General enquiries on this form should be made to:

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SID 5 **Research Project Final Report**

defra

- **Note**

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- This form is in Word format and the boxes may be expanded or reduced, as appropriate.

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Project identification

1. Defra Project code   WR0107

2. Project title

   Modelling the Impact of Lifestyle Changes on Household Waste Arisings (Additional Research)

3. Contractor organisation(s)

   AEA
   The Future Foundation

4. Total Defra project costs   £   28,989
   (agreed fixed price)

5. Project: start date ....   27 July 2006

                 end date ....   24 August 2007

6. It is Defra's intention to publish this form.
   Please confirm your agreement to do so...**YES** ☒ **NO** ☐

   (a) When preparing SID 5s contractors should bear in mind that Defra intends that they be made public. They should be written in a clear and concise manner and represent a full account of the research project which someone not closely associated with the project can follow.

       Defra recognises that in a small minority of cases there may be information, such as intellectual property or commercially confidential data, used in or generated by the research project, which should not be disclosed. In these cases, such information should be detailed in a separate annex (not to be published) so that the SID 5 can be placed in the public domain. Where it is impossible to complete the Final Report without including references to any sensitive or confidential data, the information should be included and section (b) completed. NB: only in exceptional circumstances will Defra expect contractors to give a "No" answer.

       In all cases, reasons for withholding information must be fully in line with exemptions under the Environmental Information Regulations or the Freedom of Information Act 2000.

   (b) If you have answered NO, please explain why the Final report should not be released into public domain

Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

> *This research was commissioned and funded by Defra. The views expressed reflect the research findings and the author's interpretation. The inclusion of or reference to any particular policy in this report should not be taken to imply that it has, or will be, endorsed by Defra.*
>
> *__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.*

SUMMARY

The Defra Waste Resources Evidence Programme funded an innovative research project (WR0107) – "Modelling the Impact of Lifestyle Changes on Household Waste Arisings" that has resulted in the development of a forecasting tool to gain a better understanding of the composition of household waste and also how those arisings might grow in the future. The model takes into account the impact of economic, social and consumer trends on the composition and magnitude of household waste arisings to provide a range of alternative projections on the impact of different lifestyle trends on the future of household waste composition in England through to 2020. The model was designed to enable policy-makers to see the effect of probable trends in the main economic and social drivers on household waste arisings, such as increasing affluence and decreasing household occupancy levels. It also enables policy-makers to identify which sources of the waste stream are most sensitive to potential policy interventions and therefore provides evidence on which to prioritise and target policies.

The innovative input-output model (forecasting tool) that has been constructed was developed using the most up-to-date data on waste arisings available at that time. Following completion of the initial research and model development in July 2006, new data on waste have become available. Defra therefore commissioned additional work to investigate possible refinements to the model; in particular to investigate the short-term rates of growth in household waste (these have turned out to be rather lower that what the model would heave predicted); at the same time, Defra wished to see if the model could be used to quantify the potential impacts of qualitative future waste scenario research being conducted in parallel (WR0104) – "Lifestyle Scenarios: Futures for Waste Composition".

This summary report documents the additional research that has been undertaken between July 2006 and August 2007 and reviews the key outputs and areas of data uncertainty that have been investigated. Although this report has been written so as to be understood as a stand-alone document interested readers are strongly encouraged to firstly consult the original research report outputs available on the Defra Science and Research Projects website.

Research Methods in Outline

The forecasting tool that was built under the original research contract was calibrated against existing trends and trajectories of historic development and market dynamics relevant to waste generation. The tool is based around the fact that most household waste is generated by consumers' expenditure (important exceptions being garden waste, direct mail and free newspapers) and using a series of data assumptions the model was constructed and calibrated to provide a strong alignment with historical trends. The model did however appear to start over estimating total household waste arisings from 2002-2004. Subsequent waste statistics, which have been released by Defra since the creation of the model, have also been below levels that the model predicts. It was therefore agreed that further work should be undertaken to investigate possible explanations for the observed divergence between actual and predicted levels of waste arisings.

At the same time further research was conducted to see if the model could be adapted to provide quantitative outputs to illustrate a specific selection of qualitative future waste scenarios that had been developed under research project WR0104.

Key Questions Addressed in the Research

1. If the model were to have been built in the year 2000, what levels of waste growth would it have forecast for the years for which we now have reported statistics?
2. What are the possible explanations for any divergences observed?
3. Can the model be adapted to provide quantifiable outputs of future waste scenarios as defined in research project WR0104?

Key Outcomes

The additional research has established:

- The key assumptions in the model can be adjusted to reflect the three qualitative scenarios outlined in the Brook Lyndhurst research (WR0104) to provide a quantitative interpretation of future waste arisings and its possible composition.
- Had the model been built in the year 2000, it would have forecast even higher levels of waste growth for the years that we now have reported statistics. For example, the original model over-estimated arisings by 2.4% in 2004 compared to 3.6% for the '2000 based model'.
- It is likely that the mismatch between reported waste data and the model fit is a result of minor

differences in a number of factors responsible for waste growth as opposed to a significant change in recent years for an individual assumption contained in the model.
- With the weight of waste producing goods likely to continue to grow at around 1.5% pa to 2020, it does seem likely that growth in household waste arisings will soon reassert itself, although possibly at a much more modest rate than occurred in the late 1990s.

Key Recommendations

This additional research has highlighted the potential value of the model in being able to provide a quantitative forecast of a range of future scenarios for waste growth. At the same time the analysis conducted has demonstrated that there are multi variant criteria responsible for changes in household waste arisings. Further research is required to try to determine quantifiable impacts of particular waste growth scenarios and local practices (e.g. size and frequency of kerbside collection; green waste policy, etc.) that can then be used to 'fine-tune' the waste arisings assumptions associated with the model's 'base-case' forecast and lend greater confidence to future waste arisings predictions.

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:
- the scientific objectives as set out in the contract;
- the extent to which the objectives set out in the contract have been met;
- details of methods used and the results obtained, including statistical analysis (if appropriate);
- a discussion of the results and their reliability;
- the main implications of the findings;
- possible future work; and
- any action resulting from the research (e.g. IP, Knowledge Transfer).

1. INTRODUCTION

The Defra Waste Resources Evidence Programme funded an innovative research project (WR0107) – "Modelling the Impact of Lifestyle Changes on Household Waste Arisings" that has resulted in the development of a forecasting tool to gain a better understanding of the composition of household waste and also how those arisings might grow in the future. The model takes into account the impact of economic, social and consumer trends on the composition and magnitude of household waste arisings to provide a range of alternative projections on the impact of different lifestyle trends on the future of household waste composition in England through to 2020. The model was designed to enable policy-makers to see the effect of probable trends in the main economic and social drivers on household waste arisings, such as increasing affluence and decreasing household occupancy levels. It also enables policy-makers to identify which sources of the waste stream are most sensitive to potential policy interventions and therefore provides evidence on which to prioritise and target policies.

The innovative input-output model (forecasting tool) that has been constructed was developed using the most up-to-date data on waste arisings available at that time. Following completion of the initial research and model development in July 2006, new data on waste have become available. Defra therefore commissioned additional work to investigate possible refinements to the model; in particular to investigate the short-term rates of growth in household waste (these have turned out to be rather lower that what the model would heave predicted); at the same time, Defra wished to see if the model could be used to quantify the potential impacts of qualitative future waste scenario research being conducted in parallel (WR0104) – "Lifestyle Scenarios: Futures for Waste Composition".

The work has been project managed by AEA, an environmental consultancy organisation with a dedicated team of waste management experts, working in partnership with The Future Foundation, an organisation with an understanding and ability to forecast social and consumer behaviour and how those attitudes and behaviours might change in the future.

The original research was conducted over a 12-month period between July 2005 and July 2006; this additional research report covers the period from July 2006 to August 2007.

This report provides: a review of the further research and evaluation conducted into the model's forecasting accuracy; demonstrates how the model has been applied to a qualitative future scenario planning project (WR0104) to provide quantitative outputs; and identifies opportunities for further research that might provide greater confidence to future waste arisings predictions generated by the model.

2. CONSULTATION PROGRAMME

Throughout the development of the future waste arisings model an ongoing process of consultation and validation was conducted involving bodies that could provide specific expertise and knowledge. These included: the Industry Council for Packaging and the Environment (INCPEN), the Waste and Resources Action Programme (WRAP) and the Local Authority Waste Recycling, Recovery and Disposal (LAWRRD) Model Advisory Group. For the additional research commissioned between July 2006 and August 2007 the following key consultation meetings were held between AEA, The Future Foundation (FF), Brook Lyndhurst (BL), WRAP and Defra:

Date	Venue	Agenda
27 July 2006	Defra, London	Brook Lyndhurst scenarios briefing workshop
28 July 2006	AEA, Harwell	Further development of arisings model briefing with Defra
6 Sept 2006	Defra, London	Defra briefing on the need for further modelling / scenario planning work
26 Sept 2006	FF, London	AEA/FF & Brook Lyndhurst (BL) research integration meeting
16 Oct 2006	FF, London	AEA/FF & BL integration meeting with Defra and WRAP
26 Oct 2006	BL, London	AEA/FF & BL integration, technical meeting
15 Dec 2006	FF, London	AEA/FF technical meeting
19 Dec 2006	Defra, London	Defra Steering Group Meeting (SGM): AEA/FF & BL scenario modelling
8 Feb 2007	Defra, London	SGM: WRAP waste analysis; implications discussion
14 Mar 2007	Defra, London	SGM: WRAP waste growth factors; review of AEA/FF modelling factors
14 May 2007	Defra, London	SGM: Waste growth factors & modelling sensitivity

3. QUANTITATIVE ASSESSMENT OF FUTURE WASTE SCENARIOS

Following the development of the waste arisings model under the original research contract (WR0107) Defra wished to see if this forecasting tool model could be used to quantify the potential impacts of qualitative future waste scenario research being conducted under a separate research project (WR0104) – "Lifestyle Scenarios: Futures for Waste Composition" managed by Brook Lyndhurst.

Over a series of technical meetings between July 2006 and December 2006 (as detailed in Section 2) the three primary scenarios outlined in the Brook Lyndhurst research ('Blinkered Evolution', 'Civic Renewal' and 'Strong Government') were jointly assessed by the Future Foundation, AEA and Brook Lyndhurst. The objective was to agree the series of assumptions that would have to be adjusted in the waste arisings models in order to reflect each of the three scenarios and then to compare the quantitative outcome of these scenarios with the 'base-case' projection. The base-case projection had been created using the broad assumption that trends exhibited by the various assumptions over the past 10 – 20 years would continue, in a similar manner, over the next 15 years covered by the forecasts.

The scenarios considered are described below, together with a presentation of the modelling outputs obtained.

- **Scenario A – Blinkered Evolution**

In this scenario, the 25 years to 2030 have been a period in which mainstream behaviour has remained committed to the individualised consumption paradigm that dominated the late twentieth and early 21st century. Mounting evidence of climate change impacts – most obviously in terms of climactic disasters affecting millions of people around the world, but also through its impacts upon the costs of basic commodities including oil – has not brought about significant changes in either behaviour or policy in Britain.

Government is weak; civic life remains atomised; values remain predominantly economistic, prompting a continuance of materialised consumption – which in turn drives demand for ever scarcer resources. Consumption patterns and associated levels of economic activity continue to support reasonable growth in real incomes and thus spending; while technological innovation is focused on meeting the needs of consumption rather than transformation.

To an extent, many trends that were apparent in the early part of the century have continued. However, given the way in which both citizens and governments have managed to avoid facing up to the consequences of British lifestyles, it is fair to say that - in short - British society has evolved in a blinkered fashion.

Modelling Results

As can be seen from the chart below the forecast for household waste arisings under this scenario is higher, but not significantly so, than the base case – implying that many of the assumptions used in the base case are not dissimilar to those implied by a scenario of 'blinkered evolution'.

Weight of household waste 1980-2020 (Scenario A)
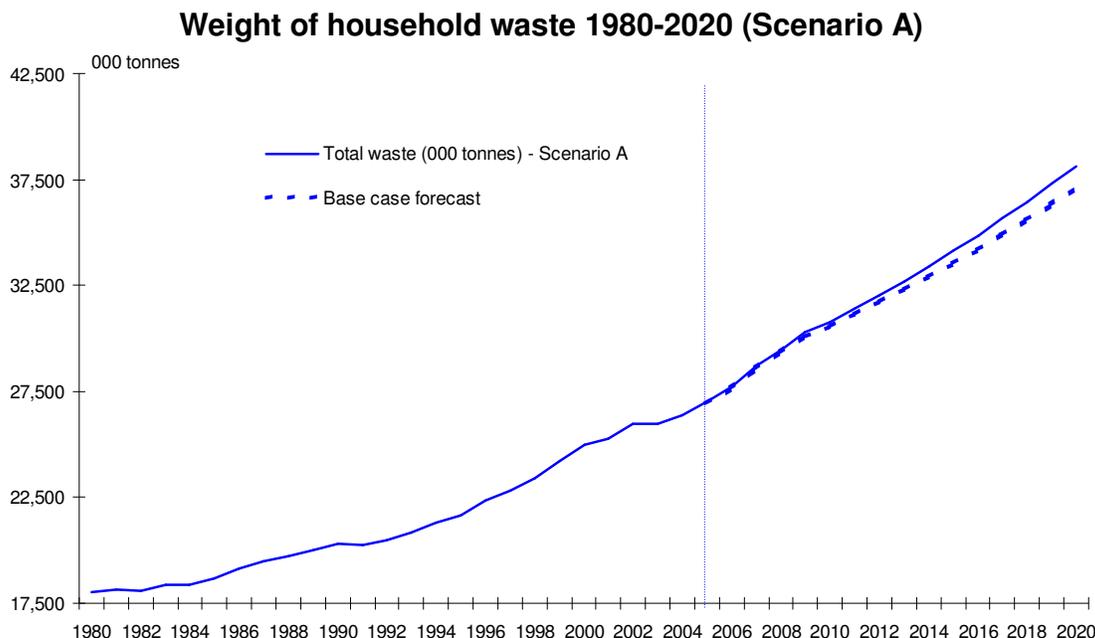
In the base scenario waste arisings are forecast to increase at an average rate of 2.1%pa over the next 15 years, while Scenario A implies growth of 2.3%pa. Under Scenario A we see faster growth of both product and packaging waste compared to the base.

- **Scenario B – Civic Renewal**

Faced, in the early twenty first century, with the overwhelming evidence of climate change, it was British citizens and consumers rather than British politicians that began to change their behaviour. Facilitated by a willing and profit-oriented private sector, early coalitions of what used to be called "ethical consumers" brought about a tipping point in attitudes around 2015, and the period since has seen the emergence of a series of new lifestyle choices across British society.

Economic growth, in the traditional sense, has been markedly slower over the past fifteen years than in the 1992 to 2012 period, and many economists remain worried that "competitiveness" is being lost, to the long run detriment of the country's viability. Others argue that a process akin to the Japanese period of no growth in the 1990s is occurring, while still others argue that an entirely new form of economics has emerged.

Whatever the analysis, the society of 2030 appears to be one in which psychological and physical well-being is both centre stage politically, and improving. And it is a society that is gradually reducing its negative environmental impacts, with only limited regulatory or fiscal intervention.

In many ways, Adam Smith's "invisible hand", grounded as it always was in civic society, has guided Britain into a period of unexpected renewal.

Modelling Results

The chart below shows that using the assumptions we have associated with the 'civic renewal' scenario although waste continues to grow for the next few years, as the changes implied by the assumptions start to 'kick in' then the growth in waste arisings starts to stabilise and then fall.

Weight of household waste 1980-2020 (Scenario B)
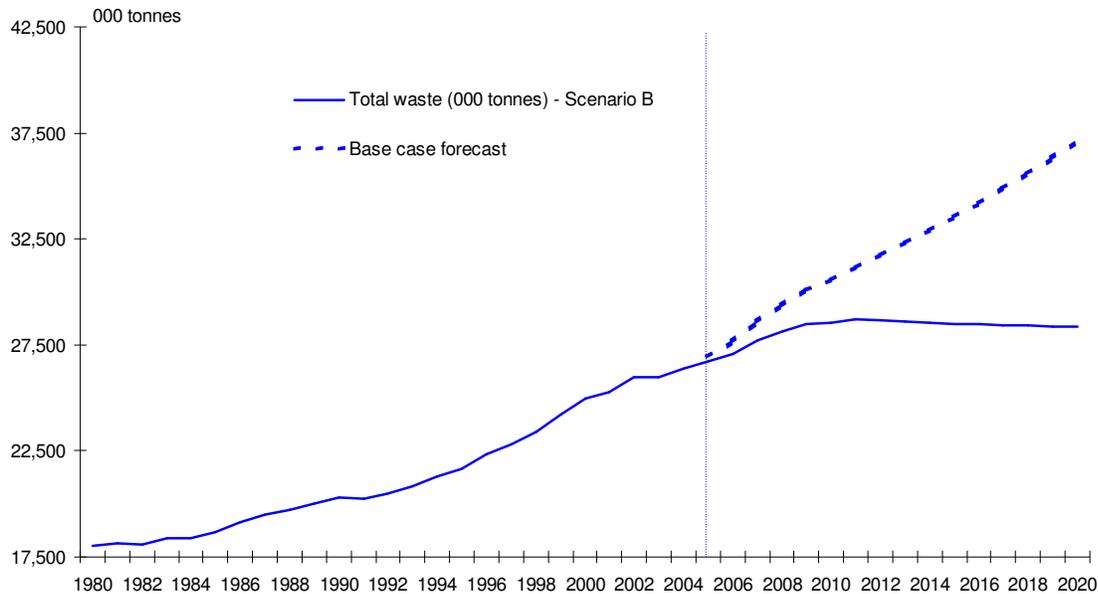
Comparing actual growth rates in the base case and Scenario B shows that over the 15 years covered by the forecast 'civic renewal' results in overall growth in arisings of just 0.3%pa, all the growth occurring at the start of the forecast horizon.

Scenario C – Strong Government

Faced, in the early twenty first century, with the overwhelming evidence of climate change, the British Government has led the campaign, sustained over the past twenty five years, to transform the UK economy. Facilitated by a willing and profit-oriented private sector, successive waves of regulation, legislation and revisions to the tax system have been largely successful in both maintaining the growth in living standards required for electoral success and reducing emissions of CO_2 required to save the planet.

Economic growth, in the traditional sense, has been maintained at or around the long run average over the past twenty five years, although there have been a couple of "mini-recessions" as particular sectors of the economy were forced to adapt more quickly to the requirements imposed by carbon trading.

By and large, the citizens and consumers of Britain have accepted that the "price" of achieving an environmentally sustainable future has been to cede more authority to a strong government, and whether by luck or judgement most of the governments since 2005 have used their strength well.

Modelling Results

The assumptions used in this Scenario result in both upward and downward pressures on waste arisings compared to the base case, and on balance we see a continued growth in arisings, but at a lower rate than in the base case.

Weight of household waste 1980-2020 (Scenario C)
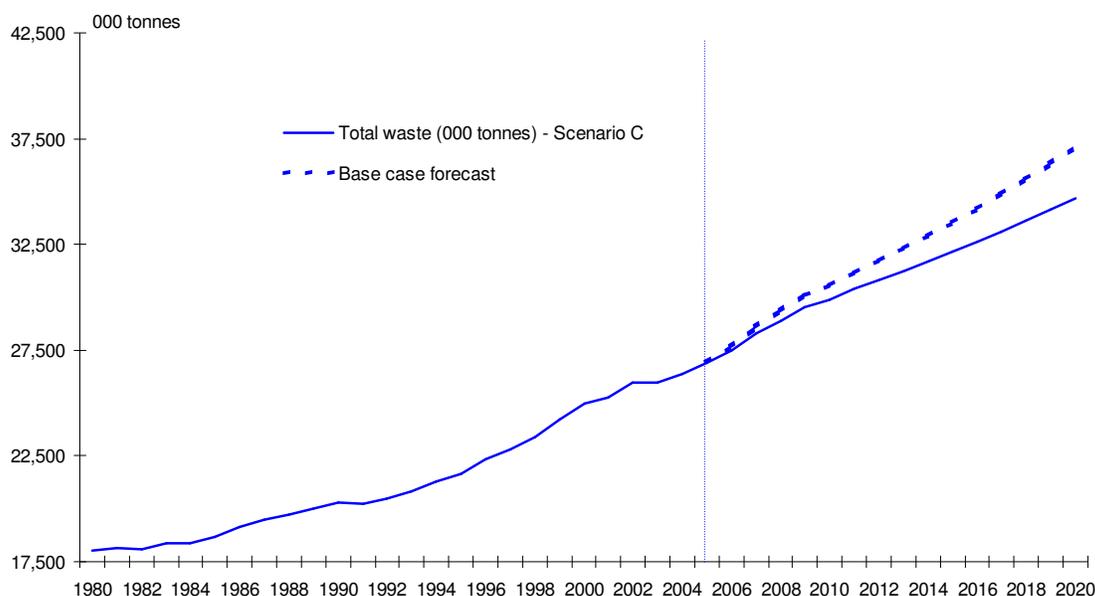
While in the base case arisings increase by 2.1%pa in Scenario C we see average annual growth of 1.7%pa.

For further details of this quantitative modelling exercise interested readers should refer to (WR0104) – "Lifestyle Scenarios: Futures for Waste Composition" published on the Defra Science and Research Projects website.

4. FURTHER MODEL VALIDATION EXERCISE

As noted earlier, following completion of the initial research and model development in July 2006, new data on waste have become available. However these most recent rates of growth in household waste have turned out to be rather lower that what the model would heave predicted. It was therefore agreed that a further model validation exercise should be conducted based upon answering the question: 'If the model were to have been built in the year 2000, what levels of waste growth would it have forecast for the years for which we now have reported statistics?'

The basis for the retrospective forecast was to assume that the model was being constructed in 2000 so the only data available for calibrating the model would have been the waste, economic, demographic and social statistics and lifestyle trend data available at that time. The retrospective forecasts could then be compared to the actual reported data and the original base-case forecast from the 2006 model.

Further details of the approach adopted are described in 'WR0107 Annex 4 – Supplementary Model Validation Report (December 2006)' also published on the Defra Science and Research Projects website.

By way of illustration, comparing a selection of forecasts that would have been made in 2000 with actual reported data:

- The reduction in average household size would have been over estimated by 2.1% (2.27 persons per household forecast versus 2.32 actual) – this would increase the forecast waste arisings in the model.
- The increase in Real Household Disposable Income (RHDI) would have been over reported by 0.4% (£773.7b versus £770.2b) – this would increase the forecast waste arisings in the model.
- The increase in direct mail would have been over estimated by 1.1% (303.5kt versus 300.2kt) - this would increase the forecast waste arisings in the model.
- The reduction in circulation of free newspapers would have been over stated by 2.8% (209.3kt versus 215.4kt) – this would reduce the forecast waste arisings in the model.

The output from this process was a graphical representation of the forecast based upon parameters and assumptions from 2000 compared to the reported waste data and also the original base-case model fit.

## Household Waste Arisings in England (000s tonnes)
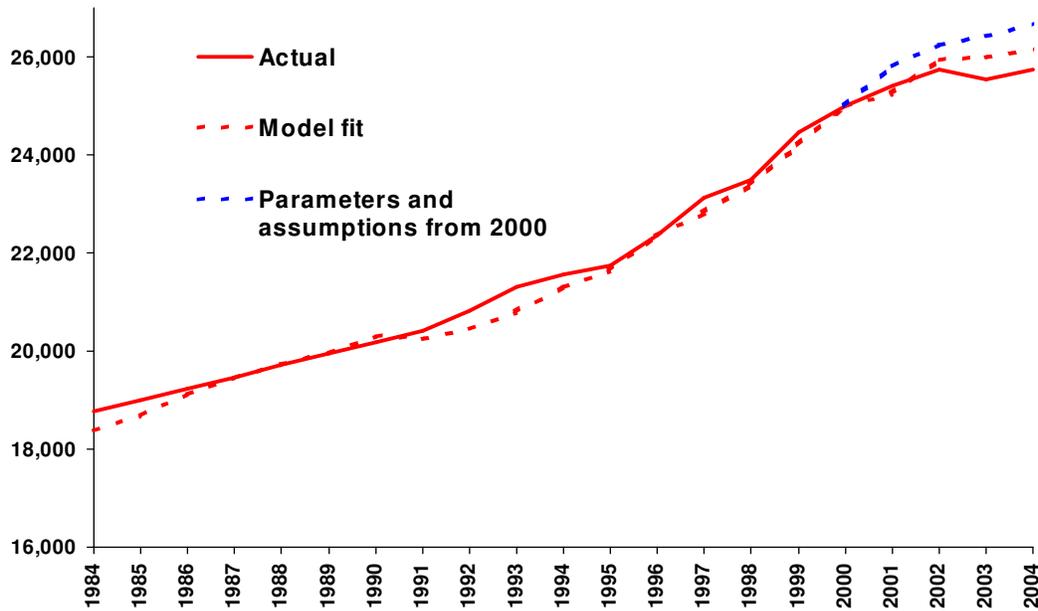
The graph shows that the retrospective forecasts are above both the actual and base-case model. For 2004 our model fit is 2.4% above the Defra reported statistics but the forecast that we would have made in 2000 is 3.6% above (equivalent to 926,000 tonnes).

Furthermore the data for the 2005/06 financial year also showed a fall in household waste arisings in England which is again not consistent with the predictions of the model and, in more general terms, not consistent with the growth in consumer spending on waste generating goods, as can be seen in the graph below.

Household Waste Arisings in England and Consumer Spending on Waste Producing Goods (at 60% of actual)

Index 1984=100
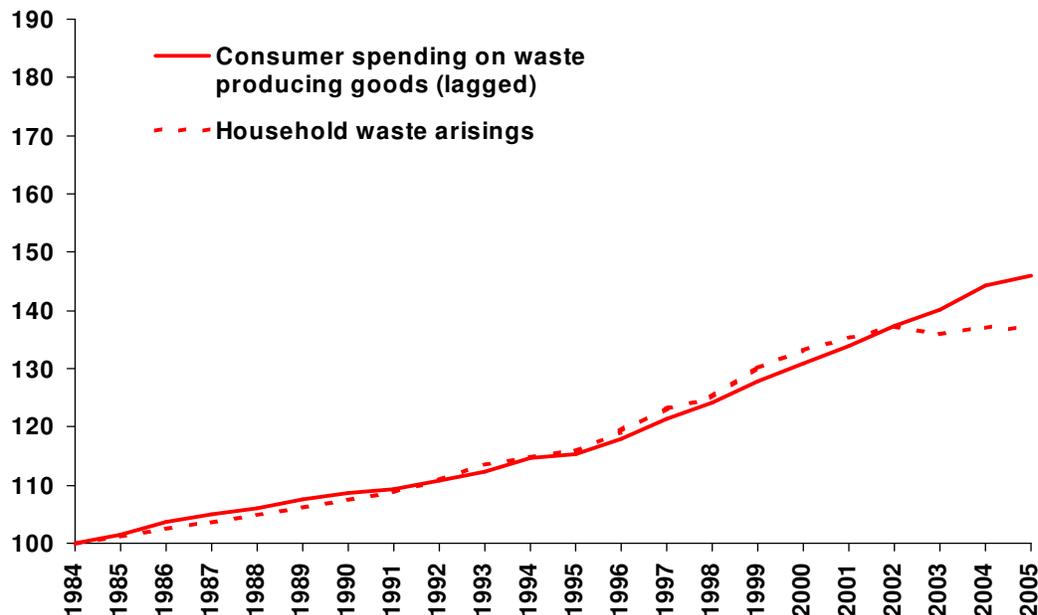
In initial discussions, various alternative 'speculations' were put forward, which alone or in combination, could potentially account for the divergence observed between the model and recent data:

(A) Official figures may be under reporting actual household waste arisings for some reason (e.g. local authorities changing the way they report data; waste moving from the 'household waste' classification to other sectors)
(B) Behaviour described within the model actually having changed over the past few years (within the model it was assumed, as there is no evidence available to do otherwise, that the trends over the past three years have either remained unchanged or have continued to follow the trend of the last 10 years).
(C) A 'new' waste growth factor (e.g. local authority uptake of alternate week collection regimes) has been introduced in recent years and has not been accounted for in the model parameters.

It was therefore agreed at the Research Steering Group Meeting in December 2006 that Julian Parfitt from WRAP would undertake a detailed assessment of local authority waste data, to try to ascertain the reliability of the reported statistics against which the model is compared, and that AEA and The Future Foundation would investigate the sensitivity of the model to changes in individual behavioural trends and specific waste growth factors contained within the model.

5.   DIVERGENT TREND ANALYSIS

In 2002 the Strategy Unit Report 'Waste Not Want Not' produced an assessment of the municipal waste arisings on an assumed rate of waste increase of 3% per annum, faster than the growth in GDP (2.0-2.5%). This was based on the 1996 -2000 time series from Defra's Municipal Waste Management Survey, which at that point was reporting 3.4% average annual growth in municipal waste. This rate of increase represented a doubling time for municipal waste arisings of about 20 years. Since 2000 there has been a significant slowing down in the rate of municipal waste increase in England, with the average annual increase in municipal waste arisings over the 5 years to 2005/6 estimated to be 0.5 per cent, based on official data (see below).

From 2004/05 the paper-based Municipal Waste Management Survey was replaced by the quarterly web-based reporting system that underpins the monitoring requirements of the UK's implementation of the Landfill Directive. The 2005/06 WasteDataFlow dataset represents 100% coverage of local authorities, has received a high level of scrutiny in being the first full year of the LATS regime, and therefore provided a good opportunity to take stock of the data series produced since 2000 in order to reassess:

• Data consistency at the district authority (WCA/UA) level across six years;
• The national estimates made from non-responding authorities;
• The drivers behind waste increases / decreases at the district level.

In January 2007, Julian Parfitt from WRAP undertook a detailed process of manually auditing the local authority waste data, at the district authority level, with the overall conclusion that total municipal waste quantities have remained little changed since 2000/01.

Overall, the reassessment suggested that the rate of municipal waste increase averaged about 0.14% per annum between 2000/01 and 2005/06, as compared with 0.5% reported for the original dataset. For household waste, the significant annual rate of increase seen in the 1995-2000 series appears to have been reversed into a marginal average year-on-year decline (-0.04%) according to the reassessed data.

These findings effectively ruled out Hypothesis (A) that official figures were under reporting actual household waste arisings. Furthermore, a number of key observations were noted in the assessment process that Defra has recognised would benefit from further research. These include:

• Waste growth rates over the past 10 years (1995-2005) differ markedly on a regional basis (e.g. 3.3% increase in the North East compared to 12.5% in London);
• Local authority green waste policy (i.e. offering residents a kerbside garden waste collection) is positively correlated to waste arisings;
• Similarly, council kerbside recyclables policies are positively correlated to waste arisings;
• An initial assessment of total bin capacity available to householders per week doesn't appear to have a simple relationship with variation in waste arisings.

To investigate Hypothesis (B) the next phase of the divergent trend analysis considered whether behaviour described within the model has actually changed over the past few years (within the model it was assumed that the trends over the past three years have either remained unchanged or have continued to follow the trend of the last 10 years). To test how changes to the assumptions might affect predicted waste arisings the research team considered the key drivers on a sequential basis. For each assumption changes were made to the driver in order to see if the model can be made to fit the actual data for 2002 – 2005 more accurately. It should be noted that

this was a hypothetical exercise to illustrate the degree of change in that one assumption that would be required to fit the reported data. In all cases, that actual degree of individual change is not considered likely. For example, the 'model' for garden waste looks at the number of households, proportion of households with gardens, average waste per garden and the proportion of garden waste going into the household waste stream. If, however, we assume that the amount of garden waste produced fell by 25% between 2001 and 2005 (rather than unchanged as assumed in the original model) and the amount of garden waste going to civic amenity sites stabilised at 2001 levels (rather than gradually increasing as assumed in the original model) then the model can be seen to track 'actual' data accurately.

Household Waste Arisings in England (000s tonnes)
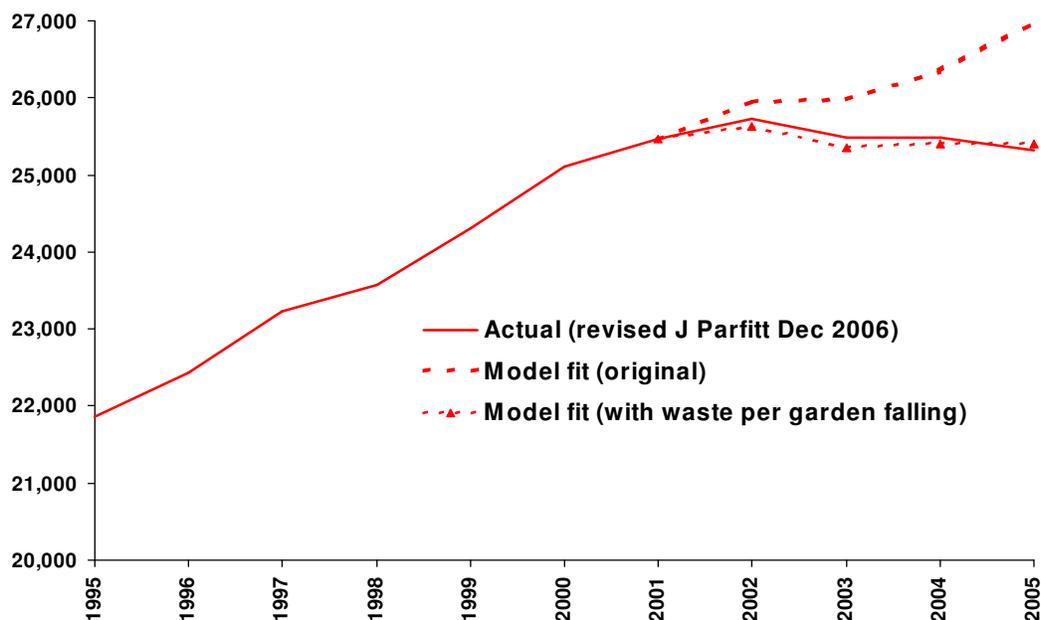
Similar approaches and results were obtained for a range of key drivers contained in the model (e.g. proportion of product that ends up as waste / gets disposed of outside of the household waste stream; product quality improvements; etc) and further details are described in '*WR0107 Annex 5 Supplementary Divergent Trend Analysis Report (May 2007)*' also published on the Defra Science and Research Projects website.

In addition, to investigate Hypothesis (C) a number of alternative factors were analysed (e.g. first time house buying decline of 35% between 2001 and 2005) but none offered a logical explanation for declining household waste arisings (e.g. between 2001 and 2005 real expenditure on household goods has risen by 14%).

The results were presented and discussed at a Defra Steering Group Meeting on 14th May 2007 and it was concluded that (given the size of adjustments required) the mismatch between model fit and 'actual' is highly unlikely to be as a result of a change in just one waste growth factor. It was deemed much more likely that it would be a combination of several of the factors (e.g. the hot weather in recent years has reduced the amount of garden waste; more home composting is happening; people are throwing away a little less food; packaging weights have fallen a little; etc). However, in the absence of further evidence to support making such changes, it was agreed it is not possible to accurately recalibrate the model until further research is conducted into understanding the reasons for the recent trend in household waste reduction.

6.   OPPORTUNITIES FOR FURTHER DEVELOPMENT

With the weight of waste producing goods likely to continue to grow at around 1.5% pa to 2020, it is important that we understand why waste growth has recently slowed down, and whether or not that trend will continue. Defra subsequently commissioned Resource Futures and AEA to conduct further research in October 2008 to try to understand the policy related or other factors that have caused the change in waste growth patterns over the last five years – '*WR0121: Municipal Waste Growth - The Influence of Local Waste Policies*'.

With that research now completed it may be possible to recalibrate the data and assumptions contained within the model that has been developed so as to lend greater confidence to future waste arisings predictions.

References to published material

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

Project Reports and Presentations available from the Defra Research website:
http://www2.defra.gov.uk/research/project_data/

Maunder, A; White, P; Howard, M; Farmelo, C; Yates, T:

     WR0107 – Summary Report SID5 (August 2006)

     WR0107 – Supplementary Report SID5 (October 2007)

     Annex 1: Main Report (August 2006)

     Annex 2: Inception Report (August 2005)

     Annex 3: Interim Report (December 2005)

     Annex 4: Supplementary Model Validation Report (December 2006)

     Annex 5: Supplementary Divergent Trend Analysis Report (May 2007)

Brook Lyndhurst
WR0104: Lifestyle Scenarios: The Futures for Waste Composition

Resource Futures and AEA
WR0121: Municipal Waste Growth - The Influence of Local Waste Policies