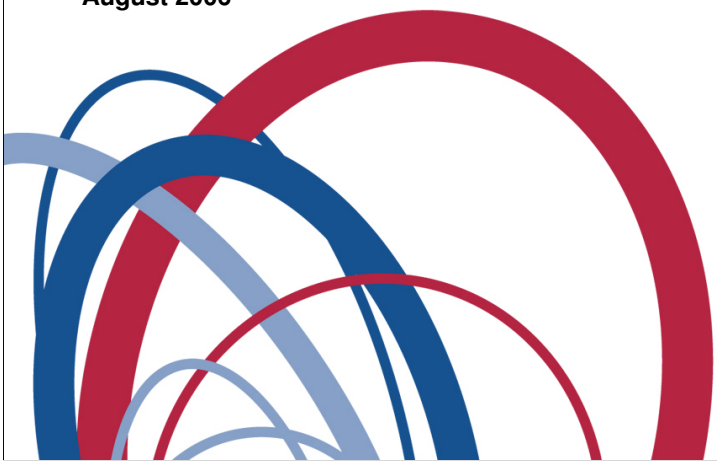
Modelling the Impact of Lifestyle Changes on Household Waste Arisings

Defra Waste and Resources Evidence Programme Project (WR0107)

Annex1: Main Report

August 2006



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Important Research Update (September 2009)

The innovative input-output model (forecasting tool) that was constructed as a part of this research, was developed using the most up-to-date data on waste arisings available in 2005, at the project start, i.e. up to and including data for 2003/04. Following completion of the initial research and model development in July 2006, new data on waste arisings became available, which highlighted a divergence between the model predictions and reported data from 2002-2006.

Additional research indicated that it would be necessary to include a range of as-yet-not-understood factors within the model in order to develop more accurate predictions. Defra have commissioned further research to try to understand other factors that may have influenced changes in waste growth patterns. The Information Note published with this report gives more detail on this research and the background.

The divergence observed between the model forecasts and recent waste growth currently limits the application of the model for policy purposes, and means that caution should be used with respect to interpreting the figures contained in this report and the associated research documents (e.g. quantification of future waste tonnages). However, this project still allows exploration of future trends in waste composition, if not total quantity.

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Appendix 1. Data sources and assumptions
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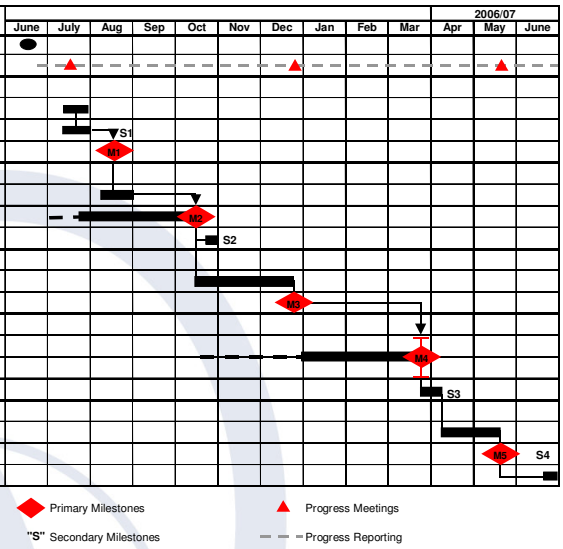
This main report provides details of the primary research and development, undertaken by AEA, The Future Foundation and The Social Marketing Practice (between June 2005 and August 2006) in the development of an innovative forecasting tool to try to model the impact of lifestyle changes on future household waste arisings.

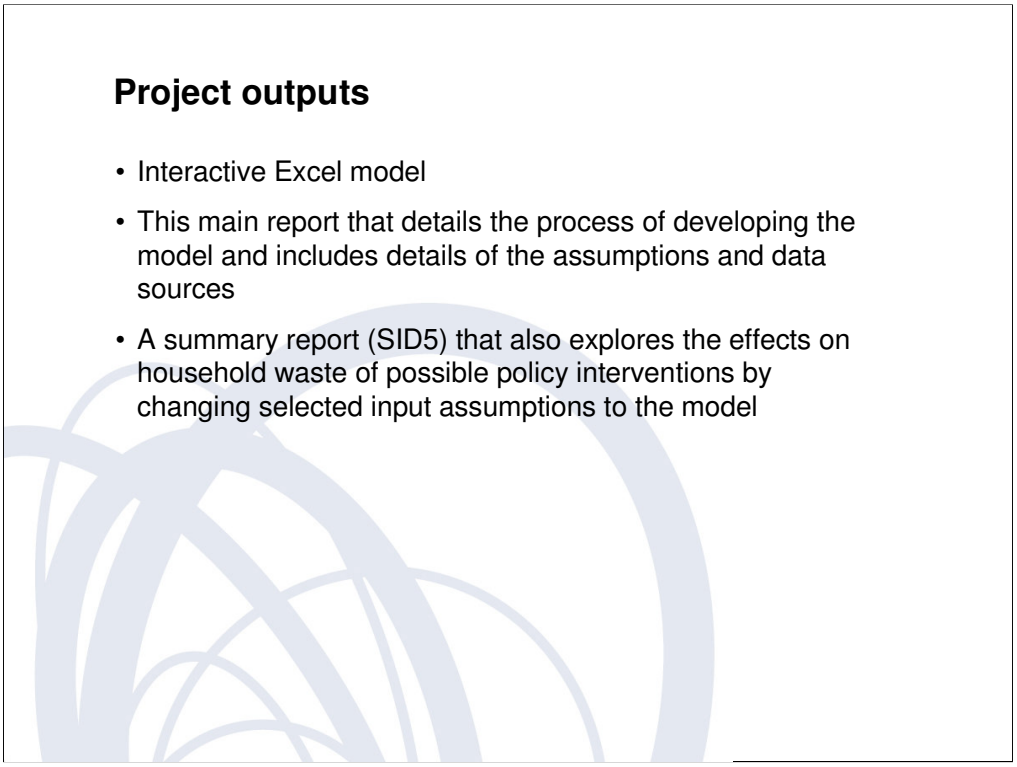
1. Objectives of the project, timing and outputs

- Overall, the purpose of this project is to lead to the development of an innovative and flexible model that:
  - Integrates socio economic impacts with waste data and an understanding of policy initiatives
  - Provides a robust basis for forecasting future household waste arisings and its possible composition
  - Allows investigation of the potential impact of a range of waste policy initiatives
- The model will assist Defra by providing a tool for forecasting outcomes and planning waste management policy

Project timing

Lead	Support	Ref	OBJECTIVES
AEA	FF/SMP	a	Meeting with Defra & Research Start Up
	FF/SMP	b	Progress Reporting and Progress Meetings
	Objective 1: Scoping Study & Data Gathering		
AEA	FF/SMP	c	Literature Review
	FF/SMP	d	Data Gathering
	FF/SMP	e	Inception Report
	Objective 2: Analysis & Consultation		
AEA	FF/SMP	f	Analysis of Data
	SMP/FF	g	National Stakeholder Consultation
	FF/SMP	h	Summary of Workshop Outputs
	Objective 3: Model Construction		
FF	AEA/SMP	i	Model Construction
	AEA/SMP	j	Interim Report
	Objective 4: Consultation & Validation		
AEA	SMP/FF	k	2 Local Area Workshops
	SMP/FF	l	National Stakeholder Consultation
	FF/SMP	m	Model Adjustments & Revised Spreadsheets
	Objective 5: Policy Recommendations & Final Report		
AEA	SMP/FF	n	Preparation of Recommendations
	FF/SMP	o	Presentation of Recommendations & Handover
	FF	n	Training





The main output of the project is a detailed forecasting model, designed to be used within Defra for assessing the effect that changes to assumptions have on household waste. The model relates household waste arisings to a range of drivers – economic growth, household size, the composition of household consumption by various types of expenditure, the proportion of product weight entering the household waste stream etc.

Two main report documents accompany the model:

•This main report that includes details of the process used to build the model, the assumptions used and the information used to feed into the model (and details about the sources of this information).

•A summary report (SID5) that also explores the effects on household waste of changing selected input assumptions to the model. The report anticipates a number of possible policy interventions and how they would affect selected assumptions in the model (for example the effect of a particular policy on the proportion of product weight entering the household waste stream). For a range of theoretical interventions, the report describes the effect on household waste and each aspect of the composition of household waste.

2. Historical waste data available to model

1. Time series data of total waste arisings
2. Cross-sectional composition data
3. Background data from other sources

Data on the generation of household waste

- There is limited consistent historical data on household waste
- The most reliable data is from Defra/Cipfa, which provides information over the last 20 years
- This data shows household waste to have grown by 1.6%pa over the twenty year period 1984 – 2004 - well below the 3% plus figures quoted in paper's such as the Strategy Unit's 'Waste Not Want Not'
- According to the Defra data growth over the years1996 – 2000 was 3.2% pa. This, however, appears to be an unusual period
- Growth in waste appears to be well below the 2.6%pa growth in GDP
- Similar findings are evident across other countries :
  - EU25 municipal waste growth averaged 2%pa, GDP growth averaged 2.3%pa, while:
  - In the US waste has grown at 0.4% pa, compared to GDP growth of 4.1%pa
  - In Japan waste has grown at 0.3% pa, compared to GDP growth of 1.3%pa

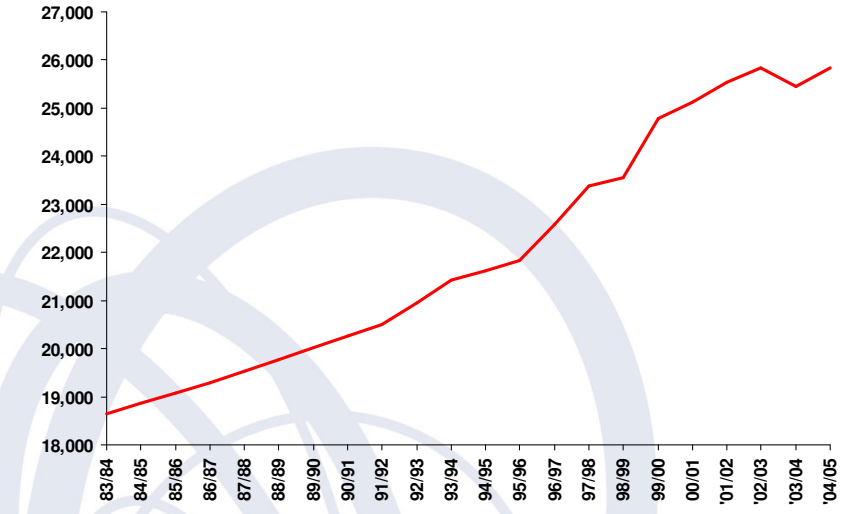
Prior to beginning this programme of work, there was very limited data on household waste. The most reliable information is from Defra/Cipfa but even from this source, time-series data is available only for total household waste.

The historical data suggests that household waste has been growing somewhat slower than quoted in some papers on subject. Only in the years 1996 – 2000 does household waste appear to grow at faster than 3% p.a. This appears to be an unusual period, and some reasons for the strong growth (examined in subsequent pages) are unlikely to occur again.

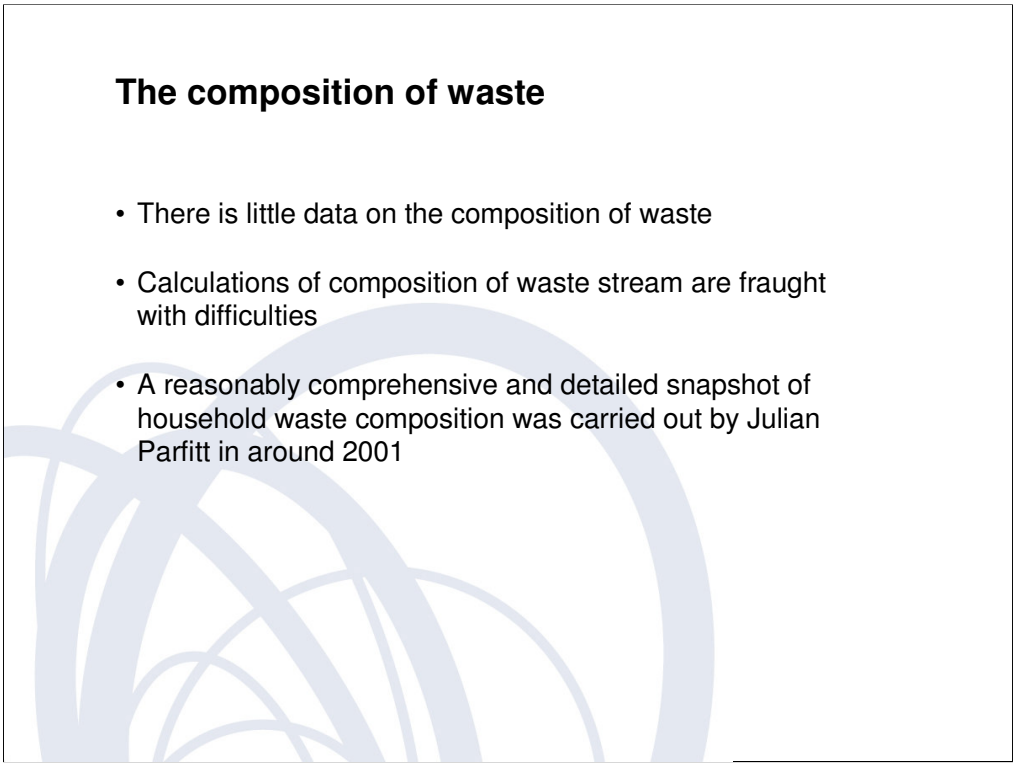
This data confirms a link to UK Gross Domestic Product (GDP) – growth in GDP is accompanied by growth in household waste – but over the whole period from the mid-80s, growth in household waste has been significantly slower than GDP growth of 2.6% p.a. This reflects the situation in other developed-world countries, where waste growth has been well below GDP growth.

Household Waste in England (000 tonnes)

Data from Defra/CIPFA

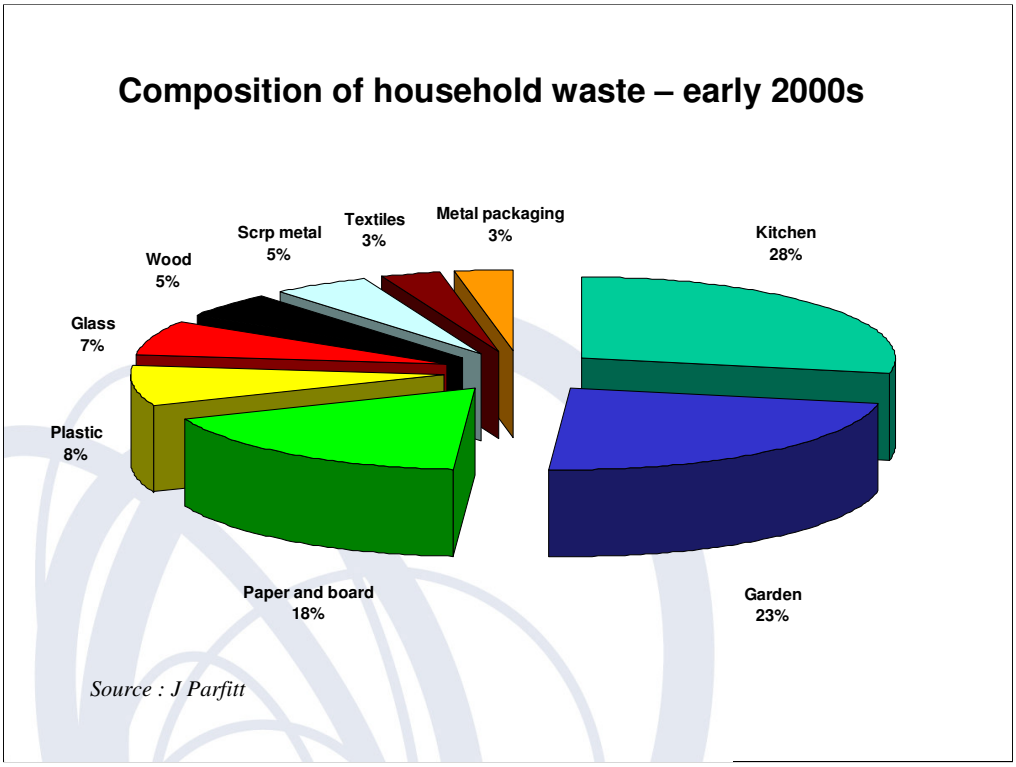


Source publication: Municipal Waste Management Survey



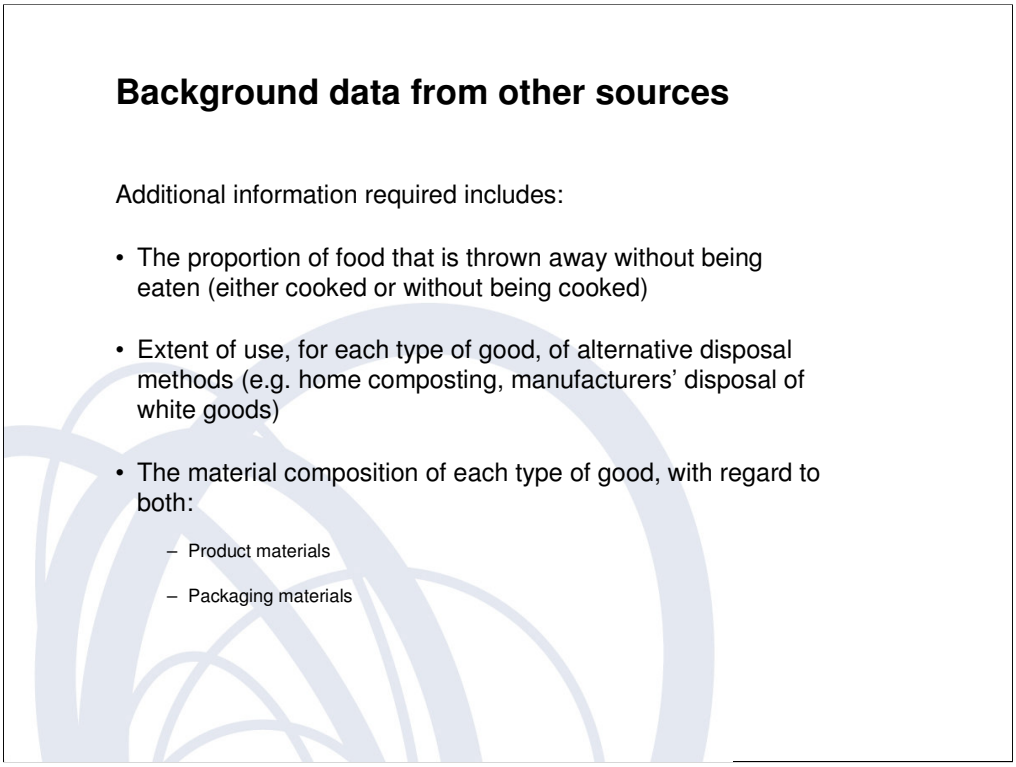
Prior to beginning this programme of work, there was no historical time-series information about the composition of household waste. A number of separate studies of waste composition have been carried out over recent years (many funded by the Defra Local Authority Support Unit, Direct Consultancy Support programme), but the studies have inconsistencies in definitions and in most cases are carried out on a sample that is geographically unsuitable to be used as a base for calculating composition of household waste for England as a whole.

A reasonably comprehensive and detailed snapshot of household waste composition was carried out by Julian Parfitt (of WRAP) covering the period of the early 2000s. This provides a benchmark for the comparable sizes of different stream within household waste.



The results of the composition study carried out by Julian Parfitt highlight the dominant waste streams within household waste (paper and board, garden or green waste and kitchen waste). Although the available data only covers a single point in time it does provide an indication of the relative importance of the different streams. The importance of green waste to some extent reflects the changes made in the late 1990s as to how this waste stream was managed. During this period, efforts were made to encourage a greater proportion of green waste to be put into the waste stream, in order to be composted.

So there is a suggestion behind the figures above that green waste has grown in share of the the household waste stream. This is one explanation for the high growth in household waste arisings (faster than GDP growth) over the 1996-2000 period.



In order to build a full picture of the weight and type of household waste that enters the waste stream across England, additional information is needed to enrich the limited data, discussed in the previous pages, on total weight and composition of waste.

Other data sources include:

•Information provided by WRAP about the proportion of food that is thrown away. Although a complete picture of wastage by type of food product was not available, sources from the US and UK (such as Prudential's *Soggy Lettuce Report*) provide the basis for making magnitude estimates for the amount of food wasted and a general picture of how wastage can vary across food type.

•Under the guidance of experts from organisations including WRAP and Defra, estimates were made of the penetration of alternative disposal methods for each of the 53 categories of purchased goods that produce waste. This includes home composting of food waste (at least 10% of food waste by weight is composted); disposal of clothing through the commercial, rather than household, waste stream (through collection for charity shops); disposal of electrical items through the commercial, rather than household, waste stream (through schemes that require manufacturers to dispose of white goods that they produced).

•Estimates were made for the material composition of each category of product, and the material composition of the packaging for each category of product. INCPEN provided current and historic estimates of how consumer packaging of goods has changed in total weight and in weight of materials used (for example the relative penetration of glass versus plastic bottles, and the average weight of each). A range of industry sources were used to provide a composition picture for those product categories that are composed of a number of different materials.

3. Modelling approach

1. The input/output model
2. Details of the consumer spending model
3. Modelling of non-spending based elements

Input output modelling as an approach

- Given that most household waste is generated by consumers' expenditure then historical data on consumers' expenditure can be used to construct a model of household waste
- Detailed consumer's expenditure forecasts can therefore be used to generate forecasts of waste
- To do this consumer's expenditure data back to the mid 1980s has been used to track spending in constant price terms – close to a 'physical' measure of purchases – and this has been mapped on to waste production
- For each element of consumers' expenditure that creates waste the following calculations were needed:
  - The weight of product
  - how much waste created, broken down between 'product waste' and 'packaging waste'
  - how these have changed over time

As there is limited historical data available on waste (particularly the composition of waste) it was decided to construct the model on the basis of linking waste generation to consumers' expenditure.

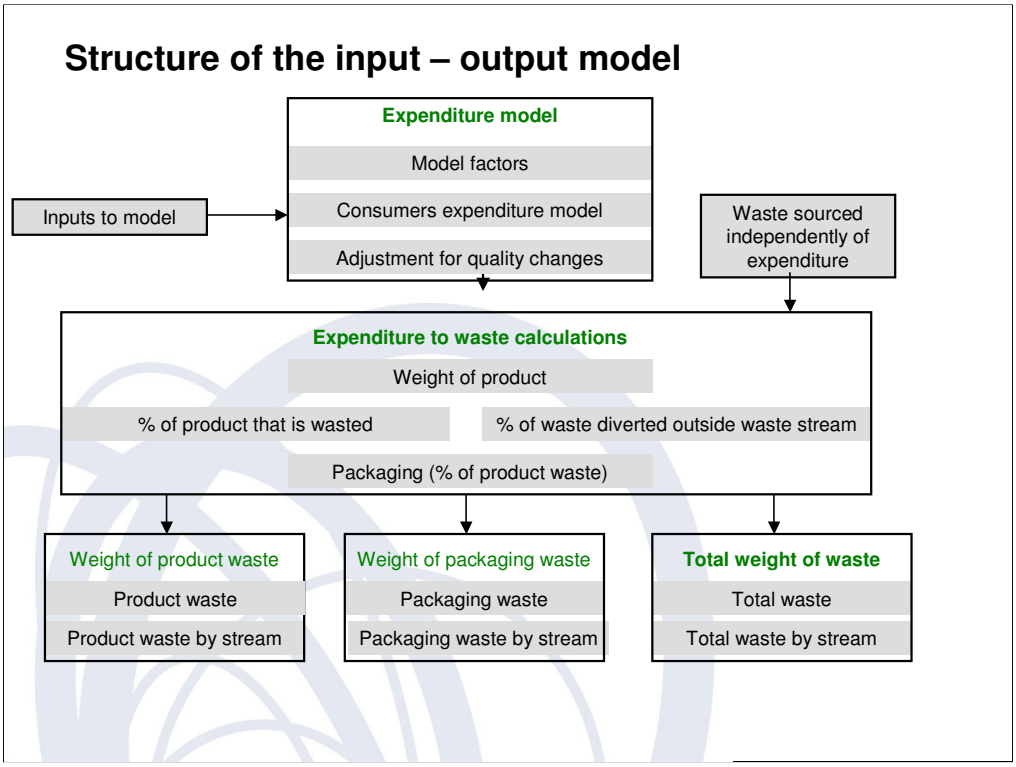
This input-output model is built on the principle that most household waste is generated as a result of consumer purchases. The latter is measured through national accounts figures for consumers' expenditure. So by measuring spending in constant price terms – close to a 'physical' measure of purchases – the weight of household waste produced can be tracked.

There are over 100 separate consumer spending categories, of which only some produce waste that will end up in the household waste stream. For example food bought for consumption at home triggers disposal at home, as would the purchase of items within categories such as garments, household textiles and newspapers.

There are categories that produce no waste – such as services that repair clothing – and expenditure in these categories clearly does not feed into the model of household waste. Neither do services such as restaurants: although they may be expected to produce waste it would not feed into the household waste stream and so is not relevant to this model.

Expenditure on most categories of goods is largely driven by macro-economic factors – primarily either disposable income or house prices. Additionally expenditure, in most categories, depends on changes in the price of those goods in relation to the price of other products. Trends in expenditure on some of the categories are also driven by changing social and attitudinal factors. For example, expenditure on tobacco products has fallen faster than would be suggested purely by changes in affluence and the price of tobacco products; consumption falling as a result of the increasing awareness of the the damage that smoking can do to health.

The format of expenditure models, and the effect of the drivers of the models (in particular how assumptions for the drivers feed into forecasts of expenditure), are discussed in more detail in Sections 6 and 7.



As discussed above, models of expenditure on different categories of product provide a base for modelling the waste produced by purchase of such products. In order that real expenditure better approximates a physical measure of 'volume' of goods bought, an adjustment must be made for quality changes. This is because a growth in real expenditure can reflect both that a larger 'physical' amount of that product is bought, but also that a low-quality product is being replaced by a higher-quality (and higher cost) product. Using figures from National Statistics, the expenditure models have been adjusted so that they factor out quality changes and capture *only* changes in the physical amount of product bought, so that this can be mapped onto the weight of waste produced.

This mapping is done via the average weight per kilogram of each category of expenditure. For example, a little under £14bn was spent in 2005 on meat, at an average of around £6.50 per kg, giving a total of 1.8m tonnes of meat products bought in 2005. From the weight of product in each category, the following assumptions need to be made in order to arrive at estimates of the amount of waste generated per product category :

•Assumptions for the average proportion of product in each category that is wasted give the weight of waste created from that category

•Assumptions for the average proportion of waste that is disposed of somewhere *other* than the through household waste give the weight of waste from that category that enters the household waste steam

•Assumptions for the average proportion of weight that is packaging give 'product waste' and 'packaging waste' for that category

(See Appendix 1 for details of the above assumptions.)

The input-output model as described above effectively captures most areas of waste production through consumer behaviour. There remains three main areas (discussed on the following page) that are not captured through this link to consumer spending, since in these three categories the weight of waste entering the waste stream is not dictated by spending by consumers.

Modelling of non-spending based elements

There are three main categories of waste that enters the waste stream through household waste but for which the weight of waste is not governed by volume of consumer spending:

- Green (or garden) waste
- Free newspapers
- Direct mail communications to consumers from companies

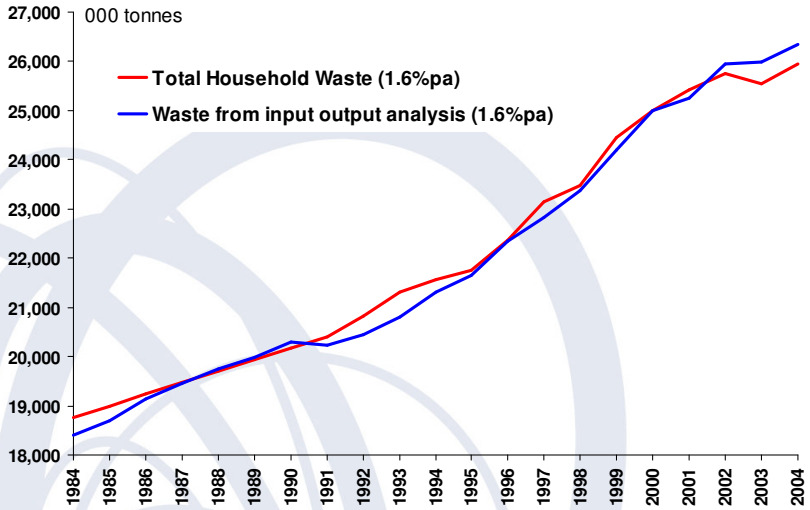
Garden waste enters the waste stream as a result of the removal of green waste from the garden. Production of garden waste in England is dependant simply on the total garden area in England (the weather, the proportion of garden area given over to plants, and the way that gardens are planted). This is a product of the number of households in England with a garden, and the average amount of garden waste produced per garden (which is directly governed by average garden size). In order to model the weight of garden waste that enters the waste stream, a further calculation must be made. The proportion of collected garden waste that is put into a formal waste stream (rather than composted back into the garden) determines how much of the garden waste produced actually enters the household waste stream. WRAP suggest that the proportion that enters the waste stream has grown over the last ten years. This has been the main driver of growth in green waste within the formal waste streams, since the number of gardens in England is growing only very slowly (though the number of English households is growing, the proportion of those that have a garden has been in slow decline).

Waste from free newspapers is directly dependant on the number of free newspapers in circulation. The average weight of a free newspaper is assumed to have remained unchanged over the period 1980-2005. So, with the number of copies of free newspapers in steady decline since the late 1980s it is a trivial calculation to determine a requisite downward trend in the weight of thrown-away free newspapers that enters the household waste stream. An existing Future Foundation forecast of free newspaper distribution is used to forecast future waste arising from this source.

Similarly, the weight of thrown-away direct mail depends directly on the weight of direct mail that is sent to consumers by companies. Assuming that the average weight of an item of direct mail has not changed over the period 1980-2005, the weight of direct mail waste depends on the number of items. This in turn is a product of total expenditure (at constant prices) on direct mail to English households, and the average cost per item of direct mail. The Advertising Association carry both these pieces of information so calculation of a historic trend in weight of direct mail is relatively straightforward. They also produce forecasts of the above, so forecasts of waste arising from direct mail can be obtained relatively straightforwardly.

4. Fit of the model

Comparison of recorded weight of household waste and household waste as modeled by input-output analysis



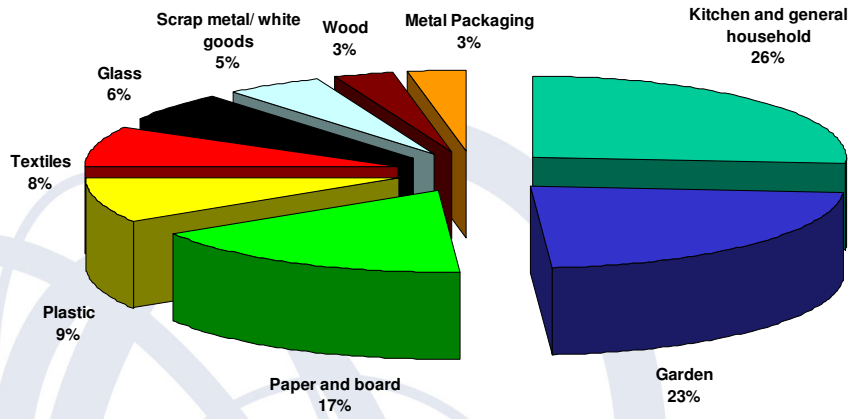
The input-output model created on the basis of the process described above provides a good fit to the historical data for total English household waste as measured by Defra/Cipfa. Growth in household expenditure on goods (along with the models of non-expenditure derived categories as described above) maps effectively onto waste production, to give an average growth of 1.6%p.a. over the period 1984-2004.

As detailed in subsequent pages, the input-output model also provides a depth of detail for the composition of household waste through the 1980s, '90s and 21st Century.

5. Findings of the model for 2005

1. Composition of waste by waste stream
2. Breakdown between product and packaging waste
3. Composition of waste by source of waste

Model output: Household waste composition, 2005



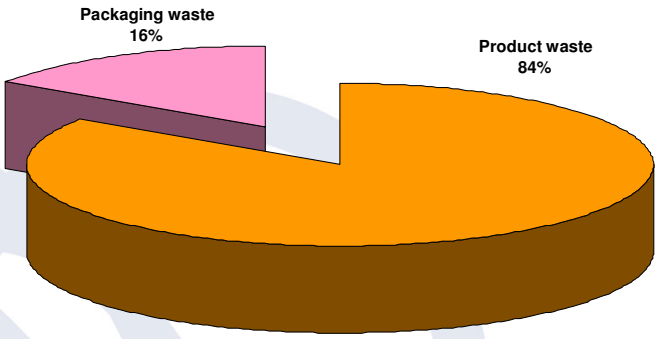
Source : Future Foundation *'Model of household waste composition and weight'*

As described in Section 3 above (Modelling approach), the material composition of household waste can be estimated through a combination of information and estimates from organisation such as WRAP and INCPEN and the benchmarking of Julian Parfitt's composition study.

Broadly in line with the findings from dedicated composition studies, according to our model household waste by weight is dominated by paper and board, kitchen and general household waste and green (garden) waste, to the extent that in 2005 these elements make up around two thirds of the total weight of household waste in England.

It should be noted that the input-output model suggests that a significant share (8%) of household waste is textiles waste: a greater amount than anticipated by the composition studies of the early 2000s. From 2000 to 2005, textiles waste grew at a rate of around 5% (against total household waste growth of 1.5% over this period) and would explain why these waste stream appears to now account for a larger share of the total. This is likely to be a result of the boom in spending on clothing over the late 1990s and the early 2000s.

Model output: Balance between product waste and packaging waste, 2005



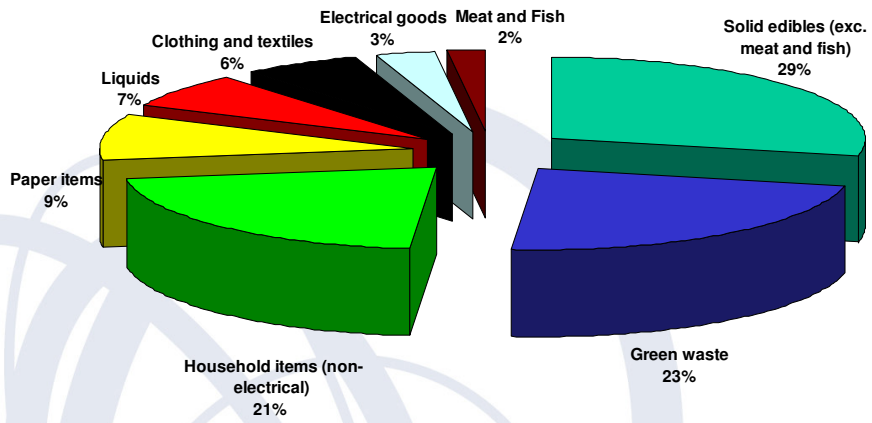
Source : Future Foundation *'Model of household waste composition and weight'*

The combination of social changes (such as the increase in smaller households) with changes in packaging regulation and practise means that there are a number of forces at work behind the relationship of packaging weight to the total weight of items thrown away.

Although the weight of packaging waste grew from 2000 to 2005 somewhat faster than the weight of product waste, packaging still represents less than a sixth of all household waste in England in 2005. This is because there are large components of the waste stream that have no packaging (e.g. green waste), or packaging that is insignificant compared to the weight of the product on disposal (e.g. clothing).

Almost 40% of packaging waste by weight is paper and board. The remainder is composed primarily of glass, plastic and metal packaging.

Model output: Household waste by source, 2005



Source : Future Foundation *'Model of household waste composition and weight'*

The composition analysis of household waste, discussed earlier in this report, highlighted how large a contribution kitchen waste makes to overall household waste arisings. With this in mind, it is unsurprising that the purchase of food contributes more than any other type of goods to household waste – almost a third of all household waste comes from this source. **The chart above shows waste not by type of waste, but by the expenditure or activity that resulted in the creation of that waste.**

Green waste (which is in general not triggered by consumer purchases) has a significant impact on the overall weight of household waste. Clearly efforts to divert green waste *away* from the household waste stream could noticeably reduce the weight of waste that enters the waste stream, although this would then impact on efforts to hit recycling targets.

The other sources of household waste that are not triggered by consumer spending are free newspapers and direct mail. Combined these two elements of waste make up around one fifth of all paper items that are disposed of into the household waste stream; more than three fifths of disposed paper items are newspapers actually purchased by consumers. Paper items as a whole contribute just under one part in ten to the total weight of waste.

The purchase of household items produces almost a quarter of all household waste (if both electrical and non-electrical items are combined). Along with clothing, these are important sources of waste because their disposal tends happen some years after their purchase.

So waste in 2005 that results from this type of expenditure is actually a result of a purchase made some years before – perhaps, in the case of some household items, as much as ten years before. This complicates the overall dynamic for household waste in terms of the relationship between purchase and disposal. It is a subject that will be explored in more detail later in this report.

6. Forecasting methodology

1. Forecasting consumer spending
2. Generation of waste forecasts
3. The futureproofing process

Forecasting consumer spending

- Having built the model to ensure that we are able to track waste production for the 21 years to 2004/05 we are then in a position to produce forecasts
- The building blocks for the forecasting are forecasts of consumer spending for each of the 53 separate consumer spending categories that generate waste. These are based on detailed consumer spending forecasts that the Future Foundation generates on a regular basis.

An econometric model was built to map consumer spending between 1980 and 2005 in each of the 53 separate categories that generate waste (the spending categories that generate any significant waste are shown in Appendix 2). Each model is driven by a combination of economic and social factors – see Section 7 Forecast assumptions.

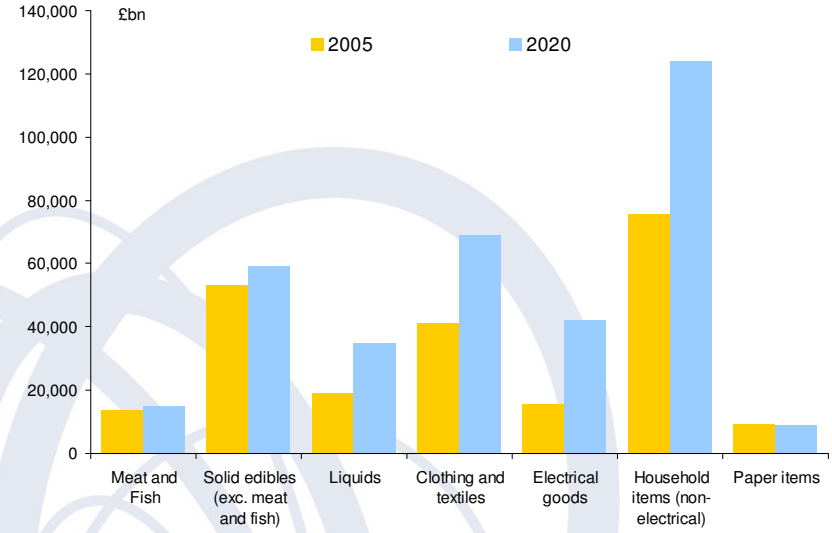
Expenditure in most categories increases as wealth (measured by a factor such as Real Household Disposable Income or house prices) increases (assuming all other factors are equal) and decreases as the price of goods in that categories – relative to the general rate of inflation (again with the assumption that all other factors remain unchanged). Demographic changes (such as changes in household size) are also important drivers of consumer spending, affecting in particular the balance of expenditure between different types of product. This is examined in more detail in Section 7.

Expenditure on goods that are associated more with *discretionary* spending tend to be driven more powerfully by income than *essentials*. For example, a 1% real increase in RHDI prompts expenditure on technology items such as IT or audio-visual equipment to increase by 2-3%. Such a rise in incomes would imply an increase in expenditure on food of only around 0.5%.

If the price of a range of products decreases, the effect of the price fall on expenditure on each of those types of product will vary. For example a 1% fall in the price of shoes would only suggest a 0.5% increase in the amount spent on them by consumers. In contrast, between 1980 and 2005 consumers would react to a 1% fall in the price of games and toys with a 2% increase in expenditure on those products.

Consumer spending forecasts

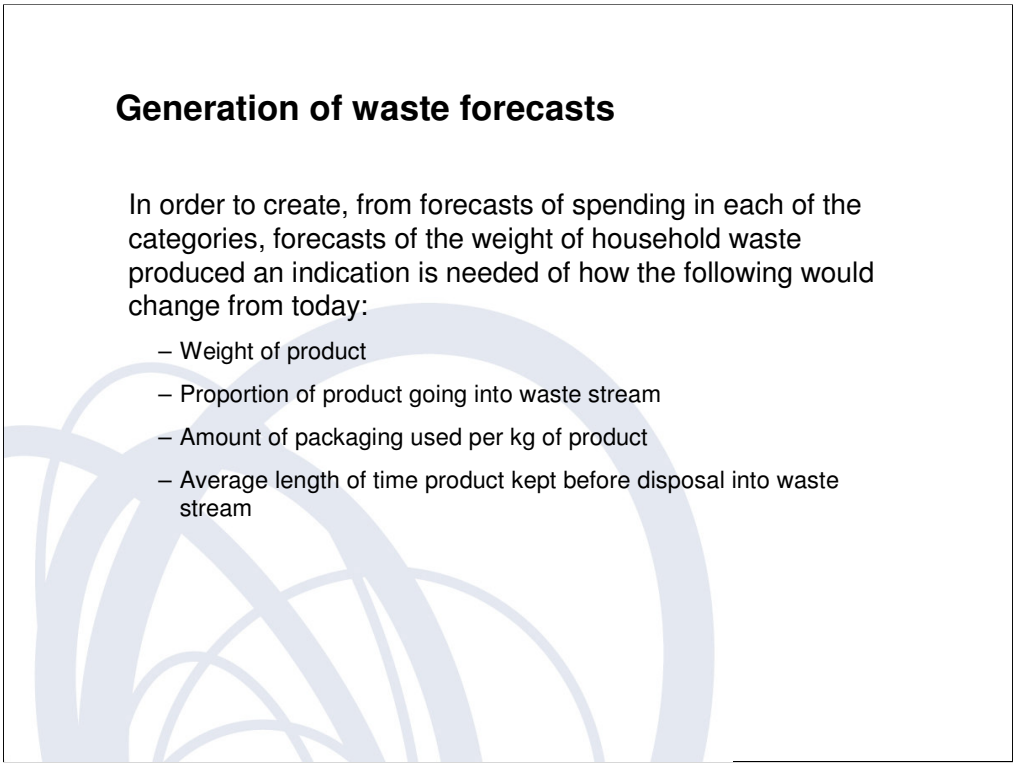
Forecast expenditure at constant prices (£bn)



Source : Future Foundation *'Model of household waste composition and weight'*

Expenditure on waste-producing items is forecast to grow in real terms from just over £230 billion in 2005 to almost £360 billion (at constant 2005 prices) in 2020.

Given the various drivers of expenditure (discussed briefly above), the categories that are forecast to show strongest growth to 2020 are household items (both electrical and non-electrical) and textile goods (mostly clothing). Expenditure on these items will be driven *both* by real prices (expected to fall on average for these three categories) and incomes (whose growth to 2020 should drive growth in such discretionary spending more than growth in expenditure on essentials such as food).

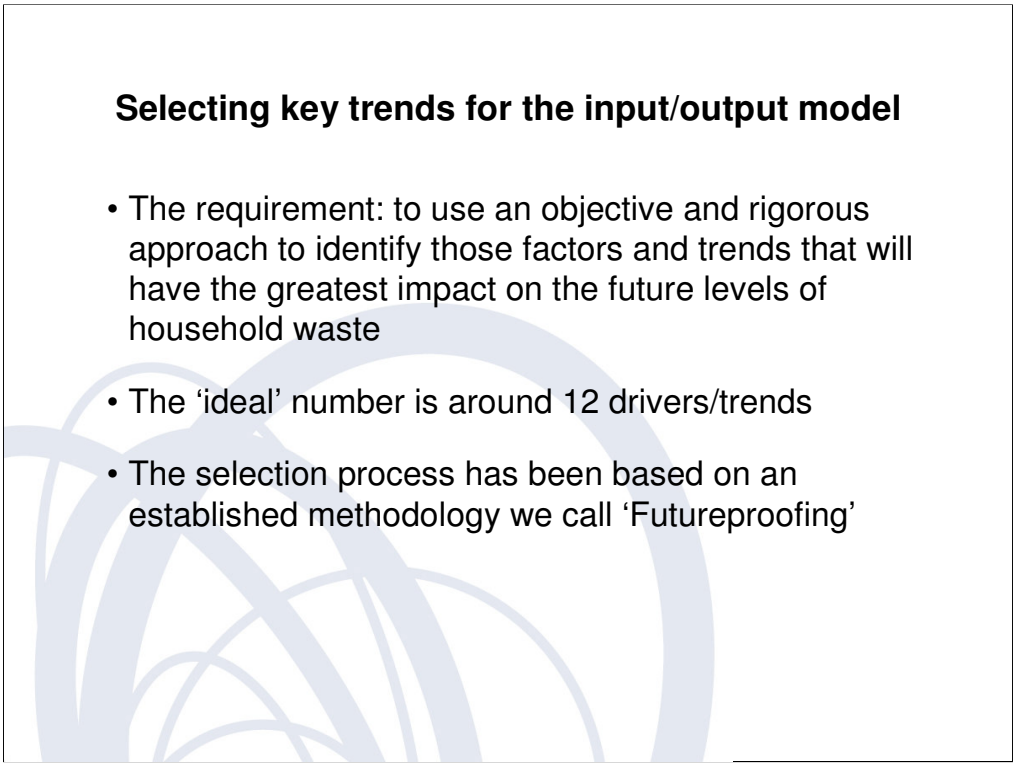


In order to create, from forecasts of spending in each of the categories, forecasts of the weight of household waste produced, an indication is needed of how the modelling inputs and assumptions (see Section 3) will change over the forecast period.

Assumptions for the future amount of packaging used per kilogram of product, and for the future length of time that products are kept before disposal into the waste stream, are examined in more detail in Section 7.

The products contained in the majority of expenditure categories will eventually be disposed of in their entirety. The exceptions to this are consumable products; mostly food that is eaten rather than thrown away. In producing the base-case forecast, it is assumed that the proportion of each expenditure category that enters the waste stream will continue to change from 2005-2020 according to the trend shown over the 1980-2005 period. As we have become more affluent, the proportion of food that is thrown away rather than eaten has grown; the forecasting assumption is for this growth to continue.

Over the period 1980-2005, it is assumed that the weight of product bought by a unit of *real* spending within a particular category remains unchanged (once adjustments for quality changes have been made). This assumption is replicated over the forecast period 2005-2020.

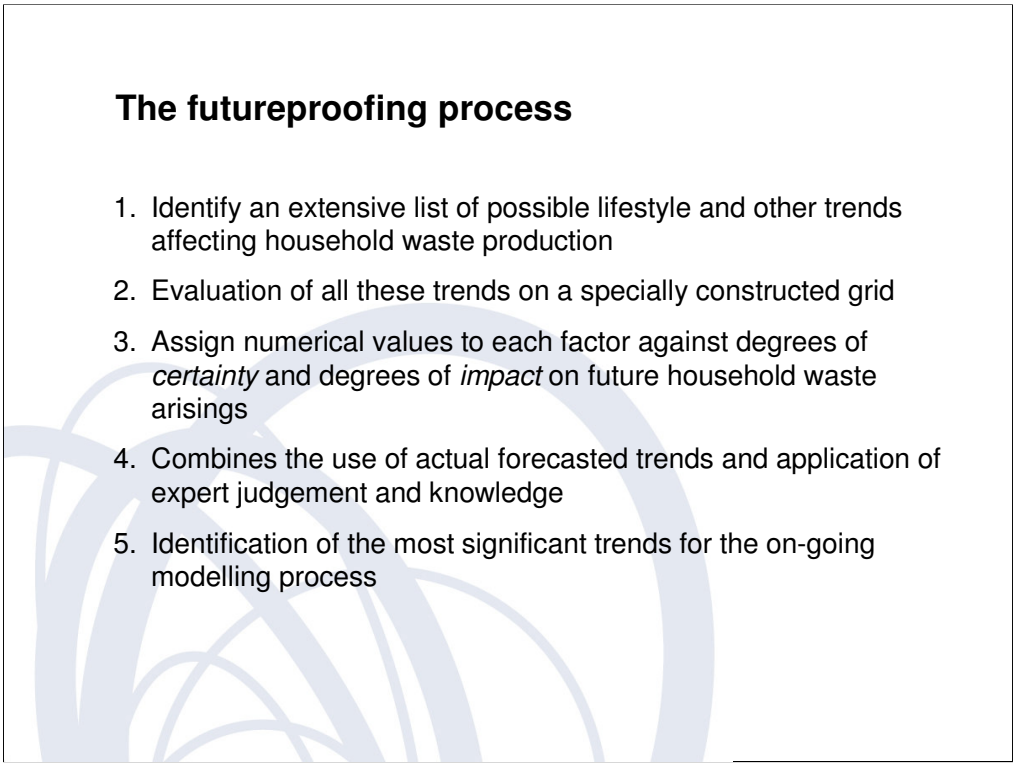


Given the plethora of factors and trends that could be used to inform the model, the requirement has been to use an objective and rigorous approach to identifying those will have the greatest impact on the future levels of household waste.

In terms of the modelling process the 'ideal' number is around twelve drivers/trends, for which we have a good idea about the likely future direction and impact.

The selection process has been based on an established methodology called 'Futureproofing' – an approach that has been developed and applied successfully to a number of projects by the Future Foundation (for Electrolux, PostComm, Hachette and P&O Cruises amongst others).

Ref: Nelson, W & Garvey, B (Market Research Society, 2005) *Using research to 'futureproof' strategies*



The futureproofing process includes the following steps:

1. Identification of an extensive list of possible lifestyle and other trends affecting household waste production, using the Future Foundation's online data and trends resource *nVision*

2. The next stage involves a workshop to undertake an evaluation of all these trends using a specially constructed grid

3. This involves assigning numerical values to each factor against degrees of *certainty* and degrees of *impact* on future household waste arisings

4. This approach allows for the most use of actual forecasted trends (where sufficient numerical data exists for a quantitative forecast) and to apply expert judgement and knowledge to other trends where future outcomes can only be assessed in a qualitative manner.

5. From this process, the most significant trends for the on-going modelling process have been identified.

The impact assessment: scoring system and quantification

Consumption	
Score	**% annual effect**
-9 to -6	-1.5%
-6 to -3	-1.0%
-3-0	-0.5%
0	0.0%
0-3	0.5%
3-6	1.0%
6-9	1.5%
9+	2.0%

Packaging	
Score	**% annual effect**
-4 to -2	-1.0%
-2 to 0	-0.5%
0	0.0%
0-2	0.5%
2-4	1.0%

Every nominated trend was ranked initially on scale of 0 to 3 in terms the degree of certainty of the trend occurring

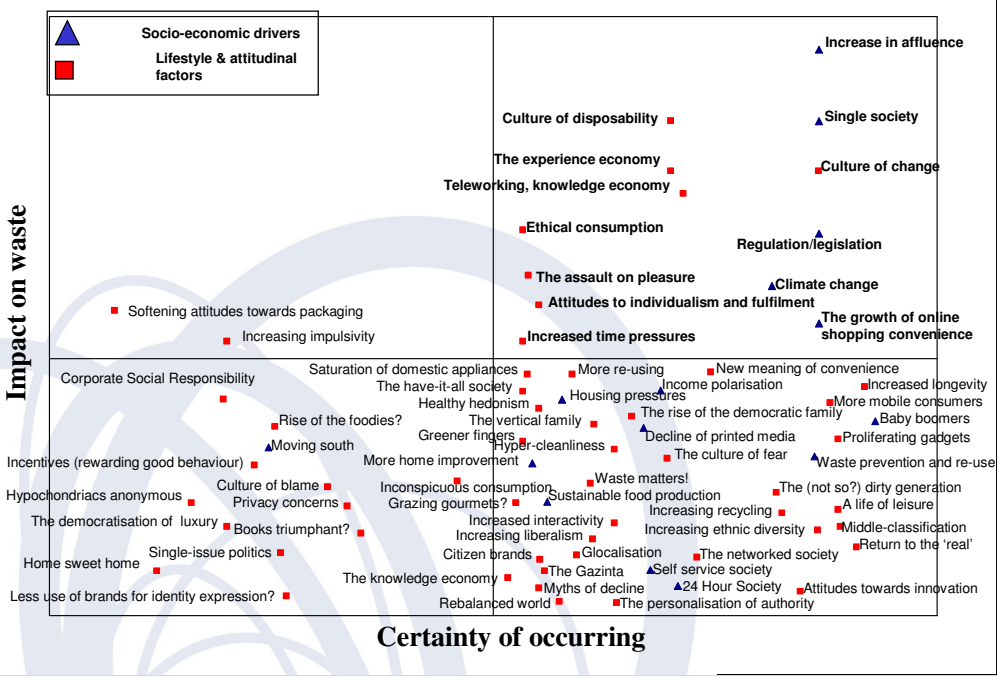
Then the impact on both consumption and weight of packaging used of each trend are assessed, on a scale from +3 (strongly positive) to –3 (strongly negative), in terms of how much they would change from the direction and strength of current trends (i.e. more or less than has been happening over the past few years) - not their absolute effect

These are then combined to produce an overall 'score' for each of the 76 trends assessed

Using a weighting system to combine the impact on waste and certainty of occurring, this provides the list of the 12 key ranked trends

For each product category, the overall score for how that category will change in the future *relative to current trends* is quantified according to the above tables. This allows future waste production and packaging use within each expenditure category to be inflated or deflated according to the combined effect of the 76 trends on that category.

The results of the future proofing workshop



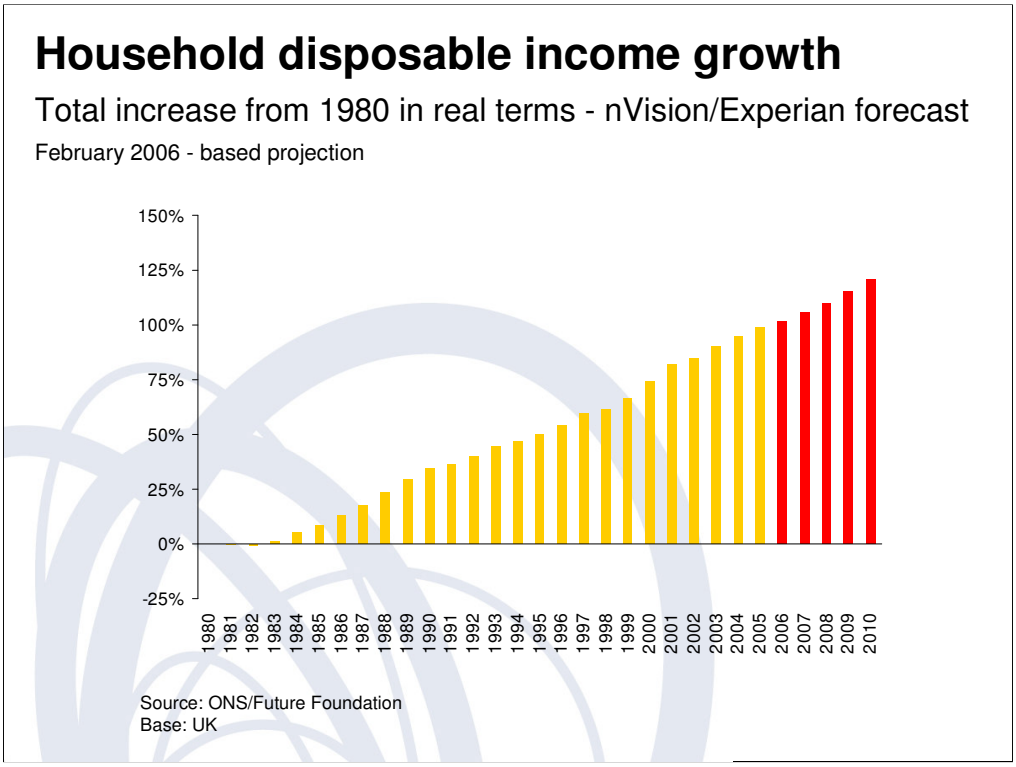
Impact of 12 key drivers

Compared to their historical impact

	Impact on consumption	Impact on packaging (per unit of consumption)
Increase in affluence	+	+
Culture of change	+	neutral
Single Society	+	+
The experience economy	-	neutral
shortening product life cycle	+	neutral
Teleworking, knowledge economy	neutral	+
Increasing longevity	+	neutral
Baby boomers	neutral	neutral
The growth of online shopping, convenienc	+	+
Regulation/legislation	-	-
Climate change	-	-
Ethical consumption	-	-

7. Forecast assumptions

1. Macro-economics
2. Price of goods
3. Household size
4. Shortening product life-cycles
5. Packaging as a proportion of total waste
6. Other assumptions



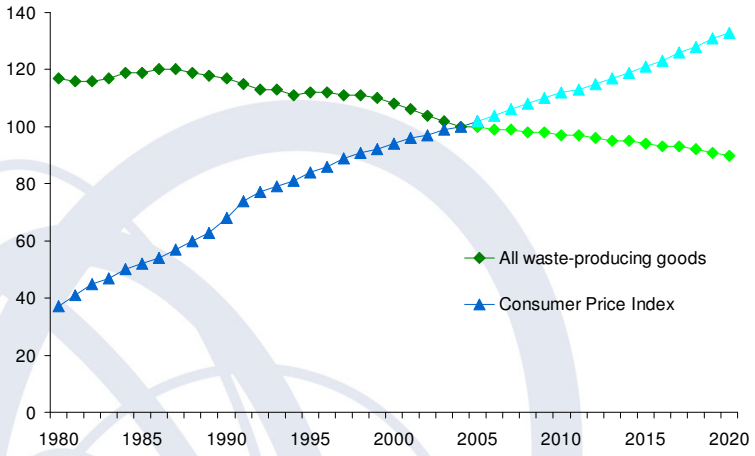
Wealth – or disposable income – is by far the key driver of the growth in waste and we estimate that each 1% increase in real disposable income results in approximately a 0.5% increase in waste, other factors remaining unchanged.

Over the past 20 years the amount of waste produced each year has grown by over 40% (an increase of 7.5m tonnes per year). This growth has been almost entirely due to a greater volume of goods being consumed (facilitated by greater affluence) with 90% of the growth in waste being increased product waste.

Over the next 15 years we anticipate consumer affluence to increase by another 40% (equivalent to 2.3% pa, compared to 2.7% growth over the last 15 years), which will be a key driver of future waste generation.

Price of waste-producing goods compared to Consumer Price Index

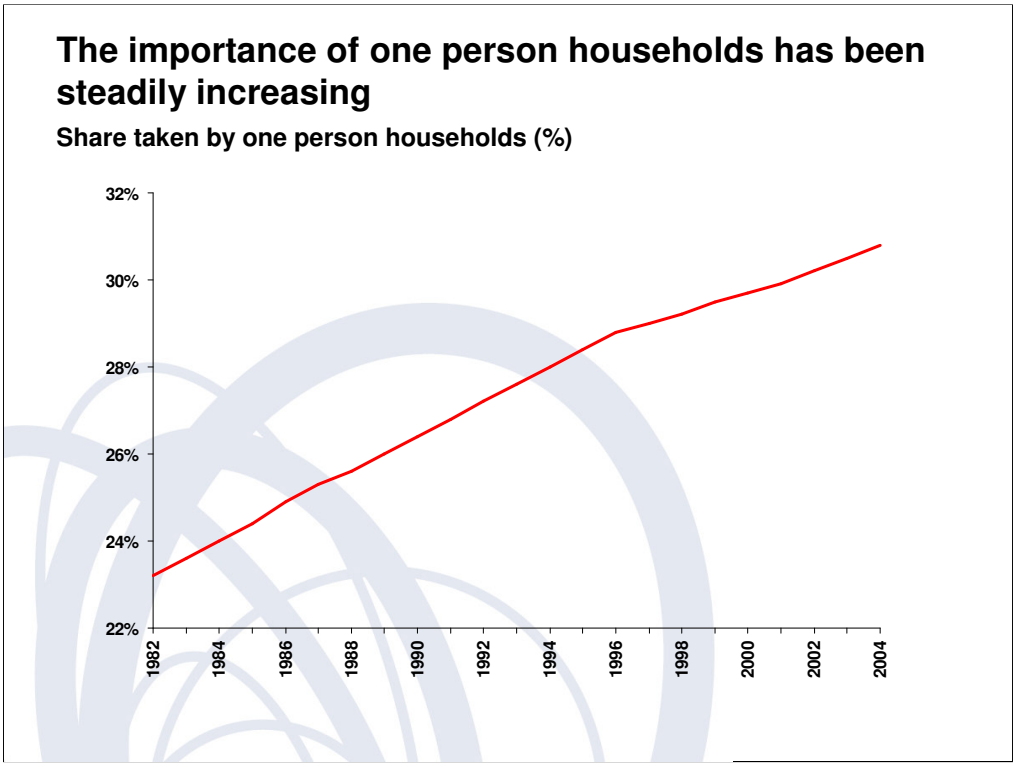
Index (2004=100) of CPI and average real price of waste producing goods



Source: ONS/Future Foundation
Base: UK

The last 15 years has seen the real price of goods fall, while the other section of the 'consumer purse' – services – have risen in price, primarily a result of the importance of trends in the growth in labour costs within the UK. Expenditure on categories such as clothing has boomed (with the result that clothes contribute an ever growing weight of waste), driven in no small part by the affordability of imports from Asia compared to the price of European-manufactured items.

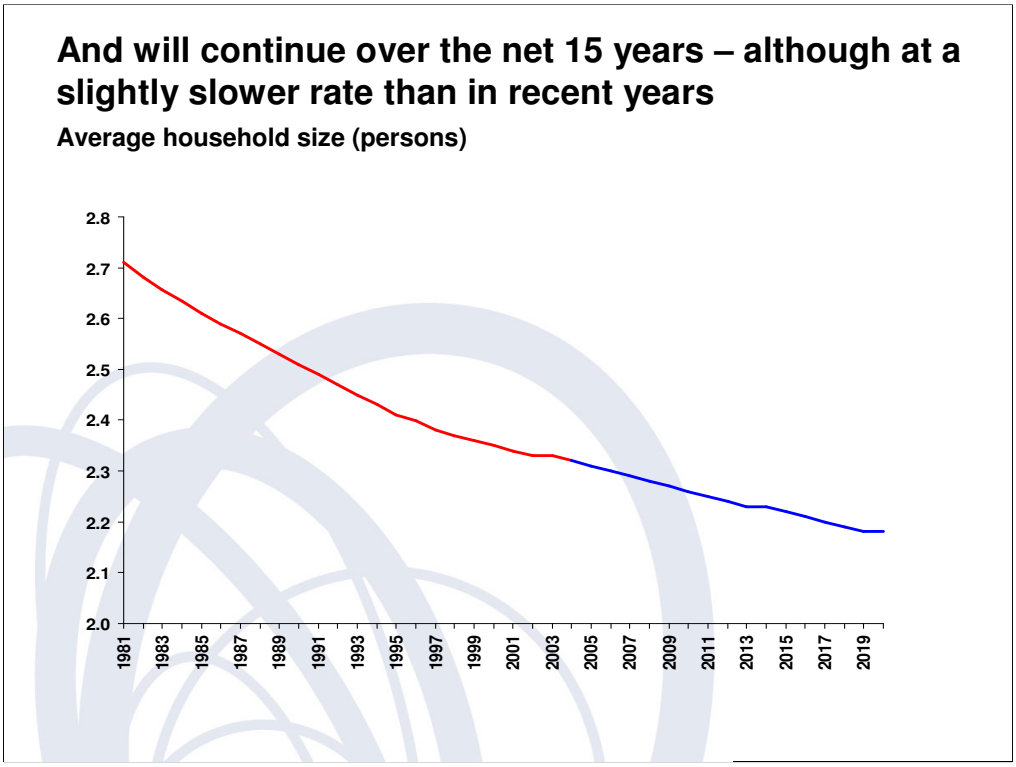
Electrical goods are the other major area of spending that have enjoyed year-on-year falls in real price, driven by technological improvements enabling more – and better quality – items to be produced for a given cost. This affordability of electrical goods, allied to the technological advances, is a key factor in the shortening product lives of such items. So declining prices of goods drives both the amount purchased and the pace at which purchased items are disposed of.



Household size is critical in determining the level of consumption of goods. Consumption per person is significantly greater in smaller households. A two-person household consumes, on average, 20% less per person than is consumed in a one-person household. Households of three or more people consume, per person, two thirds the weight consumed in a single person household.

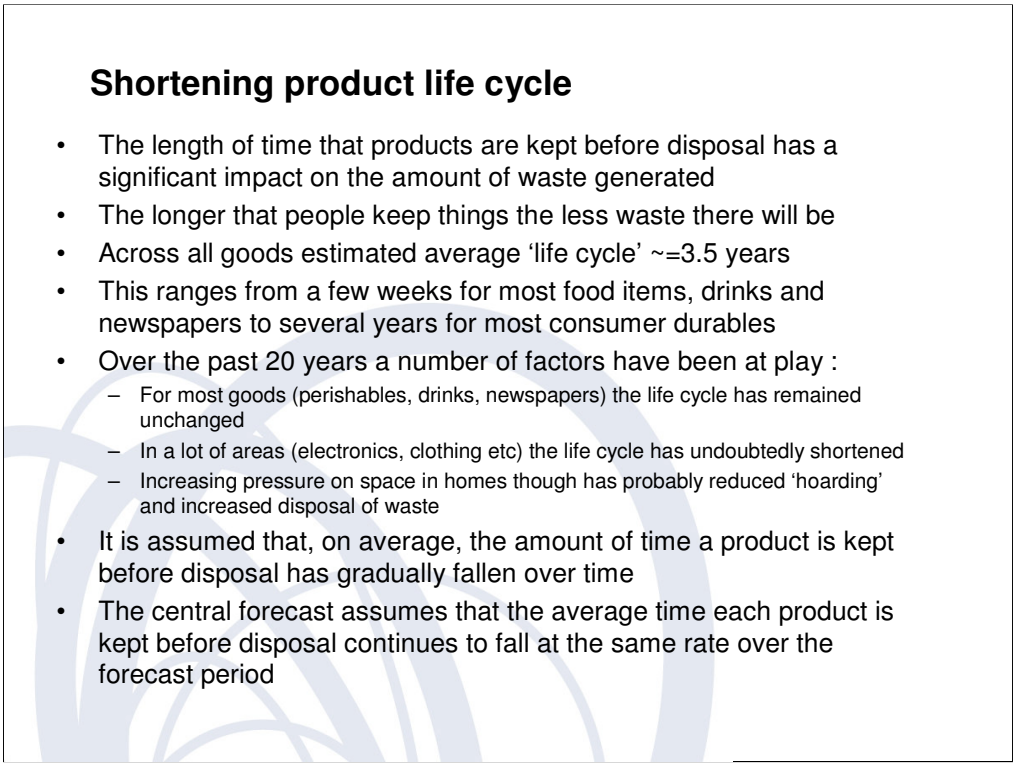
The effect of changes to household composition on consumption varies between product types. Products such as clothing that are specific to an individual, rather than a household, are not consumed less per person in larger households. This is as expected, since clothing is rarely shared between household members!

On the other hand, the use of household goods such as furniture is, by definition, shared between the members of the household. A multi-person household has, on average, a similar number of household goods as a single-person home. So consumption of household goods in a single person household is around double the equivalent consumption *per person* in a two-person home and close to three times the household goods consumption *per person* in a household of three of more people.



The growth in smaller households and overall decline in household size has been one of the many contributory factors to the above-average growth in expenditure on household items, whether these are audio-visual or IT equipment or non-electrical items for the home. Household size should continue to fall over the next 15 years, from 2.32 persons in 2004 to 2.18 in 2020, albeit at a slightly slower rate than occurred over the past 15 years. And the importance of this trend to the consumption of selected goods will also continue to be felt.

The trend is also important in influencing the balance between packaging and product. Each kilogram consumed within a single-person household carries a larger proportion of packaging than each kilogram consumed per person in a multi-person household. This makes intuitive sense: food products, for example, carry a much smaller weight of packaging *per serving* if bought in bulk, compared to the equivalent product bought as a single serving. Indeed food and drink, along with personal care products, are most affected by the likelihood of smaller households to buy in packaging-intensive small packets. With single-person households forecast to grow from 31% of all households in 2004 to 36% in 2020, this trend will continue to have an impact on packaging.



The length of time consumers keep products before disposing of them has a significant impact on the amount of waste generated: by definition the longer that people keep things the less waste there will be.

Across all goods we estimate that the average 'life cycle' is around 3.5 years (weighted by value). This ranges from a few weeks for most food items, drinks and newspapers to several years for consumer durables

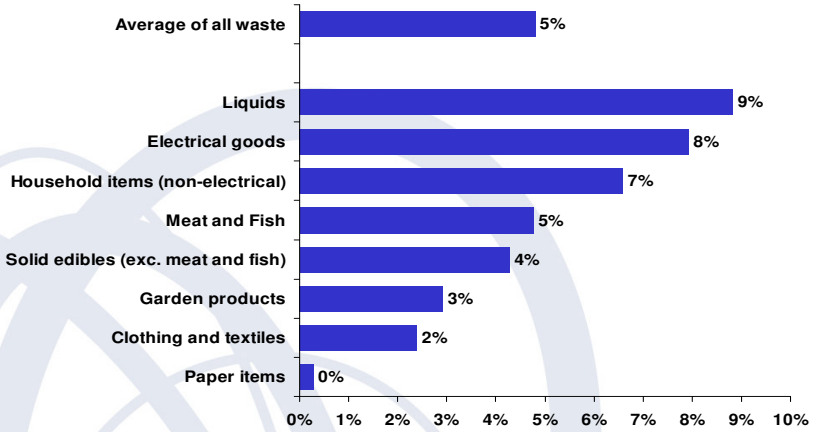
Over the past 20 years we suspect that a number of factors have been at play:

- For many goods (perishables, drinks, newspapers) the life cycle has remained unchanged
- In a lot of areas (electronics, clothing etc) the life cycle has undoubtedly shortened
- Increasing pressure on space in homes has probably reduced 'hoarding' and increased disposal of waste

We have therefore made the assumption that, on average, the amount of time a product is kept before disposal has gradually fallen over time. For our central forecast we have made the assumption that the average time each product is kept before disposal continues to fall at the same rate over the forecast period

Assumed packaging weight across product categories

Proportion of total weight (of product plus packaging) that is made up of packaging



Source : Future Foundation *'Model of household waste composition and weight'*

To determine the weight that packaging contributes to total purchased weights of the various items within the 53 categories of spending that produced waste, the guidance of INCPEN (The Industry Council for Packaging and the Environment) was sought. This enabled estimates of packaging weights to be made for 2004 (taking into account the various material composition of packaging used for the various products).

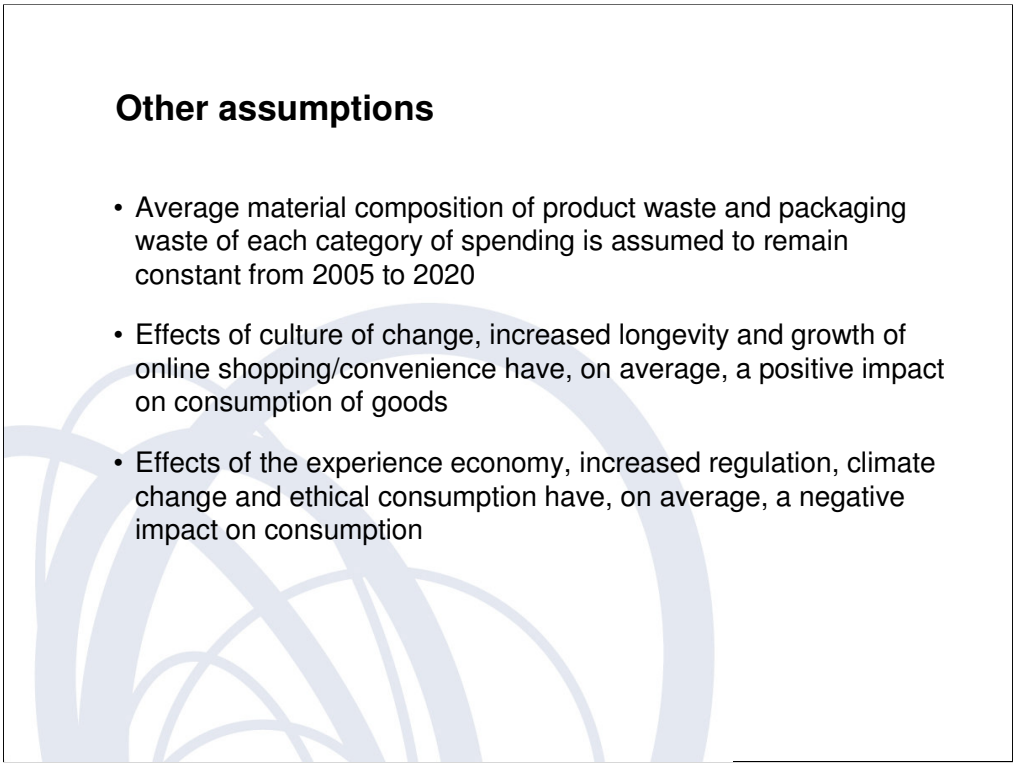
The guidance of INCPEN was also used to formulate estimates for past and future changes in the average weight of packaging used. Some of the factors affecting this are:

•The trend for more products to be packaged and for extra layers of packaging to ensure structural strength and to enable products to be sold in smaller units or servings

•The trend, as wealth increases, for products that use higher quality or heavier packaging

•Regulation and cost incentives encouraging the weight of material used for a particular purpose to be reduced. Technological advances enable the production of packaging that fulfil this objective. Examples include the use of glass bottles that in 2004 are half the weight of their equivalent in 1990.

These factors combine to pull the character packaging in opposite directions. For the base-case forecast, the assessment of their combined effect – informed by the views of INCPEN – is that on average packaging will neither increase or decrease in its proportion of the total purchased weight of a particular category of goods.

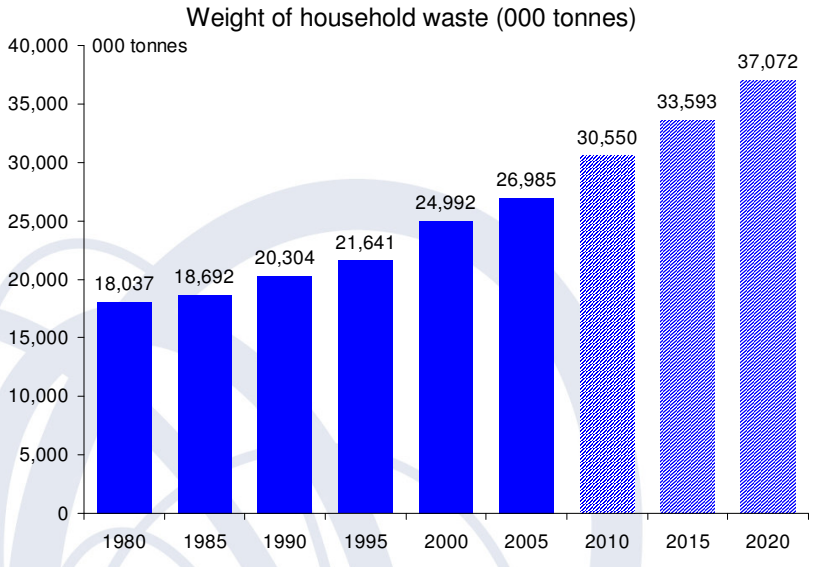


The material composition of each category of expenditure is determined, for 2004, by a combination of data from a number of sources and guided assumptions (see Appendix 1 for more details). The forecasting assumption is that, for each individual category, the composition remains unchanged. For example the composition that is estimated for product waste in 2004 from carpets and other floor coverings is 85% textiles waste and 15% plastics waste. The assumption is that this balance remains unchanged for each year between 2004 and 2020.

The futureproofing process identified the social trends that have an impact on waste arisings (see Section 6). The trends identified include drivers such as increased wealth, whose impact on waste is discussed elsewhere in this report in a detail that reflects the robust quantitative relationship between the two. Other social trends identified by the futureproofing as having, on average, a **positive** impact on the consumption (and therefore on waste) of goods are: the culture of change, increased longevity and growth of online shopping/convenience. In other words, increases in these trends are expected to prompt an increase in consumption and waste.

Other social trends identified by the futureproofing as having, on average, a **negative** impact on the consumption (and therefore on waste) of goods are: the experience economy, increased regulation, climate change and ethical consumption. In other words, increases in these trends are expected to prompt an decrease in consumption and waste.

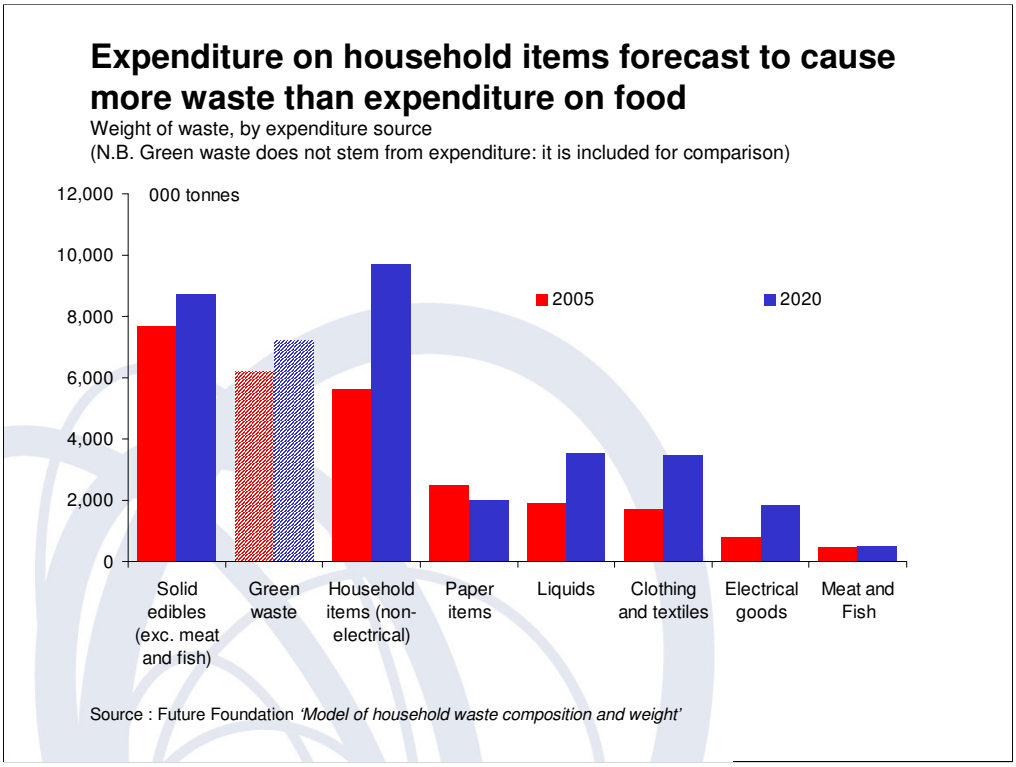
8. Base-case forecast



Source : Future Foundation *'Model of household waste composition and weight'*

9. Breakdown of the base-case forecast

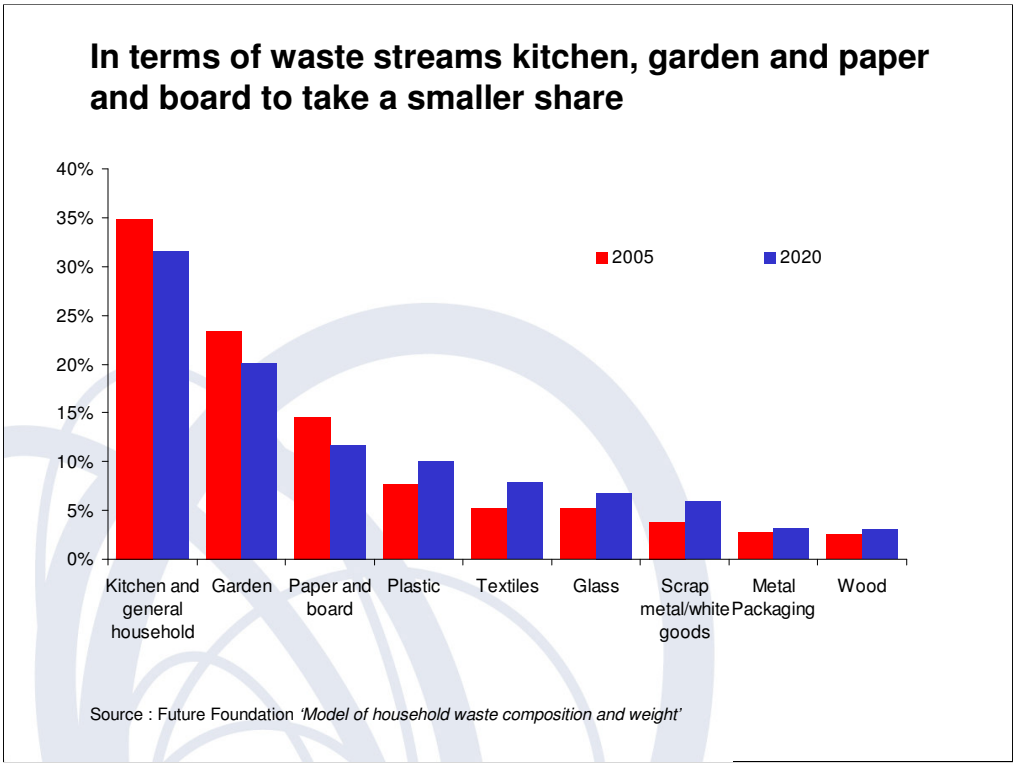
1. Components of the base-case forecast
2. The effect of the time-lag between purchase and disposal of goods
3. The special case of garden waste



The forecast growth areas of household waste reflect future goods expenditure growth. The next 15 years should see strong growth in expenditure on household items (both electrical and non-electrical) and clothing. Between 2005 and 2020 this is forecast to feed growth in clothing and textiles waste of 4.8%p.a., electrical goods waste growth of 5.8%p.a. and growth in waste from non-electrical household items of 3.7%p.a. With food waste forecast to grow at less than 1%p.a., household items are forecast by 2020 to contribute more to household waste than food.

The waste produced by the three fastest-growing broad categories (mentioned above) are forecast to grow faster between 2005 and 2010 than between 2010 and 2020. All three categories are characterised by durable goods that are kept for a number of years before disposal. So this time-lag between purchase and disposal of such items means that future waste includes some items that have already been purchased: the strong expenditure growth of recent years feeds the strong waste growth of coming years. This phenomena is examined in more detail later in this section.

The weight of green waste is included as a comparison with waste from the various expenditure sources, despite not being a result of consumer spending growth. Green waste from gardens is forecast to grow more slowly than waste from expenditure; it is examined in more detail later in this section.



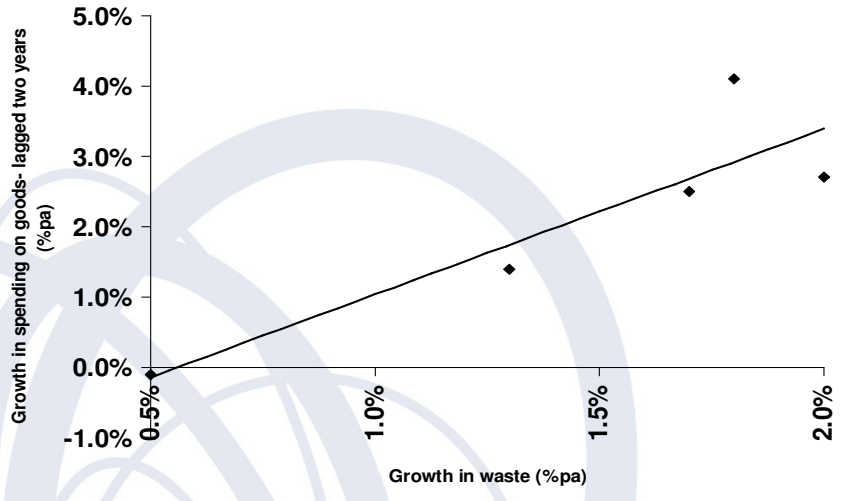
The forecast growth of material components of the household waste stream reflect the growth in goods that are forecast to contribute to household waste. Strong growth in waste from clothing and textiles means that the textile component of the household waste stream will increase significantly in size over the next 15 years. Similar growth in electrical and non-electrical household goods will see an increase in the share of waste that is plastic or glass, or white goods.

The relatively slow forecast growth waste that results from food expenditure suggests that kitchen and general household waste (essentially waste that can only be put into a kitchen bin) will grow more slowly than other material waste: by 2020 less than a third of everything that goes into the household waste stream is forecast to be this type of waste. Food is also a dominant contributor to paper and board waste; so these materials are also forecast to become a less significant component of the household waste stream in 2020 than they are in 2005.

As discussed elsewhere in this section, the relatively slow forecast growth in garden waste means that it, too, will become a relatively smaller component of the household waste stream.

High growth over the next five years as a result of lag between purchase and creation of waste

Scatter plot showing growth in waste and consumer spending lagged two years



Source : Future Foundation *'Model of household waste composition and weight'*

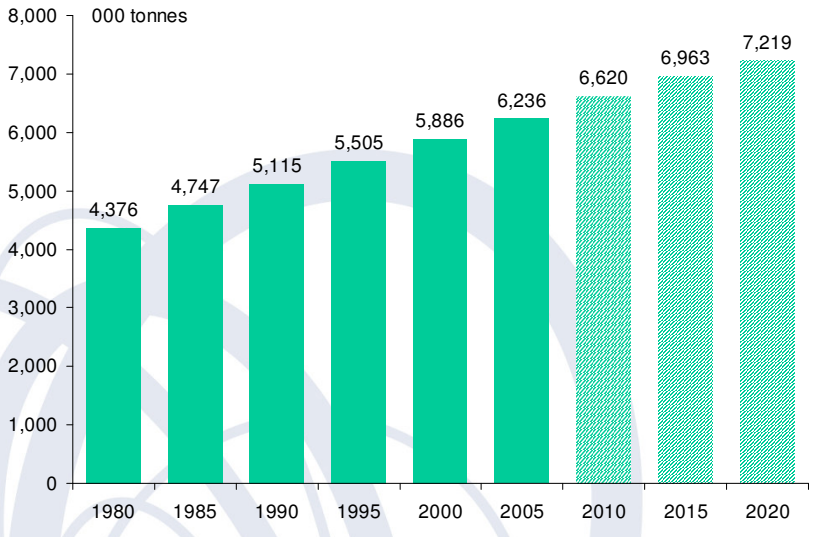
As mentioned above, a number of durable goods that enter the household waste stream do so only a number of years after purchase. Household items tend to have the longest life-spans although it is assumed that (particularly in the case of electrical items) these are shortening (see Section 7).

The presence of durable goods that are not disposed of in the year of purchase (unlike food or items such as newspapers) complicates the strong relationship between household expenditure and household waste production. Waste growth over the next five years is set to be driven, not by expenditure in the year of disposal, but *on average* by the growth in expenditure two years previously.

This time-lag is one reason why waste growth in the years immediately following 2005 is forecast to be strong: goods expenditure in the years immediately preceding 2005 saw one of the strongest periods of growth of the last 60 years. Furthermore, the strongest growth in expenditure was on goods that have relatively long time-spans: household items tend to be kept for more than five years on average. So the spending boom of the early 2000s will continue to drive strong waste growth to 2010.

Forecast of green/garden waste

Weight of garden that goes into the household waste stream (000 tonnes)



Source : Future Foundation *'Model of household waste composition and weight'*

The weight of garden waste that enters the household waste stream is forecast to continue increasing between 2005 and 2020. However, it should grow at a slower rate than other components of the waste stream; it is this relatively slow forecast growth that should see green waste accounting for less than one fifth of household waste by 2020.

In contrast to most sources of household waste, disposal of garden waste is not driven by expenditure. It is a product of the total private garden area of the UK (which in turn is a product of the number of households that have a garden, of garden size and of the planting configuration of those gardens) and the rate at which green waste is disposed into the waste stream rather than left to compost in the garden.

•The forecast growth in number of households in England suggests that, despite the proportion that have a garden forecast to continue declining, the number of households with a garden should grow slowly.

•In the absence of any trend data or other indications, the average weight of garden waste produced per household is assumed to remain at 2005 levels for the base forecast.

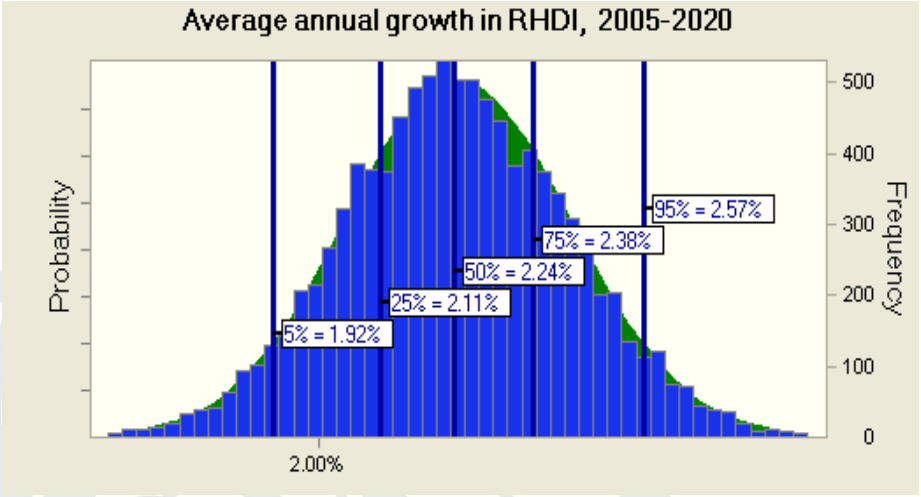
•The rate at which green waste is put into the household waste stream has grown over the last 15 years. Sources such as WRAP suggest that growth will slow over the next ten years, as home composting of green waste is encouraged. The base forecast is built on an assumption that in ten years time, the rate at which green waste is put into the waste stream will no longer be growing.

10. Monte-Carlo simulations

- A forecast of 37m tonnes of waste in 2020 is what is known as a 'point' forecast – one specific number
- However, any forecast is subject to all kinds of risk and uncertainty
- Generally the risks can be thought to lie in two areas
  - Uncertainty over the underlying structure of the model – i.e. the relationships between the factor being forecast and the drivers
  - Uncertainty over the assumptions made for the range of drivers
- Although uncertainty over the model structure is an important consideration in the exercise we carried out we only looked at the second potential area of risk and uncertainty

Uncertainty in assumptions for the economy

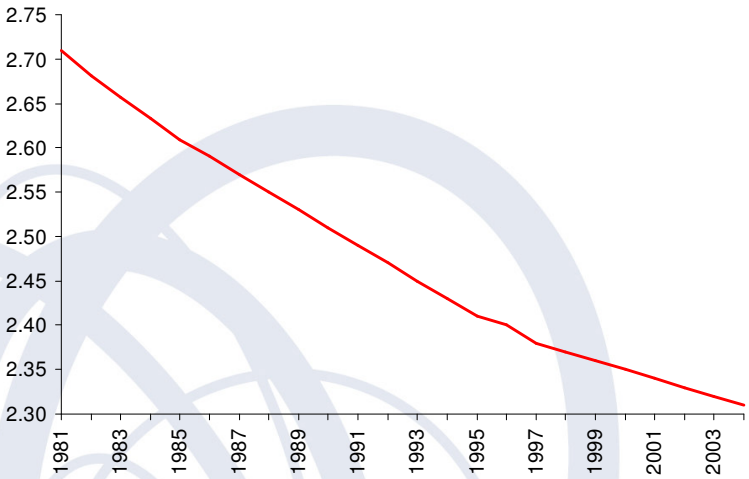
As manifested in growth in Real Household Disposable Income



For something like the economy then in terms of an average 15 year growth rate we are reasonably confident of our assumption – and are 90% certain that average growth will be between 1.9%pa and 2.6%pa

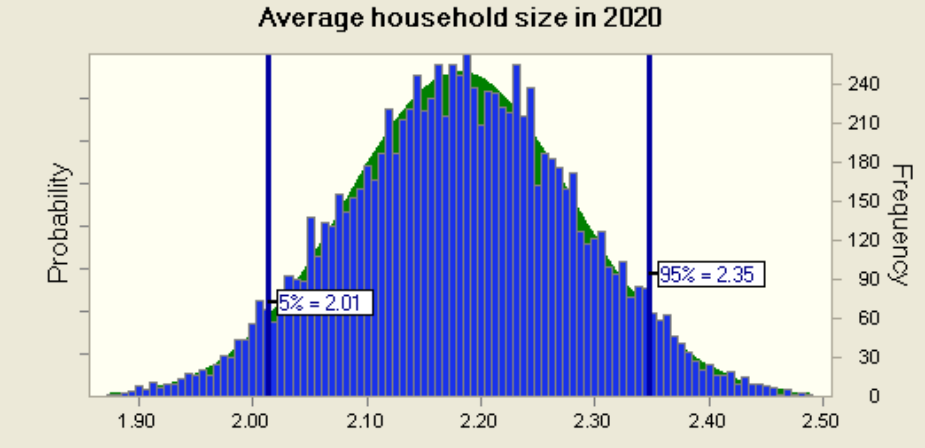
Uncertainty in assumptions for household size

Average household size (persons)



For average household size we have had a very steady decline, and see no reason why this won't continue, albeit at a slightly slower rate. There are a number of factors e.g housing shortages that might cause the trend to alter.

Uncertainty in assumptions for household size



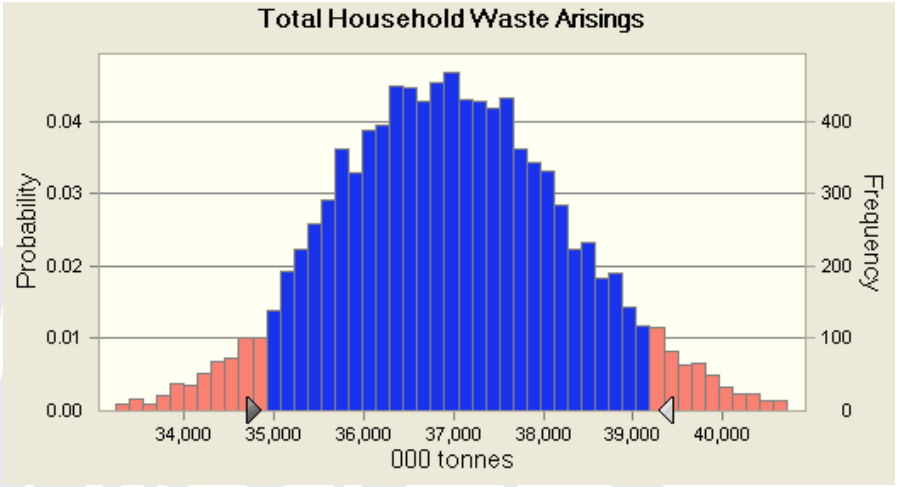
So, we are 90% certain that in 2020 the average household size will be between 2 people and 2.35 people i.e. ranging between an increase of 1% and a fall of 13%.

Factors for which we placed a range of uncertainty around

- Growth in the economy
- Change in real price charge for ‘goods’
- Average household size
- Proportion of households that have a garden
- Proportion of product weight that ends up as waste
- Proportion of waste that gets diverted outside the household waste stream
- Proportion of total weight (of product plus packaging) that is made up of packaging
- Average number of years that goods are kept after purchase before disposal into the waste stream
- % of garden waste going into the waste stream

Uncertainty in the forecast of total household waste arisings

Household waste arisings in 2020 ('000 tonnes)



The resulting distribution of forecasts for 2020 suggests that although we have a mean forecast of 37m tonnes we can say with 90% confidence that this will lie between 34.9m tonnes and 39.2m tonnes.

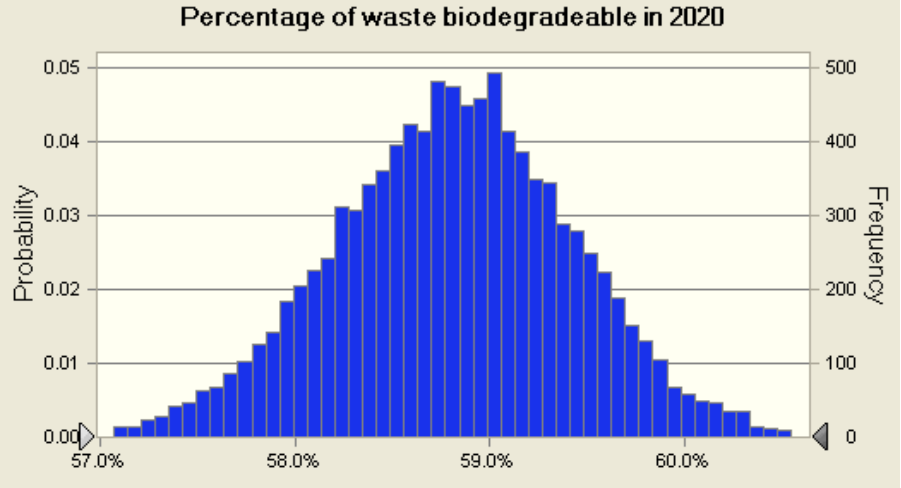
This can be translated into percentiles – we are 90% confident that waste arisings will be at least 35m tonnes by 2020 and we are 90% confident that it will be less than 38.7m tonnes by 2020.

Or in terms of growth rates, while our central forecast is for growth to average 2.2% pa, our distribution of forecasts suggests that we are 90% confident that it will lie between 1.75% pa and 2.5% pa.

N.B. Update Note (September 2009): With respect to the figures quoted above please refer to the Important Research Update at the front of this report.

Uncertainty in the forecast of biodegradable waste

Biodegradable household waste in 2020 (as a % of total household waste)



Currently the model estimates 65% of household waste is biodegradable (slightly lower than the Environment Agency's nominal figure of 68%). Our distribution of forecasts suggests that by 2020 this will have fallen to between 57% and 61%. Our apparent certainty of a fall in the proportion biodegradable is the fact that growth in food consumption will certainly be less than non food items.

Conclusions

- Use of Monte Carlo modelling allows us to generate a range, rather than just a point forecast
- Because of the lack of historical data it has been difficult to accurately assess, with precision, the degree of uncertainty likely to surround many of the model drivers over the next 20 years
- However, by putting in 'sensible' ranges around most of the drivers in the model we see that
  - Unless there are radical changes in society and the generation/treatment of waste (e.g. the introduction of direct charging for waste disposal) then waste will continue to grow
  - That the range of this growth and hence the ultimate level of waste arisings in 2020 is quite wide

Appendix 1. Data sources and assumptions

Assumptions: average weight of items and average price per kg

Estimates obtained from a number of different sources, including:

- Small sample of products from high-street store
  (e.g. for food and drink)
- Data derived from waste compositional analysis studies
  (e.g. for furniture and household items)
- Estimates from suppliers' data
  (e.g. for fuels)

Assumptions: average proportion of product weight that is thrown away

For many categories, the entire weight of product is disposed of. For others, estimates were obtained by:

- Food and drink: Proportion thrown away rather than eaten estimated: using data from surveys in UK, US and Europe including Prudential's *Soggy Lettuce Report*
- Fuels and decorating materials (e.g. paint, wallpaper): estimates of proportion of product that remains un-used
- Non-durable household goods: estimated using the composition of the category (consumable goods such as cleaning liquids; non-consumables such as cloths, scourers)

Assumptions: proportion of disposed-of product that is disposed of outside of the household waste stream

Assumptions based on estimates of penetration of the following broad alternatives to disposal into the household waste stream:

- Home composting of food waste
- Disposal of clothing through charity shops and social initiatives
- Disposal of electrical goods by schemes that fall under the responsibility of manufacturers
- Disposal of portable items away from the home
- Disposal of household items through alternative streams to the household waste stream

The following methods contribute to the diversion of waste out of the household waste stream:

Estimates of the proportion of food, for different food types, that is disposed of through home composting were made with the help of data and guidance from WRAP and AEA Technology. On average in 2004, 5.5% of wasted meat and fish is diverted away from the household waste stream by this method; 15.6% of other food is disposed of by home composting.

Disposal of textile products (predominantly clothing) through charity shops means that the items that are not re-sold are disposed of at the shop or at a central handling centre, so are put into the *commercial* waste stream. Estimates from a number of sources including charities, local authorities and WRAP suggest that just under 9% of clothing and textile waste is diverted away from the household waste stream by this method.

Schemes (whether voluntary or imposed through regulation) that require the manufacturers of household goods (usually electrical goods) to manage their disposal similarly divert waste into the commercial waste stream. Estimates guided by sources including Defra, local authorities and equipment manufacturers suggest that this method does not yet account for a large proportion of the electrical items disposed of: it is estimated that just 3.3% of electrical goods were diverted in this way in 2004.

Items such as newspapers are portable and the locations in which they are used and 'consumed' lend themselves to disposal away from the home. Future Foundation analysis of lifestyle and time use data enables an assessment to be made of where printed media are consumed. From this analysis, an estimated 6% of newspapers and magazines are diverted out of the household waste stream (e.g. by disposal at work or at travel termini – both of which feed the commercial waste stream).

Bulky household items – non-electrical as well as electrical – lend themselves to dedicated disposal/re-use methods rather than disposal through standard municipal collection of household waste. Through estimates by sources including WRAP and local authorities, it is estimated that this contributes to just under 4% of non-electrical household waste being diverted out of the household waste stream e.g. to care homes, offices, community groups, charitable organisations.

Assumptions: product life cycle

Given the general lack of information informing this factor, figures were obtained using assessments based on a combination of:

- Survey estimates from sources including ONS, WRAP, EU
- Estimates by AEA Technology and the Market Transformation Programme (MTP)
- Estimates by Future Foundation
- Estimates based on comparison with similar products for which better information was available

Assumed average base life-cycles for 2005:

Disposed of within 1 year of purchase/receipt: All food and drink (including alcoholic drink); Tobacco; Pharmaceutical and other medical products; Non-durable household goods; Fuels; Newspapers (free and paid-for); Direct mail; Stationary; Personal care products (non-electric).

Disposed of within 2 years of purchase/receipt: Pet-related products.

Disposed of within 3 years of purchase/receipt: Electrical appliances for personal care.

Disposed of within 4 years of purchase/receipt: Footwear; Telephone and telefax equipment; Games, toys and hobbies.

Disposed of within 5 years of purchase/receipt: Clothing materials and garments; Small electrical appliances; Therapeutic equipment; IT equipment; Sport, camping, open-air recreational equipment; Spare parts/accessories for personal transport.

Disposed of within 6 years of purchase/receipt: Recording media.

Disposed of within 7 years of purchase/receipt: Major household appliances; Tools and equipment (large and small); A-V equipment; Photographic equipment.

Disposed of within 8 years of purchase/receipt: Housing materials; Furniture and furnishings; Household textiles; glassware and tableware.

Disposed of within 10 years of purchase/receipt: Carpets and floor coverings; Jewellery, clocks and watches; Other personal effects.

Disposed of within 15 years of purchase/receipt: Books; Music instruments and major durables for indoor recreation.

Appendix 2. Details of futureproofing and assumptions

Consultation workshop: Syndicate exercise

- Each table was allocated 12 – 15 product categories from the ONS consumer trends data
- Taking the key trends identified by the futureproofing analysis (see section 6), groups assessed their impact on the consumption and packaging components of selected categories
- This was on a scale of +3 to –3 dependent on their view of whether these trends will affect consumption and waste in each of the categories (compared to current trends)

Spending Categories – Team A

	Category	Main elements
1	Bread and cereals	Rice, bread, pasta, pastry - cook products, other cereals products
2	Oils and fats	Butter, margarine and other vegetable fats, olive oil, edible oils, other edible animal fats
3	Other food	Sauces, condiments, salt, spices, herbs, soups, yeast, dessert preparations
4	Wines, cider and perry	Grape and fruit wines, alco pops, cider and perry
5	Clothing materials	Natural and man-made fabrics used in clothing
6	Materials	Paints, wallpaper, plaster, tiles and small plumbing items
7	Carpets and other floor coverings	Carpets, linoleum and other floor coverings
8	Glassware, tableware and household appliances	Glassware, tableware, fine china, porcelain etc saucepans
9	Pharmaceutical products	Medicinal preparations, drugs, medicines, serums, vaccines, vitamins and other oral products
10	Spare parts and accessories for personal transport equipment	All spares and accessories to be fitted by owner, but not helmets or cleaning materials, or charges for fitting or servicing
11	Information processing equipment	Personal computers, printers, calculators, word processors, typewriters
12	Games, toys and hobbies	Games, toys, toy bicycles, electronic games, fireworks, stamps for collecting, coins, hobby tools and requisites
13	Books	Books, atlases, encyclopaedias, text books, musical scores
14	Other appliances, articles and products for personal care	Non-electrical appliances, hand razors, hand clippers, blades, hair scissors, combs, brushes, hair clips, nail brushes, bathroom scales, soap, oils, shaving soap, creams and foam, toothpaste, deodorants, lipstick, nail varnish, make up, lacquers, aftershave, perfumes, and sun tan lotions

Spending Categories – Team B

	Category	Main elements
1	Meat	Beef, pig meat, lamb, poultry, frozen and processed meat
2	Fruit	Citrus fruits, bananas, apples, pears, stone fruits, berries, frozen, dried and preserved fruit
3	Coffee, tea and cocoa	All coffees, teas and cocoas
4	Beer	Beers, ales, lagers, porters, shandies. Includes low alcohol beverages
5	Garments	Men's, women's and children's clothing
6	Liquid fuels	Domestic heating and lighting oil
7	Household textiles	Fabrics, curtains, blinds, pillows, duvets, sheets, bed linen, blankets, table cloths, shopping bags, repair of textiles
8	Major tools and equipment	Electric drills, power saws, hedge cutters, lawn mowers, chain saws and repairs of such
9	Other medical products	Clinical thermometers, plasters, bandages, dressings, syringes, body supports, non-oral contraception
10	Telephone and telefax equipment	Purchase and repair of telephones, mobile phones, fax machines, answering machines etc
11	Recording media	Records, pre-recorded tapes and CDs, pre-recorded videotapes and DVDs, floppy disks, blank tapes, videotapes, CD Rs, unexposed film
12	Equipment for sport, camping and open-air recreation	Supply and repair of balls, shuttlecocks, gymnastic equipment, bats, rackets, weights, parachutes, recreational firearms, fishing equipment, inflatable boats, tents, sleeping bags, camping stoves, and barbecues
13	Newspapers	Newspapers, magazines, periodicals

Spending Categories – Team C

	Category	Main elements
1	Fish	Fresh, chilled, dried, smoked, salted, frozen processed or preserved fish and seafood
2	Vegetables	All vegetables including lettuce, celery, spinach, parsley, cabbage, cucumber, tomato beans, peppers, carrots, root and dried vegetables
3	Fruit and vegetable juices and other soft drinks	Mineral waters, spring waters, sodas lemonades, fruit juices, vegetable juices
4	Tobacco	Cigarettes, cigars, pipe chewing and spitting tobacco, loose tobacco and papers
5	Other articles of clothing and clothing accessories	Ties, handkerchiefs, scarves, gloves, belts, hats, threads, wool, buttons, zips, ribbons, laces - includes gardening and working gloves (but not rubber) and crash helmets for motor cycles and bicycles
6	Solid fuels	Coal, coke etc.
7	Major appliances whether electrical or not	Refrigerators, washing machines, cookers, vacuum cleaners
8	Small tools and equipment	Manual tools such as hammers, saws, screwdrivers, lawn mowers, garden tools, ladders, light bulbs etc
9	Therapeutic appliances and equipment	Spectacles, contact lenses, hearing aids, artificial eyes and limbs, orthopaedic footwear, supports, wheelchairs, invalid carriages, special beds, other devices
10	Audio visual and recording equipment	Radios, record players, amplifiers, speakers, tape machines, CD and DVD machines, personal stereos, televisions, videocassette recorders, aerials
11	Musical instruments and major durables for indoor recreation	Musical instruments of all sizes and types, billiard, snooker and ping-pong tables, pin-ball and gaming machines
12	Garden, plants and flowers	Flowers, shrubs, bulbs, seeds, fertilisers, composts, turf
13	Stationery and drawing materials	Writing pads, envelopes, account books, notebooks, diaries, pens, pencils, rubbers, correction fluids, ribbons, punches, scissors, staplers, drawing pins, paper, card

Spending Categories – Team D

	Category	Main elements
1	Milk, cheese and eggs	Milk, yoghurt, cheese, curd, milk desserts and drinks, eggs and sole egg products
2	Sugar, confectionery and ice-cream	Sugar, jams, marmalades, chocolate, confectionery, ice cream
3	Spirits	Spirits and liqueurs
4	Shoes and other footwear	Men's, women's and children's footwear including sports shoes but not sports specific, leggings, shoetrees but not orthopaedic footwear
5	Furniture and furnishings	All household furniture, lights, lamps pictures but excludes works of art and antiques
6	Small electric household appliances	Coffee machines, juice extractors, mixers, fryers, toasters, hotplates, kettles, fans
7	Non-durable household goods	Soaps, liquids detergents, conditioners, cleaning agents, insecticides, kitchen paperware, serviettes, bin liners, brooms, cloths, scourers, matches, candles, pegs, safety pins, nails, screws, glues, string, rubber gloves
8	Bicycles	All non-powered bicycles, tricycles but not toy bicycles
9	Photographic etc equipment	Cameras, camcorders, projectors, screens, binoculars, microscopes, telescopes and other photographic equipment
10	Pets and related products	Pets, pet foods, veterinary products, grooming goods, collars, leads, cages, kennels, tanks, litter trays
11	Electrical appliances for personal care	Razors, hair trimmers, hair dryers, curling tongs, sun lamps, electric tooth brushes etc
12	Other personal effects	Travel goods, suitcases, bags, purses, lighters, prams, cots, baby car seats, baby carriers, harnesses, reins, sunglasses, sticks and canes, umbrellas, key rings, gravestones, coffins, urns for ashes
13	Jewellery clocks and watches	Supply and repair of precious stones and metals, jewellery, clocks, watches

Outputs from syndicate exercise

- The impacts of each trend on the individual consumer spending categories were inputted onto sheets similar to the one shown overleaf

Expenditure category*: e.g. Breads & Cereals*

Key trend	**Product consumption levels** **+3 to -3**	**Impact on waste volumes** **+3 to -3**
1. Increasing affluence	0	0
2. Culture of change	0	0
3. Single society	1.5	2
4. The experience economy	1	0
5. Shortening product life cycles	0	0
6. Teleworking, knowledge economy	1	0
7. Increased longevity	0.5	0
8. Baby boomers	0	0
9. The growth of online shopping, convenience	0	0
10. Regulation/legislation	0	0
11. Climate change	0	-0.5
12. Ethical consumption	1	-1

Internal workshop – impact assessment

- In order to mesh the 12 key trends with our model, a similar output was needed for all 56 spending categories. This would then provide a robust and complete picture of how each trend would impact on overall waste arisings.
- The methodology was the same as in the consultation workshop, but the work was carried out by just one team to ensure consistency across all the categories.
- There follow some example sheets together with a brief text explaining the decisions taken.

Expenditure category*: Garments*

Key trend	Product consumption levels +3 to -3	Impact on waste volumes +3 to -3
1. Increasing affluence	1	0
2. Culture of change	1	0
3. Single society	0	0
4. The experience economy	1	0
5. Shortening product life cycles	2	0
6. Teleworking, knowledge economy	-1	0
7. Increased longevity	-1	0
8. Baby boomers	1	0
9. The growth of online shopping, convenience	1	0
10. Regulation/legislation	0	0
11. Climate change	0	0
12. Ethical consumption	0	-1

Increased disposability of clothing can be attributed to shortening product life-cycles, a culture of change and increased affluence. We also think that the experience economy will encourage more clothes shopping, for specialised clothing for sport, as well as new clothing for travel and going out.

Teleworking will have us buying fewer clothes as “we slob about” at home more, while ethical shopping may decrease product wastage in this category by encouraging giving to charity shops. While the clothes that are sold on through this channel will still end up in the waste stream, many will not be fit for resale and disposed of in the commercial waste stream. While old people buy fewer clothes, we think that the ageing of the baby boomer generation may reverse this.

Expenditure category*: Sports, camping and outdoor recreation equipment*

Key trend	Product consumption levels +3 to -3	Impact on waste volumes +3 to -3
1. Increasing affluence	2	0
2. Culture of change	0	0
3. Single society	0	0
4. The experience economy	3	0
5. Shortening product life cycles	2	0
6. Teleworking, knowledge economy	0	0
7. Increased longevity	-1	0
8. Baby boomers	0	0
9. The growth of online shopping, convenience	0	0
10. Regulation/legislation	0	0
11. Climate change	0	-0.5
12. Ethical consumption	0	0

Affluence means that people will be buying many pieces of equipment they might once have rented. The increased popularity of experiences over material goods will drive activities which will require goods in this category, although an ageing population are less likely to be taking part.