MARKET TRANSFORMATION PROGRAMME
Supporting UK Government policy on sustainable products

# **Product Overview:**
# Waste

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# Table of contents

# 1 Introduction

The Market Transformation Programme (MTP), operating through a Lead Contract to Defra, supports UK Government policy on sustainable products. Product policy is an important aspect of sustainable consumption and production[1], contributing to the UK's Sustainable Development Strategy[2].

MTP's aim is to reduce the whole life environmental impacts of products, through better eco-design. The approach is to communicate and interpret government policy objectives as a set of specific action plans, or roadmaps, looking ahead at least ten years, and to get buy in from policy makers and from industry at UK, EU and International levels. The Programme also supports policy delivery, in particular, by developing corresponding product eco-design information (labels) and performance requirements (standards) to encourage innovation and competition. The current focus of the programme is on products which use large amounts of energy and water and other products which are responsible for significant volumes of problematic waste.

This is one of a set of three papers (water, energy and waste), which aim to summarise the work the MTP is doing in relation to the environmental performance of products. This paper focuses on the end-of-life waste impact of products currently covered by MTP. The paper describes the current evidence developed by MTP on the relevant products, gives an indication of the savings potential (where possible) and puts forward suggestions for possible future work to help reduce the environmental impact of products.

Funding from the Business Resource Efficiency and Waste (BREW) Programme has enabled MTP (which historically has focused on reducing carbon emissions from products in use) to expand during 2005/06 to deal more comprehensively with waste and hazardous materials arising at end of product life. In the first year of work in this area, resources have been dedicated to developing the evidence base for products and gathering data on end-of-life waste arisings. MTP has not yet consulted with stakeholders on measures that would help to mitigate or prevent the end-of-life impact associated with waste generation, (except for the example detailed in Section 3 for Liquid Crystal Display (LCD) televisions) although in 2006/07 it plans to do so.

More detailed information on particular aspects and products mentioned in this paper is available in the Policy Briefs, Briefing Notes and other reports available on the MTP web site www.mtprog.com. The references in this paper will direct you to key documents.

1 www.defra.gov.uk/environment/business/scp
2 www.sustainable-development.gov.uk

### Market transformation scenarios

MTP uses market information to project the future environmental impact of products (currently to 2020). MTP then consults with stakeholders on measures that would help to mitigate or prevent these impacts, eg the use of labelling schemes, regulation, procurement initiatives or innovation. Three standard scenarios[3] are developed to illustrate the potential impacts of these market transformation strategies:

**Reference scenario (Ref):** A projection of what will happen without any new policy intervention. This is based on current trends, technology developments and policies that are already in place, but assumes no new policies.

**Earliest Best Practice scenario (EBP):** A projection of what would happen if everyone started buying the best available products, manufacturers put the best known technologies on the market in a fairly rapid timescale, and Government took all reasonable (but ambitious) policy steps to mitigate adverse environmental impacts. An ideal scenario for environmental point of view – but usually not realisable.

**Policy scenario:** This estimates what could be achieved through an ambitious but feasible set of policy measures if the agreement of all stakeholders was obtained.

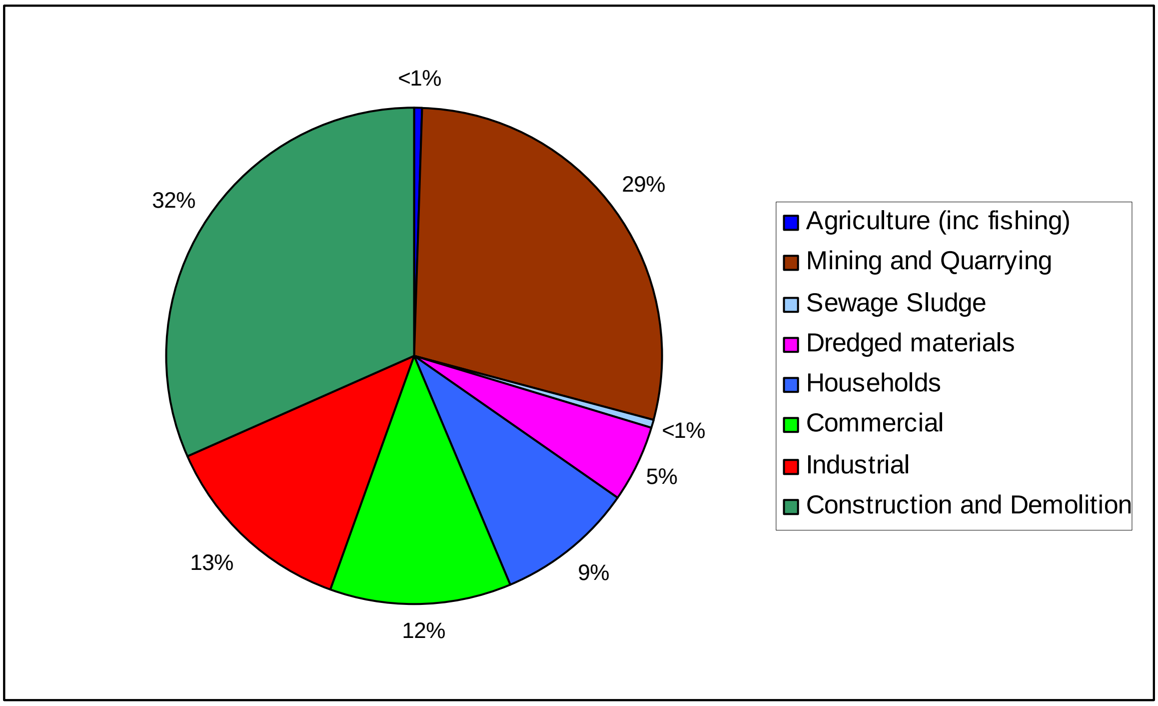
[3] See also: BNXS02 - Definition of Scenario Types used in MTP Policy Briefs.

# 2 An introduction to MTP's waste work

## 2.1 Background - UK waste arisings

In 2004, the UK produced about 335 million tonnes of waste, including municipal, construction & demolition and industrial & commercial waste. Figure 1 below shows the estimated proportion produced by each sector.

**Figure 1 Estimated total annual waste arisings, by sector in UK. Source: DEFRA, Environment Agency, Water UK, ODPM, 2004.**[4]




## 2.2 MTP's waste work

In 2005/06 MTP extended its activities to include non-energy aspects of product life cycles, with particular reference to end-of-life issues. A new Waste Sector has been established within the MTP to focus on resource efficiency and waste. In order to make the most efficient use of resources, the product base for which MTP has already collected sales and resource consumption data has been adopted as a starting point for the Waste Sector. The key waste impacts considered by MTP for these products include the hazardousness of the waste arisings and the current and projected tonnages of waste generated.

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[4] Source: Department for Environment, Food and Rural Affairs; Environment Agency; Water UK. http://www.defra.gov.uk/environment/statistics/waste/kf/wrkf02.htm

The tonnage of waste arisings is significant because the Landfill Directive (1999/31/EC) requires the amount of biodegradable municipal waste sent to landfill to be reduced, and for England to meet the targets set by the Landfill Directive and Waste Strategy 2000. Investment is needed in new infrastructure for waste management. More broadly speaking, the increased generation of waste has environmental, economic and social costs associated with the different treatment options.

The hazardousness nature of the waste material is important because it may have an impact on human health and/or the natural environment. As such, the hazardous nature of the waste will also dictate the treatment process required. The Hazardous Waste Regulations 2005 define wastes that are hazardous to health or the environment. For example, in the case of LCD televisions, a small quantity of mercury in the fluorescent lamps used for backlighting the display screen causes each television to be classified as hazardous waste, because of the toxic nature of mercury. The MTP has identified that large tonnages of such waste will enter the waste stream in future years and this will present problems if there are insufficient processing and treatment facilities, particularly for hazardous waste.

To date the MTP has:

- Targeted specific waste streams to bring about resource efficiencies
- Projected arisings for specific waste streams

In addition the MTP has identified the potential to reduce the end-of-life impact of LCD televisions by accelerated introduction of new technology (see Section 3).

Given the focus so far on products for which MTP had an existing evidence base, rather than those which generate the greatest waste arisings, the MTP evidence base currently covers 2.75 million tonnes. This is about 0.8% of the overall waste arisings within the UK. Nevertheless, this is equivalent to half a million African Bull Elephants, each weighing 6 tonnes[5]. These are the waste arisings associated with end-of life tonnages only and do not take into account waste generated in the manufacture or use of the product.

## 2.3 Targeted waste streams

Table 1 shows the waste sectors targeted by the MTP evidence base together with the tonnage and proportion of UK waste. The table also shows the weight of waste arising from products in the MTP evidence base, split according to the waste sectors, and their significance to the UK waste stream. This information is broken down in more detail in Table 2 and shows the products in each waste sector covered by the MTP evidence base. For these products MTP is working towards identifying whether there is a need to establish a Policy Action Plan.

[5] Energy Saving Trust http://www.grownupgreen.org.uk/features/?id=531

**Table 1: UK waste sectors and products by waste sector targeted by the MTP evidence base (thousands of tonnes)[6]**

| Waste Sector | UK Waste Arisings (thousands tonnes) | Proportion of Total UK Waste Arisings | Waste from products targeted by MTP evidence base (thousand tonnes) | Proportion of Total UK Waste Arisings |
|---|---|---|---|---|
| Agriculture | | <1% | 0 | 0% |
| Mining and Quarrying | 97,150 | 29% | 0 | 0% |
| Sewage Sludge | | <1% | 0 | 0% |
| Dredged materials | 16,750 | 5% | 0 | 0% |
| Household Waste | 30,150 | 9% | 1,694 | 5.6% |
| Industrial and Commercial Waste | 83,750 | 25% | 108 | 0.13% |
| Demolition & Construction Waste | 107,200 | 32% | 950 | 0.9 |
| **Total** | **335,000** | **100%** | **2,752 (of which 385 thousand tonnes is classified as hazardous)** | **0.82% (0.11%)** |

UK household waste arisings total approximately 30 million tonnes annually or 9% of UK waste. MTP evidence base targets textiles, metal/white goods, brown goods, mattresses, packaging waste from chilled ready meals, household hazardous waste, paints and varnishes and domestic lighting, which together account for 1.7 million tonnes.

UK industrial and commercial waste arisings total approximately 84 million tonnes annually or 25% of UK waste. MTP evidence base targets printers, copiers, desktops (excl monitors), laptops, Multi Functional Devices (MFDs), packaging and food waste from chilled ready meals, trade paints and varnishes, commercial lighting, which together account for 0.11 million tonnes.

UK demolition and construction waste arisings total approximately 107 million tonnes annually or 32% of UK waste. MTP evidence base targets plasterboard, window systems, flooring and roofing, which together account for 0.95 million tonnes.

[6] Source: Department for Environment, Food and Rural Affairs; Environment Agency; Water UK. http://www.defra.gov.uk/environment/statistics/waste/download/xls/wrtb01.xls ; http://www.environment-agency.gov.uk/subjects/waste/1031954/315439/923299/908241/?version=1&lang=_e; and Market Transformation Programme, What-If Tool August 2005

The proportion of UK waste arising that is classified as hazardous waste totalled 4.8 million tonnes in 2003, as documented by the Environment Agency. MTP evidence base targets fridges/freezers, televisions, domestic and commercial lighting, paints, varnishes and a range of hazardous household items (listed in Footnote 10), which together account for 0.39 million tonnes. Table 3 shows the tonnages of hazardous waste that are targeted by the MTP evidence base.

**Table 2: UK waste targeted by the MTP evidence base (thousands of tonnes)[7]**

| Waste sector targeted/Product | UK waste arisings (thousand tonnes) | Proportion of sector waste arisings |
|---|---|---|
| **Household waste sector** | | |
| Textiles | 1,000 | 3.3% |
| White goods[8] | 290 | 1.0% |
| Brown goods[9] | 210 | 0.7% |
| Mattresses | 100 | 0.3% |
| Packaging waste from chilled ready meals | 19 | 0.06% |
| Household hazardous waste[10] | 17 | 0.06% |
| Household paints | 42 | 0.14% |
| Household varnish | 7 | 0.02% |
| Domestic lighting | 8.5 | 0.03% |
| **Sub-total** | **1,693.5** | **5.6%** |
| **Industrial and commercial waste sector** | | |
| Printers | 13 | 0.016% |
| Copiers | 9 | 0.01% |
| PC's & Laptops (excl. monitors) | 47 | 0.06% |
| Multi Functional Devices (MFDs) | 5 | 0.006% |
| Food waste from chilled ready meals | 23 | 0.03% |
| Trade paint | 1 | 0.0012% |
| Trade varnish | 0.15 | 0.0002% |
| Commercial lighting | 9.5 | 0.011% |
| **Sub-total** | **108** | **0.13%** |
| **Construction and demolition waste sector** | | |
| Plasterboard | 670 | 0.63% |
| Window systems | 195 | 0.2% |
| Flooring | 5.0 | 0.005% |
| Roofing | 80 | 0.075% |
| **Sub-total** | **950** | **0.9%** |

[7] Market Transformation Programme, What-If Tool August 2005
[8] Includes refrigerators, fridge-freezers, upright freezers, chest freezers, washing machines, washer driers, tumble driers, dishwashers
[9] Includes Cathode Ray Tube (CRT), Liquid Crystal Display (LCD) and Plasma TVs, Video Cassette Recorders (VCR), Digital Versatile Disc (DVD) players/recorders.
[10] Includes Mercury (Hg) containing batteries, Nickel-cadmium (Ni Cd) batteries, engine oil, greases/lubricants, antifreeze/coolant, brake fluid, degreasers, vehicle body care products, pesticides, weed killers, oven/stove/ceramic cleaners, metal/wood polish, shoe polish, flea powder/spray/treatment/shampoo, worming tablets and other medicines

Table 3 separates out the products, already included in Table 2, that give rise to hazardous waste. This enables the total amount of material classified as hazardous waste to be identified.

**Table 3: UK hazardous waste targeted by the MTP evidence base (thousands of tonnes)**

| Hazardous waste sector product | UK waste arisings (thousand tonnes) | Proportion of hazardous waste* |
|---|---|---|
| Fridges / Freezers | 104 | 2.2% |
| TVs | 196 | 4.1% |
| Household hazardous waste | 17 | 0.35% |
| Paint[11] | 43 | 0.9% |
| Varnish[12] | 7 | 0.15% |
| Lighting domestic | 8.5 | 0.18% |
| Lighting commercial | 9.5 | 0.2% |
| **Sub-total** | **385** | **8.0%** |

* The UK produces 4.8 million tonnes/year of hazardous waste.

## 2.4 Waste arisings projections

In 2006 waste arising projections up to 2020 were produced by MTP for Wet and Cold Sector products, and for plasterboard. Tables 4 and 5 show respectively the number of cold and wet sector appliances expected to enter the waste stream up to 2020. Figures 2 and 3 show the projected waste arisings for the cold and wet sector products in terms of their material composition. Cold sector products include refrigerators, freezers, fridge-freezers, and Wet sector products include washing machines, tumble dryers and dishwashers.

### 2.4.1 Wet and cold sectors

To enable waste arising projections to be produced for Wet and Cold Sector products, compositional data was required including glass, plastics, ferrous and non-ferrous data. This evidence base was compiled by Intertek RPT. A stock model of the age profile for UK appliances previously developed for MTP was tailored to estimate the expected numbers of appliances reaching the waste stream between 2006 and 2020 (Table 4). Using the compositional data compiled by Intertek, material-specific projections were then made regarding the quantity of waste arising from these appliances over this period (Figure 2). An average composition for each appliance was assumed for the projections and this composition was assumed to remain unchanged between 2006 and 2020. (It was not possible to make projections for the wine chillers and mini-fridges, because they have only been widely available for a few years.)

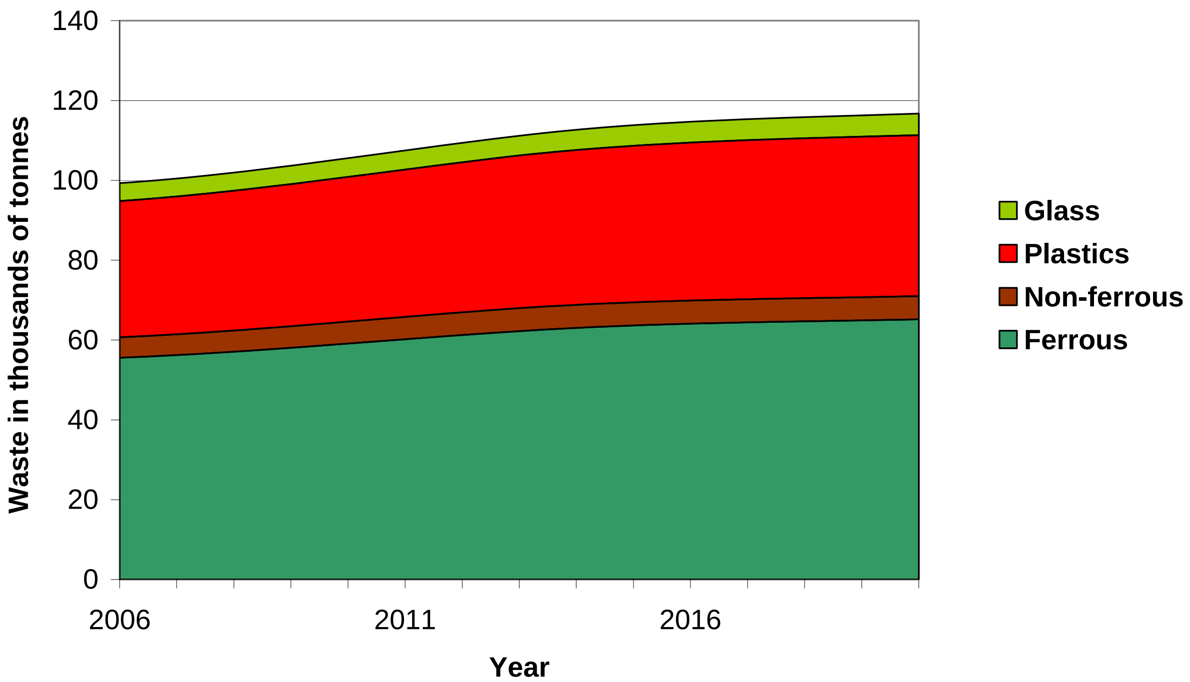
[11] Includes both trade and DIY
[12] Includes both trade and DIY

**Table 4 Projected number of domestic cold sector appliances entering the waste stream**

| Year | Fridge | Fridge freezer | Upright freezer | Chest freezer | Total |
|---|---|---|---|---|---|
| 2006 | 782,800 | 854,300 | 341,100 | 235,400 | 2,213,500 |
| 2009 | 793,600 | 863,500 | 399,400 | 267,000 | 2,323,600 |
| 2010 | 803,700 | 870,500 | 423,800 | 273,600 | 2,371,600 |
| 2015 | 861,000 | 940,600 | 505,500 | 258,300 | 2,565,500 |
| 2020 | 885,000 | 991,400 | 518,200 | 226,400 | 2,621,200 |

Table 4 shows that projected waste arisings from upright freezers are estimated to increase by 52% between 2006 and 2020, whilst those of chest freezers are predicted to decrease by 4%, over the same period. This is due to the greater number of upright freezers currently in use compared to chest freezers, since the sales for chest freezers have declined in recent years. Figure 2 shows that for Cold sector appliances projected waste arisings for ferrous and plastic waste will continue to be significant between 2006 up to 2020. The total projected waste arisings from Cold sector appliances is estimated to peak at a total of 117,000 tonnes in 2020 (Figure 2), representing a total increase of 17% between 2006 and 2020.

**Figure 2 Projected waste arisings from domestic sector cold appliances**[13]




[13] MTP Draft Cold Sector Briefing Note in preparation

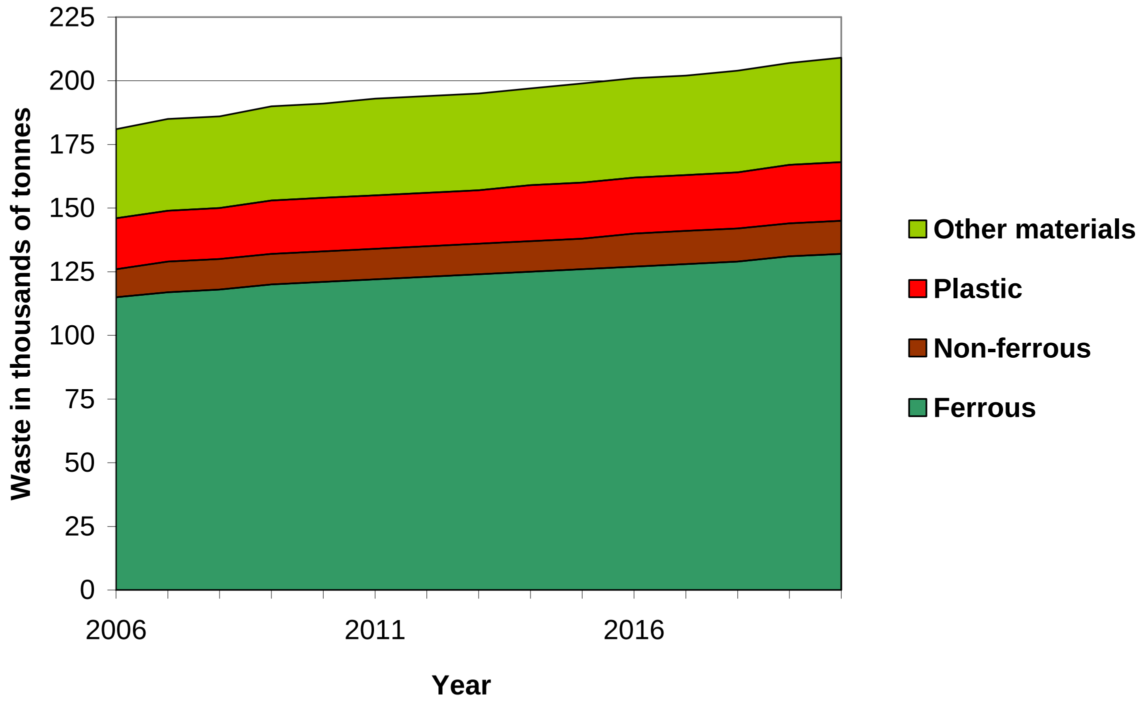
**Table 5 Projected number of domestic wet sector appliances entering the waste stream**

| Year | Dishwasher | Washing machine | Washer drier | Condenser tumble drier | Vented tumble drier | Totals |
|---|---|---|---|---|---|---|
| 2006 | 359,700 | 1,515,700 | 387,100 | 212,600 | 384,800 | 2,859,900 |
| 2010 | 408,800 | 1,588,600 | 401,600 | 250,000 | 357,700 | 3,006,800 |
| 2015 | 418,900 | 1,648,300 | 417,100 | 304,800 | 345,600 | 3,134,700 |
| 2020 | 465,800 | 1,731,500 | 431,300 | 333,200 | 334,400 | 3,296,100 |

Table 5 shows that projected waste arisings for condenser tumble dryers and dishwashers are predicted to increase by 57% and 30% respectively between 2006 and 2020, whilst those of vented tumble driers are estimated to decrease by 13%, over the same period.

Figure 3 shows that for Wet sector appliances the projected waste arisings for ferrous material will continue to be significant between 2006 up to 2020. Projected waste arisings for plastic are less significant compared to the Cold sector appliances during this period. The total projected waste arisings from Wet sector appliances are estimated to peak at a total of 210,000 tonnes in 2020 (Figure 3), representing a total increase of 17% between 2006 and 2020.

**Figure 3 Projected waste arisings from domestic sector wet appliances**[14]



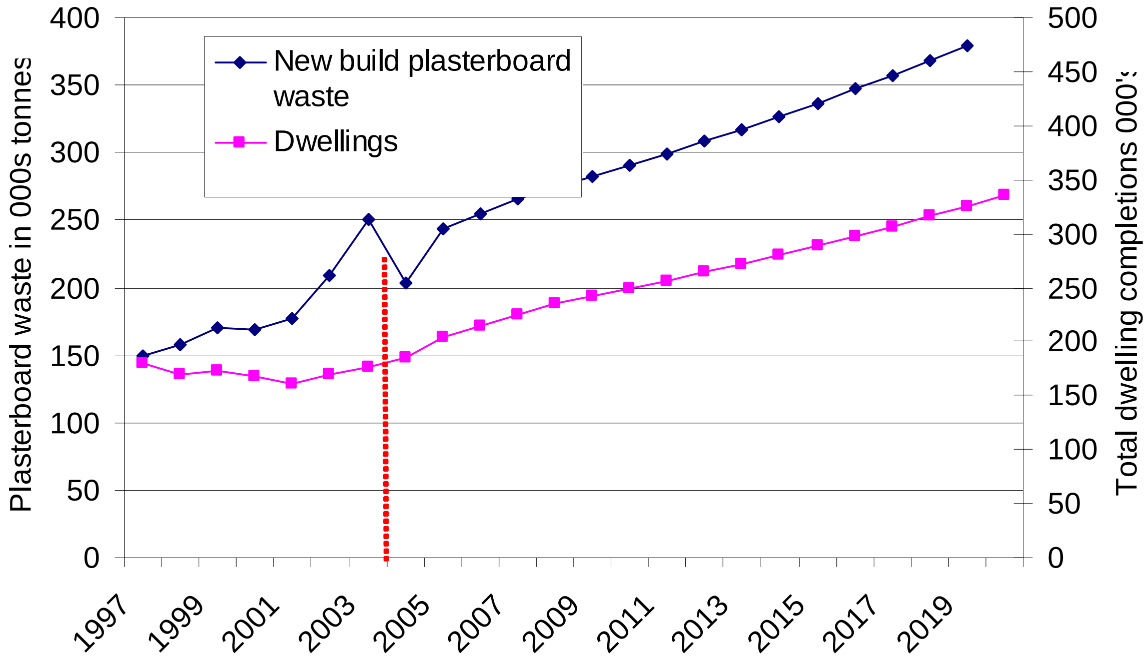

[14] MTP Draft Wet Sector Briefing Note in preparation

## 2.4.2 Plasterboard arisings

UK construction and demolition industry waste arisings are estimated at 107 million tonnes annually and this is the single largest wastestream[15]. The MTP Evidence Base covers plasterboard, window systems, roofing and flooring, which together account for an estimated 950 thousand tonnes of waste in the UK. Plasterboard has been included as an example of this wastestream, due to the current high waste tonnages attributed to this material and the predicted growth in future arisings without policy intervention. The following example illustrates how the MTP approach has been applied to predict plasterboard consumption and waste generation from new build housing, up to 2020. By collecting statistics on housing construction and understanding the use of plasterboard as part of modern construction methods, the MTP has devised projections of plasterboard waste arisings from this sector through to the year 2020 (Figure 4). Figure 4 shows a peak in plasterboard waste generation in 2004 that corresponds to a forecast step growth in dwelling completions in 2005. It should be noted that the data in Figure 4 do not take into account plasterboard product waste from demolition and refurbishment activities.

Work is now underway to determine possible policy options that could be brought into play to reduce the quantity of waste plasterboard and/or enhance its recycling. Similar activities are underway for other products including a number of those identified in the Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC).

**Figure 4 Predicted new dwelling completions and associated plasterboard waste generation (1997-2020)** [16]




Note. The dotted red line indicates where data from forecasted (Fst) information and assumptions start.

[15] Estimated total annual waste arisings, by sector in UK. Source: DEFRA, Environment Agency, Water UK, ODPM, 2002-3
[16] BNPB1: Plasterboard – industry, product and market overview Sep 2006

# 3 Identified potential to reduce environmental impact

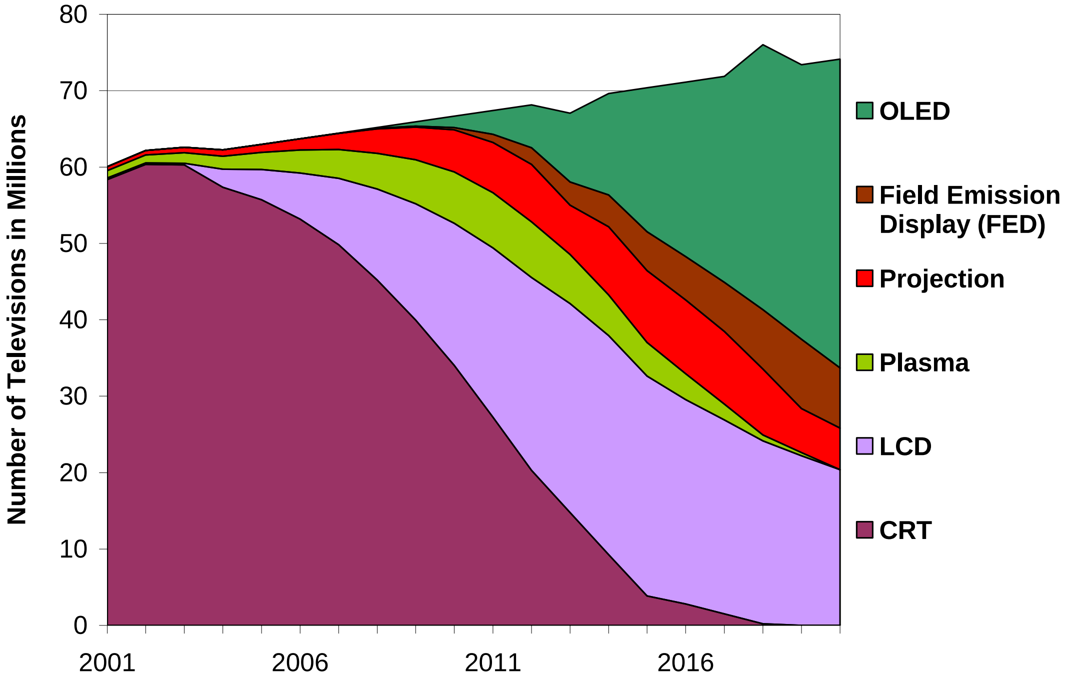
The current focus of the MTP is on developing reliable information on the end-of-life environmental impacts of selected products. Following on from this work, action plans will be developed on how to reduce end-of-life waste environmental impacts. Better data is needed to identify the key environmental impacts from waste, not just from end-of-life but also throughout the life cycle. In the future, MTP intends to address life cycle issues, although the method and extent of the life cycle assessment is yet to be defined.

The following example illustrates how the MTP approach has been applied to one particular case - reducing the end-of-life impact of mercury in LCD televisions.

Traditional cathode ray tube (CRT) televisions are being replaced by Liquid Crystal Display (LCD) televisions and it is possible that there could be 40 million LCD television screens in the UK within 5 years, with backlighting provided by fluorescent lamps. These conventional LCD televisions could then be replaced by new technologies with the organic light emitting diodes (OLED) providing the backlighting. This would result in a significant number of LCD screens requiring disposal.

Figure 5 shows projections of the number of televisions in the UK stock, by screen technology. The current stock gives an indication of the waste that will enter the waste stream and require disposal through to 2020.

**Figure 5 UK stock of televisions by screen technology 2001-2020[17].**




Disposal of LCD televisions is problematic because the fluorescent lamps used for backlighting the display screen contain mercury. Mercury and its compounds accumulate particularly in the aquatic environment where they are highly toxic to all forms of life. Their effect has increasing impact as they move up the food chain. One-half gram of mercury is sufficient to contaminate 200 Olympic-sized pools worth of drinking water, or 5 million gallons. Mercury is classified as a hazardous waste under the Hazardous Waste Regulations 2005. For this reason, mercury requires treatment at a site permitted to manage hazardous waste.

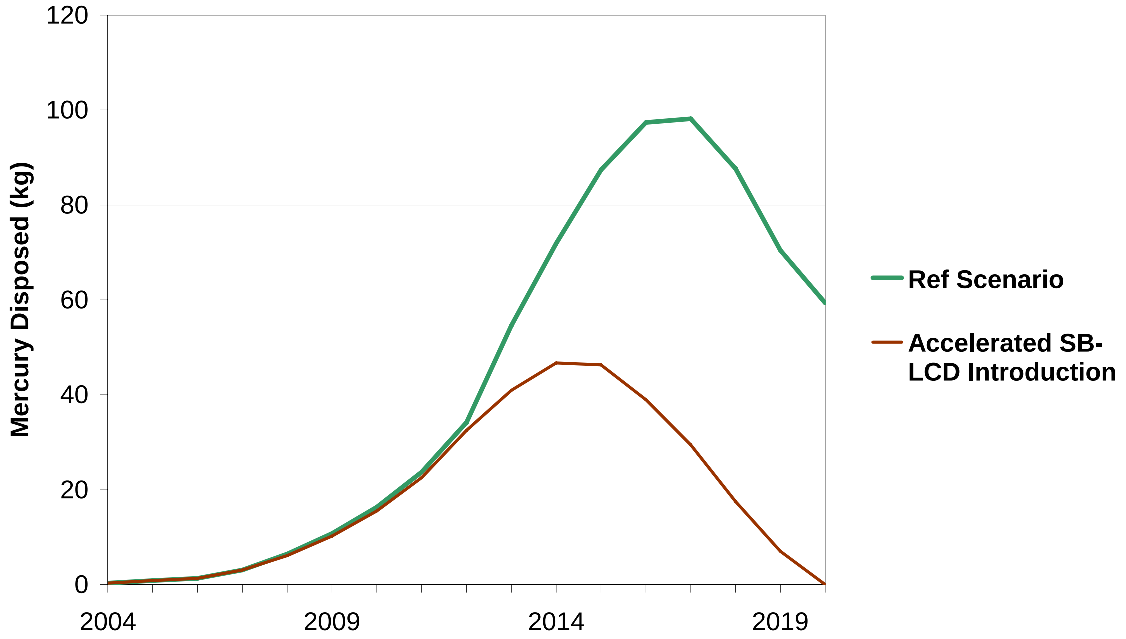
MTP has modelled the total amount of mercury arising from the disposal of LCD screens to 2020, as shown in Figure 6. It is predicted that when LCD screen disposal reaches a peak, as much as 98kg of mercury per year may require safe disposal.

MTP has modelled the impact on the waste stream of new technology containing no hazardous materials. Super-bright Light Emitting Diodes (SB-LEDs) consume less energy than traditional lamps and perform the same job. However, due to their small size, these SB-LEDs need to be formed into an array in order to provide sufficient light. The perfection of this arrangement and improving the reliability of the diodes are technical issues that have so far prevented availability of the product on the market.

Figure 6 shows the advantage of introducing SB-LED backlighting into LCD TV screens compared to the continued use of fluorescent lamps, in terms of reduced mercury disposal. Modelling has demonstrated that total mercury arisings could be reduced by over 60% between 2004-2020 if SB-LED backlighting were adopted.

[17] MTP Briefing Note MTP In Action Reducing Pollution From The Disposal Of Televisions

**Figure 6 The impact of SB-LED backlighting on LCD television screen end-of-life mercury disposal[18].**




[18] MTP Briefing Note MTP In Action Reducing Pollution From The Disposal Of Televisions

# 4 Next steps

## 4.1 Priority policies

There are two important sets of Regulations due for implementation in 2006, which will impact significantly on producers of electrical and electronic equipment.

The EU Waste Electrical and Electronic Equipment (WEEE) Directive[19] is due to be implemented in the UK, and the proposed Regulations are currently under review. The Directive covers WEEE used by consumers and for professional purposes. Producers (manufacturers, sellers, distributors) will be responsible for taking back and recovering/recycling electrical and electronic equipment.

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2005 (RoHS)[20] came into force on 1 July 2006. From this date a producer may not put new electrical and electronic equipment on the market in the EU that falls into any of the eight categories listed in the Regulations, including, for example, information technology and lighting equipment containing more than the permitted levels of hazardous substances, such as lead and mercury.

With the implementation of these Directives, there is even greater incentive for producers to design and supply products which generate less waste and to ensure that products are not classified as hazardous at end-of-life.

## 4.2 Extending MTP coverage

The Product Prioritisation Study[21] assessed the broader environmental impacts of products covered by the MTP, in addition to energy related issues and identified 30 priority products for waste, on the basis of the selected criteria applied to assess end-of-life impacts. In 2005/06 sales data was collected and is now being used to project future end-of-life waste arisings up until 2020 for selected products including domestic and non-domestic lighting, window systems, non-domestic air-conditioning, consumer electronics, information and communication technologies and packaged cooling equipment.

The MTP is in discussion with Defra to discuss product prioritisation for future work in relation to waste impacts, and this is being developed within the context of the revision of the waste strategy and the development of a product strategy. Working with Defra, our BREW partners and industry, the MTP intends to agree action plans to enable these waste impacts to be mitigated and the measures will be implemented for the highest priority products. The remaining products will be addressed by the MTP when budget and time become available.

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[19] For further information please see the Environment Agency's webpage at http://www.netregs.gov.uk/netregs/legislation/380525/473094/?lang=_e&theme=&region=&subject=&searchfor=WEEE+Directive&any_all=&choose_order=&exactphrase=&withoutwords=.

[20] For further information please see the Environment Agency's webpage at http://www.netregs.gov.uk/netregs/legislation/380525/477158/?lang=_e&theme=&region=&subject=&searchfor=WEEE+Directive&any_all=&choose_order=&exactphrase=&withoutwords=.

[21] MTP (2006). *Product Prioritisation study*. Unpublished.

**Contact:**

Market Transformation Programme
Future Energy Solutions
The Gemini Building
Fermi Avenue
Harwell International Business Centre
Didcot
OX11 0QR

MTP Helpline
Tel: +44 (0)845 600 8951
Email: info@mtprog.com
www.mtprog.com

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