel (2002) *The Legislative Driven Economic Framework Promoting MSW Recycling in the UK*, Final Report to the National Resources and Waste Forum, www.nrwf.org.

Figure 5: Charging Scheme for Households at Gent Containerparks (separate schemes apply to non-household waste)

Wat mag een huisgezin naar het containerpark brengen?

- verschillende afvalsoorten van elkaar scheiden
- grote stukken brandbaar grofvuil eerst demonteren
- veren uit matrassen verwijderen
- géén restafval, katebakvulling, Groente- of Fruitafval

!

- bedien nooit zelf de perscontainers
- roken streng verboden
- kinderen (-12 jaar) niet vrij laten rondlopen
- leg je motor stil bij het lossen van je wagen

vragen?

De containerparkwachter zal je graag helpen.
volledig reglement ter inzage bij de parkwachters

IVAGO
Proeftuinstraat 43, 9000 Gent
tel. 09 240 81 11 - fax 09 240 81 99 - info@ivago.be - www.ivago.be

afvalsoort	alle parken	Gent-Proeftuinstraat en Oostakker Lourdestraat
aard	vrij	
grof	vrij	
groen	vrij	
tuinafval	vrij	
boomstronken	vrij	
snoeihout	vrij	
zuiver steenpuin	max. 10 zakken met inhoud 50 l per dag (0,5 m ³)	meer = 1,35 euro/0,1 m ³
gemengd steenpuin	max. 5 zakken per dag (0,25 m ³)	meer = 2,70 euro/0,1 m ³
gipskarton	max. 0,1 m ³ per dag	meer = 13,3 euro/0,1 m ³
roofing	enkel betalende parken	13,3 euro/0,1 m ³
asbesthoudende platen	enkel betalende parken	5,35 euro/0,1 m ³
timmerhout en planken	vrij	
papier	vrij	
glas	vrij	
flessen en bokalen	vrij	
vlak en vervuld glas	vrij	
metaal	gedemonteerd max. 2 m lang	
elektrische toestellen en apparaten	max. 2 stuks	
grote huishoudapparaten	max. 2 stuks	
tv-schermen en monitoren	max. 2 stuks	
overige kleine apparaten	vrij	
verpakking	PMD	
voertuigonderdelen	zuiver piepschuim	
	max. 2 stuks	
	fretband	
	max. 5 stuks	
	autoband zonder velg	
	max. 5 stuks	
	autoband met velg	
	enkel betalende	
	5 euro/stuk	
	max. 10 l	
KGA	motorolie	max. 6 kg

Tarieven voor niet-huishoudelijke gebruikers* (KMO's, zelfstandigen, bedrijven...)

afvalsoort	tarief
aard	25,00 euro/m ³
grof	27,00 euro/m ³

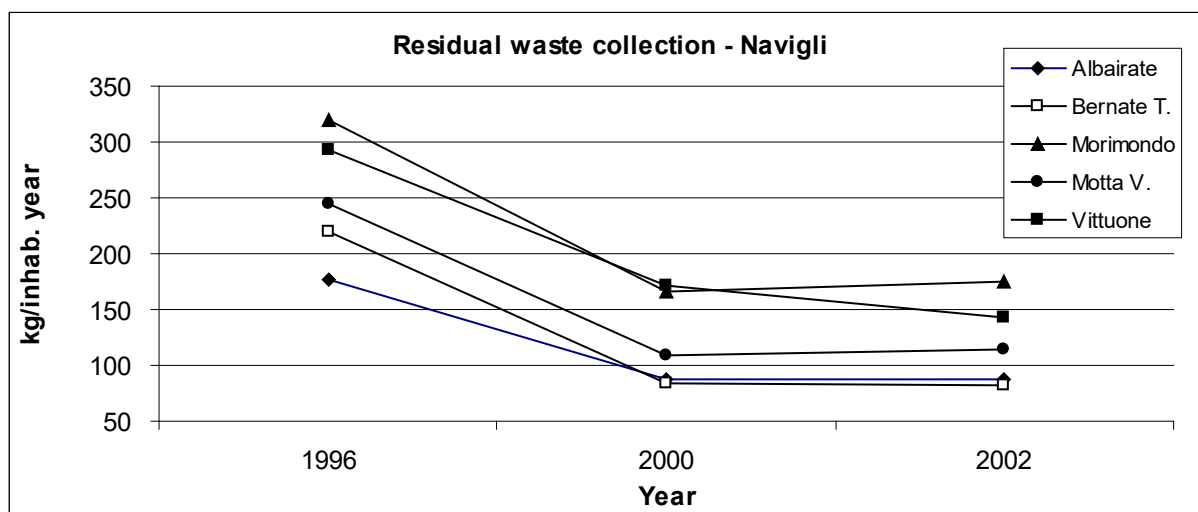
Table 5: Waste Charge for Households - Variable Charges are Estimated Costs– Treviso District (I)

Household	Fixed quota	Variable charge	Total Charge per HH (incl VAT and District tax)	After Reduction for Home Composting	
				only garden waste	food & garden waste
1 pers	€53.08 (£34.25)	€13.40 (£8.65)	75.12 (£48.46)	73.61 (£47.49)	70.58 (£45.53)
2 pers	€53.08 (£34.25)	€26.80 (£17.29)	90.26 (£58.23)	87.24 (£56.28)	81.18 (£52.37)
3 pers	€53.08 (£34.25)	€40.20 (£25.94)	105.41 (£68.01)	100.86 (£65.07)	91.78 (£59.21)
4 pers	€53.08 (£34.25)	€53.60 (£34.58)	120.55 (£77.77)	114.49 (£73.86)	102.38 (£66.05)
5 pers	€53.08 (£34.25)	€67.00 (£43.23)	135.69 (£87.54)	128.12 (£82.66)	112.98 (£72.89)
6 pers	€53.08 (£34.25)	€80.40 (£51.87)	150.83 (£97.31)	141.75 (£91.45)	123.58 (£79.73)

The systems also vary in the extent to which convenient source separation systems exist. In the area which had probably the best system in operation before the DVR scheme was introduced (Comuni de Navigli), the effects on waste quantities, both in terms of reduction and separation, appear to have been limited. The source separation of foodwaste (introduced since 1997) led to a sharp reduction in residual

waste production. On the surface, from the data available, it might appear that the application of a DVR charging system does not seem to further reduce the amount of residual waste, in comparison to the reduction achieved by introducing a quality system of source separation (the DVR scheme was introduced in 2001) (see Figure 6).

Figure 6: Evolution of Residual Waste Collected in (some) Municipalities of Navigli-District (between 1997-1999 door-to-door collection for foodwaste started; between 2001-2002 all municipalities applied a DVR Charge Scheme).



This, however, has to be set against the ongoing increase in the production of total waste. Hence, what appears to be happening here is that the DVR scheme is improving the accuracy of separation as carried out by different premises. Perhaps unsurprisingly given the nature of the system, it is the bulky wastes which are most affected by the scheme. More of this is being collected separately. It should be noted that in other studies such as those carried out in the US, since fly-tipping is often associated with bulky items, the implementation of quality bulky waste collections once DVR schemes are implemented is considered important both for maintaining fly-tipping at low rates, but also, for increasing rates of separate collection.

The effect of the introduction of the DVR scheme on the different routes for MSW collection is shown in detail for 2 of the 13 municipalities in Figure 7. This shows that waste separation and recycling appears to be principally affected by introducing the door-to-door collection of the strategically important (large proportion) waste fractions and less by the application of the DVR scheme.

By contrast, in Gent, increases in source separation occurred, though some of this must be attributed to ongoing changes in the collection infrastructure. The scheme was introduced in 1996. Table 6 shows how the DVR scheme helped to increase source separation rates. The authority also suggests that the scheme helps to stabilise waste arisings (i.e. waste collected is no longer rising).

In Treviso and Landkreis Schweinfurt, source reduction effects appear to be significant. In the former, a 13% reduction was accompanied by a 14% increase in separately collected materials, leading to a residual waste reduction of 27% (see Figure 8). In the latter, a reduction in residual waste collected of 43% was achieved (see Figure 9). Recycling rates increased from 64% before the DVR scheme to 76% after.

Figure 7: Evolution of Different Waste Fractions Collected Before (2000) and After (2002) Introducing a DVR Charge Scheme in 2 Municipalities of Navigli-District;

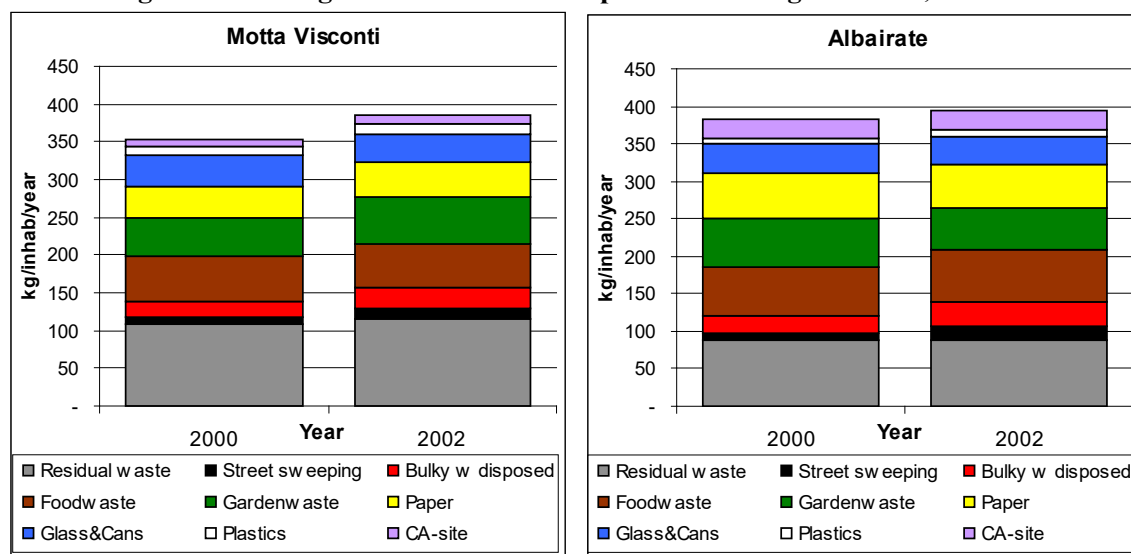


Table 6: Effects on Waste Production (figures are tonnes unless stated)

	1995	1996	1997	1998	1999
Total Refuse (1)					
Yearly tonnages					
Door-to-door	68,967	58,220	49,396	35,824	31,426
Bulky waste	4,466	10,846	10,468	10,874	8,663
Street cleansings	1,252	1500	1,600	1,651	2,271
TOTAL	74,685	70,566	61464	48,349	42,360
Kg per resident					
Door-to-door	300	253	219	160	140
Bulky waste	19	40	46	49	39
Street cleansings	6	7	7	7	10
TOTAL	325	300	272	216	189
Selectively Collected Waste (2)					
TOTAL	30,954	36,764	47,598	58,701	66,941
Kg per resident	135	160	211	261	299
Percentage of Total %	31	35	44	55	61
Total household waste (1+2) (tonnes)	105,639	105,830	107,463	107,050	109,301
ton					
kg per resident	460	460	475	477	487

Figure 8: Evolution of Different Waste Fractions Collected Before (2001) and After (2002) Introducing a DVR Charge in the TV2 District Area – Average Data for 18 Municipalities

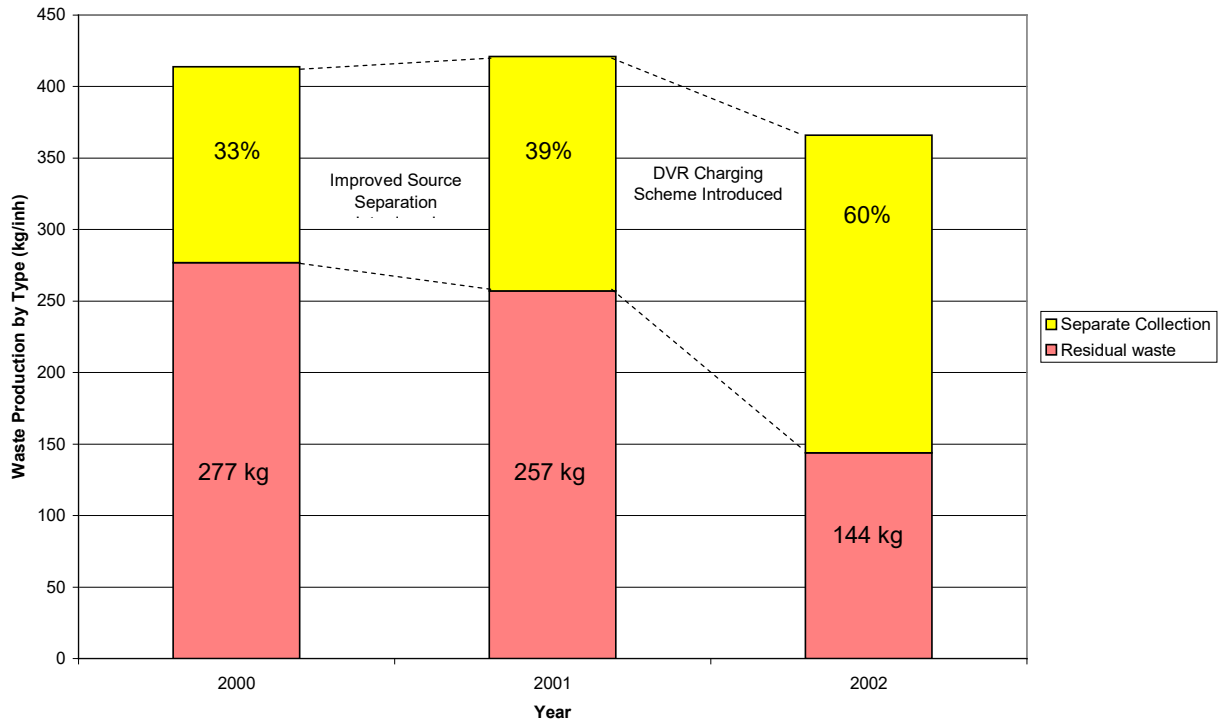
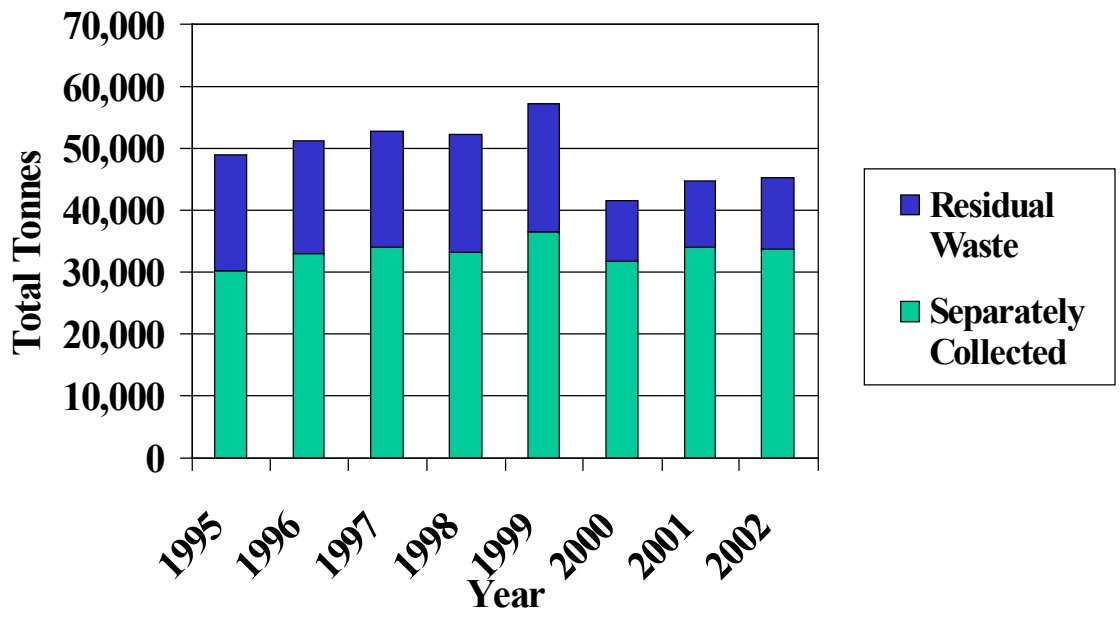


Figure 9: Net Effect of DVR Scheme on Waste Management System in Schweinfurt



The most awkward implementation was in Fingal where a combination of a lack of convenient source separation combined with the absence of appropriate legislation (enabling the local authority to implement sanctions against non-payers) has led to problems of non-payment.

The above comments suggest that the effects have to be understood in the context of the pre-existing source separation scheme. In schemes such as Comuni de Navigli, a system which operates well, and sets out to avoid collecting garden waste, reduces scope for a fall in the quantity of waste collected (because less of the waste collected prior to the scheme can be home composted). In the case of Landkreis Schweinfurt, households were able to reduce total waste quantities from already low levels principally through diverting material from the biowaste bin to their gardens. In Treviso and Gent, the effect of the system has been to improve source separation with some effect on total waste quantities.

Even where the effects on waste flows appear to be relatively insignificant, a number of less obvious benefits arise in the context of these systems. Firstly, awareness among the general public is deepened. Secondly, greater transparency in costs can be attained. Thirdly, the system's operation can be used as a tool to manage the performance of vehicle crews, but also to check on those households who apparently produce very little waste.

The most significant problems in any of the schemes have been those felt in Ireland, for reasons just discussed. In the other cases, fly-tipping is not entirely absent, though the degree to which the DVR scheme increases such activity is believed to be small (it was happening before).

In several of the cases, information provision in the run-up to (and in some cases, following) implementation has been accorded a significant priority. This is an important message for any local authority seeking to introduce such schemes. In Landkreis Schweinfurt, the time elapsing between the decision to implement the scheme and its full implementation was fourteen months, with a thirteen week information campaign targeted at each of 29 communities in the County. In the Italian schemes, information points are a significant element of the new costs incurred in the context of these schemes.

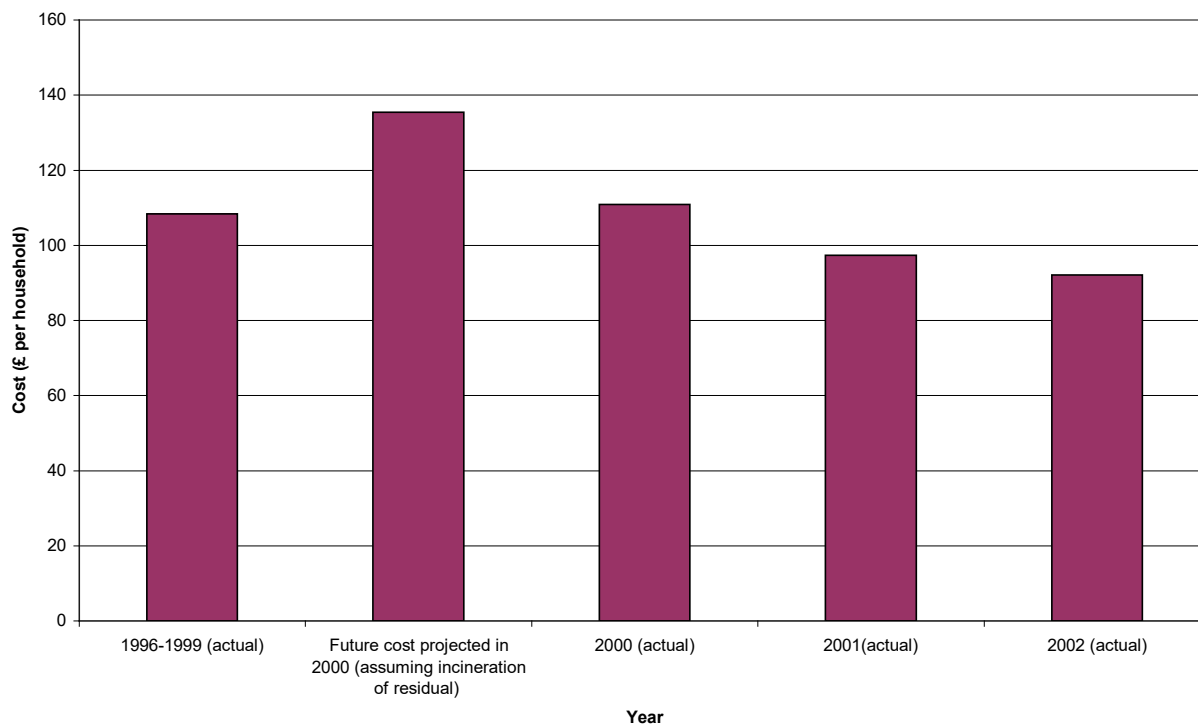
In the majority of the schemes, the cost profile of the systems is viewed favourably. This is especially the case in Gent, where the switch to the DVR scheme was effectively used to generate revenue for the joint public-private company to fund investments elsewhere in the overall waste management system. Even before one considers the revenues, however, the estimated effects of the scheme were to save money because of the avoided refuse collection and disposal costs implied by the system's effects. Savings of approximately £9.38 per household are estimated by the company responsible for the scheme, IVAGO (see Table 7).

Similarly, in Landkreis Schweinfurt, costs for householders have fallen and the system has reduced the costs of waste management for the municipality. Costs for households opting for a 120l bin for refuse and a 120l bin for biowaste are shown in Figure 9. This system – costing approximately £90 for a household opting for this service level – delivers a recycling and composting rate of the order 80%. No other revenue source is received, but the collection of packaging is paid for by the Duales Sytème Deutschland (the organization with responsibility for meeting Germany's packaging recycling and recovery targets).

Table 7: Total Costs, Savings and Revenues of DVR System in Gent (annual)

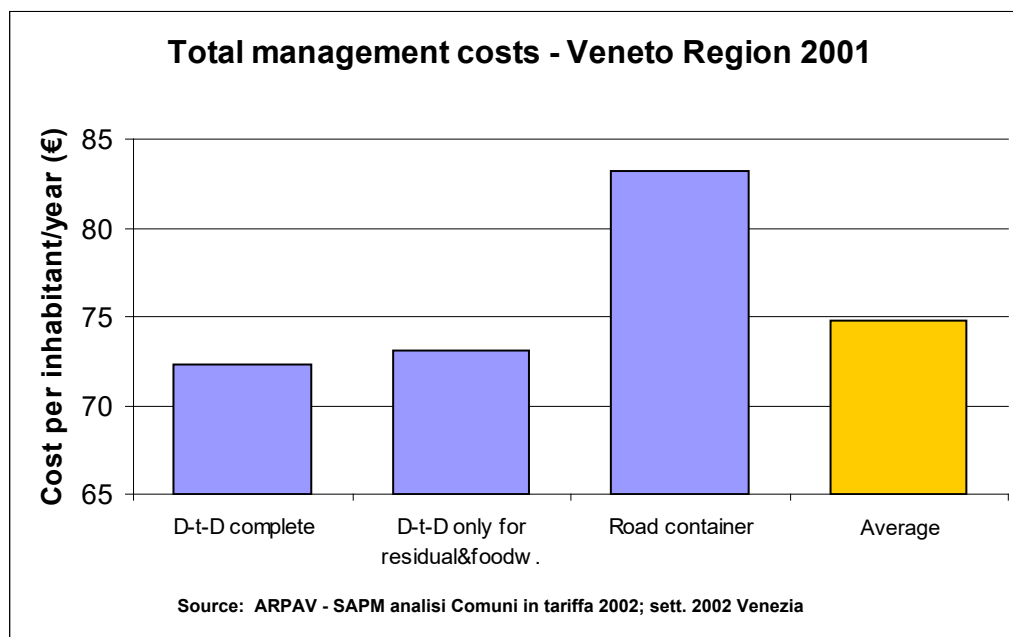
Cost Item	Total Costs (€ and (£))	Costs (£/household, approx)
<i>EXTRA COSTS</i>		
running Diftar system (third party)	€0.7 mn (£0.45 mn)	£4.11
extra in-house administration and follow up of container changes (4 people)	€0.15 mn (£0.1 mn)	£0.88
depreciation of containers	€0.35 mn (£0.23 mn)	£2.05
clean up from evasion of the charge system	€0.3 mn (£0.19 mn)	£1.76
<i>AVOIDED COSTS OF TREATMENT</i>		
- 16.600 tons residual waste	-€2.3 mn (-£1.48 mn)	-£13.49
- 2.400 tons organic waste	-0.2 mn (-£0.13 mn)	-£1.17
<i>LOGISTICS SAVINGS</i>		
fewer people and fewer lorries	-0.6 mn (£0.39 mn)	-£3.51
INCOME FOR TREASURY FROM CHARGES = 1	€5.4 mn (£3.48 mn)	£31.67
<i>TOTAL COSTS</i>	€1.5 mn (£0.97 mn)	£8.80
<i>TOTAL SAVINGS</i>	€3.1 mn (£2.0 mn)	£18.18
COSTS NET OF SAVINGS = 2	-€1.6 mn (-£1.0 mn)	-£9.38
NET EFFECT ON REVENUES = (1 – 2)	+€7.0 mn (+£4.5 mn)	+£41.06

Figure 10: Costs for Households Using 120 l bin for Refuse and 120 l bin for Biowaste, Landkreis Schweinfurt (DVR scheme implemented in 2000)



The Italian experience is perhaps more relevant for the UK in this context since disposal fees tend to be not so dissimilar to those in the UK. Here, the focus has been on low-capital cost systems, using sack-based, or in exceptional cases, bin identification systems, as the implementing tools. There has been a tendency to steer clear of the higher capital cost on-vehicle weighing approaches. Again, the net effect of implementing DVR schemes in Italy tends to be a fall in overall costs. A qualitative evaluation of the Treviso experience compares the total management cost (£60 per inhabitant per year, or approximately £40 per inhabitant per year) in the district with those determined by the Environmental Agency of Veneto-Region for 2001 (ARPAV). The Agency analysed the financial plans of about 90 municipalities of the Region. Some of the municipalities considered are not applying DVR schemes. Even so, the (total) cost of the Treviso district are competitive with those of other waste management schemes of the same Region (see Figure 11).

Figure 11: Management Costs for Veneto Region, 2001



Evidence in this research, and in the German case study, suggests that the effect on waste arisings of weight-based systems may be greater. Much depends, however, on the magnitude of the incentive that can be safely applied (i.e. without jeopardizing revenue stability), and the scope for large incentives at current disposal costs in the UK may be somewhat limited. In addition, to the extent that there are still concerns regarding the ‘disappearing waste’ in DVR schemes, these are likely to be heightened in cases claiming high levels of source reduction. Even so, it is from our Landkreis Schweinfurt study that even close examination of the possible illegitimate routes which such wastes might have followed tends to support the view that through careful preparation and implementation, systems do not tend to generate the negative outcomes which many suspect that they must.

4.0 COSTS OF CHARGING SYSTEMS

The costs of charging systems are not amenable to easy generalizations. Of course, costs will vary with the nature of the system being implemented, but equally, in order to understand the *incremental* costs associated with the scheme’s implementation, one needs to understand the new system in the context of what existed before. For example, if an authority sought to implement a weight based system, whether it was changing *from* a bin or a sack-based scheme would affect the incremental costs of implementation. In such cases, the collection system is effectively changing at the same time as the DVR scheme is implemented.

Generally, we differentiate between:

- **Static costs**, understood as the incremental costs of vehicle adaptation where relevant, incremental costs of additional staff time in collection process (tagging etc.) and in ‘regulation’ of scheme, enforcement, costs of administering the scheme (including additional time for admin staff and billing mechanisms); and

- **Dynamic costs**, understood to cover the overall impact on total system costs. This includes changes in cost associated with the impact of the scheme on the quantity of waste collected, such as changes in quantities of residual waste and materials separately collected, savings associated with waste reduction (in the context of measurement against what would have occurred in the absence of the scheme), savings associated with avoided residual waste collection and disposal, and any costs associated with additional clean-up / enforcement associated with policing attempts to evade the charge scheme.

Note that the costs net of the revenue generated by the DVR charge payments depend upon the way in which revenues are treated. Strictly speaking, if they are to be treated as a charge, the revenues should all be used to fund the service being provided.

A model was developed which projects the costs of specific systems under different assumptions concerning the collection system and disposal costs. The costs projected are simply representative costs and represent attempts to bring together information from system providers, case studies discussed above and elsewhere, and typical scheme impacts.

4.1 Results

4.1.1 Comparative Analysis

For comparison, we show below all systems performing with the same response. This is given as 6% source reduction, 5% increase in composting and 5% increase in recycling, in line with US systems. On the one hand, this analysis may be ‘unfair’ to the extent that it denies the differences in the systems. On the other, it has the merit of revealing some of the influences on costs.

In our modelling, the costs are much higher than is estimated for US systems. Note, however, the difference in the ‘net costs before accounting for collection system changes’, and the ‘net increase’ after accounting for these. The former situation show costs of the order £1.66 per inhabitant assuming relatively high billing costs, £2.50 per household spend on information provision and an additional £1.00 per household spent on follow up of evasion. These are relatively generous rates.

In most costings examined by us, relatively little account is taken of the change in costs of operating the separate collection systems. Whilst it is possible that these might exhibit no significant increase before and after the DVR charging scheme’s introduction, this would imply a relatively low efficiency of logistics prior in the pre-scheme phase. If it is the case that savings can be made on the refuse collection logistics, it seems correct, to us, to allow for a higher cost of collection of source separated fractions, and for the treatment of biowastes, in the wake of introducing DVR schemes. It is quite possible, however, that this might be ‘discounted’ as at least a more desirable expenditure increase than other means of treating municipal waste.

Even a £6.67 per household outlay for a 13% increase in recycling rate, and a 6% reduction in waste arisings might be considered ‘good value for money’ in the current context. The sack-based schemes deliver this for £4.07 per household. If one was to assume a landfill tax rate of £35 per tonne, and a background disposal cost of the order £50 per tonne, the net costs fall to £0.87 per household for the sack-based scheme and £3.47 for the weight-based scheme. We re-emphasise here that these are deliberately costed on the high side, but other schemes frequently start from a more healthy position than many UK authorities in terms of, for example, provision for informing and educating citizens.

Table 8: Comparative Analysis of DVR Schemes, Current Disposal Costs, Equal Dynamic Performance

	Weight-based	ID (expensive)	ID (cheap)	Sack
Source Reduction Effect	6%	6%	6%	6%
Recycling Effect	5%	5%	5%	5%
Effect on Separate Collection of Biowastes	5%	5%	5%	5%
Effect on Separate Collection of Recyclables	16%	16%	16%	16%
Disposal Cost (per tonne)	£30.00	£30.00	£30.00	£30.00
Efficiency of Logistical Savings	50%	50%	50%	50%
Total Cost Per Household (admin, incl. billing, and chip)	£3.07	£2.93	£2.93	£1.54
Savings on Refuse Collection (net of costs of equipping vehicle)	£-1.68	£-2.01	£-2.67	£-2.75
Savings on Refuse Disposal	£-4.80	£-4.80	£-4.80	£-4.80
Increase in Composting Costs (assuming 'meat included')	£2.00	£2.00	£2.00	£2.00
Additional Monitoring of Evasion	£1.00	£1.00	£1.00	£1.00
Information Provision	£2.50	£2.50	£2.50	£2.50
Net Costs Before Accounting for Collection System Changes	£2.09	£1.62	£0.96	£-0.51
Increase in Costs of Recycling Provision	£2.08	£2.08	£2.08	£2.08
Increase in Costs of Compost Collection Provision	£2.50	£2.50	£2.50	£2.50
Net Increase	£6.67	£6.20	£5.54	£4.07
Charge	£20.80	£27.60	£27.60	£31.20
Preceding Collection and Disposal	£66.04	£66.04	£66.04	£66.04
New Cost	£72.72	£72.24	£71.58	£70.11
Required Flat-rate fee	£51.92	£44.64	£43.98	£38.91
Source Separation Before DVR	32%	32%	32%	32%
Source Separation After DVR	45%	45%	45%	45%

It should be noted, however, that in studies undertaken, the impact of weight-based schemes in terms of source reduction tends to be greater than for other schemes. This would imply that although the weight-based systems appear relatively expensive in this comparison, the situation might be different if one accounted for the distinct dynamic effects of the various DVR schemes.

Clearly, the dynamic influence of any scheme depends upon many factors, not least of these being the nature of the incentive mechanism confronting householders, but also including the nature of the collection scheme prior to the DVR scheme's introduction. Below, in Table 9, we estimate the costs of systems delivering different rates of performance as set out in the top rows of the Table. The figures used reflect the effects of schemes studied in the full report.

As can be seen from the above, the net costs of more capital intense systems may be lower once the dynamic effects are factored in. The performance of the weight-based scheme assumed in the above Table assumes a charge is in place on biowaste collection, so that the increase in the quantity of material delivered into the biowaste collection is small. The effect is to increase home composting and improve the accuracy of separation of the biowaste which is not home composted.

Table 9: Comparative Analysis of DVR Schemes, Increased Disposal Costs, Equal Dynamic Performance

	Weight-based	ID (expensive)	ID (cheap)	Sack
Source Reduction Effect	25%	13%	13%	6%
Recycling Effect	5%	7%	7%	5%
Effect on Separate Collection of Biowastes	3%	7%	7%	5%
Effect on Separate Collection of Recyclables	33%	27%	27%	16%
Disposal Cost (per tonne)	£30.00	£30.00	£30.00	£30.00
Efficiency of Logistical Savings	50%	50%	50%	50%
Total Cost Per Household (admin, incl. billing, and chip)	£3.07	£2.93	£2.93	£1.54
Savings on Refuse Collection (net of costs of equipping vehicle)	-£5.77	-£4.47	-£5.04	-£2.75
Savings on Refuse Disposal	-£9.90	-£8.10	-£8.10	-£4.80
Increase in Composting Costs (assuming 'meat included')	£1.20	£2.80	£2.80	£2.00
Additional Monitoring of Evasion	£1.00	£1.00	£1.00	£1.00
Information Provision	£2.50	£2.50	£2.50	£2.50
Net Costs Before Accounting for Collection System Changes	-£7.90	-£3.34	-£3.91	-£0.51
Increase in Costs of Recycling Provision	£2.08	£2.92	£2.92	£2.08
Increase in Costs of Compost Collection Provision	£1.50	£3.50	£3.50	£2.50
Net Increase	-£4.32	£3.07	£2.50	£4.07
Charge	£14.00	£21.60	£21.60	£31.20
Preceding Collection and Disposal	£66.04	£66.04	£66.04	£66.04
New Cost	£61.72	£69.12	£68.55	£70.11
Required Flat-rate fee	£47.72	£47.52	£46.95	£38.91
Source Separation Before DVR	32%	32%	32%	32%
Source Separation After DVR	53%	53%	53%	45%

4.2 Summary

The costings set out above are not strictly accurate in respect of the increased costs of source separation infrastructure. These costs will be affected by the effects of the schemes on specific materials, notably, the material specific effects in respect of capture rates of source separated fractions. They do, however, give an indication of what might be achieved through such systems. Savings are clearly possible when employed, especially as the costs of residual waste management increase. In our Gent study, savings of the order £9 per household were estimated. In the Landkreis Schweinfurt system, the saving was closer to £4 per household, but this system started from a position of high recycling and already low residual waste per inhabitant.

The notion that DVR systems are expensive is not borne out by experience. The literature alludes to many instances where the dynamic effects of the system imply savings (notably on refuse collection and disposal) which outweigh the static costs associated with the scheme's introduction. Even the more sophisticated schemes may generate net savings. However, many of the reports do not obviously estimate the increase in collection costs which might be associated with the increased quantity of material collected through source separation routes. In our analysis above, the systems most likely to generate net savings are those which have effects on source reduction which are proportionately greater than their effects on the quantity of materials collected through source separation routes. In the literature, these tend to be the weight-based schemes, which generate larger reductions in waste arisings, but smaller effects on

the quantity of material collected for source separation (presumably because although the proportion of the available material which is collected separately may have increased, the quantity of material available for capture has fallen, so absolute quantities remain quite similar).

Given the dynamic effects, these systems appear, on average, to generate effects which are worth the potentially small, or even negative, marginal costs. Furthermore, from the local authority's point of view, any increase in cost can be offset by revenue generated by the charge (which is what charge revenue is intended for – i.e, funding the provision of a service). This may be a means by which to generate additional revenue to support other activities in the period immediately following implementation, including, for example, increased efforts in enforcement and prosecution in respect of fly-tipping where this is believed likely to be of concern. All experience, however, suggests that this is not a major issue. Fly-tipping is principally related to commercial and bulky wastes, so as long as provision for collection of the latter through bulky waste collections and recycling parks / CA sites is present, the problem can be kept in check. Other communities have found that one or two high-profile fines / prosecutions can also help to maintain discipline in this context.

Where DVR schemes are concerned, higher disposal costs are not so much necessary as desirable, since they accentuate the benefits of the avoided disposal costs occasioned by the increases in source separation and the source reduction driven by the charging scheme. At a £35 landfill tax, the DVR schemes begin to look much more cost-effective. The higher avoided disposal costs make the logic of such systems even more compelling.

It is interesting to speculate as to the effects of DVR schemes in the current context, and that of a higher disposal cost in future. The Strategy Unit Report recently suggested that it would like to see 30% of all local authorities trialling incentive schemes by 2006.¹³ In what follows, we project the effects of this at current levels of arisings of municipal waste in the UK. We also calculate a benefit:cost ratio for the implementation of such schemes.¹⁴

The results are shown in Table 10. For a net cost of just over £14 million, benefits of £112-319 million are generated. This is associated with an increase in the national recycling rate from 32% to 37%, and a reduction in residual waste of 7% of the pre-scheme level. The implied benefit:cost ratio is between 8:1 and 22:1. Of course, at higher disposal costs, the benefit:cost ratio can become negative (since the net costs fall below zero). In this case, the net costs are negative, whilst generating the same benefits of £319 million are generated (see Table 11). The benefit cost ratio loses much of its meaning because of this net fall in costs.

Table 10: Costs and Benefits of 30% Coverage of Households Through DVR Schemes, Current Disposal Costs

¹³ In the full report, we argue that so called 'positive incentive' schemes are likely to be a poor use of financial resources. They seem to require a fund to be developed to pay for the positive changes in behaviour before any change has been generated. They appear to be mechanisms designed to side-step the lack of the relevant enabling legislation allowing DVR schemes to be introduced. Furthermore, they establish 'disposal' as the norm, with separation being rewarded, whereas DVR schemes establish 'disposal' as something to be paid for, with separation behaviour being rewarded by collections which are either free, or lower in cost. This is an important distinction to be made if it is intended that recycling should become 'the norm' rather than something which people are paid to do.

¹⁴ The environmental benefits are calculated on the basis of a review of published studies. Approximate figures are used for the benefits of recycling a typical tonne of waste (£100 per tonne), the benefits of composting a typical tonne of waste (approx £3 per tonne), and the benefits of source reduction (approx. £200 per tonne). Because source reduction may be due primarily to increases in home composting, low and figures are calculated on the basis that 20% and 100%, respectively, of the source reduction delivers the suggested benefit of £200 per tonne.

	Costs (per household unless stated)					
	Weight-based	ID (cap int)	ID (lab int)	Sack		
Dynamic Effect						
Source Redn	25%	13.00%	13.00%	6.00%		
Recycling	5%	7.00%	7.00%	5.00%		
Compost	3%	7.00%	7.00%	5.00%		
Net Residual Effect	33%	27.00%	27.00%	16.00%		
Disposal Cost (per tonne)	£30.00	£30.00	£30.00	£30.00		
Efficiency of Logistical Savings	50%	50%	50%	50%		
Total Cost Per Household (admin, incl. billing, and chip)	£3.07	£2.93	£2.93	£1.54		
Savings on Refuse Collection (net of costs of equipping vehicle)	£-5.77	£-4.47	£-5.04	£-2.75		
Savings on Refuse Disposal	£-9.90	£-8.10	£-8.10	£-4.80		
Increase in Composting Costs	£1.20	£2.80	£2.80	£2.00		
Additional Monitoring of Evasion	£1.00	£1.00	£1.00	£1.00		
Information Provision	£2.50	£2.50	£2.50	£2.50		
Net Costs Before Accounting for Collection System Changes	£-7.90	£-3.34	£-3.91	£-0.51		
Increase in Costs of Recycling Provision	£2.08	£2.92	£2.92	£2.08		
Increase in Costs of Compost Collection Provision	£1.50	£3.50	£3.50	£2.50		
Net Increase	£-4.32	£3.07	£2.50	£4.07		
Charge	£14.00	£21.60	£21.60	£31.20		
Preceding Collection and Disposal	£66.04	£66.04	£66.04	£66.04		
New Cost	£61.72	£69.12	£68.55	£70.11		
Required Flat-rate fee	£47.72	£47.52	£46.95	£38.91		
Source Separation Before DVR	32%	32%	32%	32%	32%	
Source Separation After DVR	53%	53%	53%	45%	32%	
						TOTALS
Current Waste Arisings (tonnes)	34,000,000	34,000,000	34,000,000	34,000,000	34,000,000	34,000,000
Scenario 1						
Households Covered (24 million in total)	5%	5%	10%	10%	70%	
Waste Covered Before	1,700,000	1,700,000	3,400,000	3,400,000	23,800,000	34,000,000
Recycling at 32%	544,000	544,000	1,088,000	1,088,000	7,616,000	10,880,000
Residual Waste Before DVR	1,156,000	1,156,000	2,312,000	2,312,000	16,184,000	23,120,000
Waste Arisings After	1,275,000	1,479,000	2,958,000	3,196,000	23,800,000	32,708,000
Recycling After DVR	680,000	782,000	1,564,000	1,428,000	7,616,000	12,070,000
Residual Waste After DVR	595,000	697,000	1,394,000	1,768,000	16,184,000	20,638,000
Increase in Recycling Rate						5%
Reduction in Residual Waste (absolute)						2,482,000
Reduction in Residual Waste (as % original)						7%
Net Costs (£ millions)	£-5.18	£3.69	£6.01	£9.77	£0.00	£14.28
Estimated Environmental Benefit, Recycling (£ millions)						£60.39
Estimated Environmental Benefit, Source Reduction (low, £ millions)						£51.68
Estimated Environmental Benefit, Source Reduction (high, £ millions)						£258.40
Total Benefits (low, £ millions)						£112.07
Total Benefits (high, £ millions)						£318.79
Net Benefit:Cost Ratio (low)						7.85
Net Benefit:Cost Ratio (high)						22.32

Table 11: Costs and Benefits of 30% Coverage of Households Through DVR Schemes, Increased Disposal Costs

	Costs (per household unless stated)						
	Weight-based	ID (cap int)	ID (lab int)	Sack			
Dynamic Effect							
Source Redn	25%	13.00%	13.00%	6.00%			
Recycling	5%	7.00%	7.00%	5.00%			
Compost	3%	7.00%	7.00%	5.00%			
Net Residual Effect	33%	27.00%	27.00%	16.00%			
Disposal Cost (per tonne)	£50.00	£50.00	£50.00	£50.00			
Efficiency of Logistical Savings	50%	50%	50%	50%			
Total Cost Per Household (admin, incl. billing, and chip)	£3.07	£2.93	£2.93	£1.54			
Savings on Refuse Collection (net of costs of equipping vehicle)	-\$5.77	-\$4.47	-\$5.04	-\$2.75			
Savings on Refuse Disposal	-\$16.50	-\$13.50	-\$13.50	-\$8.00			
Increase in Composting Costs	£1.20	£2.80	£2.80	£2.00			
Additional Monitoring of Evasion	£1.00	£1.00	£1.00	£1.00			
Information Provision	£2.50	£2.50	£2.50	£2.50			
Net Costs Before Accounting for Collection System Changes	£-14.50	£-8.74	£-9.31	£-3.71			
Increase in Costs of Recycling Provision	£2.08	£2.92	£2.92	£2.08			
Increase in Costs of Compost Collection Provision	£1.50	£3.50	£3.50	£2.50			
Net Increase	£-10.92	£-2.33	£-2.90	£0.87			
Charge	£14.00	£21.60	£21.60	£31.20			
Preceding Collection and Disposal	£79.64	£79.64	£79.64	£79.64			
New Cost	£68.72	£77.32	£76.75	£80.51			
Required Flat-rate fee	£54.72	£55.72	£55.15	£49.31			
Source Separation Before DVR	32%	32%	32%	32%	32%		
Source Separation After DVR	53%	53%	53%	45%	32%		
						TOTALS	
Current Waste Arisings (tonnes)	34,000,000	34,000,000	34,000,000	34,000,000	34,000,000	34,000,000	
Scenario 1							
Households Covered (24 million in total)	5%	5%	10%	10%	70%		
Waste Covered Before	1,700,000	1,700,000	3,400,000	3,400,000	23,800,000	34,000,000	
Recycling at 32%	544,000	544,000	1,088,000	1,088,000	7,616,000	10,880,000	32%
Residual Waste Before DVR	1,156,000	1,156,000	2,312,000	2,312,000	16,184,000	23,120,000	68%
Waste Arisings After	1,275,000	1,479,000	2,958,000	3,196,000	23,800,000	32,708,000	96%
Recycling After DVR	680,000	782,000	1,564,000	1,428,000	7,616,000	12,070,000	37%
Residual Waste After DVR	595,000	697,000	1,394,000	1,768,000	16,184,000	20,638,000	63%
Increase in Recycling Rate							5%
Reduction in Residual Waste (absolute)							2,482,000
Reduction in Residual Waste (as % original)							7%
Net Costs (£ millions)	£-13.10	£-2.79	£-6.95	£2.09	£0.00	£-20.76	
Estimated Environmental Benefit, Recycling (£ millions)						£60.39	
Estimated Environmental Benefit, Source Reduction (low, £ millions)						£51.68	
Estimated Environmental Benefit, Source Reduction (high, £ millions)						£258.40	
Total Benefits (low, £ millions)						£112.07	
Total Benefits (high, £ millions)						£318.79	
Net Benefit:Cost Ratio (low)						-5.40	
Net Benefit:Cost Ratio (high)						-15.36	

Once disposal costs are at £50 per tonne or so, than as household coverage is extended more uniformly, so the benefits increase, and the costs fall. Indeed, in net terms, the costs turn negative. At 70% coverage, in the Scenario below (Table 12), the benefits are estimated to be in the range £258-723 million. At the higher end of the range, this is approaching half the current bill for municipal waste management in the UK. This is a staggering figure, and one which places concerns regarding implementation costs into perspective. Residual waste requiring disposal falls by almost 6 million tonnes, or 16% of the total quantity of waste. Costs of implementation there may be, but the net financial costs are low, and negative at higher disposal costs. Factoring in external benefits makes not doing this seem a strange decision.

Of course, the modelling as carried out here is somewhat speculative. It makes certain assumptions concerning behavioural change which might not be borne out in practice. Indeed, as we have suggested elsewhere, responses are strongly conditioned by the ability of householders to respond in terms of source separation and opportunities for waste reduction. However, these figures are indicative of what is achieved in systems examined in this report.

One of the key constraints on adoption of DVR schemes in the UK at present would, or certainly *ought* to be, the relative paucity of high quality collection systems. Optimal functioning of these systems occurs in the context of separate collection systems for most of the key dry recyclable fractions, as well as

biowastes (either kitchen only, or kitchen and garden waste), at the doorstep, and with Civic Amenity sites being re-configured to collect separately a whole range of other materials besides.

Table 12: Costs and Benefits of 70% Coverage of Households Through DVR Schemes, Increased Disposal Costs

	Costs (per household unless stated)						
	Weight-based	ID (cap int)	ID (lab int)	Sack			
Dynamic Effect							
Source Redn	25%	13.00%	13.00%	6.00%			
Recycling	5%	7.00%	7.00%	5.00%			
Compost	3%	7.00%	7.00%	5.00%			
Net Residual Effect	33%	27.00%	27.00%	16.00%			
Disposal Cost (per tonne)	£50.00	£50.00	£50.00	£50.00			
Efficiency of Logistical Savings	50%	50%	50%	50%			
Total Cost Per Household (admin, incl. billing, and chip)	£3.07	£2.93	£2.93	£1.54			
Savings on Refuse Collection (net of costs of equipping vehicle)	£-5.77	£-4.47	£-5.04	£-2.75			
Savings on Refuse Disposal	£-16.50	£-13.50	£-13.50	£-8.00			
Increase in Composting Costs	£1.20	£2.80	£2.80	£2.00			
Additional Monitoring of Evasion	£1.00	£1.00	£1.00	£1.00			
Information Provision	£2.50	£2.50	£2.50	£2.50			
Net Costs Before Accounting for Collection System Changes	£-14.50	£-8.74	£-9.31	£-3.71			
Increase in Costs of Recycling Provision	£2.08	£2.92	£2.92	£2.08			
Increase in Costs of Compost Collection Provision	£1.50	£3.50	£3.50	£2.50			
Net Increase	£-10.92	£-2.33	£-2.90	£0.87			
Charge	£14.00	£21.60	£21.60	£31.20			
Preceding Collection and Disposal	£79.64	£79.64	£79.64	£79.64			
New Cost	£68.72	£77.32	£76.75	£80.51			
Required Flat-rate fee	£54.72	£55.72	£55.15	£49.31			
Source Separation Before DVR	32%	32%	32%	32%	32%		
Source Separation After DVR	53%	53%	53%	45%	32%		
							TOTALS
Current Waste Arisings (tonnes)	34,000,000	34,000,000	34,000,000	34,000,000	34,000,000		34,000,000
Scenario 1							
Households Covered (24 million in total)	10%	10%	25%	25%	30%		
Waste Covered Before	3,400,000	3,400,000	8,500,000	8,500,000	10,200,000		34,000,000
Recycling at 32%	1,088,000	1,088,000	2,720,000	2,720,000	3,264,000		10,880,000
Residual Waste Before DVR	2,312,000	2,312,000	5,780,000	5,780,000	6,936,000		23,120,000
Waste Arisings After	2,550,000	2,958,000	7,395,000	7,990,000	10,200,000		31,093,000
Recycling After DVR	1,360,000	1,564,000	3,910,000	3,570,000	3,264,000		13,668,000
Residual Waste After DVR	1,190,000	1,394,000	3,485,000	4,420,000	6,936,000		17,425,000
Increase in Recycling Rate							12%
Reduction in Residual Waste (absolute)							5,695,000
Reduction in Residual Waste (as % original)							17%
Net Costs (£ millions)	£-26.21	£-5.58	£-17.38	£5.23	£0.00		£-43.94
Estimated Environmental Benefit, Recycling (£ millions)							£141.49
Estimated Environmental Benefit, Source Reduction (low, £ millions)							£116.28
Estimated Environmental Benefit, Source Reduction (high, £ millions)							£581.40
Total Benefits (low, £ millions)							£257.77
Total Benefits (high, £ millions)							£722.89
Net Benefit:Cost Ratio (low)							-5.87
Net Benefit:Cost Ratio (high)							-16.45

5.0 SURVEY OF LOCAL AUTHORITY REPRESENTATIVES

In order to inform our understanding of potential barriers to the implementation of DVR schemes in the UK, feedback has been sought from a number of local authority representatives. The survey focused primarily on collection authorities (WCAs) in the UK. The sample included one authority from each of Northern Ireland, Scotland and Wales. English WCAs were selected using a judgmental approach supplemented with an element of stratification to reflect the distribution of different types (one or two tier) of authorities. One Waste Disposal Authority was also included in the sample.

In total, 65 interviews were carried out with local authority representatives. In order to obtain a range of views from within a single authority, it was the intention to interview four individuals occupying specific positions within each organisation. In practice, it proved extremely difficult to arrange appointments with Chief Executives and out of the 24 contacted only 10 agreed to an interview. The majority declined on the basis that they were either too busy or did not generally participate in surveys. It also proved difficult to contact council leaders due to their multiple commitments.

The following interviews were carried out across a total of 24 authorities:

Chief Executives	10
Council Leaders	13
Heads of Waste Service	23
Environment Portfolio Holders	18
JWDA Chairman	1

Local authorities were selected to cover a range of authority types and included 2 London Boroughs, 2 Metropolitans, 4 Unitaries, 23 Waste Collection Authorities and 1 Waste Disposal Authority. The sample included authorities with low, medium and high recycling rates.

The questionnaire covered four main topic areas:

- general awareness of charging systems
- issues relating to existing approaches of local authorities to waste reduction and charging
- perceived obstacles, benefits and disbenefits associated with charging systems
- issues relating to the distribution of fixed and variable elements of the charge and its collection

The following sub-sections discuss some of the key issues arising from the interview process

5.1 Why Schemes Exist Elsewhere But Not in the UK

We asked those interviewed what they thought were the motivations behind the implementation of charging schemes in other countries (Figure 10). Most responded that they thought the schemes existed to generate incentives for households to recycle more and/or minimise waste.

When asked why these schemes do not exist in the UK, relatively few gave ‘the obvious’ answer that such schemes are prevented by law (see Figure 11). However, around 30% of respondents from all categories cited the lack of leadership and political will displayed at the national level.

The main reason given by all groups was the view that the public expect the costs of waste management to be included in the Council Tax as has traditionally been the case. Also ranking high was the view that

the political concerns of councillors prevented implementation. Direct charging was seen as a potential vote-loser.

Figure 12: Understanding of Motivation for Introducing Charging Schemes elsewhere

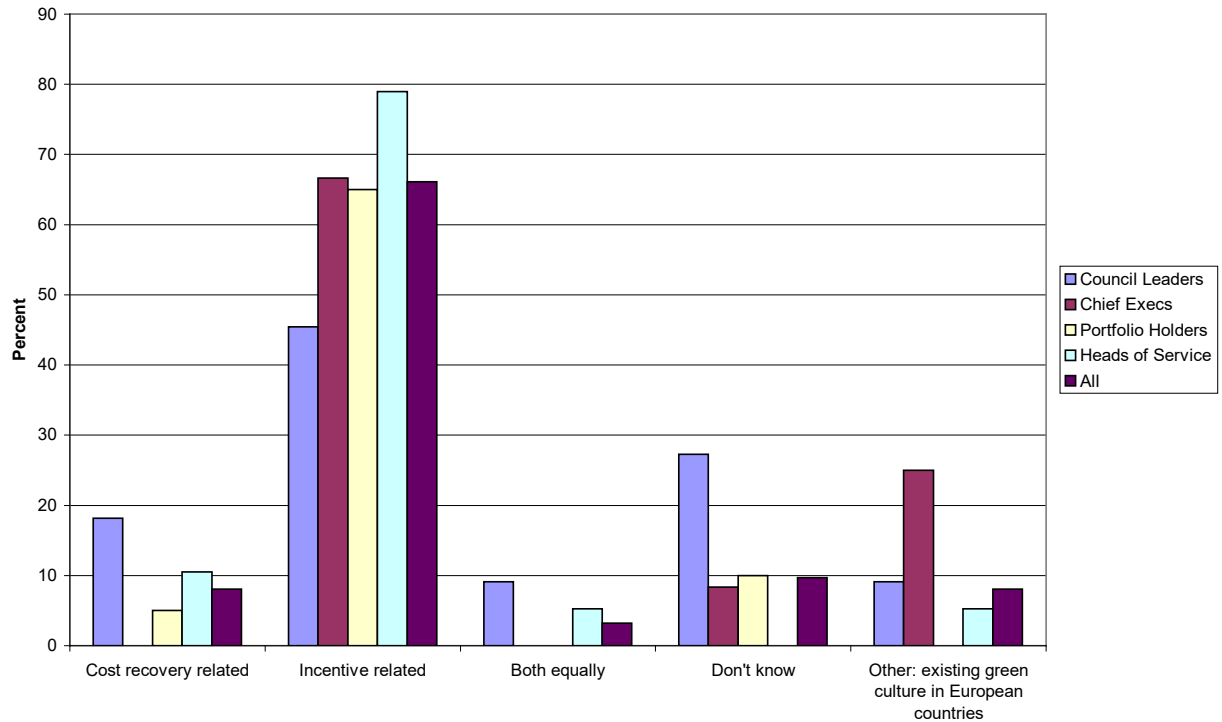
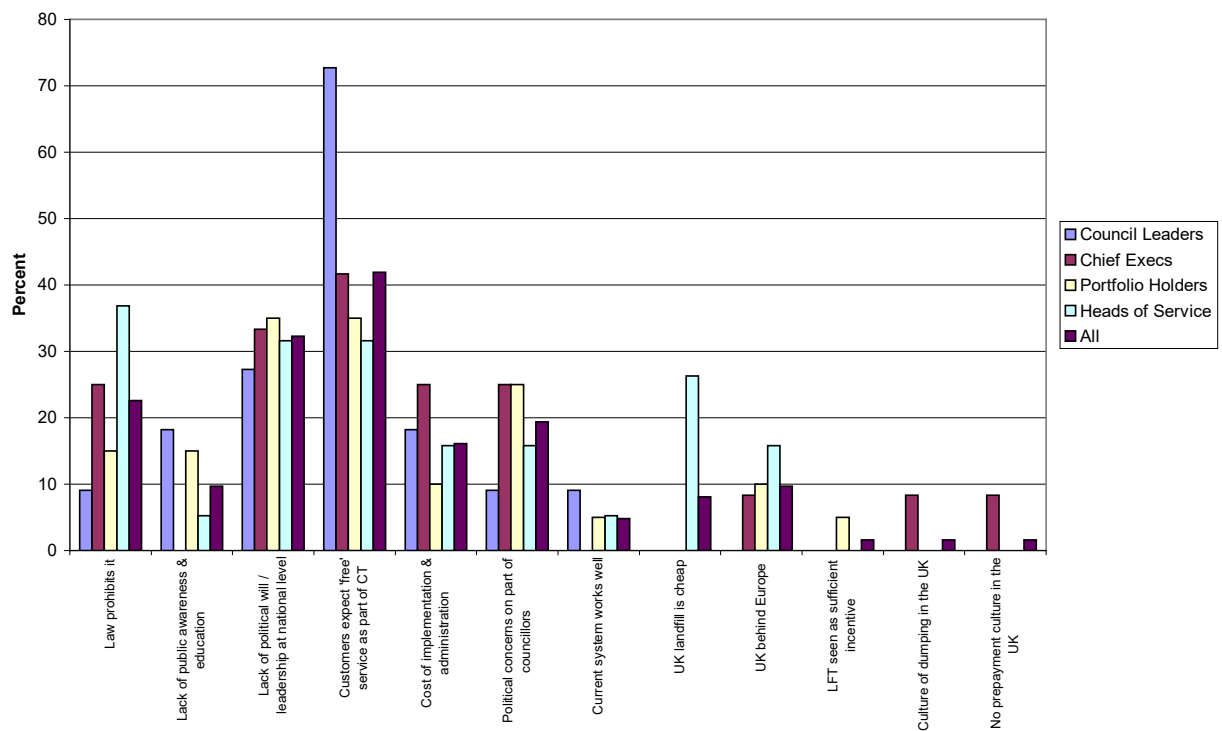


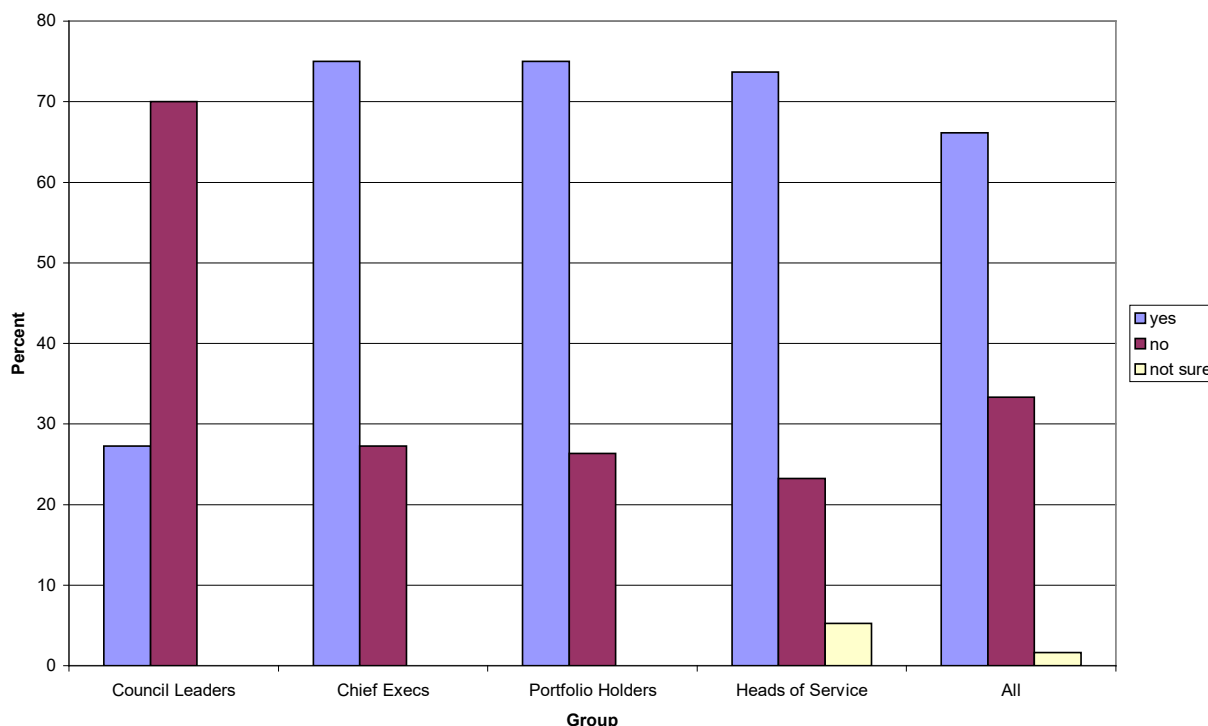
Figure 13: Reasons Given for why Charging Schemes do not Exist in the UK



5.2 Consideration of Charging Schemes

All respondents were asked whether their authority would consider implementing variable charging if local authorities were given the power to do so. Whereas just over 70% of Chief Executives stated that their authority would consider introducing such a system, the response of Council Leaders was almost completely the reverse, 70% holding the opposite view. As with Chief Executives 70% of Portfolio Holders and Heads of Waste Service thought that their authority would look to implement charging (Figure 12).

Figure 14: View as to Whether Authorities Would Consider Implementing Variable Charging



This reflects reasons expressed in answer to the question why charging systems currently do not exist in the UK (Figure 11), where approximately 20% of each Chief Executives, Heads of Waste Service and Portfolio Holders named political concerns on the part of elected members as an obstacle. Interestingly, Council Leaders were only half as likely as Portfolio Holders to cite political concerns as a barrier.

It is worth noting that a number of respondents, particularly among the Portfolio Holders and Chief Executives, felt that a charging system should only be introduced if it were imposed nationally by central government. The main reasons given for this view were that if direct charging were introduced by individual local authorities, public resistance and lack of understanding would be greater and there would also be an increased risk of illegal waste disposal across authority boundaries. A number of respondents also stated that the introduction of direct charging should be accompanied by a national education and awareness-raising campaign, which explained the motivations behind the scheme and the potential benefits to householders (such as cost savings through increased recycling and waste reduction).

5.3 Perceived Barriers to Implementing Charging Schemes

All respondents were asked to specify what they perceived to be the key obstacles to the implementation (as opposed to the operation) of charging systems. No prompts were given. They were then asked to score

these obstacles in terms of their significance on a scale of 1-5, with 5 representing a major barrier, and 1 representing barriers which were not at all significant.

Figure 13 shows the average weighted scores for each group and for the total sample. These have been derived by taking the total score for each category and dividing it by the number of respondents in the category. Figure 14 shows the percentage of respondents citing a particular obstacle. The two figures show a similar profile.

Consistent with the response to the question concerning why systems are not already in place in the UK, the key obstacles cited were the social and political barriers, and the perceived costs.¹⁵ Environmental/health concerns were also commonly referred to. The obstacles most frequently cited by respondents from all groups were those related to social issues. Council Leaders in particular felt that these were of greatest significance with a weighted average score of 2.75.

The most commonly cited social concern was public disapproval of, and potential customer resistance to, direct charging. This is consistent with the perception that residents expect a ‘free’ waste collection and disposal service, which has traditionally been delivered by local authorities and paid for through the Council Tax. An overwhelming majority of Council Leaders (over 70%) also considered this as the main reason why such schemes do not exist in the UK (Figure 11). Chief Executives and Heads of Waste Service also felt that public resistance was a relatively significant barrier to the introduction of direct charging (approximate average score of 2.5).

A further social concern cited by respondents from all groups related to the potential impact of direct charging on socially disadvantaged groups. Respondents felt that direct charging might penalise large or low-income families or those with special needs (e.g. those in home-care) and that the charging system would have to be designed in such a way as to allow discounts or rebates for such groups.

¹⁵ Barriers classed as *social* included ‘protest / lobbying’ and ‘potential deprivation issue (regressive ‘tax’)’. *Political* barriers included responses reflecting concerns ‘direct charge could be seen as additional tax’, ‘direct charge is a potential vote loser’, ‘direct charge will raise questions about what the rest of the council tax is spent on’. *Cost* barriers included concerns that the system ‘costs too much to implement’, that it needed to ‘demonstrate cost effectiveness’ and that the ‘cost/benefit analysis’ was not clear. *Legal* barriers include comments that it is against the law to introduce a direct charge for waste services. *Environmental / health* barriers included responses relating to increased fly-tipping, burning or hoarding of waste. Barriers classed as *technical and contractual* included responses relating to the ‘management of systems logistics’, ‘supporting infrastructure’, ‘contract renegotiation’ and ‘time required for implementation’.

Figure 15: Average Weighted Score for specific Barriers to Implementation of Variable Charging Cited by Group

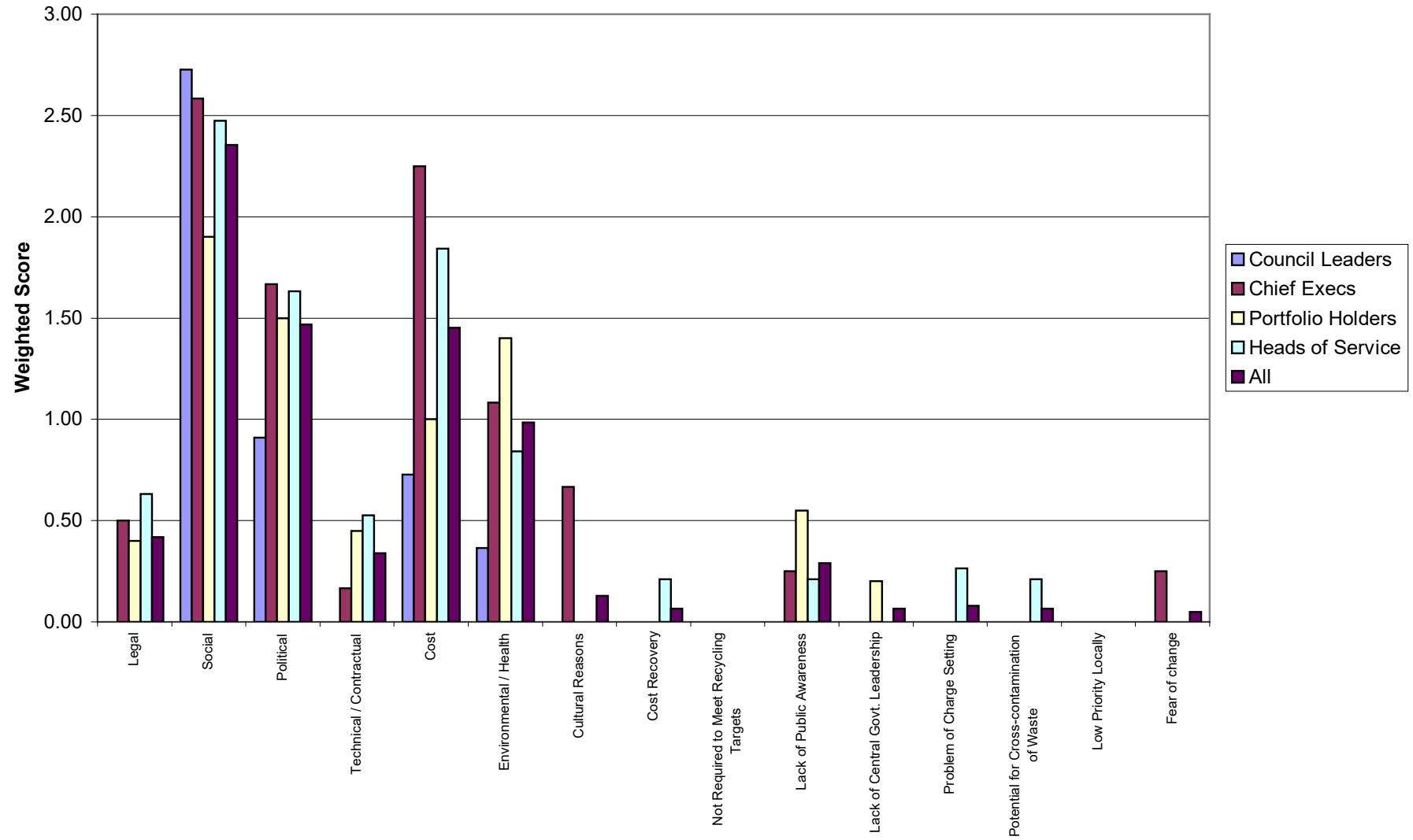
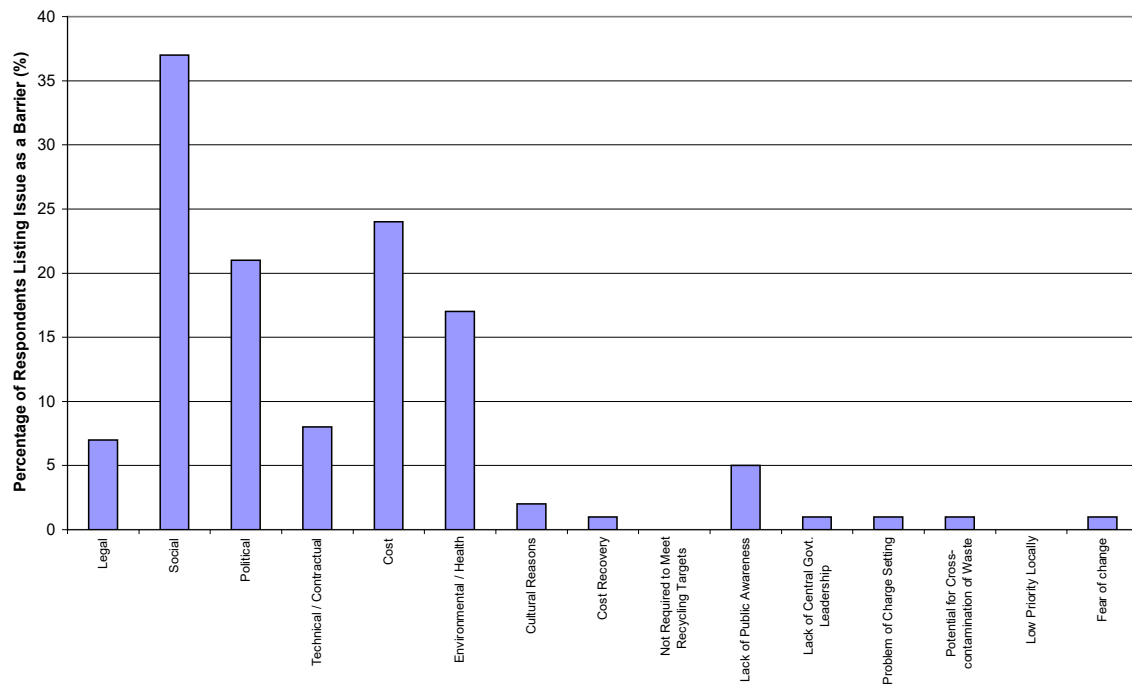


Figure 16: Percentage of Respondents in Total Sample Citing Specific Barriers

Political concerns, such as the perception of direct charging as an additional tax, were frequently cited by respondents from all groups. With a weighted average score in excess of 1.5, Chief Executives and Portfolio Holders attributed it the highest significance. Respondents also voiced concern that direct charging for waste services would raise questions about the remainder of the Council Tax and the services it provided.

Cost concerns featured most strongly among Chief Executives with a weighted average score of approximately 2.5. Heads of Waste Service also frequently cited the cost of implementation and administration of a charging system as a barrier to its introduction (1.8). By contrast, Council Leaders considered this a less significant barrier (0.6).

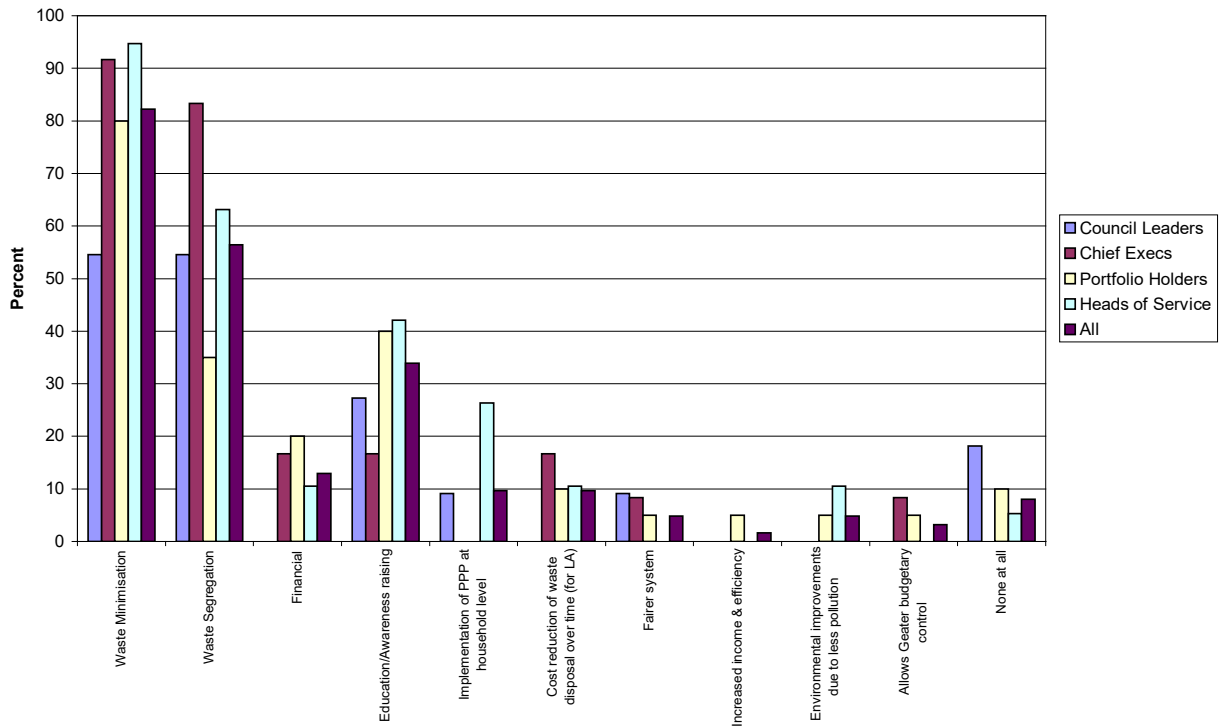
Environmental / health concerns associated with a potential increase in fly-tipping were also frequently mentioned by respondents from all groups. This concern featured predominantly among Portfolio Holders, with a weighted average score of approximately 1.5.

5.4 Benefits

All respondents were asked what they saw as the benefits associated with the operation of a variable charging system. There were no prompts for specific answers.

The overwhelming majority of respondents cited waste minimisation as the main benefit (see Figure 15). Over 90% of Heads of Waste Service and Chief Executives and 80% of Portfolio Holders felt that variable charging would contribute to a reduction in household waste. Only 55% of Council Leaders thought variable charging would have a significant impact on waste production.

Figure 17: Expected Benefits of a Variable Charging Scheme



Chief Executives were also the most optimistic of the groups with regards to the impact variable charging may have on waste segregation, with 82% expecting a reduction in residual waste and an increase in recycling. Among Heads of Waste Service, 62% cited this benefit, as did 55% of Council Leaders and 35% Portfolio Holders.

A significant number of respondents, particularly Heads of Waste Service (42%) and Portfolio Holders (40%), also expected that the introduction of variable charging would have a significant educational effect in terms of raising awareness of the ‘true cost of waste’.

Financial benefits such as improved cost recovery and greater budgetary control were cited by Chief Executives, Portfolio Holders and Heads of Waste Service. Respondents from these groups, in particular Chief Executives (18%), anticipated that variable charging would in the long term also lead to a reduction in the cost of waste disposal for local authorities.

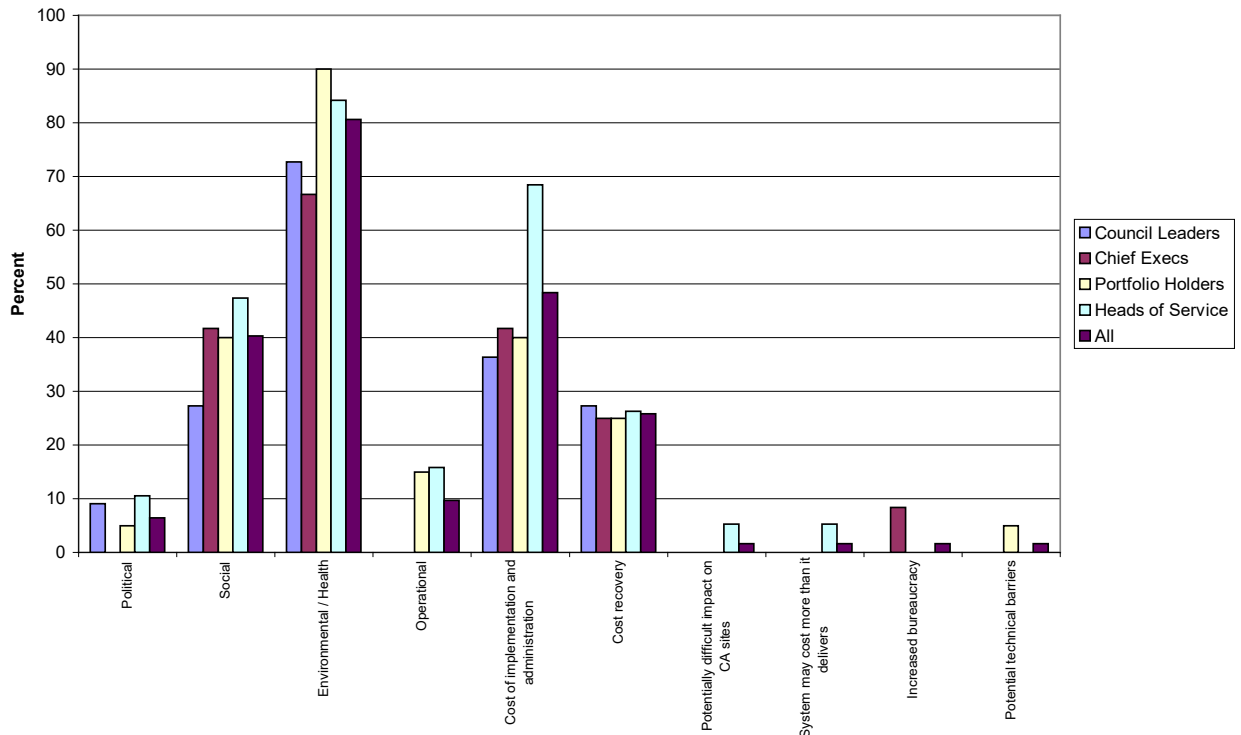
A number of respondents stated that they saw ‘no merit at all’ in variable charging systems. Council Leaders (20%) in particular expressed this view. Reasons cited included that a number of authorities had only recently undergone an extensive overhaul of their waste management system and the introduction of a new system was not a priority at this time. In addition, a number of respondents felt that their existing recycling collections were performing well and expected to reach government recycling targets without the implementation of variable charging.

5.5 Disbenefits

All respondents were asked to specify any potential disbenefits expected to arise through the operation a system of variable charging. No prompts were given.

The single most significant disbenefit perceived by all groups related to potential environmental / health issues (see Figure 16). The overwhelming majority of respondents, especially Portfolio Holders and Heads of Waste Service (90 and 85% respectively), expected a significant increase in illegal waste disposal, in particular fly-tipping.

Figure 18: Expected Disbenefits of a Variable Charging Scheme



The perceived cost of implementation and administration of a variable charging systems was also frequently cited by respondents from all groups. Heads of Waste Service expressed particular concern over cost with 59% citing it as a disbenefit. This reflects their specific responsibility for waste management and understanding of the budgetary constraints of local authorities. Related to this were concerns over charge recovery, cited by almost 30% of all respondents. In this context, respondents referred to potential charge avoidance by the public through illegal waste disposal. Furthermore, respondents expressed concerns over calculating the correct charge levels required to ensure cost recovery.

Potential social disbenefits were also named by respondents from all groups, but featured most strongly among Heads of Waste Service (48%) and Portfolio Holders (41%). Concerns expressed in this context reflect the perceived obstacles to implementation of direct charging systems in the UK. Respondents felt that there could be negative financial implications for large or low-income families, families with babies and householders with special needs. A number of respondents also expressed concerns regarding a potential increase in neighbourhood disputes over fly-tipping of waste into neighbour's bins.

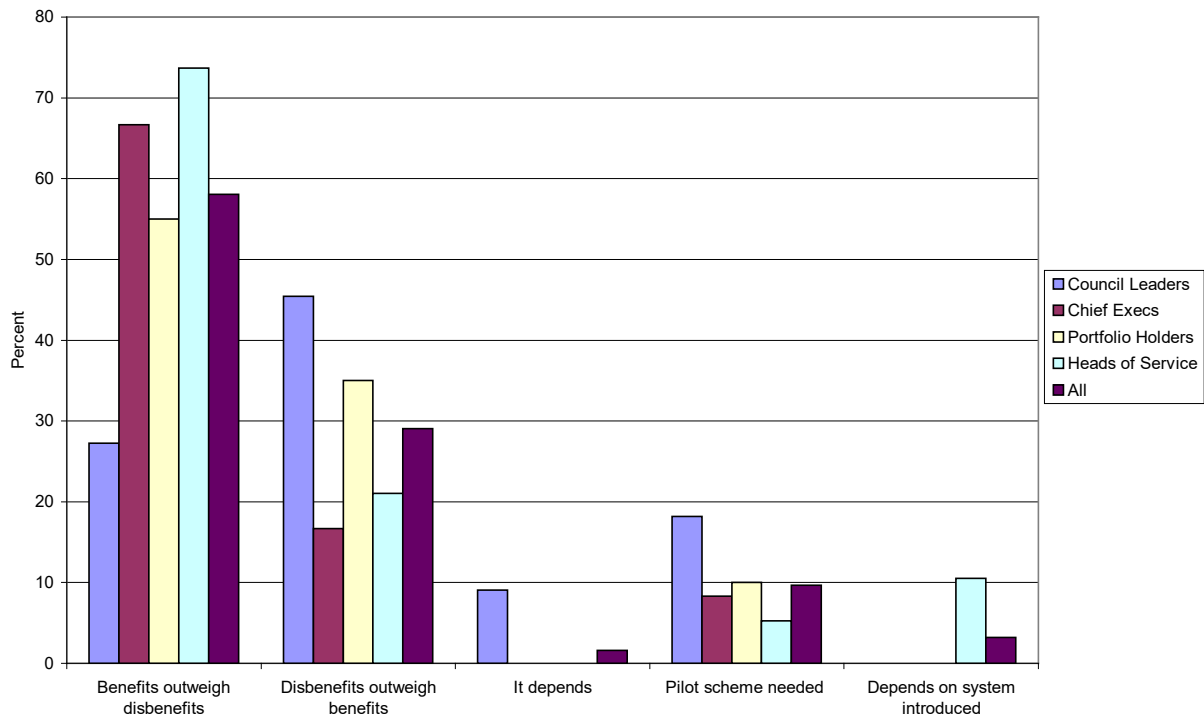
5.6 Net Benefits, or Net Disbenefits?

All respondents were asked whether they considered the benefits to be greater than any downside, or whether the opposite was the case.

As Figure 17 shows, the overall majority of respondents felt the benefits of variable charging outweighed any disbenefits. Approximately 60% of Heads of Waste Service and Chief Executives,

and more than 50% of Portfolio Holders felt that the benefits of variable charging would be greater than any disbenefits.

Figure 19: Would Benefits Outweigh Disbenefits?



However, 36% of Portfolio Holders believed that the disbenefits would outweigh the benefits. By contrast, only 24% of Heads of Waste Service and 18% of Chief Executives held this view. More than 10% of Heads of Waste Service felt the outcome would depend on the particular system introduced, as different systems had different advantages and disadvantages which would have to be evaluated.

Council Leaders, however, showed a more cautious response. Figure 17 shows that almost 45% felt the disbenefits would be greater than any benefits and 30% thought the opposite would be the case. Almost 20% stated that they would like to see a pilot scheme to assess the practicalities and merits of such systems. By contrast, 10% or less of respondents in other groups mentioned the need for a pilot scheme. In addition, Council Leaders stated that the outcome would depend on how quickly any benefits became apparent. This concern regarding the instant success of any new scheme adopted perhaps reflects a more short-term outlook among elected members’.

These results are consistent with respondents’ attitudes towards a possible implementation of variable charging by their authority discussed above.

A large number of respondents from all groups – including those expecting net benefits – emphasised that ultimately the potential benefits depended very much on the type of system that was introduced and how it was implemented. Respondents also stressed the need for public education and awareness-raising to explain why the scheme was put in place.

5.7 Comment on Survey Findings

Care should be taken in seeking to extrapolate from our rather small sample to the UK as a whole. However, the intention was to seek more detailed information concerning knowledge of, and reactions to, DVR schemes.

5.7.1 General Awareness of Charging Systems

Although recycling is now being ‘mainstreamed’ in the UK, the awareness of DVR schemes is relatively low, with less than half of those responsible for waste being aware of systems other than weight-based schemes. Furthermore, the depth of knowledge is highly uneven, with many having apparently given little consideration to such schemes (unsurprisingly, perhaps, given the legislative situation), but with some having carried out their own studies on such schemes.

Perhaps reflecting the current situation in UK recycling systems, there was much greater interest in the incentive effect imparted by DVR schemes than the role they can play in cost recovery.

5.7.2 Issues Relating to Existing Approaches to Charging

The main reason given by all groups as to why charging schemes do not exist in the UK was that the public expect the cost of waste management to be included in the Council Tax, as has traditionally been the case. Also ranking high was the view that the political concerns of councillors prevented the implementation of charging schemes. Charging was seen as a potential vote-loser. Note however that fewer councillors held this view than representatives from other groups.

Heads of Waste Service cited the low cost of landfill as a reason why charging is not implemented in the UK. They also felt the UK was a long way behind Europe in waste management terms, and in moving towards implementation of charging schemes. Both Council Leaders and Chief Executives thought that a key issue was the costs of implementation and administration.

Interestingly, no one took the view that such schemes ‘wouldn’t work’, or ‘couldn’t work’, or gave other negative reactions concerning potential outcomes.

5.7.3 Perceived Obstacles, Benefits and Disbenefits Associated with Charging Systems

The survey identified that key barriers to the implementation of DVR schemes are considered to be those of a social/political nature, costs, and environmental/health issues. It is important to seek to understand the degree to which the barriers cited reflect experience elsewhere, and whether the obstacles are ones which are insurmountable, or ones which can be readily overcome.

As to the most commonly cited social concern, that of public disapproval of, and potential customer resistance to, direct charging, there are at least four possible underlying perspectives:

1. the issue is that of a perception that households would be ‘charged twice’ for waste?, or
2. the issue of significance is that of taking the charge for waste management out of the Council Tax, or
3. the issue is related to that of the public ‘seeing what’s left’ in the Council Tax as being ‘too much to pay’ for the remaining non-waste services?, or
4. the issue is that of households being charged by some measure of how much waste is set out for disposal?

Certainly, the ‘double-payment’ issue is a non-issue. The aim can be made quite explicit – that the charge should cover the costs of waste management and that the Council Tax should fall by a corresponding amount (or it should be clearly demarcated on Council Tax bills).¹⁶

Since public resistance was cited as a relatively significant barrier to the introduction of direct charging (approximate average score of 2.5), and since the potential impact of direct charging on socially disadvantaged groups was also seen as significant, one would incline towards the view that it is the latter issue which is accorded greatest significance in respect of public response. The fact that direct charging for waste services would raise questions about the remainder of the Council Tax and the services it provided was accorded lesser significance, though it was certainly a concern.

To this end, one might reasonably dispute whether these are such significant barriers. Many different measures – free tags, rebates, free ‘emptyings’ etc., each allowing some ‘free basic service’ – are measures which can be applied in charging systems to offset any potentially regressive impacts. As such, this barrier is potentially overplayed. It can be (and is, in existing systems) overcome.

Equally, the corollary of a concern about the fact that the public might question ‘the rest of the Council Tax’ is that there is a corresponding desire to hide the true (low) costs of waste management to those who are in receipt of the service. At a time when a regime of ‘Best Value’ is sweeping through local authority service provision, it seems odd that one would seek to hide from citizens the true costs of individual services. Surely, the more people understand this, the more informed any debate about costs and value (Best, or otherwise) would become. The same ought to apply to the costs of the remaining services, and it seems to border on the undemocratic to exhibit duplicity in seeking to mask the true costs of the other services which Council Tax payments support. One of the advantages of DVR schemes is their cost transparency, but if such transparency is perceived as a threat, perhaps this ought to give rise to concerns of a different nature.

Cost concerns also featured as a barrier. Yet as we saw in Section 4.0, the costs are frequently over-estimated. Net of charge revenues, DVR schemes can be negative cost systems, and frequently are. This is because there is a strong tendency to view only the incremental costs of the equipment and the administration, without considering the dynamic effects of DVR charging systems. The dynamic effects, as we have seen, generate waste reduction, and improved segregation performance.

Environmental health concerns due to a potential increase in fly-tipping were also frequently mentioned by respondents from all groups. Once again, though in other countries, this is always perceived as a potential problem, the degree to which it actually arises as a major problem appears to be much lower. Experience elsewhere suggests that probably, people have better things to do with their time than to drive into the country with sacks of waste to dispose of material there (not least because the savings on a given sack are unlikely to be especially large). As long as good services for source separation (at the doorstep and at CA sites) are in place, and as long as enforcement is taken seriously as a potential issue, it seems that this is overplayed in the concerns of those seeking to implement schemes. The keys to reducing evasive behaviour are a) convenient and high quality recycling, composting and re-use / reduction schemes which offer an alternative to payment of the charge; and b) that enforcement is taken seriously, and is supported by sanctions (backed by the authority to apply them) applied by the local authority, especially in the period immediately following scheme introduction.

¹⁶ It seems unlikely to us that the existing Council Tax billing mechanism would be an appropriate way of collecting charges under DVR schemes since the billing tends to follow an annual cycle (even if payments may be made throughout the year). The variable elements of a charge are probably best collected more frequently.

The issue of public awareness and education is obviously an issue in any service change. It is especially important where charging systems are being introduced. UK local authorities have tended to be somewhat parsimonious in their spend in this area (though assistance through the landfill tax credits scheme has helped). This would be an issue of potential concern in UK authorities seeking to implement these schemes, and the respondents clearly felt that this would influence the way any scheme was perceived.

One of the most interesting conclusions to come from the above analysis is the clear distinction between Council Leaders and the other interviewees on the really key questions in the survey. Council leaders:

- Believe the disbenefits will outweigh the benefits; and
- Do not think they would introduce charging schemes, were they able to do so,

All other interviewee groups:

- Believe benefits will outweigh disbenefits; and
- Would seek to introduce a charging system were they able to do so.

This is made all the more interesting since the nature of the disbenefits cited by all groups are broadly similar.

This difference between groups found expression in other responses to key questions. The overwhelming majority of respondents cited waste minimisation as the main benefit. This was particularly true of Heads of Waste Service and Chief Executives. Fewer Council Leaders thought variable charging would have a significant impact on waste generation.

It would be tempting to conclude from this that even if the law allows charging systems to be introduced, it is the internal politics of local authorities, notably Council Leaders, as much as any other factor, which may be a major stumbling block for the introduction of charging schemes. It is not for no reason that some municipalities seek to implement these types of change quickly following Council elections!

5.7.4 Issues Relating to the Distribution of Fixed and Variable Elements of the Charge and its Collection

There was no clear preference for establishing the fixed or the variable aspect of the charge as the greater element. Respondents favouring a higher variable element emphasised the incentive effect of the charging system, stating that householders would be able to make savings by increasing their recycling rate and reducing the overall amount of waste set out. Respondents preferring a larger fixed element emphasised the greater fairness of such a charging system, as it would be less likely to penalise any particular social groups.

Experience from elsewhere suggests that a key issue here is revenue stability. The implementation of a DVR scheme should not rely so heavily on variable rates that the response generated from householders becomes so great that overall revenue declines significantly. A first priority is to ensure the total charge revenue covers the cost of the system. The way in which other Member States implement the requirements of the Packaging Directive are important from this perspective. Where specific fractions are effectively financed through the producer responsibility mechanism, the need to cover the costs of these clearly evaporates. This leaves fewer fractions for which fixed infrastructure costs must be recovered, enabling (at least in theory) a higher proportion of the overall fee to be charged on a variable basis.

Interestingly, comments regarding the benefits of charge differentiation vary widely and do not show a general consensus. A number of respondents favouring charges for segregated wastes emphasised that dry recyclables should be included as these collection costs also need to be covered by local authorities. It was commented that the rate for dry recyclables should be lower than that for residual waste. Other suggestions included that the system could feature a rebate or credit scheme to reward residents who participated in recycling, which would reinforce the incentive effect. A number of respondents specified that the fee should also include compostables, but that the rate applied should be lower than that for residual waste.

It would appear that in respect of dry recyclables, once again, producer responsibility can play a role. Evidently, the need to charge for packaging recycling in Germany does not exist since this is operated and paid for through the DSD system. In Belgium, where Fost-Plus covers some, though not all, of the costs of packaging collection, a variable charge is applied, but at a lower rate than for the residual waste fraction.

Since compostables are not readily covered by producer responsibility, the costs of their collection usually has to be met by municipalities. Most now seek to implement a system which encourages home composting, and where collections are for kitchen and garden waste, it is typical for this to happen through charging for biowaste collection. The other reason for doing this is so as not to encourage contamination of biowaste by refuse by making the differential so large that incentives to cross-contaminate are established.

6.0 INTERVIEWS WITH KEY STAKEHOLDERS

As part of the work undertaken, we conducted face-to-face interviews with a number of organizations with an interest in this area. The interviews conducted broadly reflected the line of questioning followed in the interviews with local authorities. Questions were deliberately retained to ensure consistency in some of the responses.

Our impression is that there is much better understanding of why these systems do not exist than of how these systems are, or can be, designed to operate. It is interesting that there is implied criticism of national and local government with regard to the degree of commitment to the issue of waste management. Equally, the degree to which interesting and innovative behaviour was encouraged was questioned, and some suggested it was unlikely to arise spontaneously.

Low commitment from central government was cited as an issue, whilst there was also a perception that it was difficult to retain the sort of high calibre staff within local authorities who might persuade local and national politicians of the desirability of at least allowing such schemes to be tested.

This is interesting given that in the local authority research, interviews revealed that some local authority officers have been engaged in exactly this sort of activity, pushing forward the idea with local politicians and drawing their attention to the potential benefits. Whilst this is far from universally the case, it does illustrate the fact that officers are aware of these types of scheme, and that some have been persuaded of the rationale for allowing trials to take place.

Most respondents felt that benefits would outweigh disbenefits though some respondents were more cautious, urging the need for UK-specific trials. In truth, the question concerning relative benefits and disbenefits depends heavily on the details of implementation, and the background service level against which the scheme is introduced.

Interesting responses were received to the questions regarding the balance between fixed and variable charge elements, with some being attracted by the prospect of a 'strong incentive', implying a large variable element. The problem with this approach is that it requires good judgement (or luck) if problems of revenue instability are to be avoided. It does illustrate, however,

a desire on the part of several respondents to see incentives in place for people to engage in source separation schemes provided by municipalities. Indeed, one respondent felt that the rationale for any scheme is made stronger where differential performance (in terms of materials capture) occurs across groups of householders – the DVR scheme is seen as a way of bringing all households more or less ‘up to scratch’.

The mixed responses regarding fly-tipping reflect a general unease about the issue, possibly in the context of insufficient knowledge of what has occurred elsewhere. Opinion ranged from one who felt this was a major obstacle, to one who believed this was overplayed, it was an issue amenable to control. One commented that those who really felt it worthwhile to drive into the country to dispose of a black bag ought to have better things to do with their time.

Another issue arising in discussions concerned the possible loss of goodwill. This is an issue which has also been discussed in some of the Danish literature. One paper in particular argues that introducing charging systems can lead to citizens ‘reframing’ the conditions upon which they engage with recycling systems.¹⁷ Before schemes, citizens engage in systems out of a sense of altruism and civic duty, as well as a sense of ‘feeling good’ that they have ‘done their bit.’ Introducing charging schemes can lead to them altering the mental model which they use to determine their participation in the scheme. Some citizens may resort to a ‘cost-benefit’ rationale, implying that if the incentive is weak, the good will of citizens in recycling ‘for free’ before the DVR scheme may be jeopardised. In the paper where this discussion appears, it is suggested that this raises some questions about the design of DVR schemes. Equally, it seems to us that this type of approach re-emphasises the importance of convenience in the provision of quality source separation schemes. This, along with information provision, can act to minimise the extent to which a reframing in cost-benefit terms actually jeopardises engagement with the scheme.

It is interesting to note, in respect of this last point, that many of our respondents thought that the way in which households would respond to the implementation of DVR schemes would be strongly influenced by the way in which the scheme was presented to households. Furthermore, several expressed concerns that the resources necessary to do this would be under-estimated in UK local authorities, given the low priority currently given to adequate promotion of existing source separation schemes in the UK.

7.0 RECOMMENDATIONS

7.1 Time to Change?

Our review of EU experience, and of EU approaches to charging for waste management clearly shows the UK to be out of step with all nations who are seeking to pursue sustainable waste management strategies. More and more nations and regions clearly see the importance of implementing the polluter pays principle at the household level. The only countries where any municipal waste management services are financed through general municipal taxes are France, Greece, Portugal, Spain and parts of the United States. In each of the last two, this varies regionally. With the exception of the United States, if one adds the UK, this looks like a list of the worst performers in respect of source separation in Europe.

In all other countries, and indeed, some of those mentioned, municipalities have competence for the levying of fees directly for waste management (though they do not necessarily relate the fee to the level of service use). The UK appears unique in prohibiting this. Spain is the latest EU country to have implemented DVR schemes (sack-based schemes in Catalunya).

¹⁷ John Thorgersen (1994) *Monetary Incentives and Environmental Concern: Effects of a Differentiated Garbage Fee*, CeSaM Working Paper No.2, September 1994.

We have estimated the net costs of introducing these systems across 30% of households in the UK allowing for the dynamic responses which can be expected flow from them. For a net cost of £14.28 million (at current disposal costs), we estimate external (environmental) benefits of between £112 and £319 million through the increases in source separation and the waste reduction which result. Waste requiring disposal falls by 2.35 million tonnes. As landfill tax increases, the net costs fall below zero as the avoided disposal costs increase. In other words, as landfill tax rates move towards the stated figure of £35 per tonne, these systems can generate significant environmental benefits at negative (net) cost.

The question is surely not so much one of ‘if’, but ‘when?’, and if one of the advantages of DVR charging schemes is that it makes people take responsibility for their waste, the answer to the question ‘when?’ ought to be ‘as soon as possible’. This has been recognised by the Strategy Unit in its recent report, where it was stated that *‘the Government should secure an early legislative opportunity to grant local authorities powers to implement incentive and charging schemes for waste if they want to do so’* (our emphasis). This would also be entirely in keeping with the current drive towards greater freedoms and flexibilities for local Government which one sees in other areas of service provision.

This is not to trivialise the real political barriers to change. These barriers, however, relate to issues of expedience, and to that of how to implement charging systems in the context of the existing framework for funding public services. Yet the potential advantages of DVR systems suggest that ‘business as usual’ has little to recommend it. So unless the decision has been made to maintain the existing financing framework *ad infinitum*, the decision to change ought to be taken sooner rather than later, subject to the political opportunities for such changes.

Of course, it would be desirable to have cross-party political support for this change. The potential benefits outlined in this report are of such significance in the strategic context that opposition on party political grounds would seem churlish. DVR schemes can be implemented in ways which do not harm the poor, and measures can be taken to discourage fly-tipping. What is needed is support for the message that DVR schemes, to the extent that they are used as mechanisms to fund public services, are not ‘new taxes’, but a different way of paying (and potentially, a way of paying less than one would otherwise have to).

Outside some of the more obvious political arguments, it is difficult to formulate good arguments for maintaining the existing situation, and for preventing experimentation with, and full-scale adoption of, DVR schemes. Change is always ‘difficult’ and will no doubt bring with it a degree of dissatisfaction amongst vocal minorities. But these are not arguments for not changing the existing situation.

7.2 Changing the Situation

Despite the potential benefits associated with introducing a DVR scheme, few seem willing to take the political decision to do so themselves. On the one hand, there is criticism concerning a lack of national leadership, and clearly, as long as the legislation appears to prevent such systems, the first decision that needs to be made is one which must be taken centrally. At the same time, whilst the majority interviewed in our survey foresaw greater benefits than disbenefits, some Portfolio Holders and Chief Executives in our survey clearly felt that it would be more straightforward to implement charging schemes if there was an obligation on them to do so. No one, it seems, wants to make the decision, even those who see merit in the results which flow from it.

In this context, it seems unlikely that Government would make such a system mandatory. A sensible approach to take would seem to be to change the existing legislation and allow local authorities who wish to implement such schemes to do so. At the same time, some encouragement to implement such systems should be given, even if only in the form of formal recognition of the potential benefits which might flow from scheme implementation.

Alongside legislative changes which ‘allow’ DVR systems to be implemented, careful attention needs to be paid to the duties placed upon local authorities. The legislation should give to local authorities powers to:

1. decide not to collect where charges for refuse collection have not been paid (i.e., the duty placed upon local authorities must not be one which says ‘collect from everyone irrespective of payment or non-payment’ – this is the lesson of the Irish experience);
2. enforce the rigours of a specified system, and prosecute and fine evasive behaviour. This is the corollary of the previous point; and
3. require that households deliver their waste into the system operated by, or on behalf of, the local authority. This is intended to avoid a situation in which households by-pass the system by engaging directly with private contractors (who may offer a lower service level for a lower cost).

An important question is that of how to extricate ‘waste management funding’, in the form of DVR charging, from the existing system of funding for waste management services.

Unless a decision is taken to require all local authorities to implement DVR schemes (which seems neither likely, nor necessary), at any given time, some local authorities would have schemes in place, and others would not. Currently around a quarter of funds for public services are raised through the Council Tax, and three quarters comes from Central Government. These funds should be capable of being moved across services since they are not strictly earmarked for specific purposes. At the same time, decisions concerning the allocation of Central Government Grants have to be made on a fair basis across local authorities. If some authorities are raising revenue directly from citizens whilst others are not, the potential for making a fair allocation of the Central Government Grant are somewhat reduced.

It would seem to be necessary, in a situation where some local authorities implement DVR schemes and others do not, to take waste management out of the SSA formula, requiring the funding to be raised entirely from a combination of the Council Tax and charges levied directly upon householders. This would leave local authorities free to determine whether all, or only part of, the costs of waste management services, were to be raised outside of the Council Tax ‘umbrella’. Such flexibility would appear to be useful given that administratively, different schemes have different billing requirements. Pre-paid sack-based schemes, for example, need not require any separate billing mechanism, so any fixed portion of the overall waste management service cost could be retained within the Council Tax billing mechanism. Weight-based schemes demand separate billing mechanisms, and the local authority would be left free to determine whether only the weight-based (variable) element, or a fixed element as well as the variable element were billed separately to the householder.

One argument against this is that the Council Tax might be strongly geared to changes in waste management services. Yet it is difficult to view this as a flaw in the system. Indeed, various comparators of local authority performance seek to highlight the costs of service provision, often, one suspects, in vain. In any case, it is difficult to see why this would be the case. At a cost of around £60 per household, the provision of waste management services is hardly a major determinant of the level of the Council Tax. Indeed, if very high quality systems were implemented against a backdrop of higher disposal costs, it should be entirely possible to maintain costs at £100 or less per household. Even at these levels, any implied increase in the Council Tax would still be a relatively small fraction of the current level. In the existing system, an increase in service costs of £40 per household per annum would be met in part, say to the tune of £10, through the Council Tax. The increase under this system would be £40 per annum, a difference of £30 or 3% of the average band D Council Tax (around £1,000 per annum).

7.3 Informing Key Decision-makers

Our survey reveals many interesting things. One has been that the level of knowledge and understanding of these systems is quite varied. For example, less than half of those surveyed were aware of the different types of DVR scheme (pay per bag, frequency based, weight based etc.). In addition, it was clear from many of the interviews that the depth of knowledge is also limited, understandably since few have had cause to give such schemes serious consideration. Some of our interviews seemed to illustrate how respondents were able to identify ways of overcoming some of the potential downsides they themselves identified.

Evidently, if the decision was made to allow these schemes to be introduced, there is scope for providing information to local authorities, decision makers and the public. The significance of this appears to be that the more people understand DVR charging systems, the more accepting, and less resistant, they become of these systems.

We also believe that the careful use of language can play a role here in improving communication about these systems. Hence, a process of informing local authorities about these systems ought to go hand in hand with the changes to legislation which are required to enable DVR charging systems to be implemented.

In most countries, it would appear that the early movers take time to implement their system, and they do so in the context of some public disquiet. However, the more systems which are in place, it appears the more acceptable further systems become. This is part of a culture change in which pre-existing flat-rate systems come to be viewed as *less* fair and transparent than those which ask the heaviest users of the service to pay most. Even so, even in some countries where many schemes are already in place, however, municipalities frequently take time taken to inform citizens, and in some cases, as in our German case study, the time spent doing this can be significant.

7.4 The Necessity of Quality Collection Services

Strategy formulation and planning inquiries are still influenced by attempts to elicit ‘the BPEO’ for waste in what is inevitably a comparative static analysis of different waste management systems. What the preceding discussion suggests is that:

1. DVR charging systems have a potentially important role to play in reducing total waste collected, and in reducing residual waste; and
2. Such systems function best, and with fewest drawbacks, where they function in the context of quality source separation systems which are convenient for householders to use. The absence of these may lead to burning of waste, and incorrect separation.

This suggests that convenient provision for source separation has a role to play in *systems* which encourage waste minimisation. Static analyses tend to ignore the potential impact of collection systems upon the amount of waste collected. If systems which encourage minimisation are deemed to be the best environmental option, then given the low (potentially declining as landfill tax increases) costs of these DVR systems, it seems reasonable to argue that both quality doorstep collection services and DVR charging systems should be integral elements of any BPEO strategy.

It ought to be possible in many local authorities to reduce residual waste from its current level in the UK (of the order 400kg per inhabitant) to around, or below, 150kg per inhabitant.

7.5 A ‘Right’ System?

There is no ‘right’ system. Municipalities which have introduced these systems tend to swear by the one they use. Some of the evidence suggests that weight-based systems are the best ones in

terms of putting pressure on waste generation. However, they are likely to be more costly in terms of billing requirements (especially since there is, currently, no direct billing mechanism in the UK for waste). Pay-per-bag schemes may be less costly in terms of billing, but they may be more open to fraud and they may not generate the same effects in terms of waste reduction. In our view, an important aspect of all schemes is that they ensure mechanisms are in place to reward home composting. Furthermore, it seems that there is plenty of room for innovative charge setting, as in our German case study, where a three-part tariff is set (a fixed element, a charge per emptying of a bin, and a charge based on weight).

There are some principles which have been established for introducing DVR schemes. The USEPA has produced several ‘manuals’ for local authorities seeking to introduce such schemes, and there is much that could be learned from this experience, though equally, the US has less experience with weight-based schemes than, say, Germany, Sweden, Denmark and the like.

German local authorities have tended to move more towards identification and weight-based schemes partly because of challenges municipalities anticipate from citizens (regarding billing), which pushes local authorities to seek digital recordings of weights and emptyings using read and write transponders. In countries with smaller municipalities, such as Italy, the possibilities for defraying the additional capital costs, and for re-optimising logistics, are somewhat reduced, and systems using lower capital outlays are used.

In the UK context, it would seem sensible for those on sack-based residual waste collections to keep these systems in place, and to opt for ‘expensive sack’ or ‘tagged-sack’ schemes such as that used in the Comuni de Navigli. In those currently using wheeled bin residual waste collection, on-vehicle weighing may not necessarily be the best system. Such systems tend to operate on collections which may be more frequent than they need to be. Systems based upon identification only leave it to the householder to present a bin for collection, and the charge is based upon a number of emptyings. Here, there is an incentive not to present the bin for collection until it is close to being full. In weight based schemes, no such incentive exists, implying that collections may be made with unnecessary frequency, increasing the costs of the residual waste collection system. Hence, systems of the type operated in the outer zones of Gent, and in Treviso, which rely on identification only, may be more appropriate, and less expensive, than weight-based systems. It is possible that the dynamic response might not be so strong. Our German case study appeared to have found a way of overcoming the possible shortcoming of weight-based systems alluded to above by using a charging system based on both frequency of emptying *and* weight. This is a particularly intelligent design.

It is important to bear in mind, whilst considering the nature of any DVR scheme, that the most important aspect of any waste management scheme is not the charging system, but the integration of all aspects of the system. Hence, there can be no substitute for careful consideration of the collection system itself. Our study has investigated a number of cases where source separation rates approach, or exceed, 60% (Gent, Comuni de Navigli, Treviso, Landkreis Schweinfurt, Nijmegen). Sadly, very few municipalities in the UK have systems in place today which could aspire to such levels of source separation. This suggests that few local authorities in the UK today could introduce DVR schemes without having to confront issues associated with evasion of the variable element of the charge. However, there is no reason why DVR systems should not be implemented swiftly after comprehensive collection schemes are in place, or indeed, at the same time as the collection system changes.

DVR systems rely upon, and appear to obtain, political support where they are introduced. They command greater financial transparency, they improve data capture, they can help to improve management of collection rounds, and they offer much-improved prospects for ensuring that commercial waste collected on municipal rounds is charged for at an appropriate rate. Allied to the

other, more often-discussed benefits of DVR schemes (set out above), these advantages constitute a powerful argument for introducing legislation to enable DVR schemes to be used. There are potential downsides to these systems, but precisely because these are so well-known, they can be anticipated. Measures can be, and are, implemented to overcome these. As long as basic rules of design are followed, DVR schemes can play an important role in achieving key objectives of sustainable waste management in the UK.