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**Final report (version 1.1)**

# New estimates for household food and drink waste in the UK

A report presenting updated estimates of food and drink waste from UK homes, alongside supporting evidence.

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**Front cover photography:** An illustration of some of the types of food waste generated by households (avoidable, potentially avoidable and unavoidable

# Executive summary

Food is a valuable resource and yet UK households throw away millions of tonnes every year, most of which could have been eaten. Since 2007, helping consumers prevent food waste[1] has been a major focus for WRAP, its funders and partners. Preventing this food waste can save consumers and local authorities millions of pounds each year and deliver significant environmental benefits, in terms of landfill avoidance, the mitigation of climate change and a reduced burden on key natural resources, including water[2].

This report presents new estimates of food waste from UK homes. Estimates were last updated in 2009[3], based on a combination of original WRAP research (from 2007/8), and a 2006/7 synthesis of local authority compositional studies. This established a baseline against which progress in terms of waste prevention could be measured. This report describes work undertaken to update the UK estimate of household food waste, to determine what progress has been made and the scale of the challenge remaining.

There were an estimated 7.2 million tonnes of household food waste in the UK in 2010. This represents a decrease of 1.1 million tonnes from the estimate from 2006/7 of 8.3 million tonnes. Table ES1 shows the breakdown of this most recent estimate by disposal route, compared to the previous estimate.

**Table ES1:** Split of 2010 household food and drink estimates by disposal route

| | Local authority collected food waste* | Sewer† | Home composting & fed to animals† | Total |
|---|---|---|---|---|
| Previous estimate | 5.8 mt | 1.8 mt | 0.69 mt | 8.3 mt |
| New estimate | 4.6 mt | 1.9 mt | 0.70 mt | 7.2 mt |
| % difference | –20% | +2% | +2% | –13% |

*Updated information available for 2010 (§2.0)

†No new data available for these streams, so increase in line with population has been assumed (§3.0)

An estimate of the split between avoidable, possibly avoidable and unavoidable food waste has been made (§4.0) and suggests that the majority of the decrease in food waste has occurred, as might be expected, within the avoidable category (Table ES2).

**Table ES2:** Split of 2010 household food and drink estimates by avoidability

| | Avoidable | Possibly Avoidable | Unavoidable | Total |
|---|---|---|---|---|
| Previous estimate | 5.3 mt | 1.5 mt | 1.5 mt | 8.3 mt |
| New estimate | 4.4 mt | 1.4 mt | 1.4 mt | 7.2 mt |
| % difference | –18% | –5% | –5% | –13% |

The financial value (retail price) and environmental impact of the avoidable food waste have also been updated. For instance:

- Greenhouse gas emissions of around 17 million tonnes of $CO_2$ equivalent are associated with the manufacture, distribution, storage, use and disposal of **avoidable** food that is wasted in the UK (previously 20 million tonnes of $CO_2$ equivalent).
- Avoidable food waste is associated with 4% of the UK total water footprint (4.3%; against a previous figure of 5%).

[1] Within this report, 'food' is used as a short hand for 'food and drink'. This includes food and drink waste: home compostable and non-home compostable; avoidable, possibly avoidable and unavoidable.

[2] http://www.wrap.org.uk/retail_supply_chain/research_tools/research/report_water_and.html

[3] Household Food and Drink Waste in the UK: http://www.wrap.org.uk/retail_supply_chain/research_tools/research/report_household.html

- Given food inflation of ca 20% over this period, and ca 18% less avoidable food waste, the retail value of avoidable food waste remains unchanged (when expressed to two significant figures) at £12 billion in 2010. However, consumers are spending at least £2.5 billion a year less on wasted food than they would have, had waste levels remained at previous higher levels.
- Of the 38 million tonnes of food and drink brought into UK homes, 19% is thrown away (previously 22%). Of the 38 million tonnes, 12% becomes avoidable waste (previously 14%).

The observed decrease in the amount of household food waste is broadly consistent with decreases in the quantity of food and drink purchased for consumption within the home (§8.0). This decrease is also discussed in light of possible influences (§9.0), including:

- Positive changes in practices and behaviours in the kitchen and whilst shopping, and changes to products and packaging, that can reduce food waste;
- Food price inflation;
- Changes to income levels; and
- How waste is collected from homes.

As no new information has been collected on the categories and types of food and drink that are wasted, it is not possible to determine which food categories have contributed most to the decline in waste. It is also not possible to determine which types of household may have reduced their food waste the most.

# Contents



# Acknowledgements


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## 1.0 Introduction

Food is a valuable resource and yet UK households throw away millions of tonnes every year, and most of this could have been eaten. Over the last few years, helping consumers prevent food waste has been a major focus for WRAP, its funders and partners. In late 2007, Love Food Hate Waste was launched, and early 2008 saw the publication of ground-breaking research on the large amount of food waste in the UK. WRAP has subsequently built up a comprehensive evidence base which has raised awareness of the issue, developed a strong case of change, and given focus to the areas where consumers need the most help, where business and local authorities can benefit, and where the biggest impacts can be made.

Preventing this food waste could save consumers and local authorities millions of pounds annually and deliver significant environmental benefits, in terms of landfill avoidance, the mitigation of climate change and a reduction in the burden on key natural resources including water.

Influencing behaviours and decisions around food design, production, purchase and use is challenging, and WRAP has worked with a wide range of partners to develop a credible, integrated and consistent approach.

Estimates for UK household food waste were last updated in 2009, based on a combination of original WRAP research (from 2007/8) and a 2006/7 synthesis of local authority compositional studies. This established a baseline against which progress in terms of waste prevention could be measured. This report describes work undertaken to update the UK estimate of household food waste, to determine what progress has been made, and the scale of the challenge remaining.

## 2.0 Household food waste collected by local authorities

A research report[4] published alongside this one contains a new estimate for local authority collected food waste (residual and separately collected) for the UK (Table 1). The report presents two alternative estimates for food waste arisings, obtained using different methods to scale up results from individual local authority analyses of the composition of waste streams. Full details of the methods can be found in that report. In short, information on the proportion of waste streams that is food, is taken from local authority compositional analyses and this is applied to WasteDataFlow[5] estimates for the total quantity of waste within relevant streams.

For consistency of methodology with previous work (notably *Household Food and Drink Waste in the UK* and Defra's *Municipal Waste Composition* study), the 'standard' methodology has been used to derive these new estimates of household food waste arisings for the UK. The two methods give very similar results for the UK – the standard method gives a figure 27,000 tonnes lower than the alternative method (or 0.6% of the total).

**Table 1:** Updated local-authority collected food waste estimate for the UK

| | LA collected food waste in 2010 (tonnes) | 95% Confidence Interval* |
|---|---|---|
| **UK** | **4,620,000** | **±160,000** |

*Confidence intervals include sampling errors

This method, used to obtain estimates for the UK, is slightly different from that presented in *Household Food and Drink Waste in the UK*. In that research, the amount of food waste collected by local authorities in England was used to estimate UK arisings, as relevant data was not available for the other nations. If a similar approach were applied to the data underpinning the current report, the results would differ by only 50,000 tonnes or 1.1% of the total (Table 12). The closeness of these two results is due to similar levels of food waste per household in all nations of the UK. Previous extrapolation of English data to the UK level is likely to have had a negligible impact on results.

[4] *Synthesis of Food Waste Compositional Data 2010; www.wrap.org.uk/hhfwfacts*

[5] *Local-authority waste data reporting; http://www.wastedataflow.org/*

**Table 2:** Comparison of different scaling-up methodologies to obtain UK estimates

| UK estimate for 2010… | LA collected food waste (million tonnes) |
|---|---|
| … as presented in this report | 4.62 |
| … calculation consistent with previous report | 4.57 |

The reduction in household food waste collected by local authorities has been more pronounced than the reduction in all waste. Between 2006/7 and 2009/10, **total** household waste (as reported by WasteDataFlow) fell by 2.5 million tonnes in the UK, which is an 8% reduction of the total. This compares to a reduction in food waste collections by local authorities from households of 1.2 million tonnes (or a 20% reduction in food waste). This means that food waste has reduced more rapidly than total household waste. Therefore, the reduction in food waste makes up around 45% of the total reduction in household waste.

## 3.0 Household food waste *not* collected by local authorities

In addition to food waste collected by local authorities, food and drink is disposed down the sewer (mainly via the kitchen sink), home composted and fed to animals. Previous estimates of these waste streams (for 2006/7) were published in *Household Food and Drink Waste in the UK*. Since this report, there has been no primary research to update these estimates, although WRAP hopes to carry out new research in 2012/2013 to enable them to be updated (dependent on funding). In the absence of new data, different options and assumptions could be used:

- **Option 1: Apply the percentage decrease from local authority collected waste to non-local authority collected waste streams.** This option is based on the assumption that the reduction in local authority collected food waste is driven largely by changes in behaviour in the kitchen and whilst shopping. In such a situation, this behavioural change would lead to similar reductions in food waste irrespective of where the food waste is disposed, and so the same percentage decrease should be applied.
- **Option 2: Use the level of waste from 2006/7.** This option is based on the assumption that there has been only negligible change in the amount of food waste poured down the sewer, home composted or fed to animals and, therefore, the amount of food waste as estimated in 2006/7 is applied to 2010.
- **Option 3**: **No change in total food waste arisings across all streams.** This option assumes that all reductions in local authority collected food waste are the result of this material still being wasted but now being poured down the sink, home composted or fed to animals.

Given the evidence of lower food and drink sales (§8.0), option 3 is unlikely – the reductions in food and drink purchases suggests that the reduction in local authority collected food waste is not the result of diversion to other streams. Furthermore, an estimate of the change in home composting level obtained in 2009[6] suggested that additional diversion since 2006/7 was likely to be negligible in comparison to the magnitude of change in local authority collected food waste (this suggested that home composting diverted around 23,000 tonnes). There is limited data on the distribution and use of sink disposal units in the UK, but they are thought to be present in a small percentage of households ($\leq$6%) and there is no evidence to suggest a marked increase in their use over this time period[7].

In light of this, and a desire to produce a conservative estimate of reduction, option 2 has been used in this report. Specifically, the waste arisings per capita in non-local authority collected waste streams have been held constant. Given an increase in the population of 2.1%[8], an uplift factor equal to this amount has been applied to the two categories 'Sewer' and 'Home composting and fed to animals'. This leads to a reduction in total food and drink waste in the UK of 1.1 million tonnes between 2006/7 and 2010 (Table 3).

[6] http://www.wrap.org.uk/retail_supply_chain/voluntary_agreements/courtauld_commitment/phase_1/index.html

[7] *Domestic kitchen furniture market report uk, 2011-2015 analysis, AMA Research Ltd;* http://www.guardian.co.uk/money/2006/aug/08/ethicalmoney.leohickmanonethicalliving

[8] *Based on comparison of mid-year UK population estimates for 2007 and 2010 (Office of National Statistics).*

**Table 3:** Split of food and drink estimates between sources

| | Local authority collected food waste* | Sewer† | Home composting & fed to animals† | Total |
|---|---|---|---|---|
| Previous estimate | 5.8 mt | 1.8 mt | 0.69 mt | 8.3 mt |
| New estimate | 4.6 mt | 1.9 mt | 0.70 mt | 7.2 mt |
| % difference | –20% | +2% | +2% | –13% |

## 4.0 How much of the decrease in waste arisings is associated with avoidable food waste?

WRAP has categorised food and drink waste by how avoidable it is:

- **Avoidable** – food and drink thrown away that was, at some point prior to disposal, edible (e.g. slice of bread, apples, meat).
- **Possibly avoidable** – food and drink that some people eat and others do not (e.g. bread crusts), or that can be eaten when a food is prepared in one way but not in another (e.g. potato skins).
- **Unavoidable** – waste arising from food or drink preparation that is not, and has not been, edible under normal circumstances (e.g. meat bones, egg shells, pineapple skin, tea bags).

In the absence of representative, detailed information from compositional analysis on the types of food waste, it is not possible to state for certain how avoidable food waste has changed relative to unavoidable and possibly avoidable food waste over the relevant time period. Given this, a modelling approach based on food purchase data has been used to obtain this information. Details of the approach are given in this section.

The model assumes that levels of unavoidable and possibly avoidable waste vary in proportion to the amount of food brought into the home. For instance, if the number of eggs brought into the home increases by 5%, then it is assumed that unavoidable egg waste (i.e. the egg shells) also increases by the same amount. This assumes that all other factors are equal (in this example, the weight of shell per egg).

Table 4 details the arisings of unavoidable and possibly avoidable food waste in *Household Food and Drink Waste in the UK* and the expected change in these fractions if waste levels changed in proportion to sales levels. Data for food purchases brought into the home between 2006 and 2009[9] are based on Defra's Family Food Survey[10].

This calculation indicates that the reduction in possibly avoidable waste is approximately 73,000 tonnes and 77,000 tonnes for unavoidable waste, a total of around 150,000 tonnes. Given the overall reduction seen in total arisings of 1.1 million tonnes (Table 1), this indicates that 950,000 tonnes of this total reduction comes from avoidable food and drink waste.

[9] *These years have been selected as, at the time of publication, 2009 data is the most recent available, 2006 closely corresponds to the year of the previous estimates while still giving time-series data over three years.*

[10] http://www.defra.gov.uk/statistics/foodfarm/food/familyfood/

**Table 4:** Estimates of change in unavoidable and possibly avoidable food and drink waste

| Category | Waste (tonnes; 2006/7) | | Change in food sales 2006-2009 (%) | Estimated change in waste arisings (tonnes) | |
|---|---|---|---|---|---|
| | Possibly avoidable | Unavoidable | | Possibly avoidable | Unavoidable |
| **Fresh vegetables & salads** | 811,358 | 253,406 | -6.2% | -50,304 | -15,711 |
| **Drink** | - | 426,530 | -2.5%* | - | -10,663 |
| **Fresh fruit** | 81,122 | 517,856 | -6.2% | -5,030 | -32,107 |
| **Bakery** | 117,838 | - | -3.3% | -3,889 | - |
| **Meat and fish** | 83,361 | 236,432 | -8.9%† | -7,419 | -21,042 |
| **Dairy and eggs** | 243 | 53,772 | +5.7%‡ | 14 | 3,065 |
| **All other categories** | 373,599 | 9,392 | -1.6% | -5,978 | -150 |
| **Total** | **1,467,521** | **1,497,388** | **-** | **-72,605** | **-76,609** |

*The majority of this waste is teabags, so the figure for tea sales has been used.

†The majority of this waste is from carcase meat, so this sales figure has been used.

‡Similarly, the majority of this waste is egg shells, so the sales figure for eggs has been used.

In *Synthesis of Food Waste Compositional Data*[11], five compositional analysis studies were identified that had measured the split of avoidability in the food waste sampled. However all of these came from one geographical area. Furthermore, the studies did not separately classify possibly avoidable waste, but recorded it within either the avoidable and unavoidable fractions. However, it was possible to adjust the results of *Household Food and Drink Waste in the UK* to try and account for this difference in classification. A comparison between the studies suggested that there was around 800,000-900,000 tonnes less avoidable food waste collected by local authorities compared to 2006/7. This is broadly consistent with the reduction indicated from the analysis of purchase data and this leads to confidence that the actual reduction is close to these estimates.

However, the small number of compositional studies that detail avoidable waste and their geographical clustering mean that caution should be exercised in drawing conclusions from this analysis. For this reason, we have chosen to use the estimate from the purchasing model as the basis for further calculations.

Taking the reduction derived from purchasing data means that avoidable food waste is estimated to have reduced from 5.3 million tonnes to 4.4 million tonnes, which equates to an 18% reduction in avoidable food waste. The associated changes on UK food waste arisings (to 2 significant figures) are shown in Table 5.

**Table 5:** Impact of food price inflation and changes in waste level on retail value of food waste

| | Avoidable | Possibly Avoidable | Unavoidable | Total |
|---|---|---|---|---|
| Previous estimate | 5.3 mt | 1.5 mt | 1.5 mt | 8.3 mt |
| New estimate | 4.4 mt | 1.4 mt | 1.4 mt | 7.2 mt |
| % difference | –18% | –5% | –5% | –13% |

The fact that the majority of the overall reduction in food waste comes from avoidable waste is consistent with positive changes in behaviour (§9.1). In addition, reductions in possibly avoidable and unavoidable food waste are consistent with consumers having to buy less food as they waste less of what is bought. These estimates rely on indirect data and modelling and should be viewed as approximate. The figures will be updated when more detailed waste compositional data are available that quantify the proportion of food waste which is avoidable.

Without further research, it is not possible to quantify the change in waste associated with different food and drink types (e.g. fresh fruit and vegetables, bakery, leftovers from meals) or the split between how much of this waste is food and how much is drink.

[11] www.wrap.org.uk/hhfwfacts

In the next two sections, the impact on the retail value and environmental impact of this decrease in avoidable food waste is estimated.

## 5.0 Updating the retail value of avoidable food and drink waste

The approach adopted for updating the retail value of avoidable food waste is to inflate the cost per tonne by the retail price index (RPI) for food and drink[12] for the appropriate time period, which is related to when the data where collected:

- For waste collected by local authorities (LAs): October 2007 to December 2010
- For waste going down the kitchen sink: March 2008 to December 2010
- For waste home composted or fed to animals: February 2007 to December 2010

The overall figure is a weighted average of the three different disposal routes in proportion to the total retail price of avoidable food waste disposed of to these routes[13] (Table 6).

**Table 6:** Food inflation from research date to December 2010

| Food and drink waste: | Start date | RPI at start date | RPI in Dec 2010 | Change in RPI % |
|---|---|---|---|---|
| Collected by LAs | Oct 2007 | 167.4 | 201.7 | 20.5% |
| Going down kitchen sink | March 2008 | 172.0 | 201.7 | 17.3% |
| Home composted or fed to animals | Feb 2007 | 161.4 | 201.7 | 25.0% |
| **Overall** | **-** | **-** | **-** | **19.9%** |

Applying these inflation figures to the original estimates of the retail value of food waste, and assuming the majority of the reduction in arisings has occurred within the local authority collected streams (consistent with §2.0 and §3.0), leads to a change from £12.2 billion to £11.8 billion (Table 7). Had the reduction in food waste not occurred, consumers would have been spending around £2.5 billion a year more on food and drink bought but thrown away.

**Table 7:** Impact of food price inflation and changes in waste level on retail value of food and drink waste

| Food and drink waste stream: | Retail value (£ million) of: | | |
|---|---|---|---|
| | Previous estimate | 2006/7 waste levels; 2010 prices | 2010 waste in 2010 prices |
| Collected by LAs | £8,700 | £10,500 | £7,500 |
| Going down kitchen sink | £2,700 | £3,200 | £3,200 |
| Home composted or fed to animals | £800 | £1,000 | £1,000 |
| **Overall** | **£12,200** | **£14,700** | **£11,800** |

Given the small change in the retail value of food waste and the uncertainties around these new estimates, WRAP will continue to use existing financial messages in communications with consumers.

[12] *From Office of National Statistics website (indicator = CHBA)*

[13] *It would be possible to use RPI information for individual food categories, but given the uncertainty in the relative amounts of waste between categories, this approach is unlike to obtain a more accurate answer.*

## 6.0 Greenhouse gas emissions associated with avoidable food waste

The greenhouse gas emissions relating to the production, manufacture, storage, distribution, retail sale, in-home use and disposal of food and drink that is wasted was calculated in *Household Food and Drink Waste in the UK* (Appendix E). For food and drink waste, it was calculated that for every tonne of avoidable food and drink waste, 3.8 tonnes $CO_2$ equivalent of greenhouse gas were emitted[14].

Applying this factor to the updated quantity of avoidable food waste leads to an estimate of 17 million tonnes of $CO_2$ eq. in 2010, or equivalent to the emissions of 1 in 5 cars on UK roads.

## 7.0 Water footprint associated with avoidable food waste

The water footprint of the UK is the amount of water used to produce goods and services consumed in the UK: the sum of direct (e.g. household water use) and indirect (water used along the supply chains of goods and services) water use. Research published by WRAP and WWF[15] found that the water footprint of avoidable food waste was 5,400 million cubic metres per year representing around 5% of UK water requirements, based on information in *Household Food and Drink Waste in the UK*.

If the water footprint associated with avoidable food waste has decreased in line with arisings, this would mean that the water footprint has reduced to 4,500 million cubic metres per year representing around 4% (4.3%) of UK total water requirements.

## 8.0 Comparison with food-purchases data

Data on purchases of food and drink brought into the home, and purchases made out of the home, have been used to see if they provide corroborative (or conflicting) evidence for a reduction in household food waste.

There are many possible sources for such data; the most useful for this purpose are from Defra's Family Food Survey. These provide a weight-based measure of food and drink purchases, rather than the number of sales units or monetary value of sales. Furthermore, the datasets separate food and drink eaten outside of the home from that brought into the home. The latter includes food and drink bought in supermarkets, corner shops, takeaways, and also produce from allotments, gardens and other 'free food'.

WRAP have used these data to estimate the quantity of food and drink purchases that are brought into the home, and separately purchased out of the home[16]. The most recent data from the Defra Family Food Survey are for the calendar year 2009. As can be seen from Table 8, the food and drink purchases brought in to the home for 2009 are 553g per person per week lower than in 2006, a decrease of 4.5%. This reduction is evenly split between food (247g / person / week) and drink (283g / person / week).

Between these years, the population of the UK has increased by 2.0% and therefore the total percentage reduction in purchases over the whole UK is 2.6% (see bottom half of Table 8). This equates to around 1 million tonnes less food and drink being brought into the home in 2009 compared to 2006. The weight of fresh fruit and vegetable purchases have reduced by around 6% between 2006 and 2009 (i.e. faster than the reduction in food purchases). As well as the impact on avoidable food waste, this reduction in purchases will also have an impact on possibly avoidable and unavoidable food waste (e.g. citrus peel, banana skins) – see §4.0.

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[14] *This estimate excludes the impact on greenhouse gas emissions of land-use change relating to food production. For more information see: The Water and Carbon Footprint of Household Food and Drink Waste in the UK:* http://www.wrap.org.uk/downloads/Water_and_Carbon_Footprint_report_22_Aug_11_Final.433c5f26.10610.pdf

[15] The Water and Carbon Footprint of Household Food and Drink Waste in the UK*:* http://www.wrap.org.uk/retail_supply_chain/research_tools/research/report_water_and.html

[16] *For food and drinks reported in the Family Food Survey in millilitres, conversion from volumetric measures to weight-based has been made by WRAP.*

These figures suggest that of the 38 million tonnes of food and drink brought into the home (Table 8), 19% is thrown away (previously 22%). Of the 38 million tonnes, 12% becomes avoidable waste (previously 14%).

**Table 8**: Food and drink purchases **brought into the home**

| | 2006 | 2007 | 2008 | 2009 | Change 2006-2009 | % Change 2006-2009 |
|---|---|---|---|---|---|---|
| **Purchases (g / person / week)** | | | | | | |
| **Food & drink (total)** | 12,348 | 12,059 | 11,757 | 11,795 | -553 | -4.5% |
| Food (excluding milk) | 7,049 | 6,971 | 6,826 | 6,803 | -247 | -3.5% |
| Drink (excluding milk) | 3,489 | 3,309 | 3,184 | 3,206 | -283 | -8.1% |
| Milk | 1,809 | 1,779 | 1,747 | 1,786 | -23 | -1.3% |
| *Fresh fruit and veg* | 2,206 | 2,183 | 2,084 | 2,028 | -178 | -8.1% |
| **UK Population (000s)** | **60,584** | **60,986** | **61,398** | **61,792** | **1,208** | **2.0%** |
| **Purchases (000 tonnes per annum)** | | | | | | |
| **Food & drink (total)** | **39,007** | **38,349** | **37,638** | **38,004** | **-1,003** | **-2.6%** |
| Food (excluding milk) | 22,269 | 22,167 | 21,852 | 21,918 | -351 | -1.6% |
| Drink (excluding milk) | 11,022 | 10,524 | 10,194 | 10,330 | -691 | -6.3% |
| Milk | 5,716 | 5,658 | 5,592 | 5,756 | 40 | 0.7% |
| *Fresh fruit and veg* | *6,968* | *6,940* | *6,672* | *6,535* | *-434* | *-6.2%* |

It is also useful to look at the amounts of food purchased out of home, as changing economic conditions are likely to have affected the amounts of meals consumed out of home, which in turn would affect the amount of food purchased for in-home consumption (Table **8**9).

683,000 tonnes less food and drink was purchased outside the home in 2009 compared to 2006. The majority of this decrease was seen in drink (547,000 tonnes less) and over half the total decrease was alcoholic drinks (352,000 tonnes less, or a 19% reduction in total purchases).

Taking the data from both in and out of home purchases, around 1.7 million tonnes less food and drink was purchased in 2009 compared to 2006 – drink is associated with 1.1 million tonnes of this decrease and food with 0.5 million tonnes. Although WRAP's household food waste prevention work has focused largely on food, many of the messages are relevant to drinks such as juice, and the drinks industry have responded positively to help consumers reduce drink waste (shelf-life extension, pack size availability, better reclosable functionality etc).

Although there are undoubtedly other influences on the amounts of food and drink purchased, such as healthy eating messages, these reductions are of a similar magnitude to the reduction in food waste as described in §3.0 and §4.0. As such, the trend in purchasing data is broadly consistent with the trend in waste arisings. In addition, it must be remembered that the purchase data shown here only covers 2006-2009, and 2010 data are required to fully assess the consistency of waste and purchasing data.

These results are discussed in light of modelling work on the impact of food prices and income levels in §10.0.

**Table 9:** Food and drink purchases for consumption **out of the home**

| | 2006 | 2007 | 2008 | 2009 | Change 2006-2009 | % Change 2006-2009 |
|---|---|---|---|---|---|---|
| **Purchases (g / person / week)** | | | | | | |
| **Food & drink (total)** | 1,652 | 1,540 | 1,423 | 1,408 | -244 | -14.8% |
| Food (excluding milk) | 590 | 568 | 544 | 535 | -54 | -9.2% |
| Drink (excluding milk) | 1,043 | 954 | 863 | 853 | -190 | -18.2% |
| Milk | 19 | 17 | 16 | 19 | -0 | -0.3% |
| ***Alcoholic drinks*** | *587* | *526* | *464* | *466* | *-121* | *-20.6%* |
| ***Hot beverages*** | *129* | *133* | *124* | *120* | *-9* | *-6.8%* |
| ***Juice*** | *18* | *17* | *17* | *16* | *-2* | *-11.8%* |
| ***Other beverages*** | *309* | *277* | *258* | *251* | *-58* | *-18.9%* |
| **Purchases (000 tonnes per annum)** | | | | | | |
| **Food & drink (total)** | 5,219 | 4,898 | 4,556 | 4,536 | -683 | -13.1% |
| Food (excluding milk) | 1,863 | 1,808 | 1,743 | 1,725 | -138 | -7.4% |
| Drink (excluding milk) | 3,295 | 3,035 | 2,762 | 2,749 | -547 | -16.6% |
| Milk | 61 | 55 | 51 | 62 | 1 | 1.7% |
| ***Alcoholic drinks*** | *1,854* | *1,674* | *1,485* | *1,502* | *-352* | *-19.0%* |
| ***Hot beverages*** | *407* | *424* | *396* | *387* | *-20* | *-4.9%* |
| ***Juice*** | *58* | *55* | *54* | *52* | *-6* | *-10.0%* |
| ***Other beverages*** | *977* | *881* | *827* | *808* | *-169* | *-17.3%* |

## 9.0 Other Evidence of Impact

The analyses presented above indicate that the quantity of food waste has reduced between 2006/7 and 2010. This section explores other, relevant information sources to see if they provide conflicting or corroborating evidence for a reduction of household food waste. This additional evidence suggests that there have been changes in the way people plan, shop and cook food that are likely to have led to less waste.

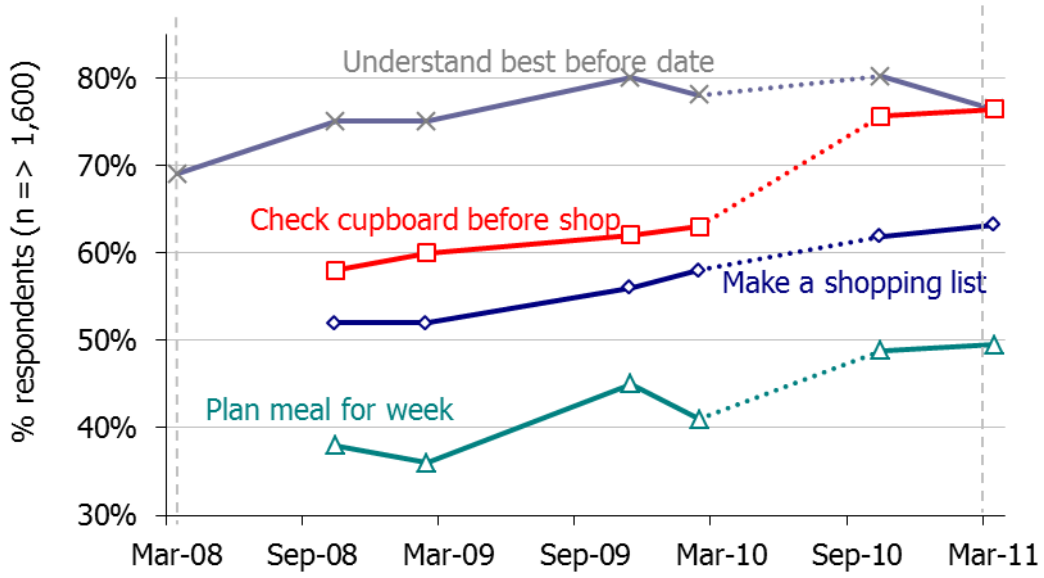
### 9.1 Self-reported behaviours that reduce food waste

There are many actions that people can take to reduce food waste in the home. Due to the complexity of food waste generation, these behaviours encompass food planning, the way people shop, store, prepare and use of food.

Three behaviours have been tracked consistently over the last few years, all associated with planning[17]. Figure 1 gives the proportion of the population claiming to perform these behaviours, as measured by the regular questionnaire survey commissioned by WRAP. In general, these have increased over time: in particular, before changes to the questions in October 2010, the levels of the behaviours that were tracked increased by six, five and three percentage points (the first two of these increases are significant at the 95% level). Furthermore, further small increases in these behaviours (not individually significant at the 95% level) were seen with the new behavioural questions between October 2010 and March 2011. In addition the understanding of the 'best before' date has increased between 2008 and 2011, reflecting increased knowledge that could help reduce the likelihood that food is wasted.

[17] *In autumn 2010, WRAP updated the behavioural questions asked in its regular household food waste questionnaire and the questionnaire also moved on-line (previously it was performed face-to-face). Results from these questions will provide consistent time-series data from autumn 2010 onwards. Two waves of the questionnaire containing the new questions have been carried out.*

**Figure 1:** Trends in food-waste reducing behaviours (% reporting all of the time or most of the time) and those understanding best-before dates (note that *y*-axis does not start at zero).




Questions and mode of questionnaire changed between February and October 2010 and therefore increases between these two dates are methodological (dotted lines are a guide for the eye).

However, it should be noted that these behaviours constitute a minority of those that WRAP is targeting. Although questions have been asked about other food waste reduction behaviours, they have not been asked to all respondents and/or the method of measurement has changed significantly over the time period of interest. It should also be noted that these are all self-reported levels of behaviour.

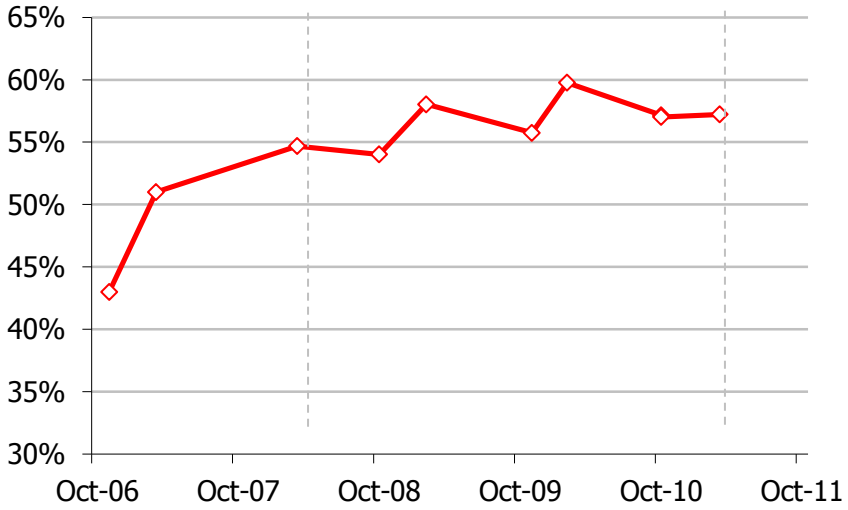
## 9.2 Self-reported levels of food waste

There is a strong correlation between the quantities of food waste generated by a household, as measured via compositional analysis, and self-reported levels of food waste, as determined by questionnaire survey[18]. Despite this strong correlation, there was a general trend of under-estimation of the amount of food waste generated.

The results of this self-reported question are given in Figure 2. It can be seen that there has been a 14% increase (significant at the 95% level) in the proportion of responses of 'none' or hardly any' since 2006, with a 2% increase (**not** significant at the 95% level) during WRAP's last business plan (April 2008 and March 2011), as indicated by the dotted lines.

[18] From: *The Food We Waste*, WRAP (available on request).

**Figure 2:** Trends in self-reported levels of food waste (% answering 'none' or 'hardly any'). Note that the *y*-axis does not start at zero.




Question: Thinking about the different types of food waste we have just discussed, how much uneaten food, overall, would you say you generally end up throwing away? Options = i) Quite a lot; ii) A reasonable amount; iii) Some; iv) A small amount; v) Hardly any; vi) none; vii) Don't know. Asked to all respondents with some responsibility for food shopping, or food cooking and preparation. Minimum base size = 1663. Although the mode of questionnaire changed from face-to-face to online between February 2010 and October 2010, a comparative study was performed in October 2010 suggesting negligible difference (0.2%) relating to mode.

It should be noted that the stated level of food waste could be affected by factors other than actual levels of food waste, such as how aware respondents are of their food waste. This relationship between stated and actual levels of food waste could change over time (e.g. as a response to WRAP's awareness raising activity), thus influencing the results.

Given the backdrop of large reductions in food waste and increased (self-reported) levels of food-waste-reducing behaviours, the recent decrease in Figure 2 illustrates the difficulty in interpreting the results of this question.

The Food and Drink Federation have recently published the results of a consumer survey[19], where half of the respondents to the survey of over 1,000 people claimed to be throwing away a 'lot less' or a 'little less' food compared to a year ago. 43% thought the amount they were throwing away was about the same, whilst only 4% thought it had increased. In response to a similar question asked by WRAP in a February 2010 survey, 33% of respondents thought they were wasting less than a year before. This could reflect a real shift since in the last 18 months, but of course the differences might also be influenced by the position of the question in the survey and what has been asked beforehand (i.e. priming people on sustainability issues).

## 9.3 Local studies to determine impact

Many local authorities and waste partnerships have run Love Food Hate Waste activities. For budgetary reasons, most do not directly measure the quantity of food waste before and after this activity[20]. However, Worcestershire County Council did perform compositional analysis before and after their work in spring 2011. This showed that there was around 15% less avoidable household food waste was collected by the authority after their Love Food Hate Waste intervention (May 2011) compared to before it (February 2011) – a decrease which is significant at the 95% confidence level.

This demonstrates that Love Food Hate Waste activities can have a substantial impact on food waste over a relatively short period of time.

The information in this section – taken as whole – is consistent with the downward trend reported in household food waste arisings. In particular, the population is reporting higher levels of waste preventing behaviours in the

[19] http://www.fdf.org.uk/news.aspx?article=5518&newsindexpage=1#

[20] *Usually self-reported information is obtained via questionnaire surveys.*

home and lower self-reported levels of waste. Furthermore, there is evidence that local interventions – of which there have been many (§10.0) contribute to this trend.

## 10.0 Activities by WRAP and its partners to reduce household food waste

Helping consumers prevent food waste has been a major focus for WRAP, its funders and partners: with the launch of Love Food Hate Waste, publication of ground-breaking research and inclusion of household food and drink targets within both the first phase of the Courtauld Commitment and its successor.

Major retailers and brands have supported Love Food Hate Waste and its objectives, and also made changes to the way foods are packaged, labelled and sold. In 2008, Sainsbury's introduced new storage guidance to customers both in-store and on its website, advising shoppers to store their loose fruit and vegetables in the fridge to keep it fresher for longer, and in the same year launched their campaign: *Love Your Leftovers*. In 2009, Morrison's launched its own campaign (*Great Taste Less Waste*) to help its customers waste less food, including 'best kept' labelling to inform customers how best to store products, and promotion of effective meal planning through recipe suggestions that use the same core ingredients. The Co-operative was the first UK retailer to print storage advice on their bags for loose fresh produce.

Examples of activities delivered by brands include Warburtons and Kingsmill introducing different loaf sizes, whilst Warburtons and Hovis both improved on-pack labelling to make it easier for customers to know how to store their bread in the best way, and when to eat it by. Heinz launched an innovative "Fridge Pack" for baked beans in 2010, which could be kept in the fridge for up to 5 days after opening, giving consumers longer to eat the product. Birds Eye introduced re-closable packs for both frozen peas and fish-fingers, to help reduce waste.

By the end of 2010 all of the major retailers and many of the major food and drink brands had delivered relevant messages and/or innovative products to their customers to help them reduce waste.

Joint working between WRAP, the Food Standards Agency, UK Governments and the food and drink industry has led to significant progress in simplifying date labels, and ensuring storage guidance is clearer and more consistent.

WRAP has also supported 22 local Love Food Hate Waste campaigns involving more than 300 local authorities. These initiatives have helped local people reduce food waste and have included road shows, cookery demonstrations and recipe competitions, working with community groups, housing associations, and businesses. The South West Waste and Recycling Forum, for example, prevented an estimated 8,000 tonnes of food waste going to landfill through their local campaign, which was awarded the 2010 Gold Green Apple Award for partnership working and the Food Waste Award 2010 from the Plant & Waste Recycling Show. In the West Midlands region, WRAP worked with Improvement and Efficiency West Midlands and the 33 local authorities on a jointly funded Love Food Hate Waste campaign to help tackle food waste.

Community groups and individuals have taken action to help prevent food waste locally. WRAP's partnership with the Women's Institute demonstrated that local groups can make big reductions in food waste, saving money in difficult financial times.

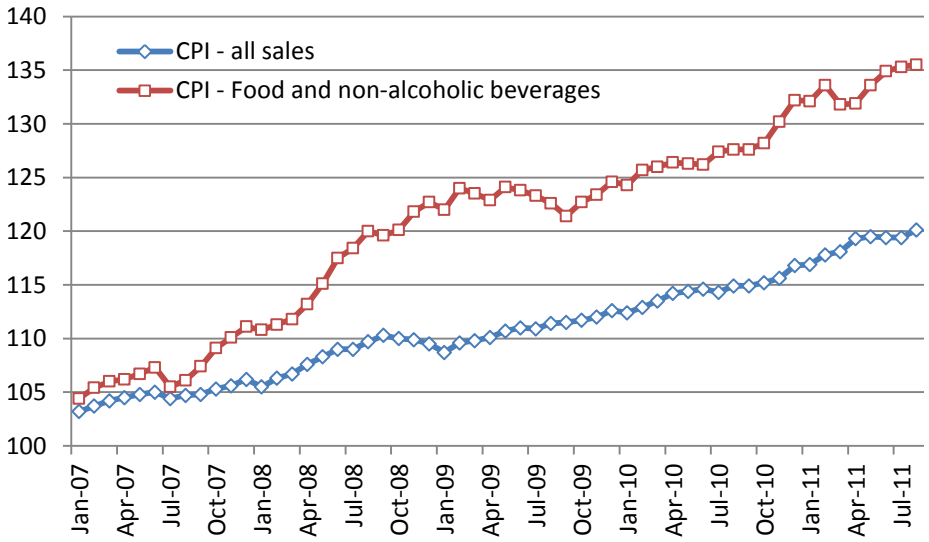
WRAP has also worked extensively with the media to ensure that positive food and drink waste prevention messages are spread widely, including local and national radio and print media, consumer magazines and TV.

## 11.0 Other influences on food waste

There are a number of factors – other than the work of WRAP and its partners – that could have influenced household food waste. These include (but are not limited to) food prices, income levels and the collection system for waste.

For example, consumer food prices have undergone high levels of inflation – most notably in the second half of 2007 and 2008 during which prices rose by 16% (Figure 3). This compares with a 4% rise in consumer prices (as measured by the Consumer Price Index) over the same period.

**Figure 3:** Consumer price index for food and non-alcoholic beverages compared to overall consumer price index (CPI); 100 = 2005 level




Source: Office of National Statistics.

As a result of price rises and other economic changes, food expenditure patterns have shifted, not only in terms of quantities and types of food, but also the proportion of food eaten in the home. It is possible that changes in behaviours related to food waste (Figure 1) have been triggered – at least in part – by these economic factors.

There is evidence that the method of collection type, of household waste, has an impact on the quantities and composition of waste collected. The evidence connecting food waste arisings and the collection type is currently incomplete[21]. Nevertheless, changes in food waste collection schemes should not be ruled out as one possible driver for the observed trend in reduced food waste arisings.

It is extremely difficult to separate the impact of different factors for a number of reasons:

- Past modelling of the impact of income and prices on food sales usually focuses on value of food purchased rather than the quantity. New models based on weight of food are being developed, but results are semi-quantitative given the sparse data on levels of food waste. Specifically, it is difficult to estimate the impact of these economic conditions because time series data on food waste arisings is not known with accuracy during previous food price rises or recessions.
- The influence of price rises and changes in income level are hard to separate fully from the influence of WRAP and its partners. For example, communications around reducing household waste were tailored to the economic situation: e.g. many websites and articles detailing how people could make financial savings cited food waste reduction as a possible route, and directed people to the Love Food Hate Waste website. This type of communication is likely to have been more effective because of the economic situation at the time, and it would be almost impossible to quantitatively attribute the impact between the economic situation and WRAP's contribution.

It is unlikely that all of the reduction in food waste is the result of the work of WRAP, its partners and others active in the field of food waste reduction. However, the evidence provided in this report would suggest that WRAP – and the work with its partners – has been a key influence on food waste levels.

[21] *Literature Review - Relationship between Household Food Waste Collection and Food Waste Prevention,* WRAP*:* *http://www.wrap.org.uk/downloads/Impact_of_collection_on_prevention_FINAL_v2_17_8_11.b13e1fe5.11159.pdf*

## 12.0 Conclusion

There is strong evidence from both waste and purchasing data that there has been a substantial reduction in the amount of food waste generated by households in the UK, which will have delivered huge benefits to the environment, in terms of reductions in $CO_2$ e emissions (3.6 million tonnes less per year), water usage (1 billion tonnes[22] less per year) and the amount of material sent to landfill (around 1 million tonnes). Although food price inflation means that the value of the lower level of avoidable food waste is similar to that in 2007, without this reduction, consumers would be spending around £2.5 billion a year more on food and drink that ends up as waste.

Determining the extent to which different factors have triggered, and then enabled, this reduction in household food waste is difficult. The tough economic times and rising food prices have undoubtedly contributed to the desire to maximise the value out of the food that is bought, and reduce food waste, and changes to the way waste is collected from households may also have helped raise awareness of the amount of food being thrown away. Work is in progress by WRAP to develop new approaches to help understand how all of these factors interact to motivate and bring about changes in food waste levels.

Although the findings presented in this report are extremely positive, it is important to recognise that household food waste remains the single largest contributor to overall UK food waste (around 50% of the total). Continued effort is required to bring about further significant reductions in the £12 billion worth of avoidable food waste associated with around 17 million tonnes of $CO_2$ e and a water footprint of 4.5 billion $m^3$.

Further work is required to understand the detail behind these changes in household food waste, in particular around the types of food being thrown away, by different types of household. In addition, future research to track changes in household food waste will rely on there being a significant number of compositional studies carried out across the UK.

[22] *This is equivalent to 1 billion m3 of water. In a previous version of this report this was incorrectly reported as litres rather than tonnes.*

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