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Household recycling behaviour and attitudes towards the disposal of small electrical and electronic equipment

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Abstract

Waste electrical and electronic equipment (WEEE) is recognised as the fastest growing waste stream in the European Union (EU), with estimates of up to 20 kg per person per annum. A wide variety of WEEE is discarded by consumers, often in different ways depending on size with small items (e.g. toasters) being easier to dispose of than larger ones (e.g. washing machines). Currently, small WEEE is not treated as a priority waste stream in the UK as in order to meet targets under the WEEE Directive[2] (CEC, 2003c) it makes more sense to focus on larger items for which collection, reuse and recycling systems already exist, but small items need to be tackled for a number of reasons, including the long term strategic development of infrastructure. In light of this, the paper will assess consumer attitudes towards the disposal of small WEEE, and identify key problems raised by the implementation of the WEEE Directive in relation to these small product groups. The findings from a large scale postal questionnaire, and semi-structured interviews conducted in Cardiff, Wales will be used, and key literature and research carried out to date on the disposal of WEEE, and household attitudes to waste and recycling will be assessed. It will also look at how the implementation of the WEEE Directive 'fits in' with the current transition in the UK towards more sustainable waste management practices at the household level, and then explore the most effective ways of engaging householders in the recycling of small WEEE. Key recommendations will then be outlined concerning

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[2] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). Published in OJ L 37/24, 13.2.2003. Brussels: Commission of the European Communities.

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the future strategic development and practical implementation of the WEEE Directive in relation to consumer involvement and small product types.

Keywords: Household recycling behaviour; Attitudes; Small waste electrical and electronic equipment

1. Introduction

This paper gives an insight into household consumer attitudes and activities concerning the management of waste electrical and electronic equipment (WEEE)[3] in the UK, especially in relation to small items[4] (see Fig. 1), and makes recommendations regarding the implementation of the WEEE Directive. The focus will be on the recovery and recycling of small WEEE not on waste minimisation, which though a vital element of a more sustainable society, is beyond the scope of this paper. The paper is written at a time when the Government and other stakeholders are working to implement the WEEE Directive and so its findings are relevant to those involved who may be charged with developing systems for the collection of WEEE.

It is important to look at the WEEE issue specifically in relation to small items as although the UK can meet initial collection and recycling targets relatively easily by continuing with current systems that deal with large items of WEEE such as washing machines and fridges, it is expected by the European Union (EU) that all designations of WEEE will be tackled. Even though large white goods make up the majority of WEEE by weight, small and medium sized items are the vast majority by number (Enviros, 2002). Additionally, the WEEE Directive represents one part of the move within the EU towards sustainable resource and waste management practice and more responsible behaviour by producers and consumers. This is reflected in current UK efforts to improve the household recycling rates of a number of products and materials, and WEEE is no exception.

To investigate the issues surrounding small items of WEEE and consumers, this paper draws upon existing literature on WEEE and household attitudes to waste and recycling, and refers to the findings of a large scale household research survey carried out by one of the authors in Cardiff. The context of the paper includes information on the background to the WEEE Directive, the situation regarding household waste and recycling in the UK, the problems associated with WEEE, a broad summary of key elements of the WEEE Directive relevant to this study, specific problems associated with small WEEE, current infrastructure and disposal options, and consumer attitudes to waste and recycling. This will be followed by the reasoning and methodology of the research and the presentation of key findings, discussion and analysis. Finally, recommendations and conclusions will be drawn.

[3] WEEE refers to electrical or electronic equipment, which is waste within the meaning of Article 1(a) of the Directive.

[4] The term small product groups refers to those household electrical and electronic products that due to their size are easy to dispose of in the general household refuse, for example kettles, toasters, electric toothbrushes, shavers and radios (see Fig. 1). These items may be in working order, broken but repairable, broken and un-repairable or obsolete.

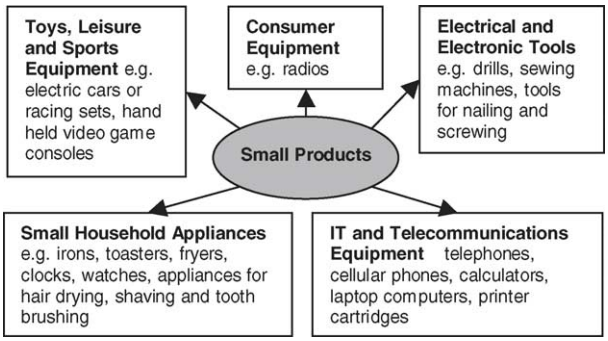

Fig. 1. Examples of small electrical and electronic products included in the WEEE Directive.

2. Context

In the last 15 years, the notion of sustainability has become more widespread and is continuing to have an influence on global business, organisations and governance. The global social, ethical and environmental impacts of business activities are gaining an increasingly high profile, especially for trans-national corporations, and corporate social responsibility is now frequently viewed as a necessity to maintain business success and license to operate. This change in business attitude is mirrored and encouraged by changing policy and legislative approaches.

Traditionally, in the EU, the legislative approach towards environmental problems has been one of 'command and control', largely addressing 'end of pipe' pollution problems. Now, the emphasis is changing towards producer responsibility whereby those who produce goods are then responsible for environmental impacts throughout the whole of their life cycle, from resource extraction to recycling, reuse and disposal. Efforts have also been made within the EU to further integrate environmental policy into other areas of strategy and regulation. Indeed, at a strategic level, the EU is making a concerted effort to integrate different areas of environmental and waste policy, and has various measures and strategy documents in place. These include the Landfill Directive (Dir 1999/31/EC, CEC, 1999) and a Communication towards a thematic strategy on the prevention and recycling of waste, which was adopted by the Commission in May 2003 (CEC, 2003a).

In the UK, legislation is the principle driver for changes towards sustainable waste management practices. The Landfill Directive is undoubtedly the main piece of legislation related to waste management currently influencing the UK and sets out, amongst other things, targets for EU Member States to reduce quantities of biodegradable municipal waste sent to landfill. This has been imported into UK law in the form of the Waste Strategy for England and Wales (DEFRA, 2000) which provides a framework for dealing with waste diverted from landfill. Central to this strategy is the need to minimise the substantial growth in waste generation that has occurred in recent years, and it sets targets for the amount of waste to be recycled (see Table 1).

The release of the Waste Strategy for England and Wales has led to a flurry of activity from local authorities to increase recycling rates and the instigation of a variety of initiatives

Table 1
Targets set in the Waste Strategy for England and Wales (2000) for the amount of waste to be recycled

By 2005 to recycle or compost at least 25% of household waste
By 2010 to recycle or compost at least 30% of household waste
By 2015 to recycle or compost at least 33% of household waste

designed to improve waste management and recycling activity especially at the level of the household. But, due to differing priorities, strategic insight and capacity and the activities of other regional organisations, recycling infrastructure is variable throughout the UK consisting of a mix of door to door collections, wheeled bin segregation schemes, council bring sites, council pick up services, recycling points in, for example, supermarkets and other localised services, intermediate labour organisations[5] and charities. Therefore, recycling rates are variable on a regional, local and even street-by-street basis. In terms of WEEE, despite the intense activities of local authorities to develop recycling infrastructure little account has been taken of this waste stream even though it would help meet mandatory recycling targets.

WEEE is recognised as the fastest growing waste stream in the EU, with estimates of between 14 kg per person per annum (cited in Keynote, 2003) and 20 kg (estimated by AEA, cited in Enviros, 2002), and it is increasing at about three times greater than the average for municipal waste (Wilson, 2001). In the UK in 1998, '*6 million tonnes of WEEE were generated accounting for 4% of the municipal waste stream*. . .[this is] *rising at 3–5% a year and is estimated to hit 12 million tonnes by 2010*' (Toner, 2002). Historically, the electronics industry has been perceived as a 'clean' industry (Ellis, 2000), however the reality is that it is one of the most polluting, with a number of hazardous chemicals, components and processes used in the manufacture of Electrical and Electronic Equipment (EEE).[6] There are a number of issues throughout the EEE lifecycle, from material extraction and component and product manufacture, to energy requirements in the use and the disposal of products at the end of their life. This is compounded by the fact that in recent years EEE has increased in technological complexity, with new product innovations and ever shortening product life expectancy. McLaran (cited in Hansen et al., 1999) notes, '*electronic functionality within consumer electronics is a dynamic and fast moving field, characterised by advancing technology and price reduction to support increasing demand*'. This has inevitably led to a number of detrimental implications for the environment (see Hansen et al., 1999). The hazardous content of components is a major concern (for example see Ellis, 2000) especially as in the UK more than 90% of WEEE is landfilled, incinerated or recovered without any pre-treatment, and the electronics industry has come under mounting pressure to reduce its impact on the environment from a variety of sources. Hansen et al. (1999) notes that

[5] Intermediate Labour Organisations provide training and work experience for the long-term unemployed. Some are independent companies, others are projects incorporated into the structure of other organisations, such as Development Trusts. ILO projects hire participants for periods and act as a stepping stone to obtaining permanent employment. The heart of an ILO is the provision of paid work together with high quality training, personal development and active job seeking (source: http://www.sedi.info/glossary.html).

[6] The RoHs Directive (2002/95/EC) on the restriction of the use of certain hazardous substances in electrical and electronic equipment is being implemented to tackle some of the hazardous substances present in WEEE (see CEC, 2003b).

'*environmental considerations in production and product development are becoming of increasing importance in the consumer electronic industry due to legislative pressure, cost savings and emerging green markets*'.

The European Commission identified the need for legislation to address the escalating problem of WEEE at the Community level, and this has taken the form of the WEEE Directive, which needs to be transposed into the national law of Member States by August 2004. The Directive has extended producer responsibility as its central tenet and aims to increase rates of reuse, refurbishment and recycling. Therefore, once implemented, producers of EEE will be responsible for the dismantling and recycling of products at the end of their life. The WEEE Directive is in the process of being transposed in the UK, with many questions and concerns remaining unanswered. In brief, the WEEE Directive covers EEE used by consumers and that which is intended for professional use.[7] There is an initial 4 kg per resident collection target, which is already met in the UK, largely through the collection, reuse and recycling of large white goods such as cookers, fridges and washing machines. Consumers must be able to return waste equipment free of charge, and producers meet reuse and recycling targets of 50–80% of product weight depending on appliance type. In the UK, it is likely that the collection of WEEE will be carried out by local authorities and distributors, and producers will then provide for the financing of the dismantling and recycling of products once they are in collection facilities. This is still under discussion and the latest consultation document (DTI, 2003a) suggests that distributors should develop a system, which will provide financially for the development of local authority infrastructure in order to meet their obligations under the Directive. The Department of Trade and Industry has a preference for the market share route of compliance and developing the existing infrastructure, but it is ultimately the producer's choice. For example, Electrolux, Braun, HP and Sony have opted for the individual responsibility approach where they will be responsible for the collection and treatment of their own products, but are working collectively to reach their WEEE obligations.

In June 2003, a report commissioned by the Industry Council for Electronic Equipment Recycling (ICER) confirmed that the UK is exceeding separate collection targets for WEEE, with around 7.83 kg per head collected in 2002, but preliminary research indicates that the recycling rates of this WEEE are falling short of the requirements of the Directive (Letsrecycle, 2003). It is also important to note that collection targets are currently met by only a small proportion of the products covered by the Directive therefore efforts need to be made to ensure that other items are dealt with, this is especially important as targets will be reviewed and increased over time. Additionally, tackling the WEEE problem is just one small but important part of the move towards sustainability and more sustainable waste and resource management in the UK. The implementation of the WEEE Directive will raise awareness of issues surrounding the manufacture, use and disposal of EEE and, together with other ongoing initiatives to address general waste and encourage recycling will contribute to meeting sustainability goals.

Householder involvement is paramount to the success of recycling initiatives as these are reliant on the willingness of individuals to change current behaviours and participate, providing that they are empowered to do so. This is especially the case for those products

[7] Electrical or electronic equipment which is waste within the meaning of Article 1(a) of the Directive.

and materials that pose a greater challenge when recycling, whether it's due to a lack of awareness, or the product type. For example, small items of WEEE pose a number of unique problems for reuse and recycling and it is important that mechanisms are put in place to ensure that they are not overlooked. Problems associated with WEEE have only been acknowledged relatively recently and the focus has been on the disposal of large items, or those small items with a high residual value such as mobile phones. This is due to the fact that there is a market demand and economic incentives to reuse and recycle these products and items and, in the case of refrigerators, a legal obligation to treat them in accordance with the requirements of the European Council Regulation No. 2037/2000 on substances that deplete the ozone layer. This is not the case for the majority of small WEEE, which present quite unique problems due to their size and diversity:

- Their size means that they are easy to dispose of in general refuse.
- There is a lack of infrastructure for the collection and treatment of small WEEE, for example many charities will no longer accept electrical and electronic items due to safety fears and the fact that it is often uneconomic to make repairs.
- They do not pose any difficulties when considering disposal as, for example, a washing machine might due to its size and weight.
- Many have been produced as 'disposable' items that are not intended to be durable, for example, toys with electronic components, and so they have not been manufactured with upgradeability and reuse in mind.
- More products are having electrical and electronic components incorporated into them, which were not present before, for example toys, diaries and novelty items such as badges, pens and cards.
- The size, variety, complexity and cost of small products together with low market demand often makes repair, refurbishment and reselling, and recycling less viable than with larger items (with the exception of mobile phones), see Fig. 2.

The directive indicates that systems will have to be developed and set up for the collection, treatment, recycling and re-use of WEEE. There are a number of schemes in operation in

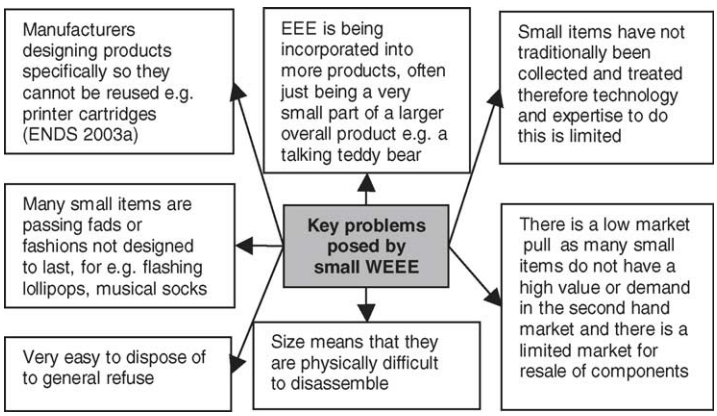

Fig. 2. Key problems posed by small product groups from a reuse, refurbishment and recycling perspective.

England and Wales but they are piecemeal and so there are currently a variety of routes that WEEE does, or could, take under the WEEE Directive (adapted from Bridgwater and Anderson, 2003):

- Retailer take-back schemes (including in-store take-back schemes and mail back services).
- Collection by local authorities at civic amenity sites.
- Collection by local authorities via bulky waste collections.
- Collection by local authorities via kerbside collections.
- Collection by reuse schemes, e.g. Furniture Recycling Network.
- Other collections, such as for computer refurbishment.

There is a quite well-established infrastructure generally in the UK for the collection and recycling of fridges, mobile phones and IT equipment, with most WEEE collected at civic amenity (CA) sites, through distributor take-back schemes or special collections (Letsrecycle, 2003), and many local authorities offer free bulky good collection services. It is also often the case that retailers, on delivery of a new product, will take an equivalent product away for the consumer, sometimes for a small charge, and these are then refurbished and recycled. This is especially the case for large white goods. There are also many organisations that refurbish computers and have established second hand markets through private sales, second hand shops and charity shops (Enviros, 2002). Additionally, there are a number of local community organisations, which will refurbish and recycle WEEE and then sell the goods back to local communities at a reduced price or offer them in exchange for volunteer time. For example, Computers in the Community[8] and CREATE.[9] However, these organisations generally focus on large household appliances or high value goods such as computers, neglecting small items.

Although some elements of the required infrastructure for the WEEE Directive are well established they are far from comprehensive in scope or spatial distribution. In response to the WEEE issue, various trials and studies have taken place in order to assess other viable options[10] and a research report was recently completed on the potential for recycling small WEEE (Enviros, 2003), which explores the advantages and disadvantages of different disposal route options for small WEEE. It is clear that most of the systems in place or

[8] Computers in the Community—is a charity which recycles excess and obsolete computers and other related equipment from businesses and local authorities across Wales, for redistribution into the community. http://www.citcwales.org.uk/.

[9] CREATE exists to provide quality training and work for people who are at a disadvantage in the labour market. They repair and refurbish household appliances—fridges, cookers and washing machines, and sell them at reasonable prices. This provides products that people can afford, gives significant environmental benefits, and training in a quality social business. http://www.createuk.com.

[10] (1) A 3-month partnership trial in Hampshire involving Comet, Wincanton, DEFRA, the Renew Trust, Remploy and the local waste disposal authority. (2) The Lothian and Edinburgh Environmental Partnership (LEEP) Project (http://www.leep.org.uk/). (3) An ICER recycling study (see http://www.icer.org.uk/). (4) A partnership between the UK Centre for Economic and Environmental Development (UK CEED), Hewlett Packard, Peterborough Council and other private and public sector partners designed to identify best practice options for collecting, processing and remanufacturing/recycling WEEE items. (5) the European Trade Organisation for the Telecommunications and Professional Electronics Industry (ECTEL) has trialled mobile phone take back in the UK and Sweden.

being piloted are addressing only certain items of WEEE, mainly large items or high value goods with few exceptions, for example, the Peterborough trial,[11] which is one of the most comprehensive approaches in the UK. Current schemes are largely reliant on consumers making the effort to dispose of items responsibly, which can be difficult if infrastructure is sparse and information lacking. With regard to small items of WEEE, adequate infrastructure is not in place to collect small items for recycling and most are disposed of via household refuse collections (Cooper and Mayers, 2000). As noted by Cooper and Mayers (2000), '*new collection and recycling processes are required for small appliances*'. One option for WEEE collection is via CA sites. There are 450 CA sites in the UK where consumers can dispose of waste and where it is mooted that WEEE collection services will be installed. However, these are not evenly distributed with few sites in London or in rural areas, and according to Biffa, only a third are suitable for WEEE banks (ENDS, 2003). The Government recently commissioned a report to investigate the potential of using CA sites for the collection of WEEE (Bridgwater and Anderson, 2003), which finds that over half of the CA sites in the UK currently collect WEEE (other than refrigeration), and there is considerable capacity to expand the collection of WEEE on the basis of available site space alone.

Focussing on the disposal of WEEE, one of the most comprehensive and enlightening studies carried out in the UK was the E-SCOPE study, initiated in 1998 (see Cooper and Mayers, 2000). This study investigated the purchase, use and disposal of household appliances from the consumer perspective, and quantitative information on product ownership, lifetime, use and disposal. It also identified the likely effectiveness of different approaches addressing the need to reduce WEEE. It was found that households owned on average 25 appliances and over the last 5 years ownership of products increased by approximately 60%. It was also found that '*over 60% of small work or personal care appliances were disposed of in dustbins, wheelie bins or rubbish sacks*' (Cooper and Mayers, 2000). More positively, in the study it also became clear that householders wanted better information on how to dispose of appliances safely. More recently, the study carried out by Enviros (2003), which compiled existing information and carried out consultations with various stakeholders and two focus groups with consumers, also had a number of useful findings. This report confirmed that whilst waste management companies and reprocessors are heavily involved in white goods recycling, they are not involved in small WEEE recycling other than for mobile phones, largely due to the diversity and low residual value of small WEEE. In order to encourage more recycling of small WEEE, the focus group participants expressed a need to know who would benefit and that schemes should be promoted on the basis of the benefits to consumers, the community at large and/or other good causes. Perhaps surprisingly, '*participants were generally very negative about the involvement of large EEE retailers, but positive about the big supermarkets*', however the reasons for this are unclear. It was also found that the '*key*

[11] A partnership between the UK Centre for Economic and Environmental Development (UK CEED), Hewlett Packard, Peterborough Council and other private and public sector partners has been set up to identify best practice options for collecting, processing and remanufacturing/recycling WEEE items. In 2002, Peterborough City Council received a grant of £266,000 from a DEFRA Waste Minimisation and Recycling Fund for local authorities to meet recycling targets. This has enabled Peterborough to develop the only local authority WEEE facility in the UK, and the UK CEED project will be integrated with this to analyse, amongst other things, how the costs of processing and remanufacturing/recycling may be most effectively allocated to members of the supply chain. For more information see http://www.ukceed.org.

drivers of successful schemes are awareness, convenience and other forms of motivation. Incentives are important where the process is not very convenient and/or where the item in question is perceived to have a high residual value' (Enviros, 2003).

There is a considerable body of research, which explores the waste management practices of householders but notwithstanding the two studies described above there is currently a lack of information regarding consumer attitudes to WEEE and especially small WEEE. This knowledge is vital if the imminent future targets of the WEEE directive are to be met, and the Cardiff research undertaken by one of the authors aimed to provide such information. The majority of household waste management research has focussed on the activity of recycling, and there are a number of UK studies that have assessed the barriers to recycling and ways in which participation can be increased (see, for example, Tonglet et al., 2004; Mattson et al., 2003; Williams and Kelly, 2003; McDonald and Oates, 2003; Salhofer and Isaac, 2002; Coggins, 2001; Perrin and Barton, 2001; Thomas, 2001; Evison and Read, 2001; Read, 1998, 1999). For example, the review carried out by Thomas (2001) found that '*recyclers were generally found to be more aware of publicity and more knowledgeable about recycling with non-recyclers more concerned about incentives to recycle and convenience*'. It was also found that 'recycler' and 'non-recycler' profiles have been developed and associated behaviour identified in relation to demographics, attitudes, education and publicity and the design of recycling schemes (Thomas, 2001). Surveys published by the Strategy Unit (2002) and the Welsh Consumer Council (2002) show that significant barriers to recycling include inadequate local facilities, lack of a kerbside recycling scheme, space concerns for storing items, lack of convenience, and limited or no access to a car. For those not participating in recycling, a survey by Wastewatch in 1999 found that '*. . . main reasons* [for not recycling] *were laziness (30%), lack of convenience (19%) or inadequate local facilities (12%), . . . 88% of households without a kerbside collection claimed that they would recycle more if such a service was provided . . . most common barriers to participation were difficulty of separation and transportation to a recycling site (26%), distance to nearest site (24%) or inability to carry the materials (13%). 8% could not be bothered and 13% had not given the topic any thought* (Wastewatch, cited in Evison and Read, 2001). The knowledge base that exists about the activity of household recycling will be of some use when encouraging consumers to recycle their electrical and electronic waste, but there are also a number of characteristics that are particular to WEEE that need to be taken into account.

3. Small WEEE recycling: attitudes and activities in Cardiff

Aspects of individuals recycling attitudes and behaviour need to be considered as the success of the WEEE Directive is reliant on consumers changing their current waste disposal habits and separating WEEE from the general mixed waste stream. It is notoriously difficult to change people's habits with regard to recycling and, as highlighted, there may be a number of reasons why people do not recycle and ways of encouraging them to do so.

In order to try and establish household attitudes to the disposal and recycling of WEEE, information was collected as part of a research project, which was conducted in Cardiff, Wales, a city of nearly 300,000 residents. This was initiated in the autumn of 2002 when

Table 2
Ward areas involved in the research

Ward A is an area where the recycling scheme has been in operation for nearly 2 years
Ward B is an area where the recycling scheme has been in operation for about 6 months
Ward C is an area where the recycling scheme is about to begin
Ward D is a control area which has never received a kerbside recycling service

Cardiff County Council (CCC) commissioned the BRASS[12] Centre at Cardiff University to undertake research into the waste management and purchasing behaviours of householders involved in the wheeled bin recycling scheme, and consisted of a questionnaire survey and interviews. Cardiff has a recycling rate of 13.5% and is undergoing a transition in terms of its recycling services with the introduction of a new recycling service which aims to meet municipal recycling targets set by the Welsh Assembly, i.e. 15% by 2005, 25% for 2006–2007 and 40% for 2009–2010. A new twin bin collection scheme has been introduced to selected residents, which involves a green bin for green waste, green bags for dry recyclables and a black bin for residual waste, with a choice over the size of these bins. Both bins and bags are collected on a fortnightly basis. Cardiff is split into 29 electoral divisions or wards and currently 19 wards participate in the wheeled bin recycling scheme, equating to 17,000 properties and by the end of 2006, every household will receive this service.[13] In the summer of 2003 a questionnaire was sent to each household in four wards across Cardiff, which were in different stages of the wheeled bin recycling scheme. These wards were chosen due to their varying recycling provision and Table 2 details the recycling provision in each area.

By targeting wards in different stages of the recycling scheme it allowed comparisons to take place and information to be gleaned on how the scheme impacts on other areas of waste management such as waste minimisation. The initial research will be followed up with a further survey in order to 'track' waste management behaviour and attitudes and provide longitudinal data, which is often lacking in the household waste management literature.

The questionnaire explored all aspects of household waste management behaviour and attitudes, and was sent to nearly 5000 households whose addresses were supplied by Cardiff County Council, and a pre-paid envelope supplied. The method of using questionnaires assured a wide coverage of the general issues relating to waste and enabled a large amount of data to be gathered. To supplement and explore the trends in the quantitative data nearly 30 semi-structured interviews were conducted with Cardiff residents. These were randomly chosen from those who returned the questionnaire. Two specific questions relating to the disposal of WEEE were included in the questionnaire, as shown in Table 3. This was explored in more depth during the semi-structured interviews with respondents, for example why householders used a particular disposal method for large, and particularly, small electrical goods, and what would encourage them to recycle small electrical goods. Additionally, the authors conducted a total of 18 interviews at the three CA sites situated within Cardiff.

[12] Business relationships, accountability, sustainability and society. http://www.brass.cf.ac.uk.

[13] Properties such as flats, houses with no frontage, etc. will operate a tri-bag system which uses bags instead of the wheeled bins.

Table 3
Survey questions relating to the disposal of WEEE

How do you dispose of	Recycle	Bin	Civic amenity site	Skip	Charity	Sell it	Phone council	Don't know	Not relevant
Big electrical and electronic items (e.g. fridges, TVs)									
Small electrical and electronic items (e.g. hairdryers, shavers)									

One criticism of the research design that needs to be highlighted at this point relates to self-reported behaviour. It has been documented that respondents tend to exaggerate their waste management behaviours especially when these are perceived to be ethically sound (Woollam et al., 2003; Williams and Kelly, 2003; Tucker, 2003). This research has not examined the behaviour of respondents with regards to WEEE and it is argued here that the limitations of self-reported research is unlikely to apply to small electrical goods since small WEEE is not really perceived to be a problem as illustrated with the face to face interviews, therefore the tendency to exaggerate may be less. There are, however, limitations when making inferences with data gathered from the questionnaire regarding the disposal of WEEE. It was revealed in the interviews that electrical items, both large and small, are disposed of in different ways according to the product type. For example, householders may dispose of electrical toothbrushes in the household refuse but attempt to sell, or give away their stereo. This is especially the case with small electrical goods due to the sheer number and variety of products currently on the market. Therefore, this must be taken into consideration when the results from the research are presented as respondents could only tick one disposal option on the questionnaire.

The overall response rate was 30%. Table 4 breaks down the response rate according to each of the four wards. SPSS Version 11 was used to collate and analyse the data. At this stage of the research, simple cross tabulations have been carried out but once the second stage of the survey has been completed more comprehensive statistical analysis will be conducted. The data gathered from the questionnaires and interviews was assessed to investigate five main areas:

(i) How do respondents currently dispose of electrical goods and why?
(ii) What are the possible significant socio-economic factors, which influence the way those electrical goods are disposed of?

Table 4
Response rates for each of the four wards

Area	Questionnaires sent	Questionnaires returned	Response rate for area (%)
A	1070	364	34
B	1341	450	34
C	1260	305	24
D	1267	358	28
Total	4938	1477	30

(iii) Are any differences present in the way that electrical goods are disposed of and thought about depending on how frequently householders recycle or how much they recycle?
(iv) Are there possible differences in the way that electrical goods are disposed of and thought about by householders who are involved in the wheeled bin recycling scheme and those who are not?
(v) What are the most effective ways to engage householders in the recycling of electrical goods particularly small product types?

4. Key findings

The survey and interviews generated a number of valuable findings. Indicative of the lack of awareness surrounding the disposal of small WEEE, a small but significant proportion did not respond to the related questions, deeming it 'not relevant' (10%), or simply ignored it (7%). This indicates that they have given the matter little thought, consider it to be unimportant or don't think that they dispose of any such items. This was reflected in the interviews with Cardiff householders as many had not considered small items of WEEE. Indeed, when asked about them, the response given was frequently 'I've never thought about it' and interviewees could not answer with certainty which disposal method they used. The lack of householder consciousness and easy disposal of small WEEE is in stark contrast with large items of WEEE, which can pose more significant problems for householders. This is illustrated by the fact that when asked about the disposal of large items, interviewees could provide greater detail and readily identify disposal methods according to specific items. For example, 'the TV was sold', 'the council collected the oven', 'the washing machine was taken by the retailer when the new one was delivered'. Also, small WEEE was not considered a 'waste' by many householders in the same sense as, for example, glass, paper, compostables etc., which represent items that have been targeted for recycling by local authorities. This lack of awareness regarding small items of WEEE may relate to the fact that disposal events by the householder take place infrequently and involve little thought, unlike other items such as glass, plastic and paper where disposal events take place frequently and so become part of the household routine. Additionally, the volume of these items send a clear message to householders about the amount of waste they generate.

Another primary finding was the lack of recycling of small WEEE that actually occurs, with 97% of such items not being recycled and the majority being disposed of via CA sites[14] (33%), or in the household refuse (26%). Taking items to a CA site could be classed as a responsible activity as it became apparent during the CA site interviews that a number of householders were asking advice on how to dispose of WEEE and where it should be put for recycling, although this was mainly for large items. Whether small WEEE is taken to CA sites in the hope that it can be recycled or not, it is clear that many respondents dispose of such items in the household refuse or in the general waste at CA sites. When interviewed,

[14] Care needs to be taken when interpreting these results as each of the responses could have different implications for recycling. For example, disposing of items to a CA site could be interpreted as being a responsible 'recycling' activity however it is unclear whether householders recycle at the CA sites or whether they just put small WEEE items directly into the general waste.

householders revealed that they did not know how to recycle small WEEE and often stated that they had 'no choice' but to put the small items in the refuse as charity shops, etc. did not accept them. Interestingly, Cooper and Mayers (2000) found that 60% of small EEE was disposed of in the household refuse, a much greater percentage than indicated by the Cardiff questionnaire. Possible explanations for this include the way in which researchers framed questions, together with whether the questions were open or response options given. Alternatively, the different spatial aspects of the two studies may have had an impact, which itself is worth noting. The Cardiff study has been carried out in a relatively small area where many households have recycling provision whereas the Cooper and Mayers study covered a much greater geographical area and so there were relatively few responses in each place. This means that regional and local trends would have been difficult to identify and to be drawn across socio-economic and demographic features and therefore the overall figure of 60% may not reflect local variations which occur in relation to varying service provision.

There is a difference in behaviour concerning the annual income of households as those in lower income bands (<£10,000) were less likely than respondents on higher incomes to visit CA sites to dispose of small WEEE. This could be due to difficulty accessing convenient transport, notably cars which is relevant for the areas surveyed in Cardiff as three of the four wards are situated two to three miles from the nearest CA site. Therefore, this distance could present a disincentive for those households who do not have access to convenient transport. Respondents on lower incomes were also less likely to discard small WEEE in the household refuse than those on higher incomes, which is surprising considering that these respondents were also less likely to visit CA sites. However, those on lower incomes are likely to keep small WEEE for longer and give items away for reuse rather than dispose of them in the household refuse. It is also worth highlighting at this point that even though those in higher income bands are in a better position to visit CA sites and the survey findings indicate that they are more likely to do so than those on lower incomes, it is documented that these households generate more waste (Welsh Consumer Council, 2004; Strategy Unit, 2002).

Gender also had an impact on questionnaire responses. Overall, the findings indicate that men are more likely to visit CA sites than women (10% more of the male respondents stated this than women). But, this trend changes for those women that recycle regularly who are as likely as men to visit CA sites. This difference could be linked to the fact that women who recycle regularly are more aware of the recycling provision at CA sites and so consequently are more likely to visit them for this purpose. Those women who do not recycle regularly may be unaware of the recycling facilities at CA sites or have not sought them out as they do not require them, and so do not have a need to visit such sites.

Additionally, further analysis of the survey results showed that householders who reported that they frequently recycled were more likely to dispose of small WEEE via a CA site in comparison to those who infrequently or never recycle. For example, in Area C, nearly 43% of respondents who recycle regularly reported that they disposed of their small WEEE in a CA site, whereas amongst those who do not recycle, only 19% take these items to a CA site (see Fig. 3). Analysis also revealed that those who do not recycle, or recycled infrequently have a tendency to dispose of small WEEE in the general household refuse.

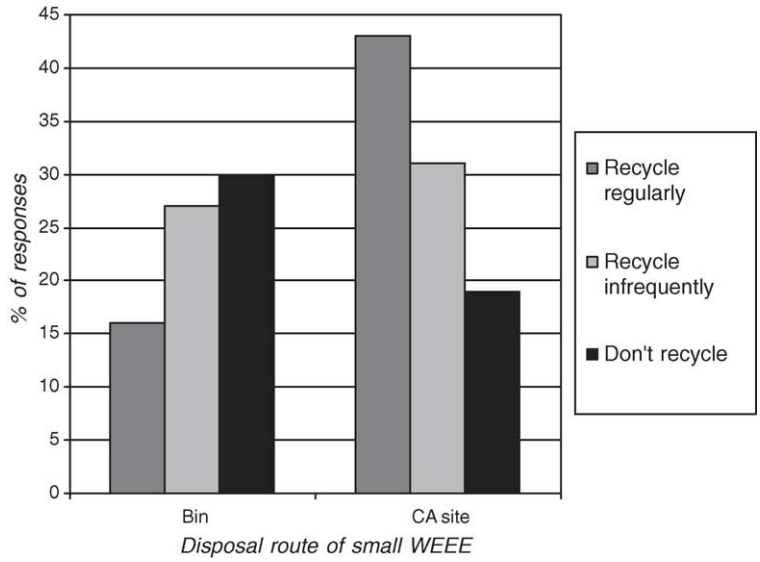

Fig. 3. How households in Area C dispose of small WEEE and recycling behaviour in relation to household items, such as paper, glass, tins and plastics.

It appears from this finding that the act of recycling other household items (such as, paper tins, glass, plastics), impacts on the way that small WEEE is disposed of. There are two key interpretations of why this behaviour occurs. Firstly, households who recycle other waste (for example, paper, glass, tins, plastics) on a regular basis may visit CA sites with the intention to dispose of their small WEEE in a responsible manner, i.e. they think it will be recycled (as highlighted earlier). Secondly, this finding may indicate a 'spill-over' effect whereby the act of recycling other items has led to a change of behaviour when respondents select a disposal route for small WEEE. Further research is necessary to find out why householders who recycle frequently make additional effort in taking their small WEEE to a CA site and if there are any other influencing factors. If this correlation is revealed to be accurate it is an encouraging sign as it shows that not only has the act of recycling produced an unexpected secondary effect but it demonstrates that householders want to recycle their small WEEE despite being currently unable to do so with ease.

Participation in the CCC recycling scheme also has a bearing on the way that small WEEE is disposed of as a greater number of those that were covered by the recycling scheme (Areas A and B), put their small WEEE in the household refuse than residents which were not included (Areas C and D). These findings show differences in the behaviour of frequent recyclers depending on whether kerbside recycling is provided. This may reflect the fact that residents who do not have a kerbside recycling collection have to make a greater effort to recycle than respondents from the wheeled bin scheme areas. Therefore, residents with no kerbside collection (Areas C and D) who recycle may be more conscious of their waste and are more likely than respondents in the wheeled bin scheme to take their small WEEE to a CA site rather than put it in the general refuse.

5. Discussion

To date, the management of WEEE has been tackled aside from other more general waste management and recycling issues and there are indications of a lack of integrated thinking which could ultimately lead to a number of problems. Efforts are being made by the Government to harmonise different areas of waste management but this is limited and by no means as co-ordinated or spatially comprehensive as required. Therefore, a strategic and integrated approach must be adopted by the UK government and other stakeholders involved in the implementation of the Directive in order to ensure that WEEE is not seen as a separate waste issue. Generally speaking, small WEEE is not currently viewed as a priority by decision makers. This is understandable as there are more pressing issues but careful planning is especially pertinent for these items as due to their size, low value and limited reuse markets they pose unique problems and with current levels of technology and expertise they may be uneconomic to treat. Therefore, the disposal of small items of WEEE requires particular attention to ensure the development of appropriate management systems. The UK can meet initial targets for the collection (4 kg per resident), and reuse and recycling (50–80% depending on product type) of WEEE in the short-term relatively easily, but to meet future targets the recovery of small EEE must be addressed. It is also important not to lose sight of the fact that the WEEE Directive presents opportunities for those willing to take the initiative and develop innovative responses.

There are additional reasons why stakeholders should take heed and plan for small items of WEEE. This study has shown that those that recycle have a higher consciousness of their waste in general. Therefore, as levels of recycling and awareness increase it is likely that the demand for recycling provision from consumers will rise. Local authorities and others need to prepare for this and take account of WEEE recycling issues and needs when designing general household recycling schemes, especially as current systems are limited and may not be able to cope with an influx of small WEEE. Local authorities are presently making concerted efforts in developing infrastructures to encourage and empower householders to participate in general recycling activities and so it is an ideal time for planning to take place that provides not only for the WEEE Directive and small items but also for future European directives that will impact on householders. The concern is that a lack of strategic thinking will lead to inadequate preparations and a reactionary response to problems as they arise. Many CA sites are in the process of refurbishment to make them more user-friendly and recycling orientated. As a large number of items, including small electrical goods, are disposed of at these sites local authorities should exploit this by developing these sites to account for WEEE, or at the very least conduct an assessment to determine what would be required to adapt CA sites.[15] In general, in the UK it is likely that CA sites will be the main facilities for collecting WEEE, but it is currently unclear how the different categories will be segregated and treated. Even if there is no specific provision for small WEEE beyond collecting it in a mixed WEEE skip for shredding and recycling, this is preferable to householders disposing of it with their general waste. Therefore, householders should be

[15] As stated in a recent Committee report "[w]e believe that civic amenity sites have a crucial role to play in ensuring that waste electrical and electronic equipment can be collected separately from the rest of the municipal waste stream" (EFRAC, 2004).

provided with guidance and advice regarding the disposal route options of small WEEE, regardless of whether there are special collection facilities.

CA sites represent just one way to engage individuals in recycling and, as many householders are not able to visit CA sites, recycling schemes and initiatives need to be developed which take into account local infrastructures and needs. It is well documented that recycling needs to be straightforward, convenient and easy but ultimately these requirements must be balanced with economic considerations. It was clear from the interviews in Cardiff that householders would recycle if there was a kerbside collection however this recycling system may not be financially viable or represent the most efficient use of resources. Therefore, even though from the consumer perspective kerbside collections are the best option, they are not necessarily the most efficient way when considering the whole picture.

The importance of adequate local infrastructure cannot be underestimated in its empowering effects on people to participate in more sustainable waste management practices, but this is of little use if householders are not aware of why they need to change their behaviour. As this research revealed, small WEEE is not considered a waste by consumers even though there is a reluctance to throw certain electrical items in the bin, for example, those with a high perceived value such as mobile phones. This represents one of the principle barriers that small WEEE poses in relation to consumer involvement in recycling. As Cooper (2000) argues, consumers need to be fully motivated to respond appropriately, otherwise the environmental benefits that implementing the WEEE Directive can bring will be seriously undermined. Part of the problem regarding the lack of public awareness surrounding small WEEE is that to date there has been little consumer engagement concerning small WEEE, and awareness raising campaigns and education initiatives are needed on the scale that we are currently witnessing with regards to other household wastes. A number of local authorities are undertaking extensive public consultations to explore waste management behaviours of residents as well as to build dialogue and consensus in waste policy decision making but it is rare for these consultations to consider small WEEE. As a result local authorities do not gain crucial information on how householders manage their small WEEE, what their attitudes are towards small electrical goods and how best to engage householders in the recycling of small WEEE. This information is crucial as it would help schemes to be designed for flexibility, account for particular needs and take advantage of peculiarities, such as the fact that women play a greater role in recycling. It is clear that many consumers are beyond the stage of being told why they need to recycle and that now it is a case of engaging the public and informing them about specific items and the ways they can be recycled. The process of public consultation also serves as an awareness raising activity for householders, and the exclusion of small WEEE from such exercises could be construed as a mechanism by some stakeholders such as the Government and Local Authorities to try and keep the issue off the consumer agenda due to the costs associated with recycling and the fact that infrastructure capacity is currently limited.

The results and preliminary analysis presented so far clearly show that small items of WEEE pose a number of unique problems when considering their management once consumers wish to dispose of them. Their size and complexity means that there are practical, technological, logistical and attitudinal issues, which need to be tackled and overcome. There is currently little emphasis on these small items when considering the implementation of the WEEE Directive and the reality is that, at least initially, the focus for reaching targets

will be on tackling larger items. The government has recognised the problems associated with small items, but infrastructure is generally not in place to deal with them and it will take time to develop. Unless a more integrated waste management approach is adopted, waste will continue to be tackled in a piecemeal, ad hoc way which leads to greater expense in the long run and reduces the opportunities for innovation to take place, ultimately hindering moves towards sustainable development and more responsible society. Indeed, if the government is serious about its policies on sustainable development then greater efforts need to be made to ensure it happens.

6. Conclusions and recommendations

The issue of small WEEE has largely been left off the political agenda and though acknowledged by stakeholders, little action is taking place to tackle it. If stakeholders want to avoid costly adaptations to general recycling schemes that are currently being developed, then the small WEEE issue needs to be considered and planned for as soon as possible. In many cases, it is not currently economically viable to recycle or reuse small WEEE but with current consumer trends the problem is only set to increase, therefore stakeholders need to be proactive in their approach to its management. Recycling raises consumer awareness and leads to demands for more recycling and this should be anticipated by stakeholders. It is short sighted by stakeholders to ignore the issue as at some point action will have to be taken and it is far better that this is planned and accounted for rather than having a forced, reactionary response.

When designing recycling schemes, it is clear that a one size fits all approach is not acceptable. In the case of WEEE, if limited facilities are provided, for example at CA sites only, this will not be adequate as these sites are not accessible for all. Therefore, the management of WEEE must be integrated with other, more widespread recycling services to take account of local and individual needs. Action needs to take place by all stakeholders to ensure that satisfactory infrastructure is put in place or planned for the future, otherwise there is the danger that costly changes will have to be made, ultimately causing confusion for consumers and undermining faith in recycling.

This study raises many questions and uncertainties that would benefit from further research. It is clear that householders do not want information on why they need to recycle, but are more interested in how they can recycle and so efforts need to be made to find the best ways of doing this, taking account of national, regional and local householder needs. Additionally, further research exploring consumer attitudes to WEEE and intentions when disposing of small WEEE at CA sites would be of use when considering the location and format of new recycling schemes. As WEEE is recognised as the fastest growing waste stream more should be done to understand and address this unsustainable trend. Another vital area of investigation was raised in 2000 by Cooper, and still applies today. Here, it was stated that further research and strategies are required to encourage the re-use of products and components. Additionally, it was recognised that the recovery of small electrical goods is essential in order to meet anticipated stringent recycling targets in the future. There are a number of research avenues, which could be taken to aid progress towards increasing the reuse of products and components, and to improve the rates of recovery of small electrical

items. For example, research on the potential tonnage that could be recovered from small WEEE would be helpful, together with systems and processes for recycling, refurbishment and reuse. This type of comprehensive data would benefit many stakeholders, particularly LAs, producers and reprocessors, in their strategic development and understanding of small WEEE. For example, in the case of LAs, it will help demonstrate how small WEEE can contribute to overall recycling figures.

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