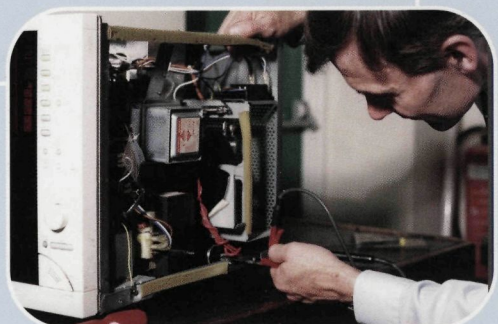


Prospects

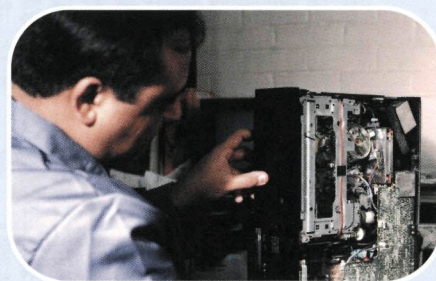
for household appliances

Tim Cooper
Kieren Mayers



E-SCOPE

(Electronics industry – Social Considerations of Product End-of-life project)



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Foreword

Good policies and effective action are best built on high quality research.

Producer Responsibility legislation is increasingly being used to develop a more sustainable approach to the use of our natural resources. At the forefront of the mechanisms for change is the attitude and behaviour of consumers.

The research carried out in this E-SCOPE project has been directed at identifying the consumer attitude and behaviour with accurate quantitative information on household appliances and their use and disposal.

I welcome this report, which is an excellent tool for determining the ways in which consumers and manufacturers alike can address the problems of reducing our household electrical and electronic waste and improving the sustainable use of our natural resources.

The report has been funded partly by manufacturing and retail organisations and partly from landfill tax credits. It is a demonstration of the positive use of the tax in assisting the environment and encouraging sustainability.

Barry Sheerman MP

Chairman
Urban Mines Ltd.

Secretary
Associate Parliamentary Sustainable Waste Group

Executive Summary

This report presents the findings of a study (known as the E-SCOPE¹ study) investigating the purchase, use and disposal of household appliances in the UK. It represents the most comprehensive and detailed investigation of the use and disposal of Waste Electrical and Electronic Equipment ('WEEE') undertaken to date in the UK. Given that the European Union is likely to adopt legislation requiring producers to recover and recycle waste electrical and electronic equipment, this area of research is particularly timely. The findings will be useful for future product design and development, the creation of improved collection, treatment, reuse and recycling services, and the preparation of appropriate UK 'Producer Responsibility' legislation.

The principal objectives of the study were to:

1. Investigate the purchase, use and disposal of household appliances from the consumer perspective.
2. Provide quantitative information on product ownership, lifetime, use and disposal, representative of the UK as a whole.
3. Identify the likely effectiveness of different approaches to addressing the need to reduce WEEE.

The research methods used included face-to-face interviews and focus groups. In total, 802 households were interviewed in over 180 locations across the UK and five focus groups were held involving a total of 50 participants. Issues of product ownership, use and disposal and consumer views on future product and service development were investigated.² In summary, it was found that:

- Households owned, on average, 25 appliances. Ownership of products within the households studied was estimated to have increased by around 60% over the last five years. The product stock was relatively young, most products (88%) being under 10 years old and more than half (57%) under 5 years old.
- The proportion of appliances in storage was low, ranging from 1% to 7% between product types. Storage of appliances appeared primarily to be associated with potential reuse rather than disposal.
- Almost one in ten households (9%) owned at least five second-hand appliances.
- At least 476,000 tonnes of household appliances, totalling over 23 million units, were discarded annually in the UK between 1993 and 1998. Large 'white goods'³ constituted the greatest proportion of the waste stream by mass (77%) and small appliances⁴ by number of units (37%).
- Householders wanted better information on how to dispose of appliances safely.
- The average age of household appliances when discarded ranged from 4 years to 12 years, depending on the type of product. Nearly one quarter of discarded products (24%) were either donated or sold for reuse.
- Almost one half of householders interviewed (45%) were of the opinion that, in general, products do not last as long as they would like. Householders most frequently identified wet appliances⁵, small work or personal care appliances and vacuum cleaners as products that they would like to last longer.

¹ Electronics industry - Social Considerations Of Product End-of-life.

² The statistics on product ownership and disposal are based on self-reported data. Fifteen product categories were used, as listed in Table 1.

³ i.e. Kitchen appliances.

⁴ Defined here as small work or personal care appliances, radio and personal radio, stereo and CD, telephones, faxes and answer phones, mobile phones and pagers and toys.

⁵ Primarily washing machines, dishwashers and tumble dryers.

- More than a third of householders (38%) said that they rarely or never got products repaired. One in ten discarded products (10%) still functioned but were not donated or sold to others for reuse.
- The main disadvantage that householders saw to purchasing longer lasting products was that they may become 'out of date'. Many (73%) regarded information on expected product life as very important and more than half (54%) were dissatisfied with currently available information on life spans.
- Householders appeared to be more willing to buy second-hand products and new products containing refurbished parts if they were perceived as good value and had adequate product warranties.
- New collection and recycling processes are required for small appliances (most of which are currently disposed of in dustbins, wheelie bins or rubbish sacks) and 'brown goods'⁶ (most of which are not currently recycled).
- The recycling and disposal of household appliances is more complex than for 'consumables' waste and the effectiveness of any new product recovery ('take-back') services will be determined by a combination of factors relating to the end-user (i.e. disposer), the service provided and the type of product discarded.

The remainder of this report provides a more detailed overview of the project and its key results.

⁶ i.e Audio-visual equipment, such as televisions and video equipment.

i) Introduction

The effect that consumption has on the environment has become a major concern within the developed world. In response, policy makers are increasingly implementing legislation forcing polluters to pay for the environmental damage they cause. 'Producer Responsibility' legislation, making producers responsible for the treatment and recycling of products at the end of their lives, is one example of such an approach. The principal aim of such legislation is to encourage, by financial means, reductions in the quantity and hazardous content of waste (Lifset, 1993).

This report presents the findings of a study (known as the E-SCOPE study) investigating the purchase, use, and disposal of household appliances in the UK. The research is particularly timely in the light of proposed EU Directives on Waste Electrical and Electronic Equipment ('WEEE')⁷, which will apply Producer Responsibility to this waste stream (Mayers and France, 1999; Cooper, 2000). It is hoped that our findings will promote understanding on the life span of household appliances (Cooper, 1994a; Kostecki, 1998) and aid the success of policy initiatives relating to the disposal of WEEE.

A summary of the E-SCOPE project is provided below, including details of the methodology, key research findings and overall conclusions.

ii) The E-SCOPE project

The E-SCOPE project was initiated in February 1998. The principal objectives of this study were to:

- 1 Investigate the purchase, use and disposal of household appliances from the consumer perspective.
2. Provide quantitative information on product ownership, lifetime, use and disposal, representative of the UK as a whole.
3. Identify the likely effectiveness of different approaches to addressing the need to reduce WEEE.

The study was funded through a combination of private donations from project partners and landfill tax sponsorship.⁸ The twelve project partners represented a broad range of stakeholders, each with an interest in the adoption of Producer Responsibility legislation for Waste Electrical and Electronic Equipment in the UK:

- The City and County of Cardiff (local authority)
- Cleanaway Limited (waste management)
- Dixons Stores Group (electrical and electronics goods retail)
- Domestic & General PLC (break-down cover and warranty support)
- The Greenbank Trust (not-for-profit organisation)
- Hewlett-Packard Limited (IT producer)
- Intex Computers Limited (electronics resale and recycling)
- Philips Electronics UK Limited (consumer electronics producer)
- Save Waste and Prosper Limited (not-for-profit organisation)
- Sheffield Hallam University (Centre for Sustainable Consumption)
- University of Surrey (Centre for Environmental Strategy)
- Urban Mines Limited (not-for-profit organisation).

⁷ Proposal for a Directive of the European Parliament and of the Council on Waste Electrical and Electronic Equipment, Proposal for a Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment, Commission of the European Communities, 13th June 2000.

⁸ The total funding of the project was £37,700, of which £13,700 was funded privately and £24,000 provided through landfill tax sponsorship.

iii) Research methodology

The research methods used in this study included face-to-face interviews and focus groups. In a house-to-house survey, 802 households were selected for interview in over 180 locations across the UK during December 1998. This sample was both demographically and statistically representative of the UK population as a whole.⁹ The questionnaire and protocol used was developed through a pilot survey of 30 households outside of the main sample. Altogether five focus groups were held, with householders of different socio-economic status and from urban and rural locations. Experienced facilitators were used for each group, using a survey protocol developed through pre-testing on a pilot group. The focus groups were conducted in April 1999.

iv) Results summary

The key results of this research are summarised below, covering product ownership and use, product disposal, and consumer views on new product and service development.

a) Product ownership and use

It was found that, on average, UK households owned 25 electrical or electronic appliances¹⁰ (detail shown in Table 1). Overall, appliance ownership was estimated to have increased by around 60% in the households studied over the last five years. The product stock was relatively young, most appliances being under 10 years old (88%) and more than half (57%) under 5 years old. The stock of cookers, refrigerators and freezers, and home and garden tools contained the highest proportion of older products (see Figure 1).

Significant differences in patterns of appliance ownership were found, depending on the type of appliance and the socio-economic group¹¹ of the householder. Respondents in higher socio-economic groups and those viewing material wealth as important owned a higher proportion of newer appliances, stored more appliances and owned fewer second-hand appliances.

An important issue in the development of Producer Responsibility policy is the disposal of old products accumulated in storage within households. The proportion of appliances in storage was low (less than 5% of all products, ranging from 1% to 7% by units according to product type, as shown in Figure 2). Over one half of households (60%) did not store any products. Between 40% and 90% of stored appliances were reported as 'still functioning', depending on the product type. Focus group participants indicated that they were likely to be destined for reuse:

"I've got 2 kettles stored because I've got 2 grown-up children. One's married now, but the other one's still at home, and he will want one of his own. I've made mistakes of getting rid of things like that, and then needing them!" - Carol, age 51, telephone engineer

"I've got a stereo under the stairs, a television upstairs on my chest of drawers that doesn't work, I've got two irons and a kettle in a cupboard in the kitchen, and I've also got a kettle out on the side and another iron... I don't like throwing anything away that might be of some use." - Sandra, age 40, unemployed

The storage of household appliances appears not to be as critical an issue as previously thought (one recent report (ICER, 2000) cites an estimate that up to 30% of appliances are in storage).

9 After determining a minimum sample size of 800 using binomial statistics (to ensure adequate statistical representation), the sample was stratified to represent UK demographics. The sample was then selected by quota.

10 Based on self-reported data (i.e. products identified in the interviews) and including rented products. The figure is the median. The inter-quartile range was 16 (50% of households owned between 18 and 34 products). The mean (27) was higher than the median (25), the distribution being skewed.

11 Socio-economic groups were classified as A (higher managerial, administrative or professional), B (intermediate managerial, administrative or professional), C1 (supervisor or clerical and junior managerial, administrative or professional), C2 (skilled manual workers), D (semi and unskilled manual workers) and E (state pensioners, etc. with no other earnings).

Most stored products are evidently being accumulated for future use. More significant than storage, however, is the fact that because appliance ownership has increased there is a growing stock of items that will eventually be discarded. The survey covered discarded appliances from existing households, but some items are only discarded at the end of the owner's life. They may be numerous and their disposal route is unknown:

"When my grandmother died, my mother phoned the council up and said: 'There's a fridge, a freezer, a washing machine, and a cooker. Can you fetch them?'... They said 'Put them out the back and we will be there within four weeks.' They were there for two days fetching them out of the house."

- Sandra, age 40, unemployed

The survey revealed around one in twenty household appliances owned to be second-hand. As shown in Figure 3, these were, in particular, large kitchen appliances and televisions. Although over one half of households (60%) did not own any second-hand appliances, nearly one third (31%) owned between one and four, and almost one in ten households (9%) owned five or more. The proportion of second-hand appliances owned was significantly higher amongst householders of lower socio-economic status. In contrast, only 10% of households overall possessed any rented products.

The survey also investigated the extent of repair work and found that a substantial proportion of householders (38%) rarely or never got their products repaired. Younger people, under 45 years, were significantly less likely to get products repaired. The main reasons cited were the cost of repairs (45%) and a low anticipated residual product life (13%). For example, one focus group participant commented:

"I think that's the main problem these days; it costs so much to get these things repaired, you might as well throw it and buy a new one." - Charles, age 69, retired

A third of discarded products that were broken were described as 'in need of repair', while the other two thirds were considered 'broken beyond repair'. The focus groups revealed that some consumers would like to be able to undertake repairs themselves. However, this has important safety implications that should be considered carefully before such practices are promoted:

"A lot of these products now, a certain part of them contains a sealed unit and once that has gone, that's it. Before you could take them to pieces and put them back again, but not now - once it's gone, it's gone."

- Barry, age 61, unemployed

Table 1: Ownership of household appliances by UK households

Product category	Number per 1,000 households
Electric cookers	685
Microwave ovens	897
Refrigerators and freezers	1,475
Washing machines, dishwashers and tumble dryers	1,529
Vacuum cleaners and carpet cleaners	1,332
Small work or personal care appliances	6,277
Hi-fi and stereo	1,599
Radio and personal radio, stereo and CD	2,050
Televisions	2,382
Video equipment	1,448
Telephones, faxes and answer machines	1,890
Mobile phones and pagers	601
Computers and peripherals	620
Toys	929
Home and garden tools	3,388

Figure 1: Age of household appliances owned by UK households

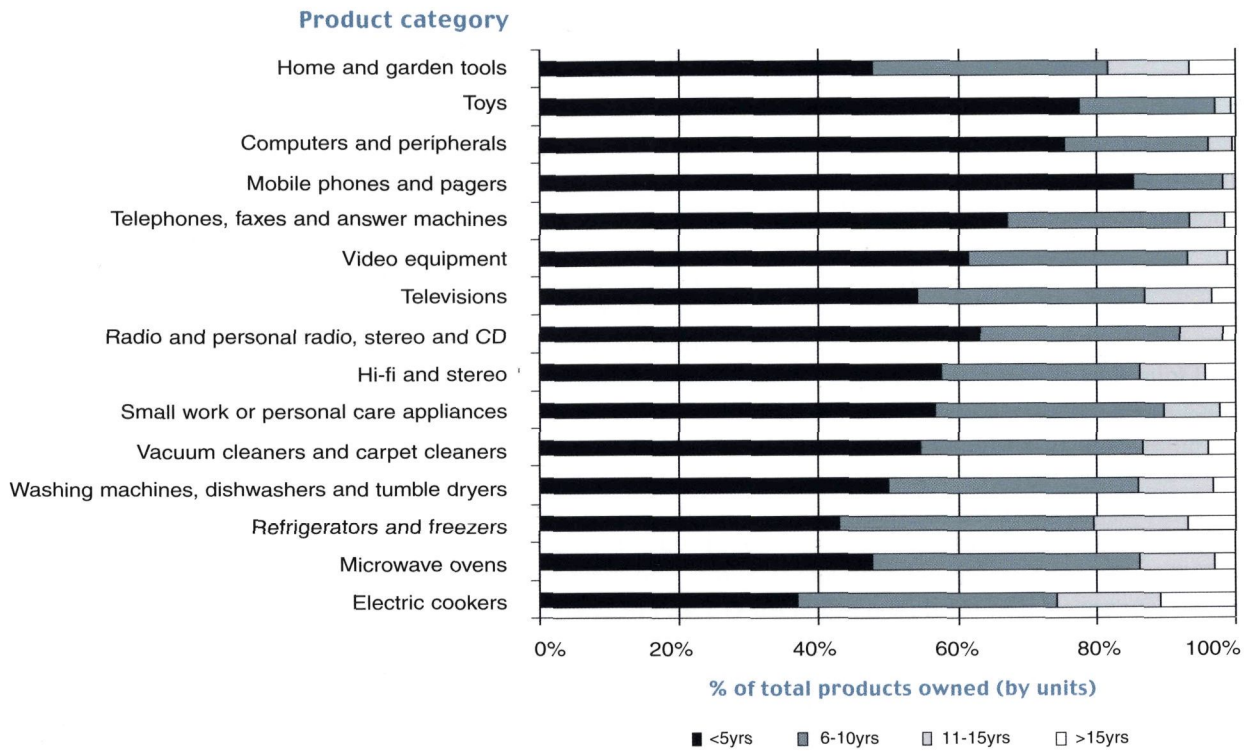


Figure 2: Condition of stored household appliances in UK households

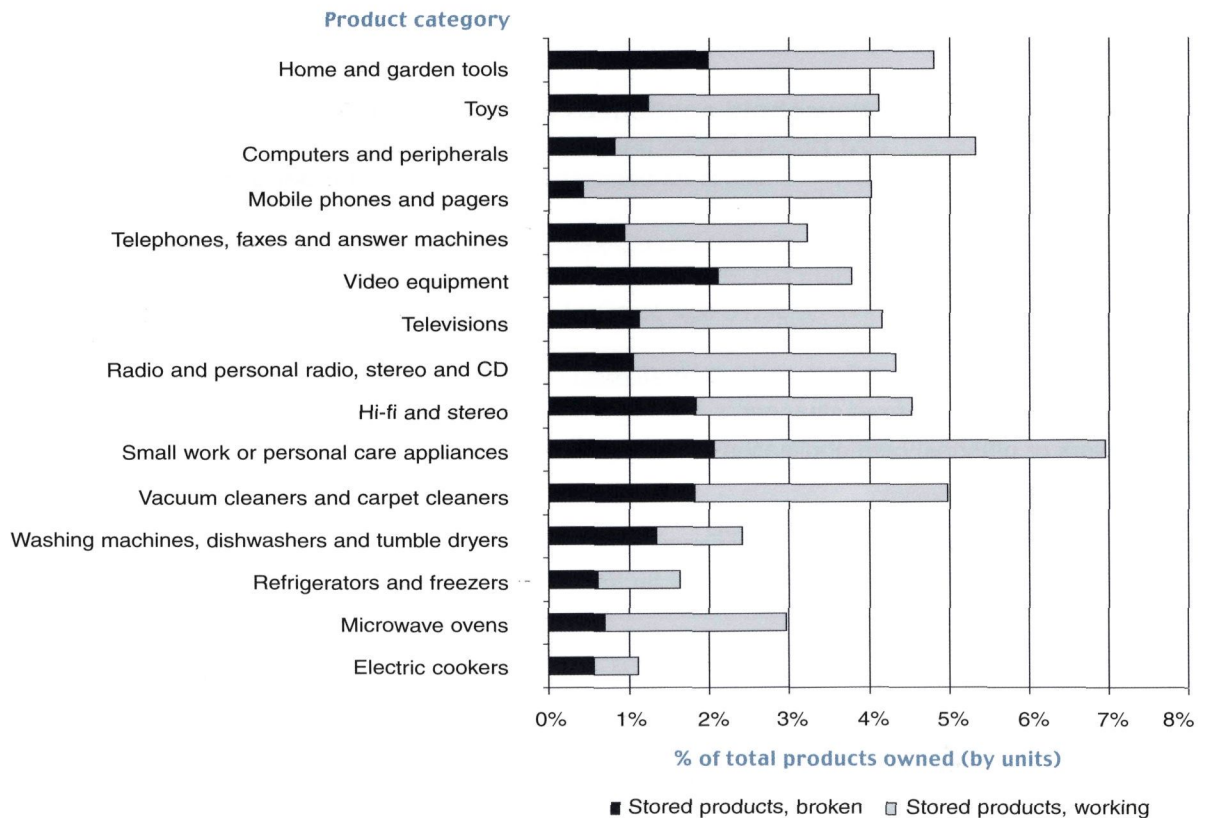
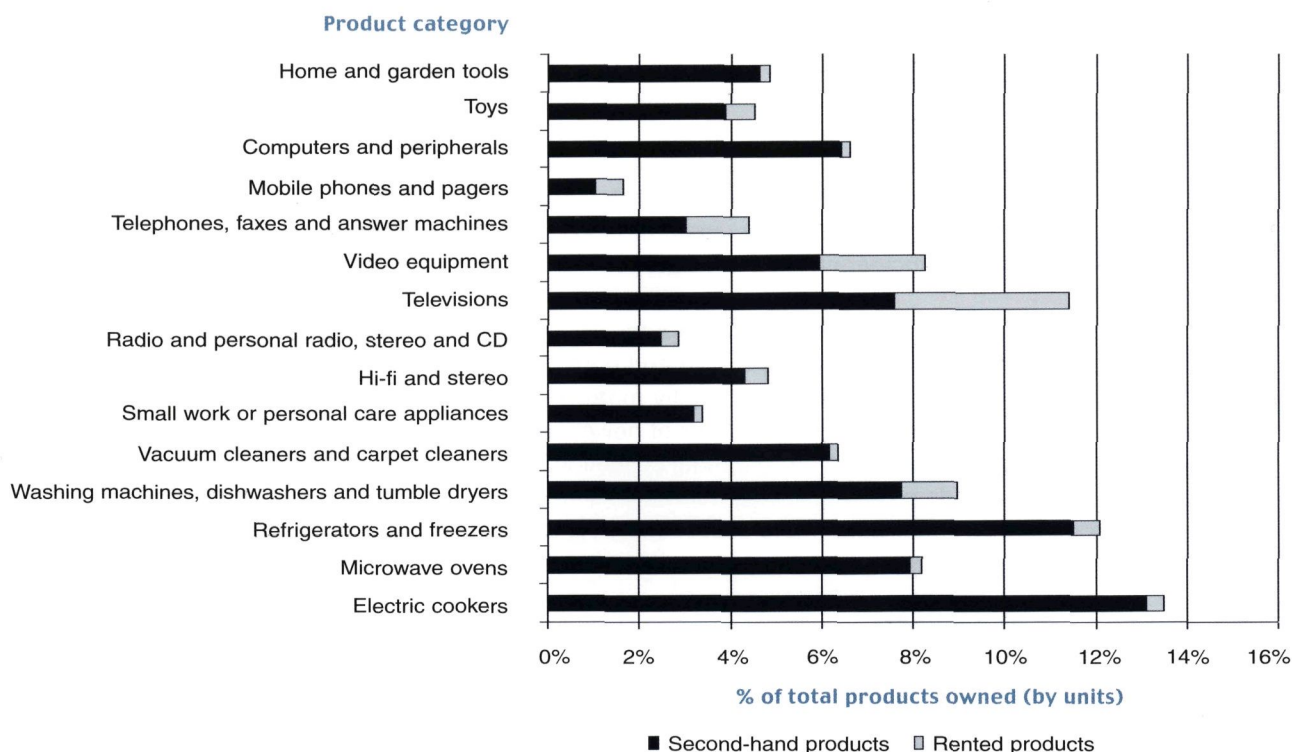


Figure 3: Second-hand and rented appliances in UK households



b) Product disposal

The average age of household appliances when discarded ranged from 4 to 12 years, depending on the type of product, as shown in Table 2.

Overall, one third of discarded appliances were reported as 'still functioning' (notably cookers, hi-fi and stereo, mobile phones and computers). As only around 24% of discarded appliances were intended for reuse (by units), being donated or sold, it can be deduced that around one in ten (10%) still functioned but, even so, were discarded for recycling or final disposal (i.e. landfill or incineration). Discarded products intended for reuse were, on average, as old as those identified as 'broken beyond repair'.

Based on self-reported disposal data, it was estimated that at least 476,000 tonnes of household appliances, totalling over 23 million units, were discarded annually in the UK between 1993 and 1998. This is sometimes described as 'end-of-life' equipment.¹² Whereas large white goods constitute the greatest proportion of appliances discarded by mass (77%), small appliances¹³ make up the most significant proportion by number of units (37%), as shown in Figures 4 and 5. Over 60% of small work or personal care appliances were disposed of in dustbins, wheelie bins or rubbish sacks, effectively preventing reuse or recycling.

Thirteen different disposal routes were investigated (as shown in Figures 6 and 7 and, in further detail, Appendices 2 and 3), accounting for all but 3% of appliances discarded (by mass). In summary:

- Around 104,000 tonnes (22%) of discarded appliances were reused, two thirds of which was donated to family or friends with most of the remainder being sold. Appliances most frequently reused were computers, hi-fi and stereo, microwave ovens and video equipment.

¹² The term 'end-of-life' often includes products which are subsequently reused. The data is based on product disposals in the past five years. See appendices for further detail.

¹³ Defined as small work or personal care appliances, radio and personal radio, stereo and CD, telephones, faxes and answer phones, mobile phones and pagers, and toys.

- Around 328,000 tonnes (69%) of discarded appliances were taken to civic amenity sites by householders, collected as 'bulky waste' by local authorities, or collected by retailers or recycling companies. Over 276,000 tonnes of this consisted of large white goods mainly destined for recycling. It is likely that much of the remaining 52,000 tonnes (mostly televisions, microwave ovens, home and garden tools, and vacuum cleaners) was incinerated or ended up in a landfill.
- The remaining 29,200 tonnes (6%) of discarded appliances were collected as 'ordinary waste' by local authorities (i.e. from dustbins, wheelie bins or rubbish sacks) or left in a skip at the owner's work-place or, illegally, on the nearest convenient skip or waste ground (the latter accounting for around 3,330 tonnes). This is destined either for incineration or landfill.

Significant differences were found in the disposal routes used, according to the type of appliance (as shown in Figure 7), socio-economic group, car ownership and householder attitudes. For example, householders of higher socio-economic status, who were significantly more likely to have access to their own means of transport and owned a significantly higher number of newer appliances, discarded a greater proportion of their appliances by donations to family and friends, collection by retailers, or taking them to civic amenity sites. In contrast, householders of lower socio-economic status disposed of a significantly higher proportion of their appliances through municipal waste collections, in a skip at their work-place or, illegally, on the nearest convenient skip or waste ground.

Discarded products not intended for reuse were most likely to be taken to civic amenity sites (32%, by mass) or collected as bulky waste by local authorities (21%). Just over one third was collected by retailers or recycling companies (35%), with the remainder (12%) either collected as ordinary waste by local authorities or left on skips or waste ground.

Table 2: Average age of household appliances when discarded by UK households

Product category	Age of appliances 'broken beyond repair' (years) ¹⁴	Age of all discarded appliances (years) ¹⁵
Electric cookers	12	12
Refrigerators and freezers	11	11
Televisions	10	10
Hi-fi and stereo	9	9
Washing machines, dishwashers and tumble dryers	9	9
Vacuum cleaners and carpet cleaners	7	8
Video equipment	7	7
Home and garden tools	7	7
Microwave ovens	7	7
Computers and peripherals	8	6
Radio and personal radio, stereo and CD	5	6
Telephones, faxes and answer machines	5	6
Mobile phones and pagers	4	4
Small work or personal care appliances	4	4
Toys	3	4

¹⁴ The data in this column shows the age of those products discarded due to 'functional' obsolescence. The relatively high figure for computers suggests that they are rarely discarded due to technical failure. Figures in some product categories are lower than in the next column, suggesting that such products are not considered repairable.

¹⁵ The data includes products donated or sold and subsequently reused, as well as products discarded as 'in need of repair' or 'broken beyond repair'.

Figure 4: Quantity of household appliances discarded in the UK (by mass)

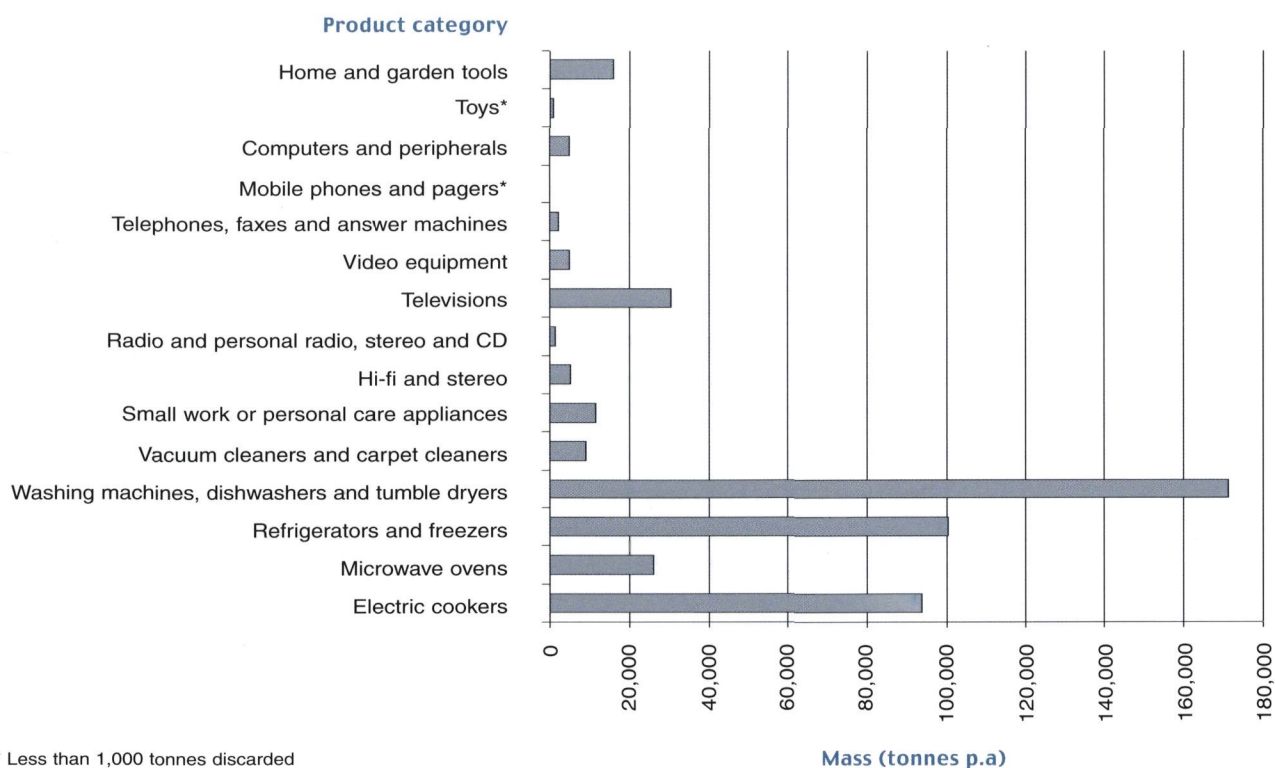


Figure 5: Number of household appliances discarded in the UK (by units)

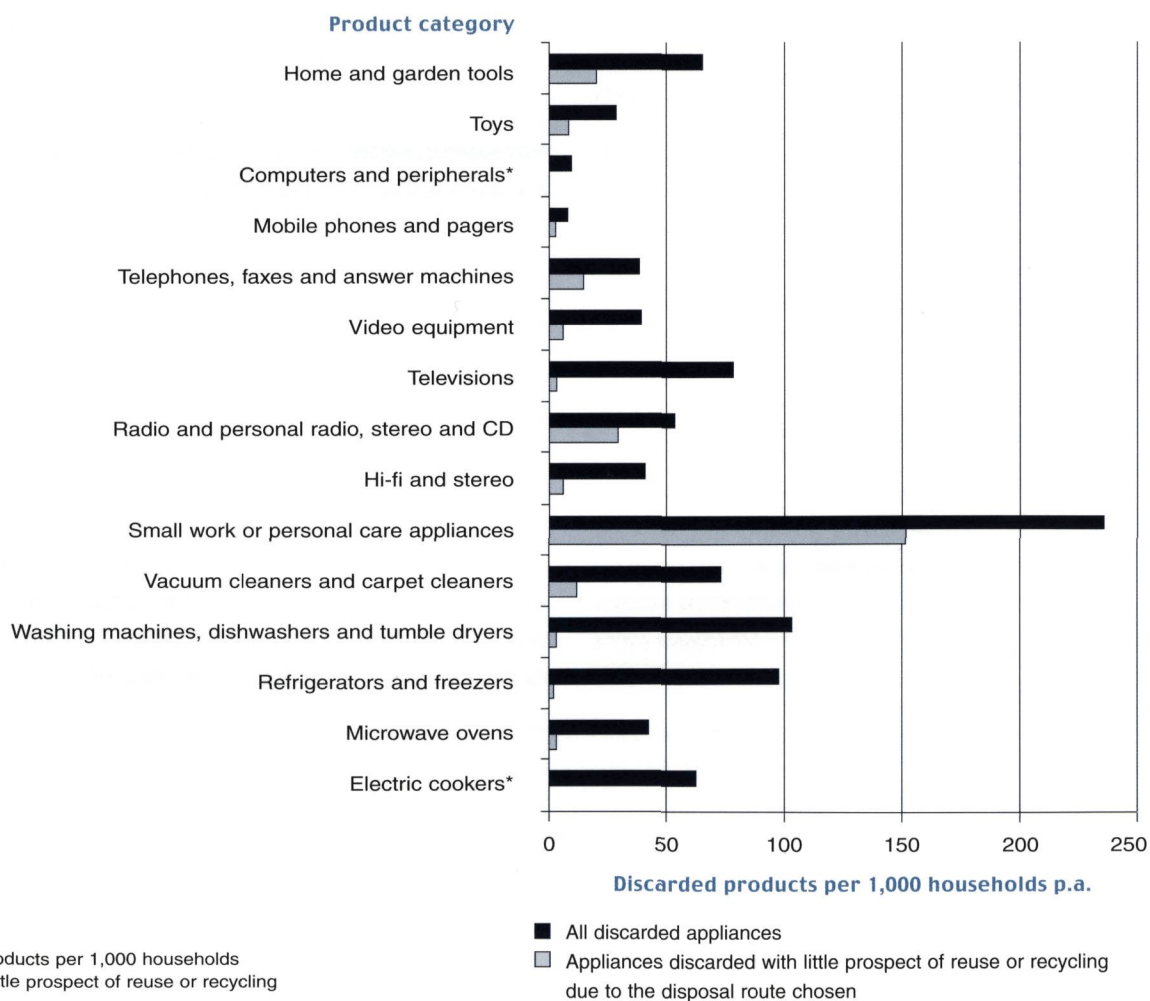


Figure 6: Quantity of waste in specified disposal routes in the UK (by mass)

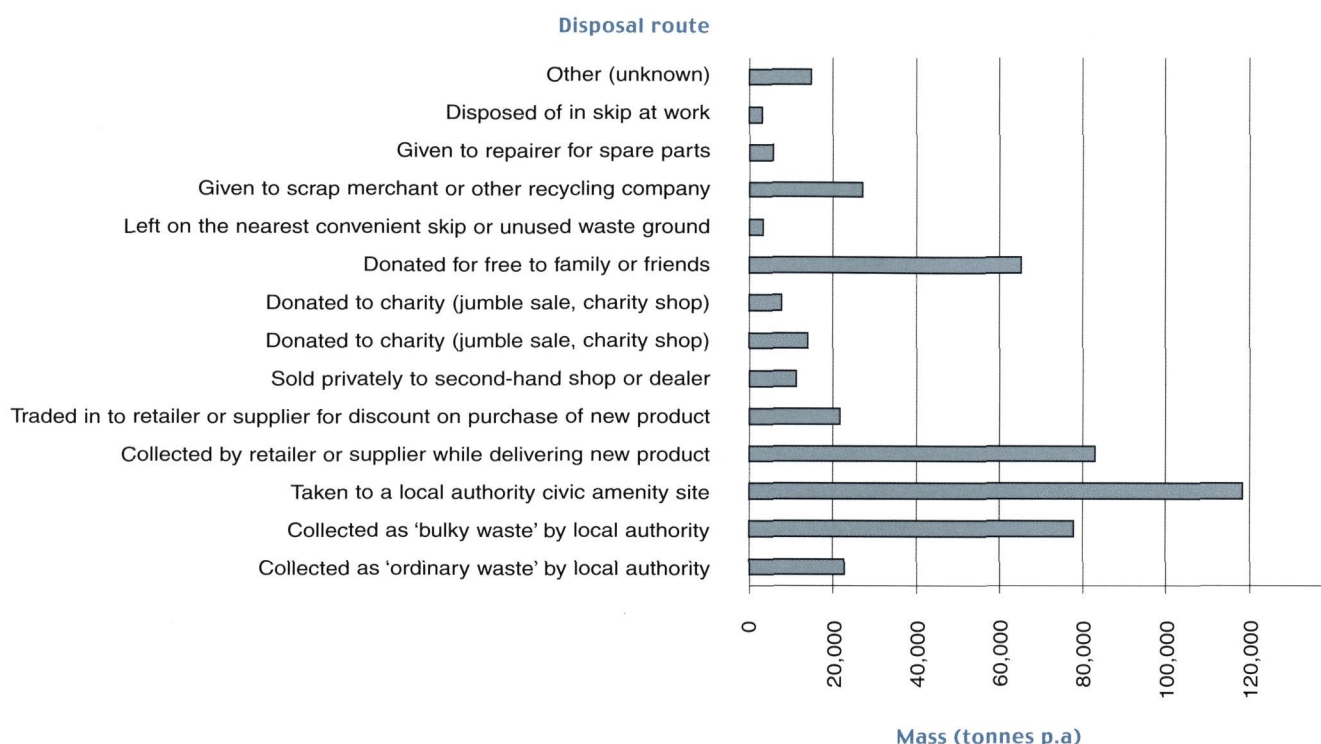
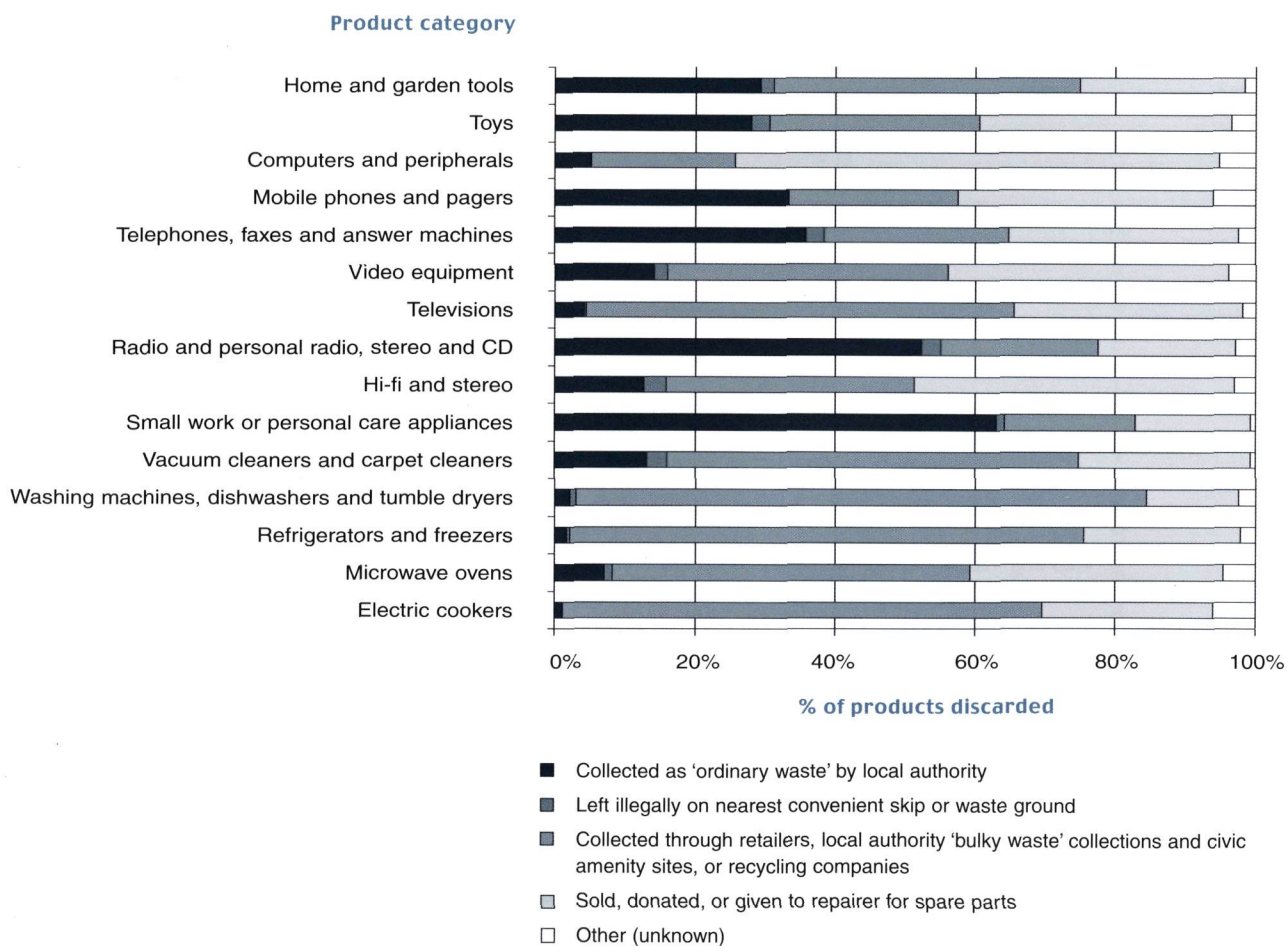


Figure 7: Disposable routes for household appliances in the UK



c) Consumer views on new product and service development

Consumer and household attitudes and behaviour were evaluated in detail using the quantitative data in conjunction with the focus group studies. Three principal areas of interest were addressed: product life spans, product recycling and disposal services, and product resale and reuse.

Product life spans

Almost one half of householders (45%) were of the opinion that, in general, products do not last as long as they would like. Women were significantly more inclined than men to be dissatisfied with product life spans. The following focus group comments summed up the perceptions of many participants:

"I think things have changed, I think they are made more disposable these days... Things used to last a lot longer." - Margaret, age 56, unemployed

"I've only been married 15 years and I've been through three washing machines. And I have been told...each time they have come out to repair them, that they are not made to be used a lot." Moira, age 38, company director

"How often have people said 'I wish I had my old one back - this one is rubbish'? How many times have we said that? I know I've said it a lot of times." - Phil, age 65, retired analyst

Other participants, however, were less critical:

"I don't think they ever last as long as you'd like... When you buy something, obviously you want to get the maximum amount of use out of it and whenever it goes wrong - even if it's after a good length of time - you always want it to last longer." - Roger, age 52, telecommunications engineer

*"I've got two boys. They are always using the kettle and the toaster and, if you think of how much they're used, when they actually go wrong it isn't such a big deal. We've probably had it about four years and it's been used a dozen times every day, every day of its life for four years; well, it's not done bad really."
- Les, age 44, vehicle administrator*

Householders considered a 'reasonable' life span for large appliances to be 10 to 13 years, depending on product type. However, over one third of householders thought that cookers, refrigerators and freezers should last at least 15 years. A reasonable life for small work or personal care appliances, mobile phones and toys was thought to be 6 years. Other types of products were expected to last 7 to 10 years.

Wet appliances, small work or personal care appliances, and vacuum cleaners were most frequently identified as products that householders would like to last longer. Products for which continual technological advancement is likely, such as telecommunications equipment, were identified less frequently.

Effective consumer choice requires appropriate product information. Almost three-quarters of householders (73%) said that having accurate information about the expected life span of products before making a purchase was 'extremely' or 'very' important. Over one half considered information on life spans currently available to be either 'inadequate' (30%) or 'barely adequate' (24%). Thus producers might gain a competitive advantage by providing such information (Cooper, 1994b).

The main disadvantages to purchasing longer lasting products were concern that they would become 'out of date' after a few years, price, and repair and maintenance costs (as shown in Figure 8). Men and those householders of higher socio-economic status were significantly more inclined to be concerned about products becoming out of date, whereas women and those of lower socio-economic status were more concerned about cost. One focus group participant suggested that the type of product might also be a factor:

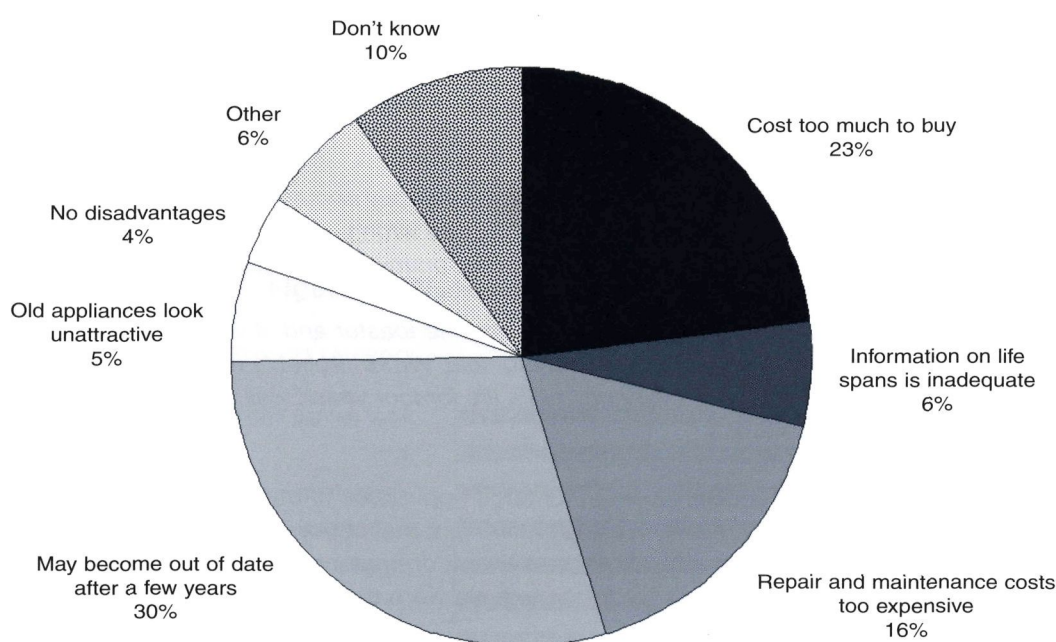
"It probably depends on the total price of the item. If it was a high priced item you would pay more. If it was a hairdryer or something you might think, well, I can throw it away after a year if it's not up to it - or a kettle or an iron, they're not in the same league, are they? - but a TV, I think you would pay more for longer life span." - Pete, age 52, computer programmer

Although participants were aware of product improvements, many were inclined to view technological advance as problematic, criticising the frequency with which new models are brought out and features regarded as unnecessary:

"I was told in the computer shop... 'They are manufacturing another one to take its place.' ...Every time you're buying one they're ready to bring another one out, and now I think that is so unfair." - Elaine, age 52, administration assistant

"You get these extras on there which you are paying for and yet you don't use half of them." - Harold, age 68, retired sales supervisor

Figure 8: Main disadvantages to purchasing appliances designed to last a long time



Product recycling and disposal services

Focus group participants expressed a range of opinions on the potential effectiveness of the various disposal arrangements for their appliances, which appeared to reflect regional differences. Some said that they did not always know what to recycle and mentioned obstacles to recycling small appliances. Others admitted that they did not care:

"Most of the time you are not really bothered what they do with it afterwards because it's gone now and that's it." - Richard, age 24, unemployed

There was common agreement on the need for information from producers, retailers, local authorities and recycling companies on how to dispose of household appliances safely. Posters, leaflets, improved product labelling and telephone help-lines were all suggested as possible means of supplying such information:

"Well, we would like to know what happens to it when it is being disposed of. Is it safe to dispose of? Is it safe for you to break it up and dispose of it in pieces? You haven't got that information. Take a microwave for instance, can you take the door and the inside panel out? You can't because it is not safe to do so." - Leslie, age 77, retired

"My neighbour took a strip light down out of kitchen, dropped it in the bin, and it exploded! It's the same with televisions, they won't always do it, but they will explode... There could be leaflets that went round, reminding you that the council will come and fetch things." - Elaine, age 52, administration assistant

"Some things, like fridges and gas cookers, have to be collected specially because they are environmentally dangerous." - Jeff, age 33, TV presenter

Some householders saw a need for more convenient disposal services, such as collections outside of normal working hours:

"You can only ring the council between 9 and 5, which is not good if you work...and you don't want some answer phone that's going to cost you while they play Greensleeves 54 times while getting through!" - Ann, age 42, sports lecturer

Although householders appeared willing to dispose of appliances through retail outlets, they expected either economic compensation or increased convenience over other means of disposal:

"Well, the last fridge we bought, the people who delivered it took the old one away with them, so I didn't have to!" - George, age 70, retired fitter

"If the shop where you bought your appliance from would take it in part exchange for a price of £10 or whatever...when they delivered the new one, then that would be a great service and you would go for that." - Malcolm, age 56, retired factory foreman

When asked about financing the separate collection and recycling of WEEE, most householders (60%) stated a preference for separate disposal fees over increased product prices or local taxes (as shown in Figure 9).

Product resale and reuse

Almost one quarter of discarded products (24%, by units) were donated or sold privately for reuse. Most were donated to family and friends or charity shops (18%); the other 6% were sold. The fact that, by comparison, only around 5% of the current stock of products is second-hand suggests that such products do not have long residual lives.

Product reliability was seen as a major risk when purchasing second-hand products:

"I bought an electrical saw from a car boot sale, and the chap plugged it in and it worked. When I got it home and used it, it didn't. You've got to be a little bit careful when you buy second-hand goods." - Charles, age 69, retired

"I don't think I'd want to buy something that was somebody's cast-off. They've got rid of it for a reason; it's either out of date or there's something wrong with it." - Roger, age 52, telecommunications engineer

"In the past I've bought stereos and things like that second-hand from friends, so you know that you've got some come-back. If you buy second-hand off someone you don't know, you've got no come-back." - Steve, age 24, technical development manager

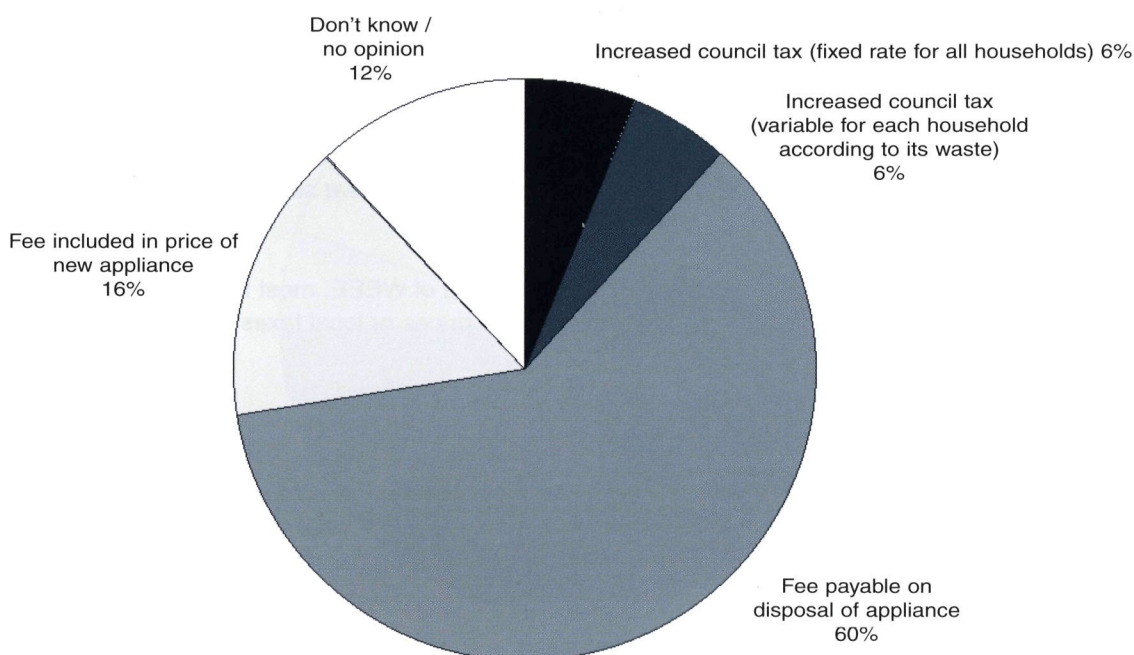
Some householders indicated that they would prefer to purchase second-hand appliances from a credible high street outlet:

"There is a retailer in Cardiff...which part-exchanges, reconditions, and resells audio appliances, amplifiers and things like that. They are good products and they do a 6 month guarantee on them. You get quality products at around half price." - George, age 70, retired fitter

In general, householders expected second-hand items or 'new' products containing remanufactured parts to represent good value and have an acceptable warranty.

Some focus group participants indicated that they obtained second-hand products when buying new was not possible due to economic constraints - for example, to equip children leaving home. In such cases the effect of product reuse would be to increase the accumulation of products in use as distinct from reducing the manufacture and sale of new products.

Figure 9: Preference for payment of collection and recycling services (with no other choice)



v) Conclusions and recommendations

This represents the most comprehensive and detailed investigation of the use and disposal of Waste Electrical and Electronic Equipment undertaken to date in the UK. The findings will be useful for future product design and development, the creation of improved collection, treatment, reuse and recycling services, and the preparation of appropriate UK Producer Responsibility legislation.¹⁶ The research approach and results are also relevant to other countries, some of which have already implemented such legislation.

¹⁶ The results of this study have already been submitted to the Department of Trade and Industry for use in assessing the implementation of the WEEE Directive.

The main practical implications of the research are presented below.

a) Product life

The research findings indicate a need to reconsider the future development and design of products and their use:

- There is an apparent desire among householders for longer lasting household appliances. Around one half of those interviewed said that they would like products to have greater life spans (particularly wet appliances and small work or personal care appliances). People appeared to accept that products most subject to technological advance would have to be regularly replaced, although focus group results suggested that many were inclined to view this negatively.
- In practice, consumers may be reluctant to purchase products designed for longer life spans because of concern that they become 'out of date' and cost.
- The life span of products is determined not only by their design life but also by the behaviour of consumers. Thus in order to optimise product life it is essential that consumer behaviour throughout the product life cycle is considered. The fact that many products that still function are discarded needs to be addressed through further research and public education.
- There is a reluctance among many consumers to have products repaired, for which the main explanation is cost. The potential use of public policy and new private sector initiatives to encourage people to get products repaired should be investigated.
- Consumers expressed a desire for clearer information on the planned design life of products in order to assist their choices in the market. Some producers of premium brand white goods have already taken a lead and provide such information, which may give them a competitive advantage.

b) Product resale, recycling and disposal services

The findings on the use and disposal of household appliances will be helpful in the development of new resale, recycling and disposal services:

- Product recovery ('take-back') schemes should not be set up on the basis of assumptions made from anecdotal evidence. Variations in the disposal behaviour and requirements of different householders were found to be too great for generalisations to be considered reliable. For example, 'bring' schemes¹⁷ are only likely to have limited success because certain sections of society are less able to use them.
- The effectiveness of product take-back services will be determined by a combination of factors relating to the householder ('end-user' related factors), the specific disposal service provided (service related factors) and the appliance type to be collected (product related factors).
- Focus group results suggested that householders have a preference for disposal services offering convenient collection arrangements and financial incentives for returning products. Specific regional differences in householder requirements for product disposal services should be investigated through further research.
- New collection and recycling processes will be required to meet future recycling targets, particularly for smaller products (most of which are currently discarded in dustbins, wheelie bins or rubbish sacks) and brown goods such as televisions and video equipment (most of which are not currently recycled). Partnerships need to be established between stakeholders before the necessary infrastructure and processes can be developed.

¹⁷ Bring schemes are those in which households deliver items to collection points for disposal.

- 'Bring' systems, whether based on civic amenity sites or retail outlets (on the sale of new products), may fail to capture second-hand appliances discarded by householders of lower socio-economic status, as they are significantly less likely to possess their own means of transport or buy products new.
- It appeared from the focus group results that householders will only change their disposal behaviour if provided with easy to understand information that explains and justifies any new disposal arrangements. Householders want better information on how to dispose of appliances safely.
- Householders in the focus groups appeared to be more willing to purchase second-hand appliances and 'new' appliances containing refurbished parts if they were perceived as good value and had adequate product warranties.

c) Government policy

The results of the study should be useful in developing effective public policy on waste, particularly in relation to WEEE:

- The recycling and disposal of household appliances is more complex than for 'consumable' wastes as such products tend to pass in and out of use, following a cascade of use through which they become financially, functionally and materially degraded. The interpretation of the legal definition of waste in respect of WEEE may need to be re-examined in the light of current and prospective reuse.
- Many products are not disposed of by their original owners as they are redistributed through reuse. The collection of products through retail outlets, where old products are traded in for new, may not capture a substantial proportion of such waste and thus has only limited potential.
- Waste legislation needs to be drafted in such a way as to provide an incentive mechanism through which products that are designed for durability, ease of repair and recycling attract relatively lower disposal costs and consumers see benefits in purchasing them.
- In the development of legislation on WEEE, measures of both the weight and number of products discarded must be considered, disaggregated by product type. This is necessary to take account of the volume of waste for collection and disposal and also the wider environmental impacts of consumption.
- Although a majority of householders indicated a preference for a fee payable on disposal to fund enhanced collection and recycling services (as opposed to increased product prices or local taxes), this may not be acceptable as even now around 3,330 tonnes of equipment is disposed of illegally.
- The growth of organisations refurbishing discarded household appliances forms an important part of the 'social economy'¹⁸. Reuse can result in substantial environmental benefits where it replaces the manufacture of new products. However, this may not always be the case for household appliances. The reuse of appliances is a complex process which merits further investigation.
- As storage of appliances appears primarily to be associated with potential reuse, policy initiatives encouraging the disposal of such appliances may not be desirable from a societal perspective unless they are specifically directed into reuse.

18 Department of Trade and Industry, 1998, 1999.

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Appendix 1: Product masses for the calculation of disposal data

Product type	Weight (kg)*
Electric cookers	62
Microwave ovens	25
Refrigerators and freezers	42.5
Washing machines, dishwashers and tumble dryers	68.5
Vacuum cleaners and carpet cleaners	5
Small work or personal care appliances	2
Hi-fi and stereo	5
Radio and personal radio, stereo and CD	1
Televisions	16
Video equipment	5
Telephones, faxes and answer machines	2
Mobile phones and pagers	1
Computers and peripherals	20
Toys	1
Home and garden tools	10

* Based on best available data, from ICER (1998) and information provided by E-SCOPE members.

Appendix 2: Number of appliances discarded in the UK, by route and product type (units p.a.)¹⁹

PRODUCT CATEGORY	ROUTE	Collected as 'ordinary waste' by local authority	Collected as 'bulky waste' by local authority	Taken to local authority civic amenity site	Collected by retailer or supplier while delivering new product	Traded in to retailer or supplier for discount on purchase of new product	Sold privately to second-hand shop or dealer	Sold privately e.g. car boot sale, advertised in newspaper/shop window	Donated to charity (jumble sale, charity shop)	Donated for free to family or friends	Left in the nearest convenient skip or unused waste ground	Given to scrap merchant or other recycling company	Given to repairer for spare parts	Disposed of in skip at work	Other (unknown)	ALL ROUTES
Electric cookers	Units	12,074	289,784	362,229	211,300	60,372	48,297	54,334	54,334	199,226	0	108,669	12,074	6,037	90,557	1,509,289
	%	0.8%	19.2%	24.0%	14.0%	4.0%	3.2%	3.6%	3.6%	13.2%	0.0%	7.2%	0.8%	0.4%	6.0%	
Microwave ovens	Units	66,409	156,966	259,598	60,372	12,074	24,149	36,223	18,111	289,784	12,074	42,260	6,037	6,037	48,297	1,038,391
	%	6.4%	15.1%	25.0%	5.8%	1.2%	2.3%	3.5%	1.7%	27.9%	1.2%	4.1%	0.6%	0.6%	4.7%	
Refrigerators and freezers	Units	30,186	464,861	591,641	458,824	90,557	66,409	84,520	18,111	356,192	6,037	126,780	6,037	12,074	48,297	2,360,528
	%	1.3%	19.7%	25.1%	19.4%	3.8%	2.8%	3.6%	0.8%	15.1%	0.3%	5.4%	0.3%	0.5%	2.0%	
Washing machines, dishwashers and tumble dryers	Units	36,223	458,824	585,604	645,976	175,078	42,260	36,223	12,074	199,226	24,149	163,003	42,260	18,134	60,372	2,499,406
	%	1.4%	18.4%	23.4%	25.8%	7.0%	1.7%	1.4%	0.5%	8.0%	1.0%	6.5%	1.7%	0.7%	2.4%	
Vacuum cleaners and carpet cleaners	Units	223,375	126,780	754,645	42,260	54,334	30,186	42,260	24,149	295,821	48,297	66,409	48,297	12,074	12,074	1,780,961
	%	12.5%	7.1%	42.4%	2.4%	3.1%	1.7%	2.4%	1.4%	16.6%	2.7%	3.7%	2.7%	0.7%	0.7%	
Small work or personal care appliances	Units	3,561,923	66,409	875,388	0	24,149	12,074	133,150	193,189	579,567	66,409	90,557	18,111	42,260	48,297	5,711,483
	%	62.4%	1.2%	15.3%	0.0%	0.4%	0.2%	2.3%	3.4%	10.1%	1.2%	1.6%	0.3%	0.7%	0.8%	
Hi-fi and stereo	Units	126,780	54,334	271,672	0	6,037	48,297	72,446	36,223	277,709	30,186	18,111	18,111	0	30,186	990,094
	%	12.8%	5.5%	27.4%	0.0%	0.6%	4.9%	7.3%	3.7%	28.0%	3.0%	1.8%	1.8%	0.0%	3.0%	
Radio and personal radio, stereo and CD	Units	664,087	12,074	235,449	12,074	0	6,037	78,483	36,223	126,780	36,223	30,186	6,037	12,074	36,223	1,291,952
	%	51.4%	0.9%	18.2%	0.9%	0.0%	0.5%	6.1%	2.8%	9.8%	2.8%	2.3%	0.5%	0.9%	2.8%	
Televisions	Units	66,409	193,189	627,864	223,375	72,446	36,223	60,372	48,297	428,638	6,037	42,260	42,260	12,074	36,223	1,895,667
	%	3.5%	10.2%	33.1%	11.8%	3.8%	1.9%	3.2%	2.5%	22.6%	0.3%	2.2%	2.2%	0.6%	1.9%	
Video equipment	Units	114,706	36,223	217,338	66,409	24,149	42,260	54,334	0	247,523	18,111	36,223	36,223	18,111	36,223	947,834
	%	12.1%	3.8%	22.9%	7.0%	2.5%	4.5%	5.7%	0.0%	26.1%	1.9%	3.8%	3.8%	1.9%	3.8%	
Telephones, faxes and answer machines	Units	338,081	12,074	156,966	48,297	18,111	48,297	78,483	24,149	156,966	24,149	12,074	0	0	24,149	941,797
	%	35.9%	1.3%	16.7%	5.1%	1.9%	5.1%	8.3%	2.6%	16.7%	2.6%	1.3%	0.0%	0.0%	2.6%	
Mobile phones and pagers	Units	66,409	12,074	12,074	6,037	18,111	0	18,111	0	48,297	0	0	6,037	0	12,074	199,226
	%	33.3%	6.1%	6.1%	3.0%	9.1%	0.0%	9.1%	0.0%	24.2%	0.0%	0.0%	3.0%	0.0%	6.1%	
Computers and peripherals	Units	12,074	0	24,149	12,074	6,037	18,111	36,223	12,074	90,557	0	6,037	6,037	0	12,074	235,449
	%	5.1%	0.0%	10.3%	5.1%	2.6%	7.7%	15.4%	5.1%	38.5%	0.0%	2.6%	2.6%	0.0%	5.1%	
Toys	Units	193,189	6,037	175,078	6,037	18,111	24,149	72,446	66,409	78,483	18,111	0	6,037	0	24,149	688,236
	%	28.1%	0.9%	25.4%	0.9%	2.6%	3.5%	10.5%	9.6%	11.4%	2.6%	0.0%	0.9%	0.0%	3.5%	
Home and garden tools	Units	422,601	48,297	507,121	6,037	585,604	24,149	48,297	36,223	235,449	30,186	126,780	30,186	42,260	24,149	1,587,772
	%	26.6%	3.0%	31.9%	0.4%	0.4%	1.5%	3.0%	2.3%	14.8%	1.9%	8.0%	1.9%	2.7%	1.5%	
ALL PRODUCTS	Units	5,934,525	1,937,927	5,656,816	1,799,073	585,604	470,898	905,906	579,567	3,610,220	319,969	869,351	283,746	181,137	543,344	23,678,085
	%	25.1%	8.2%	23.9%	7.6%	2.5%	2.0%	3.8%	2.4%	15.2%	1.4%	3.7%	1.2%	0.8%	2.3%	

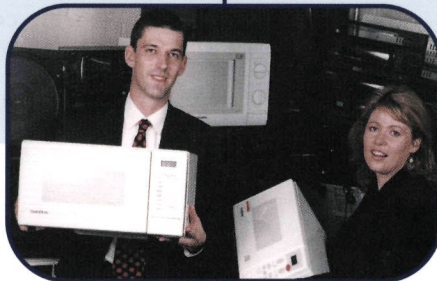
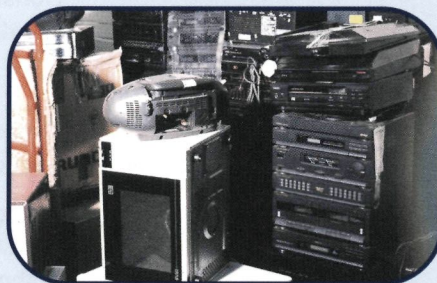
¹⁹ Based on disposals during 1993-1998.

Appendix 3: Mass of appliances discarded in the UK, by route and product type (tonnes p.a.)²⁰

PRODUCT CATEGORY	ROUTE	Collected as 'ordinary waste' by local authority	Collected as 'bulky waste' by local authority	Taken to local authority civic amenity site	Collected by retailer or supplier while delivering new product	Traded in to retailer or supplier for discount on purchase of new product	Sold privately to second-hand shop or dealer	Sold privately e.g. car boot sale, advertised in newspaper/shop window	Donated to charity (jumble sale, charity shop)	Donated for free to family or friends	Left in the nearest convenient skip or unused waste ground	Given to scrap merchant or other recycling company	Given to repairer for spare parts	Disposed of in skip at work	Other (unknown)	ALL ROUTES
Electric cookers	Weight	749	17,967	22,458	13,101	3,743	2,994	3,369	3,369	12,352	0	6,737	749	374	5,615	93,576
	%	0.8%	19.2%	24.0%	14.0%	4.0%	3.2%	3.6%	3.6%	13.2%	0.0%	7.2%	0.8%	0.4%	6.0%	
Microwave ovens	Weight	1,660	3,924	6,490	1,509	302	604	906	453	7,245	302	1,057	151	151	1,207	25,960
	%	6.4%	15.1%	25.0%	5.8%	1.2%	2.3%	3.5%	1.7%	27.9%	1.2%	4.1%	0.6%	0.6%	4.7%	
Refrigerators and freezers	Weight	1,283	19,757	25,145	19,500	3,849	2,822	3,592	770	15,138	257	5,388	257	513	2,053	100,322
	%	1.3%	19.7%	25.1%	19.4%	3.8%	2.8%	3.6%	0.8%	15.1%	0.3%	5.4%	0.3%	0.5%	2.0%	
Washing machines, dishwashers and tumble dryers	Weight	2,481	31,429	40,114	44,249	11,993	2,895	2,481	827	13,647	1,654	11,166	2,895	1,242	4,135	171,209
	%	1.4%	18.4%	23.4%	25.8%	7.0%	1.7%	1.4%	0.5%	8.0%	1.0%	6.5%	1.7%	0.7%	2.4%	
Vacuum cleaners and carpet cleaners	Weight	1,117	634	3,773	211	272	151	211	121	1,479	241	332	241	60	60	8,905
	%	12.5%	7.1%	42.4%	2.4%	3.1%	1.7%	2.4%	1.4%	16.6%	2.7%	3.7%	2.7%	0.7%	0.7%	
Small work or personal care appliances	Weight	7,124	133	1,751	0	48	24	266	386	1,159	133	181	36	85	97	11,423
	%	62.4%	1.2%	15.3%	0.0%	0.4%	0.2%	2.3%	3.4%	10.1%	1.2%	1.6%	0.3%	0.7%	0.8%	
Hi-fi and stereo	Weight	634	272	1,358	0	30	241	362	181	1,389	151	91	91	0	151	4,950
	%	12.8%	5.5%	27.4%	0.0%	0.6%	4.9%	7.3%	3.7%	28.0%	3.0%	1.8%	1.8%	0.0%	3.0%	
Radio and personal radio, stereo and CD	Weight	664	12	235	12	0	6	78	36	127	36	30	6	12	36	1,292
	%	51.4%	0.9%	18.2%	0.9%	0.0%	0.5%	6.1%	2.8%	9.8%	2.8%	2.3%	0.5%	0.9%	2.8%	
Televisions	Weight	1,063	3,091	10,046	3,574	1,159	580	966	773	6,858	97	676	676	193	580	30,331
	%	3.5%	10.2%	33.1%	11.8%	3.8%	1.9%	3.2%	2.5%	22.6%	0.3%	2.2%	2.2%	0.6%	1.9%	
Video equipment	Weight	574	181	1,087	332	121	211	272	0	1,238	91	181	181	91	181	4,739
	%	12.1%	3.8%	22.9%	7.0%	2.5%	4.5%	5.7%	0.0%	26.1%	1.9%	3.8%	3.8%	1.9%	3.8%	
Telephones, faxes and answer machines	Weight	676	24	314	97	36	97	157	48	314	48	24	0	0	48	1,884
	%	35.9%	1.3%	16.7%	5.1%	1.9%	5.1%	8.3%	2.6%	16.7%	2.6%	1.3%	0.0%	0.0%	2.6%	
Mobile phones and pagers	Weight	66	12	12	6	18	0	18	0	48	0	0	6	0	12	199
	%	33.3%	6.1%	6.1%	3.0%	9.1%	0.0%	9.1%	0.0%	24.2%	0.0%	0.0%	3.0%	0.0%	6.1%	
Computers and peripherals	Weight	241	0	483	241	121	362	724	241	1,811	0	121	121	0	241	4,709
	%	5.1%	0.0%	10.3%	5.1%	2.6%	7.7%	15.4%	5.1%	38.5%	0.0%	2.6%	2.6%	0.0%	5.1%	
Toys	Weight	193	6	175	6	18	24	72	66	78	18	0	6	0	24	688
	%	28.1%	0.9%	25.4%	0.9%	2.6%	3.5%	10.5%	9.6%	11.4%	2.6%	0.0%	0.9%	0.0%	3.5%	
Home and garden tools	Weight	4,226	483	5,071	60	60	241	483	362	2,354	302	1,268	302	423	241	15,878
	%	26.6%	3.0%	31.9%	0.4%	0.4%	1.5%	3.0%	2.3%	14.8%	1.9%	8.0%	1.9%	2.7%	1.5%	
ALL PRODUCTS	Weight	22,751	77,925	118,512	82,899	21,770	11,253	13,959	7,634	65,238	3,329	27,252	5,717	3,144	14,682	476,065
	%	4.8%	16.4%	24.9%	17.4%	4.6%	2.4%	2.9%	1.6%	13.7%	0.7%	5.7%	1.2%	0.7%	3.1%	

²⁰ Based on disposals during 1993-1998.

Contents



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