

Summary: Intervention & Options

Department /Agency: Defra	Title: Impact Assessment of proposal to introduce packaging recovery and recycling targets for 2011-20	
Stage: Initial	Version: Final	Date: March 2010
Related Publications: Producer Responsibility Obligations (Packaging Waste) Regulations 2008; Directive 2004/12/EC (amending Directive 94/62/EC on packaging and packaging		

Available to view or download at:

<http://www.defra.gov.uk/environment/waste/topics/packaging/index.htm>

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What is the problem under consideration? Why is government intervention necessary?

The externalities of having to deal with packaging sustainably at the end of its life are currently internalised through Producer Responsibility Regulations, which implement the EU Packaging Directive. The targets for packaging waste recycling in these Regulations only run until 2010. New mandatory targets are needed beyond then to deliver the aims of the UK's Packaging Strategy, *Making the most of Packaging* (to maximise GHG savings and resource efficiency, address consumer concerns about packaging recyclability) and ensure that EU targets on packaging waste recycling and recovery continue to be met.

What are the policy objectives and the intended effects?

The objective is to further government's policy to increase the recovery of packaging waste as an essential part of its strategy to reduce greenhouse gas emissions and increase resource efficiency. In addition to this, the policy will contribute to meeting and exceeding landfill diversion targets, increasing the diversion of commercial and industrial waste from landfill, and increasing energy recovery from waste. The intended effects are to require obligated businesses to recover/recycle more of their packaging waste. The UK's ambition is to work towards the recycling rates achieved by the best EU performers.

What policy options have been considered? Please justify any preferred option.

The Advisory Committee on Packaging has recommended that future targets should be set for a minimum of the next 5 years in order to provide industry with greater certainty for planning and future investment. The policy options are to either:

- a) roll forward the existing targets given they now meet the minimum EU requirement; or
- b) to raise targets to achieve the UK's ambition to work towards the recycling rates achieved by the best EU performers. This will give the best benefits and is therefore the preferred option.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

Progress against the targets is monitored annually. The targets themselves will be reviewed after 5 years or 10 years depending on responses to our consultation.

Ministerial Sign-off For consultation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister:

..... Date:

Summary: Analysis & Evidence

Policy Option: 1

Description: Roll over existing targets

ANNUAL COSTS		Description and scale of key monetised costs by 'main affected groups' Collection/sorting costs: £126m
One-off	Yrs	
£ 0	0	
Average Annual Cost (excluding one-off)		<p>Other key non-monetised costs by 'main affected groups'</p> <p>Impacts of waste treatment options on local environmental quality have not been included. The net impact would depend on the balance of local impacts of different treatment options.</p>
£ 15.1m	3	
Total Cost (PV)		

ANNUAL BENEFITS		Description and scale of key monetised benefits by 'main affected groups' . Revenue from materials: £68m Savings in disposal costs: £69m Carbon benefits: £31m
One-off	Yrs	
£ 0		
Average Annual Benefit (excluding one-off)		<p>Other key non-monetised benefits by 'main affected groups'</p> <p>Impacts of waste treatment options on local environmental quality have not been included. The net impact would depend on the balance of local impacts of different treatment options.</p> <p>Increased collection and recycling of packaging waste could have wider benefits by acting as a driver for collection and recycling of other waste streams.</p>
£ 20.6m	3	
Total Benefit (PV)		

Key Assumptions/Sensitivities/Risks

Price Base 2009	Time Period Years 10	Net Benefit Range (NPV) £ 45.6m	NET BENEFIT (NPV Best estimate) £45.6m		
What is the geographic coverage of the policy/option?			UK		
On what date will the policy be implemented?			January 2011		
Which organisation(s) will enforce the policy?			Environment agencies		
What is the total annual cost of enforcement for these organisations?			No change		
Does enforcement comply with Hampton principles?			Yes		
Will implementation go beyond minimum EU requirements?			Yes		
What is the value of the proposed offsetting measure per year?			£ 0		
What is the value of changes in greenhouse gas emissions?			£30.8m		
Will the proposal have a significant impact on competition?			No		
Annual cost (£-£) per organisation (excluding one-off)		Micro	Small	Medium	Large
Are any of these organisations exempt?		No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices)

(Increase -

Increase of £

Decrease of £

Net Impact

£ 0

Key:

Annual costs and benefits: Constant Prices

(Net) Present Value

Summary: Analysis & Evidence

Policy Option: 2

Description: Set new targets for a 10 year period to implement the aims of the UK Packaging Strategy

COSTS	ANNUAL COSTS		Description and scale of key monetised costs by 'main affected groups' Collection (including public campaign) and sorting costs: £1.068bn - £1.285bn Total Cost (PV) £ 1,105m - £1,322m
	One-off	Yrs	
	£ 0	0	
	Average Annual Cost (excluding one-off)		
	£ 133m - £159m	10	
Other key non-monetised costs by 'main affected groups' Impacts of waste treatment options on local environmental quality have not been included. The net impact would depend on the balance of local impacts of different treatment options.			
BENEFITS	ANNUAL BENEFITS		Description and scale of key monetised benefits by 'main affected groups'. Revenue from materials: £564m Savings in disposal costs: £391m Carbon benefits: £296m Total Benefit (PV) £ 1.296bn
	One-off	Yrs	
	£ 0		
	Average Annual Benefit (excluding one-off)		
	£155.9m	10	
Other key non-monetised benefits by 'main affected groups' Impacts of waste treatment options on local environmental quality have not been included. The net impact would depend on the balance of local impacts of different treatment options. Increased collection and recycling of packaging waste could have wider benefits by acting as a driver for collection and recycling of other waste streams.			

Key Assumptions/Sensitivities/Risks

- A sensitivity has looked at the effect of including a measure for the elasticity of response to an increase in landfill tax - assumed to be around 0.3;
- On collection costs, it is assumed there is sufficient spare capacity for the collection and handling of the additional tonnages overall, i.e.:
 - No need to increase collection pass rates (i.e. Frequency of collections)
 - No need to increase emptying frequency of vehicles
 - No need for additional compaction infrastructure, or retro-fit bays
 - No need to increase staff numbers (except where explicitly included, e.g. as part of additional vehicle running costs)

Price Base 2009	Time Period Years 10	Net Benefit Range (NPV) £ -26.3m to 190.3m	NET BENEFIT (NPV Best estimate) £82m
What is the geographic coverage of the policy/option?			UK
On what date will the policy be implemented?			January 2011
Which organisation(s) will enforce the policy?			Environment agencies
What is the total annual cost of enforcement for these organisations?			No change
Does enforcement comply with Hampton principles?			Yes

Will implementation go beyond minimum EU requirements?		Yes		
What is the value of the proposed offsetting measure per year?		£ 0		
What is the value of changes in greenhouse gas emissions?		£296.1		
Will the proposal have a significant impact on competition?		No		
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices)

Increase £ Decrease £ **Net** (Increase - £ 0

Key: **Annual costs and benefits:** **(Net) Present**

[Use this space (with a recommended maximum of 30 pages) to set out the evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Ensure that the information is organised in such a way as to explain clearly the summary information on the preceding pages of this form.]

1. INTRODUCTION

- 1.1 This Impact Assessment (IA) applies to proposed changes to the Producer Responsibility Obligations (Packaging Waste) Regulations 2007 (henceforth “the Packaging Regulations”).
- 1.2 The Packaging Regulations require businesses which handle more than 50 tonnes of packaging and have an annual turnover in excess of £2 million to carry out recovery and recycling of packaging waste, to enable the UK to meet its legally binding targets under the EC Directives on Packaging and Packaging Waste 94/62/EC and 2004/12/EC.
- 1.3 This IA accompanies a government consultation document on ‘Implementing the Packaging Strategy: recovery and recycling targets, funding transparency and other technical changes’. The consultation covers new recovery and recycling targets for 2011-2020; new reporting provisions for accredited exporters and reproprocessors, to promote transparency in how producer funding is spent; and technical changes to improve the clarity and operation of the Regulations.
- 1.4 This IA deals with the proposed business recovery and recycling targets for packaging waste for 2011-20. It presents the overall costs and benefits of the proposals. ***The Government welcomes responses from as wide an audience as possible on the issues set out in the consultation paper and this IA.***

2. PROPOSAL

Purpose and intended effect of measure

- 2.1 In June 2009, *Making the most of Packaging: a Strategy for a Low Carbon Economy* was published. The key aim of the Strategy is to minimise the environmental impact of packaging over its whole life cycle, without compromising its ability to protect the product¹. This can be achieved through optimising packaging, and through maximising the recycling of packaging waste.
- 2.2 Packaging waste constitutes about 10% of the commercial and industrial (C&I) waste stream and about 20% of the household waste stream in the UK. Packaging recycling and recovery rates therefore have an important role to play in meeting municipal landfill diversion targets, increasing the diversion of commercial waste from landfill, meeting overall recycling targets, and recovering energy from waste. All of which contributes to reducing greenhouse gas emissions.
- 2.3 The proposal to increase targets post-2010 and set new targets until 2020 reflects the government’s intention to increase general levels of recovery and recycling, described in the Waste Strategy for England 2007, *Wise about Waste: The National Waste Strategy for Wales*, Scotland’s Zero Waste Plan and *Towards Resource Management: The*

¹ www.defra.gov.uk/environment/waste/producer/packaging/documents/full-packaging-strategy.pdf

Northern Ireland Waste Management Strategy 2006 - 2020 ² and the Packaging Strategy's ambition to work towards the recycling rates achieved by the best EU performers.

- 2.4 Higher recycling targets for packaging support the shift from landfill to recycling and recovery. Landfill is not a sustainable way of disposing of waste. In addition to the space additional land filling would require, there are a number of other adverse environmental effects:
- climate change primarily through the release of methane gas from biodegradable material;
 - possible damage to soil and water quality through leaching from landfill sites;
 - disamenities such as noise and odour.
- 2.5 The UK's packaging recycling has risen significantly over the past decade, but analysis within the Strategy shows that more can be achieved over the next 10 years to maximise greenhouse gas emissions savings and resource efficiency, and address consumer concerns about packaging recyclability. Recycling packaging results in reductions in emissions of CO₂ because less energy is used to produce recycled raw materials than in the production of virgin raw materials. Increased collection and recycling of packaging waste could also have additional social benefits by acting as a driver for collection of other waste streams. Finally, increased recovery and recycling of packaging waste could have amenity benefits by contributing to a decrease in packaging litter.

Background

- 2.7 The EC Directive on Packaging and Packaging Waste (94/62/EC, as amended – hereafter referred to as 'the Packaging Directive') aims to harmonise the management of packaging waste by minimising the impact of packaging and packaging waste on the environment and by avoiding obstacles to trade and distortion and restriction of competition within the Community.
- 2.8 The Directive is implemented in the UK by (i) the Producer Responsibility Obligations (Packaging Waste) Regulations 2007; and (ii) the Packaging (Essential Requirements) Regulations 2003 (as amended).
- 2.9 The Directive as amended³ sets minimum recovery targets of 60% (of which a minimum of 55% recycling) to be met by 31 December 2008, as well as material-specific recycling targets. These are 60% for glass, 60% for paper and board, 50% for metals, 22.5% for plastics, and 15% for wood.
- 2.10 After 2008, Member States must continue to meet these minimum targets, but they have the freedom to set higher targets if they so choose. The Commission has noted that the 60% recovery rate in the Directive is a minimum and has indicated that Member States will be encouraged to exceed this level. The Directive targets were met in 2008.

Current achievement

- 2.11 The UK achieved the Directive targets in 2008, as set out in Table 1 below. This was a significant achievement of a key milestone in the UK's progress on packaging recycling. In 2008 the UK recovered 65% of packaging placed on the market, compared with 30% in 1998.

² Waste Strategy for England 2007, May 2007 - <http://www.defra.gov.uk/environment/waste/strategy/index.htm>

³ By Directive 2004/12/EC

Table 1: UK achievement against the packaging recycling and recovery targets, 2008

	Total Waste (tonnes)	Amount recycled/recovered (tonnes)	Directive Target	Achievement
Paper	3,839,000	3,062,946	60%	79.8%
Glass	2,630,000	1,613,310	60%	61.3%
Aluminium	145,000	50,214		34.6%
Steel	676,000	417,261		61.7%
<i>Metal</i>	<i>821,000</i>		50%	56.9%
Plastic	2,185,000	516,841	22.5%	23.7%
Wood	1,198,000	940,460	15%	78.5%
Total recycling		6,601,032	55%	61.7%
EFW		426,891		
Total Recovery	10,695,000	7,027,923	60.0%	65.7%

2.12 The Advisory Committee on Packaging has recommended that future targets should be set for a minimum of the next 5 years in order to provide industry with greater certainty for planning and future investment purposes. We are therefore proposing targets up to 2020 to allow maximum time for industry to plan compliance, but we expect to be reviewing the targets after 5 years to take account of market changes and possible EU developments.

Risk assessment

2.13 Previous changes to the targets have aimed to ensure that the UK was on course to achieve the Directive targets in 2008. Apart from the clear risk of infraction, not meeting the targets would be misaligned with the ambitions of government waste strategies and would tarnish the UK's reputation in the EU.

2.14 In 2008 the UK met, and in most cases exceeded, its EU packaging recycling and recovery targets (see Table 1 above). All future targets, whether they are increased or kept at 2010 levels, should continue to ensure that the UK meets the minimum Directive requirements. This assumes, as described in the accompanying consultation document, that the level of total packaging waste arising and the level of obligated tonnage move in concert and do not diverge.

2.15 The *business as usual* option of rolling forward the 2010 targets would not have a significant impact on the UK achieving its aims in terms of overall recycling rates, diverting waste from landfill and reduction in greenhouse gas emissions. Without the demand-pull created by targets, there would be less incentive to increase investment in the underlying waste infrastructure, which would mean recycling and recovery rates would plateau, other things being equal.

2.16 The continued increases in landfill tax over the next few years should create some additional incentive to increase recycling rather than dispose of waste to landfill. This could drive recycling levels above those required by simply rolling over existing targets. However, this is not axiomatic: the level of landfill tax is already close to a point where on average it should make recycling less expensive than landfill as a waste management option in a well-functioning market, though costs will differ for individual businesses. .

2.17 In analysing the data and compiling the scenarios it is assumed that those businesses that are obligated under the Packaging Regulations will comply with their obligation. With any regulatory system, there is always a risk that some obligated businesses might not comply, or might under-report their obligation, and if this occurs, there is a risk that overall targets might not be met.

3. OPTIONS

- 3.1 This section discusses the proposed targets, based on industry data projections for total packaging waste arising and obligated tonnage for 2011-2020. The alternative 'do nothing' option, which would not satisfy the agreed aims of the government's packaging strategy but would meet current minimum EU requirements, would be to roll forward the existing targets. However, even under this scenario, recycling levels might be expected to increase in line with anticipated growth in packaging waste arisings, and in response to the incentive effects created by future landfill tax rises, although the impact of this will vary by material.
- 3.2 Wider discussion of the profiles for each of the main packaging materials are set out in Chapter 1 of the accompanying consultation document, and are not repeated here.

The baseline

- 3.3 The main data set underpinning the targets are:
- i. the totals for packaging flowing into the UK waste stream, by material;
 - ii. the level of packaging that is 'obligated' or expected to be obligated.
- 3.4 The current targets, set in 2007, used 2006 data as a baseline. To take account of the latest available data and the effects of the economic downturn, we propose to use **2009 data as a baseline**. This data is based on the latest industry estimates for packaging production, and hence waste arisings⁴.
- 3.5 There are a number of assumptions regarding the data and trends for the period under consideration. These are:
- packaging waste will rise in line with industry predictions, which are set out in paragraphs 3.7 of the consultation document;
 - the obligated tonnage will increase at the same rate as packaging arisings, as set out in paragraphs 3.8 of the consultation document;
 - the existing breakdown between materials will be maintained (i.e. there will be no major changes in material use);
 - no new types of? packaging material will enter the market during the period.
- 3.6 The Packaging Regulations include a *de minimis* threshold, exempting businesses that have a turnover below £2m and who handle under 50 tonnes of packaging; they are 'not obligated'. However, the packaging that is handled by those exempt businesses still counts when calculating the UK's recycling targets. The recycling and recovery targets applied to the 'obligated tonnage' (that handled by 'obligated businesses') are higher than the achievement rate against the total UK packaging waste stream in order to cover the difference.

⁴ http://www.valpak.co.uk/nav/redir.aspx?l=/docs/packaging/packflow_2012_final_report_19_11_2009.pdf

'Business as Usual' scenario: rollover of existing 2010 targets - tonnages

3.7 Since the UK is legally bound to maintain minimum recycling targets under the Packaging Directive, our minimum scenario is to roll forward the published target levels for 2010.

Table 2: 2010 business targets (%)

Materials	Targets
Paper	69.5
Glass	81
Aluminium	40
Steel	69
Plastic	29
Wood	22
Recovery	74

3.8 Table 3 illustrates the tonnages that would be delivered by maintaining these targets for the proposed period. For some materials, notably paper/card and wood, the material specific targets are lower (at least initially) than 2008 actual outturn. This is because these materials have a relatively low material-specific target but contribute towards helping to meet the 'general', overall recycling/recovery target (see paragraph 4.49 in the consultation document for a more detailed explanation). Tonnages in 2010 are also lower than 2008 because of the economic downturn.

Table 3: Aggregate tonnage delivered by BAU option

	2008 actual	2010	2011	2012	2013	2014	2015
Paper	3,062,946	2,521,554	2,541,727	2,562,061	2,574,871	2,587,745	2,600,684
Glass	1,613,310	1,684,563	1,701,409	1,718,423	1,735,607	1,752,964	1,770,493
Aluminium	50,214	58,661	59,130	59,603	60,199	60,801	61,409
Steel	417,261	371,043	371,043	371,043	371,043	371,043	371,043
Plastic	516,841	545,299	553,478	561,781	575,825	590,221	604,976
Wood	940,460	222,747	223,861	224,980	226,105	227,236	228,372
Material specific recycling	6,601,032	5,403,868	5,450,648	5,497,891	5,543,651	5,590,009	5,636,977
Overall recycling	6,601,032*	6,333,976	6,391,406	6,449,447	6,513,969	6,579,551	6,646,214
Overall recovery/recycling	7,027,923	6,884,757	6,947,180	7,010,269	7,080,401	7,151,686	7,224,146

	2016	2017	2018	2019	2020
Paper	2,613,687	2,626,756	2,639,890	2,653,089	2,666,354
Glass	1,788,198	1,806,080	1,824,141	1,842,382	1,860,806
Aluminium	62,023	62,643	63,270	63,903	64,542
Steel	371,043	371,043	371,043	371,043	371,043
Plastic	620,101	635,603	651,493	667,781	684,475
Wood	229,514	230,661	231,815	232,974	234,139
Material specific recycling	5,684,566	5,732,787	5,781,651	5,831,171	5,881,359
Overall recycling	6,713,982	6,782,879	6,852,929	6,924,156	6,996,586
Overall recovery/recycling	7,297,807	7,372,695	7,448,836	7,526,257	7,604,985

*Material specific recycling and overall recycling are equivalent in 2008 actuals as the material specific data reflects the contribution each material is also making as part of 'general' recycling.

3.9 Over time, the rise in the material specific targets erodes the element that will be recycled/recovered under general recycling/recovery. Hence, in 2010, the 'general' recycling accounts for around 1.48mT of packaging waste (6.884mT less 5.403mT). This

is being met by the excess in the material-specific recycling for paper, wood and steel; all of which are still below their 2008 actual levels of achievement. Therefore, the increase in the target for paper, and the small increase for wood are in fact simply the transfer of the target from 'general' recycling to material-specific recycling rather than actual increases in recycling requirements.

- 3.10 Consequently, only those incremental volumes above 2010 levels, that are also above actual levels (for which 2008 is the latest complete data available) are shown in Table 4, and reflect the additional obligated volumes for Option 1 (the 'do nothing' option).

Table 4: Incremental tonnage for BAU option

	2011	2012	2013	2014	2015
Paper	0	0	0	0	0
Glass	16,846	33,860	51,044	68,400	85,930
Aluminium	469	942	1,538	2,140	2,748
Steel	0	0	0	0	0
Plastic	8,179	16,482	30,526	44,922	59,677
Wood	0	0	0	0	0
Material specific recycling	25,494	51,284	83,108	115,462	148,355
Recycling /recovery	62,424	125,512	195,645	266,929	339,389

	2016	2017	2018	2019	2020
Paper	0	0	0	0	0
Glass	103,635	121,517	139,577	157,819	176,243
Aluminium	3,362	3,983	4,609	5,242	5,881
Steel	0	0	0	0	0
Plastic	74,802	90,304	106,194	122,482	139,176
Wood	0	0	0	0	0
Material specific recycling	181,799	215,804	250,381	285,542	321,300
Recycling /recovery	413,050	487,938	564,079	641,500	720,229

Proposed new targets: 70% by 2020 - tonnages

- 3.11 The accompanying consultation document describes the ambition of the Packaging Strategy for the UK to become one of the best performers in the EU by 2020. The latest published data (2006) on packaging recovery and recycling performance by member states shows that the highest achieving member states recovered 80-90% of all packaging (the highest was 95%), and achieved 70-80% recycling (the highest was 79%)⁵. Those countries achieving the highest levels appear to be reaching a performance plateau.
- 3.12 In order to achieve these levels of recycling, the consultation document proposes the following material specific and overall recovery targets.

⁵ http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/packaging_waste

Table 5: Proposed targets on individual UK obligated businesses

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Paper	72.0%	74.0%	76.0%	78.0%	80.0%	82.0%	84.0%	86.0%	88.0%	90.0%
Glass	82.0%	83.0%	84.0%	85.0%	86.0%	87.0%	88.0%	89.0%	90.0%	90.0%
Aluminium	43.0%	46.0%	49.0%	52.0%	55.0%	58.0%	61.0%	64.0%	67.0%	70.0%
Steel	71.5%	74.0%	76.5%	79.0%	81.5%	84.0%	86.5%	89.0%	91.5%	94.0%
Plastics	30.0%	35.0%	40.0%	45.0%	50.0%	55.0%	60.0%	65.0%	70.0%	75.0%
Wood	28.0%	34.0%	40.0%	46.0%	53.0%	59.0%	65.0%	71.0%	74.0%	74.0%
Overall recycling/recovery	75.0%	76.0%	77.0%	78.0%	79.0%	80.0%	81.0%	82.0%	83.0%	84.0%

3.13 This will result in the following tonnage being recovered/recycled, assuming that all obligated producers comply with their recovery obligations.

Table 6: Aggregate tonnage delivered by proposed higher targets

	2010	2011	2012	2013	2014	2015
Paper	2,521,554	2,633,156	2,727,949	2,815,686	2,904,232	2,993,593
Glass	1,684,563	1,722,414	1,760,853	1,799,889	1,839,530	1,879,783
Aluminium	58,661	63,565	68,544	73,744	79,041	84,438
Steel	371,043	384,486	397,930	411,373	424,817	438,261
Plastic	545,299	572,564	678,011	794,242	915,860	1,043,063
Wood	222,747	284,914	347,697	411,101	475,130	550,169
Material specific recycling	5,403,868	5,661,099	5,980,984	6,306,035	6,638,610	6,989,306
Overall recycling	6,884,757	7,041,061	7,199,735	7,367,445	7,538,263	7,712,264
Overall recycling/recovery	6,333,976	6,477,776	6,623,757	6,778,049	6,935,202	7,095,283

	2016	2017	2018	2019	2020
Paper	3,083,775	3,174,784	3,266,626	3,359,307	3,452,833
Glass	1,920,657	1,962,161	2,004,303	2,047,091	2,067,562
Aluminium	89,934	95,531	101,232	107,037	112,948
Steel	451,704	465,148	478,591	492,035	505,478
Plastic	1,176,053	1,315,041	1,460,244	1,611,884	1,770,194
Wood	615,515	681,500	748,130	783,639	787,558
Material specific recycling	7,337,638	7,694,165	8,059,125	8,400,994	8,696,574
Overall recycling	7,889,521	8,070,112	8,254,115	8,441,612	8,632,686
Overall recycling/recovery	7,258,359	7,424,503	7,593,786	7,766,283	7,942,071

3.14 These tonnages would deliver an overall achievement in 2020 of **71.9%**, all of which would be recycling. Additional information on the predicted percentage achievements by year can be found in the full consultation document.

3.15 As explained above for the base case, for some materials, notably paper/card and wood, the material specific targets are lower (at least initially) than 2008 actual outturn. Unlike the base case, over time, the rise in the material specific targets erodes fully the element of the obligation that will be recycled/recovered under general recycling/recovery.

3.16 Under the Government's preferred option, the *additional* tonnages that would be recovered/recycled, compared with the higher of either the 2008 actual outturn, or 2010 levels of recycling are shown in Table 8, and would mean an average annual increase per material (over those 10 years) as follows:

Table 7: average annual increase in tonnage

Paper	38,989
Glass	38,300
Aluminium	5,429
Steel	8,822
Plastic	122,490
Wood	0

Table 8: Additional increase in tonnage to meet the revised targets

	2011	2012	2013	2014	2015
Paper	0	0	0	0	0
Glass	37,851	76,290	115,326	154,966	195,219
Aluminium	4,904	9,883	15,083	20,381	25,777
Steel	0	0	0	7,556	21,000
Plastic	27,265	132,712	248,943	370,561	497,764
Wood	0	0	0	0	0
Material specific recycling	70,020	218,885	379,351	553,464	739,759

	2016	2017	2018	2019	2020
Paper	20,829	111,838	203,680	296,361	389,887
Glass	236,094	277,598	319,739	362,528	382,999
Aluminium	31,273	36,871	42,571	48,376	54,287
Steel	34,443	47,887	61,330	74,774	88,217
Plastic	630,754	769,742	914,945	1,066,585	1,224,895
Wood	0	0	0	0	0
Material specific recycling	953,393	1,243,935	1,542,265	1,848,624	2,140,286

4. COSTS AND BENEFITS

- 4.1 This cost-benefit analysis attempts to identify and quantify the range of social, environmental and economic impacts of increasing the recovery and recycling of packaging waste.
- 4.2 No quantifiable social impacts have been identified; however the environmental and economic impacts identified are discussed below.
- 4.3 This Impact Assessment doesn't explicitly unpick the effect of different instruments. Both the PRN system and the landfill tax will be contributing to meeting the targets, and the relative impact of these will depend upon the material in question. This analysis therefore would need further development in order to give a more definitive view on this issue.

Option 1: "Do nothing" – roll over existing targets

- 4.4 The option to maintain the 2010 targets against a prediction of an annual increase of total packaging waste arisings and obligated tonnage of between 0.5 – 1%, will mean that an additional 720kt of material will be recycled by 2020 (see Table 4).

Benefits

- 4.5 The benefits of increasing diversion of packaging waste away from landfill relate predominantly to greenhouse gas emissions savings, as well as resource savings for products throughout their life-cycles and therefore economic efficiency. Savings are accrued both directly through reductions in methane emissions from biodegradable waste being landfilled, and indirectly through avoided (fossil fuel) energy use in primary material or electricity production. These latter benefits are those accrued from increased recycling and energy from waste technologies.
- 4.6 The disamenity costs associated with avoided landfill have not been quantified in this impact assessment as there is no equivalent data for the disamenity impacts associated with other waste treatments. However, given the lower land requirements of non-landfill treatments it seems likely that there will be a net benefit resulting from landfill diversion.

Benefits from recycling materials

- 4.7 The material extracted from the waste stream has an inherent market value to the economy, representing the resources that would be wasted if it were sent to landfill. This value is insufficiently high, given the private costs of recycling, for companies to recycle the material themselves without government intervention. However, including the social benefits of recycling this material (i.e. including the value to society of the carbon and disamenity impacts) outweighs the social costs, making it an economically rational decision to recover the value (and benefits) of these materials.
- 4.8 All the packaging materials are traded in global commodities markets, but due to market fluctuations it is very difficult to assess the price of any material in future years. Therefore table 9 is based on recent material prices. Table 10 is the product of Tables 8 and 9 and shows the additional revenue that would be generated under Option 1 by the sale of the recovered material, noting that the price for wood negative in the market place, i.e. owners of this material pay for it to be taken.

Table 9: Average material (scrap) prices (as of Jan 2010)

Material	Price per tonne (£)
Paper	53
Glass	18
Aluminium	590
Steel	75
Plastic	110
Wood	(20)

Table 10: Associated material revenue – additional recycling from rolling over existing targets – discounted to present values (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.2	0.3	0.5	0.6	0.8
Alu'm	0.3	0.5	0.8	1.0	1.3
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	0.7	1.4	2.6	3.6	4.7
Wood	0.0	0.0	0.0	0.0	0.0

Overall recycling	1.2	2.3	3.8	5.3	6.7
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	2016	2017	2018	2019	2020	Total
Paper	0.0	0.0	0.0	0.0	0.0	0.0
Glass	0.9	1.0	1.2	1.3	1.4	10.5
Alu'm	1.5	1.7	2.0	2.1	2.3	17.5
Steel	0.0	0.0	0.0	0.0	0.0	0.0
Plastic	5.7	6.6	7.5	8.4	9.2	64.9
Wood	0.0	0.0	0.0	0.0	0.0	0.0
Overall recycling	8.1	9.4	10.6	11.8	12.9	72.0

Greenhouse Gas (GHG) Emissions

4.9 The key environmental benefit of the increase in targets will be the greenhouse gas savings associated with the diversion from landfill and the resource efficiency (in particular, the associated energy savings) of replacing virgin materials with recycled materials. For biodegradable products, there is significant benefit from reduced methane emissions. WRAP has identified the relative GHG savings from the recycling of a tonne of key materials - see Table 11.

Table 11: Carbon factors (CO₂ equivalent)

Material	Carbon factor (Tonnes of CO ₂ equivalent / tonne of material recycled)
Paper	1.320
Glass	0.315
Aluminium	9.000
Steel	1.280
Plastic	1.167
Wood	0.300

4.10 Using the additional tonnages of waste diverted, shown in Table 4, and the carbon factors in Table 11, the savings in GHG emissions associated with the additional recovery/recycling activity are as shown in Table 12.

Table 12: Avoided GHG emissions (CO₂ equivalent, in thousands of tonnes)

	2011	2012	2013	2014	2015
Paper	0	0	0	0	0
Glass	5	11	16	22	27
Aluminium	4	8	14	19	25
Steel	0	0	0	0	0
Plastic	10	19	36	52	70
Wood	0	0	0	0	0
Overall recycling	19	38	66	93	121

	2016	2017	2018	2019	2020	Total
Paper	0	0	0	0	0	0
Glass	33	38	44	50	56	301
Aluminium	30	36	41	47	53	278
Steel	0	0	0	0	0	0
Plastic	87	105	124	143	162	808
Wood	0	0	0	0	0	0
Overall recycling	150	179	209	240	271	1,387

4.11 In accordance with the latest guidance from DECC on the valuation of carbon in policy appraisal, the value of carbon varies depending on whether the reduction/increase in emissions occurs in traded or untraded sectors, or internationally. Traded meaning those sectors covered by the EU Emissions Trading System (ETS) for which a traded price is used (based in the short term on estimates of the future price of EU Allowances (EUAs)).

4.12 Outside of this sector, the 'non-traded price of carbon' is used, based on estimates of the marginal abatement cost (MAC) required to meet a specific emission reduction target. For reductions in emissions overseas, the shadow price of carbon is used⁶.

⁶ Since this IA was completed, there has revised guidance issued by DECC on valuation of international emissions reductions. Instead of the shadow price of carbon, the guidance states that such emission reductions should be valued at the traded price. These prices are not significantly different to the shadow price, although GHG benefits would be slightly lower overall than as stated in this IA.

These figures are shown in Table 14. The central estimates have been used for the calculations in this IA.

4.13 Consequently, for paper and wood, where the main carbon saving is from reduced methane emissions and energy from waste by incineration (which is non-traded), the non-traded price has been used. For glass, aluminium, steel and plastics, additional reprocessing, and the replacement of virgin materials, occurs both in the UK and overseas for which a combination of the traded price and shadow price of carbon are appropriate.

4.14 Based on PRN and PERN data for 2007 and 2008, the % of recyclate material exported for reprocessing is as shown in Table 13. This data has been used to calculate a weighted average carbon price for the benefits of recycling these materials, e.g. the price used to measure the benefits of glass recycling in 2011 is around £23.5 (22%*£29 + 78%*£22).

Table 13: % of material exported for reprocessing

	% Export
Paper	55%
Glass	22%
Aluminium	55%
Steel	45%
Plastic	61%

4.15 Using the central estimates shown below, the value for the GHG savings are shown in Table 15.

Table 14: Carbon prices for the traded, non-traded and overseas sectors (£)

	Traded			Non-Traded			International (Shadow Price of Carbon)
	Low	Central	High	Low	Central	High	
2010	12	22	27	26	52	78	28
2011	12	22	27	26	52	79	29
2012	13	22	28	27	53	80	29
2013	13	23	28	27	54	81	30
2014	13	23	29	27	55	82	31
2015	13	23	29	28	56	84	31
2016	13	24	29	28	57	85	32
2017	14	24	30	29	57	86	32
2018	14	24	30	29	58	87	33
2019	14	25	31	30	59	89	34
2020	14	25	31	30	60	90	34

Table 15: Present value of the GHG savings from rolling over existing targets (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.1	0.2	0.3	0.5	0.6
Aluminium	0.1	0.2	0.3	0.5	0.6
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	0.2	0.5	0.9	1.3	1.6

Wood	0.0	0.0	0.0	0.0	0.0
Total	0.5	0.9	1.5	2.2	2.8
	2016	2017	2018	2019	2020
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.7	0.8	0.9	1.0	1.1
Aluminium	0.7	0.8	0.9	1.0	1.1
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	2.1	2.4	2.8	3.2	3.5
Wood	0.0	0.0	0.0	0.0	0.0
Total	3.4	4.0	4.6	5.2	5.7
Discounted present value over 10 years (£m)					30.8

Costs

4.16 The costs of meeting the incremental change of this ‘do-nothing’ option comprise a variable cost of collection and sorting, either from households or from commercial companies. Drawing on work from WRAP⁷, the average cost for collecting and sorting co-mingled waste is around £100 per tonne (assuming an equal share of ‘urban’ and ‘rural’ waste). For commercial collections, the figure varies between around £50 per tonne and £110 per tonne depending on the volumes and locations of the collected waste. In some cases, the cost may be well above this range. Given that packaging waste is split 55:45 between commercial/industrial waste and municipal waste; this implies an average collection cost of around £90. Using this figure, the costs for the additional tonnages (set out in Table 4) are those given in Table 16 below .

Table 16: Collection costs of rolling over existing targets (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	1.6	3.0	4.4	5.7	6.9
Alu	0.0	0.1	0.1	0.2	0.2
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	0.8	1.5	2.6	3.7	4.8
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020
Paper	0.0	0.0	0.0	0.0	0.0
Glass	8.0	9.1	10.1	11.0	11.9
Alu	0.3	0.3	0.3	0.4	0.4
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	5.8	6.8	7.7	8.6	9.4
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					125.7

Offsetting reduction in the disposal cost of refuse to landfill

4.17 By increasing recycling, handlers of waste will be able to save resource costs of disposal to landfill, equal to the landfill gate fee plus the avoided cost of collecting mixed waste. On average, the gate fee is around £22 per tonne for the UK and the average ‘mixed waste’ collection cost is about £30 per tonne. The savings in disposal costs for each material are shown in Table 17. In aggregate, the present value for these savings

⁷ "Kerbside Recycling: Indicative Costs and Performance. Technical Annex.", Tables 14 and 15.

would be around £68.5m. In addition, there would be savings in cash outflow on landfill tax (estimated at around £94.1m), as shown in Table 18. However, for an IA looking at social cost-benefits, this element is excluded from the NPV assessment.

4.18 Landfill tax is set to increase over the period 2010-13, so the cost of disposal of waste to landfill will become a relatively more expensive option compared with alternative waste treatments. Landfilled material will be subject to the following prevailing rates of landfill tax:

- £48/t in 2010/11
- £56/t in 2011/12
- £64/t in 2012/13
- £72/t in 2013/14 (being maintained at this level until 2020)

Table 17: Savings in landfill disposal resource costs (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.8	1.6	2.4	3.1	3.8
Aluminium	0.0	0.0	0.1	0.1	0.1
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	0.4	0.8	1.4	2.0	2.6
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020
Paper	0.0	0.0	0.0	0.0	0.0
Glass	4.4	5.0	5.5	6.0	6.5
Aluminium	0.1	0.2	0.2	0.2	0.2
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	3.2	3.7	4.2	4.7	5.1
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					68.5

Table 18: 'Savings' in cash outflow on landfill tax

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.9	2.0	3.3	4.3	5.2
Aluminium	0.0	0.1	0.1	0.1	0.2
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	0.4	1.0	2.0	2.8	3.6
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020
Paper	0.0	0.0	0.0	0.0	0.0
Glass	6.1	6.9	7.6	8.3	9.0
Aluminium	0.2	0.2	0.3	0.3	0.3
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	4.4	5.1	5.8	6.5	7.1
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					94.1

Summary – costs and benefits under Option 1

4.19 The summary of costs and benefits are as set out in Table 19, indicated a net present value from rolling over existing targets of around £41m.

Table 19: Summary – Option 1: Present Value of Costs and Benefits (£m)

		2011	2012	2013	2014	2015	
Collection costs		(2.3)	(4.6)	(7.2)	(9.6)	(11.9)	
Revenues	Materials	1.16	2.26	3.83	5.33	6.75	
Savings	Landfill resource costs	1.28	2.49	3.90	5.23	6.50	
Benefits	Carbon	0.47	0.91	1.54	2.20	2.77	
Net benefit		0.56	1.10	2.12	3.16	4.10	
		2016	2017	2018	2019	2020	PV (10 years)
Collection costs	Average	(14.1)	(16.2)	(18.1)	(20.0)	(21.7)	(125.7)
Revenues	Materials	8.10	9.38	10.60	11.76	12.86	72.05
Savings	Landfill resource costs	7.69	8.82	9.89	10.89	11.84	68.53
Benefits	Carbon	3.43	3.97	4.55	5.22	5.70	30.75
Net benefit		5.12	5.99	6.91	7.89	8.67	45.60

Option 2: Proposed new targets of 70% by 2020

4.20 Under this option, higher volumes will drive higher anticipated costs as more, harder to obtain material is collected and sorted. For the benefits, the unit values are derived in the same way as set out under Option 1.

Benefits

Material revenues

4.21 Based on the materials values set out in Table 9, the additional revenues for the higher volumes (Table 8) under this option are as set out in Table 20. This additional revenue can be off-set against the cost of collection, sorting and delivering the additional material to reprocessors, and investment in infrastructure.

Table 20: Associated material revenue – additional recycling from 70% option compared with 2010 actuals (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.4	0.8	1.1	1.5	1.8
Alu'm	2.6	5.1	7.6	9.9	12.1
Steel	0.0	0.0	0.0	0.4	1.0
Plastic	2.4	11.5	20.9	30.0	39.0
Wood	0.0	0.0	0.0	0.0	0.0
Overall recycling	5.5	17.4	29.6	41.8	53.9

	2016	2017	2018	2019	2020	Total
Paper	0.5	2.7	4.8	6.7	8.6	23.4
Glass	2.1	2.4	2.6	2.9	2.9	18.5
Alu'm	14.2	16.2	18.0	19.8	21.5	127.1
Steel	1.6	2.1	2.6	3.1	3.5	14.2
Plastic	47.7	56.3	64.6	72.8	80.8	426.0
Wood	0.0	0.0	0.0	0.0	0.0	0.0
Overall recycling	66.1	79.6	92.7	105.3	117.2	609.1

Greenhouse Gas (GHG) Emissions

4.22 The avoided emissions and value of the benefits in greenhouse emission reductions are as set out in Table 21 and Table 22 respectively, using the additional volumes in Table 8 and the methodology explained under Option 1.

Table 21: Avoided GHG emissions (CO₂ equivalent in thousands of tonnes)

	2011	2012	2013	2014	2015
Paper	0	0	0	0	0
Glass	12	24	36	49	61
Alu'm	44	89	136	183	232
Steel	0	0	0	10	27
Plastic	32	155	290	432	581
Wood	0	0	0	0	0

Overall recycling	88	268	463	674	901
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	2016	2017	2018	2019	2020	Total
Paper	27	148	269	391	515	1,350
Glass	74	87	101	114	121	680
Alu'm	281	332	383	435	489	2,605
Steel	44	61	79	96	113	429
Plastic	736	898	1,067	1,244	1,429	6,865
Wood	0	0	0	0	0	0
Overall recycling	1,163	1,526	1,899	2,281	2,666	11,928

Table 22: Present value of the GHG savings from increased recycling above 2010 levels (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.3	0.5	0.8	1.1	1.3
Aluminium	1.1	2.1	3.2	4.4	5.4
Steel	0.0	0.0	0.0	0.2	0.6
Plastic	0.8	3.8	7.0	10.5	13.6
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020
Paper	1.3	6.6	11.8	16.9	21.9
Glass	1.6	1.8	2.0	2.3	2.3
Aluminium	6.5	7.4	8.4	9.6	10.4
Steel	1.0	1.3	1.7	2.0	2.3
Plastic	17.3	20.4	23.9	27.8	30.9
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					296.1

Costs

Introduction

4.23 Under this option, the main requirement is to improve waste collection as, for most materials, there appears to be sufficient reprocessing capacity. The detailed costs for greater collection vary by material. Our initial views on these likely costs have been drawn from existing research and modelling around which there is a good deal of uncertainty and many assumptions. We have therefore used ranges for the costs where appropriate. In addition, improvements in the collection infrastructure are likely to be supported by a national campaign to induce behavioural change from households.

Coverage and capture rates from the household waste stream

4.24 Recent industry analysis indicates that, in most cases, to achieve increasing packaging recycling and recovery targets as shown in the preferred option more material will need to be extracted from the household waste stream⁸. This would also be true for a scenario where the 2010 targets are maintained. Whilst some industry stakeholders

⁸ http://www.valpak.co.uk/nav/redir.aspx?l=/docs/packaging/packflow_2012_final_report_19_11_2009.pdf

believe that more can still be achieved from the Commercial and Industrial (C&I) waste stream, mainly through increased SME collections and recycling, it is felt that the majority of C&I material is already collected, so there will be a greater reliance on recycling household waste to achieve new targets for certain materials (glass, aluminium, steel, plastics).

- 4.25 WRAP data shows that currently 93% of the England and Wales is served by a kerbside collection system, where materials are separated by households for collection in specially designed vehicles, and that 100% of the UK is covered by some form of bring system⁹.

Table 23: Local Authority collection systems, England, 2008/09

Scheme Type	Number of Authorities*
Kerbside Sort	184
Co-mingled (single stream)	141
Two Stream	79
Single Material	17
None	1

* This information represents WRAP's best understanding of kerbside collection schemes being operated by local authorities during 2008/09. Where an authority operates more than one type of scheme (e.g. single material collection to flats and a kerbside sort collection to households) each scheme has been counted. Therefore this number adds up to more than the total number of Collection and Unitary authorities in England.

- 4.26 These collection services provide coverage for the specific packaging materials set out in Table 24.

Table 24: % of households covered by collection service (2007)

	Kerbside Coverage	Bring Coverage
Aluminium	85%	77%
Glass	68%	94%
Paper & Board	54%	75%
Plastic Bottles	67%	67%
Mixed Plastics	11%	7%
Steel	85%	76%

- 4.27 This indicates that for some materials there is some scope to extend the coverage of collection systems in order collect more, particularly for paper/board and plastics.

- 4.28 Further analysis undertaken by PackFlow¹⁰ showed that in 2007 less than half (42-44%) of household packaging consumed in the UK was captured for recycling. The extent to which this was met by kerbside collection or bring/CA collection is shown in Table 30, with almost two-thirds (64%) collected through kerbside schemes (i.e. 27/42).

Table 25: % of household packaging captured (2007)

⁹ http://www.wrap.org.uk/downloads/Kerbside_recycling_performance_in_England_0708_-FINAL_041209.4ffd4c5f.8168.pdf

¹⁰ http://www.valpak.co.uk/nav/redir.aspx?l=/docs/packaging/packflow_2012_final_report_19_11_2009.pdf

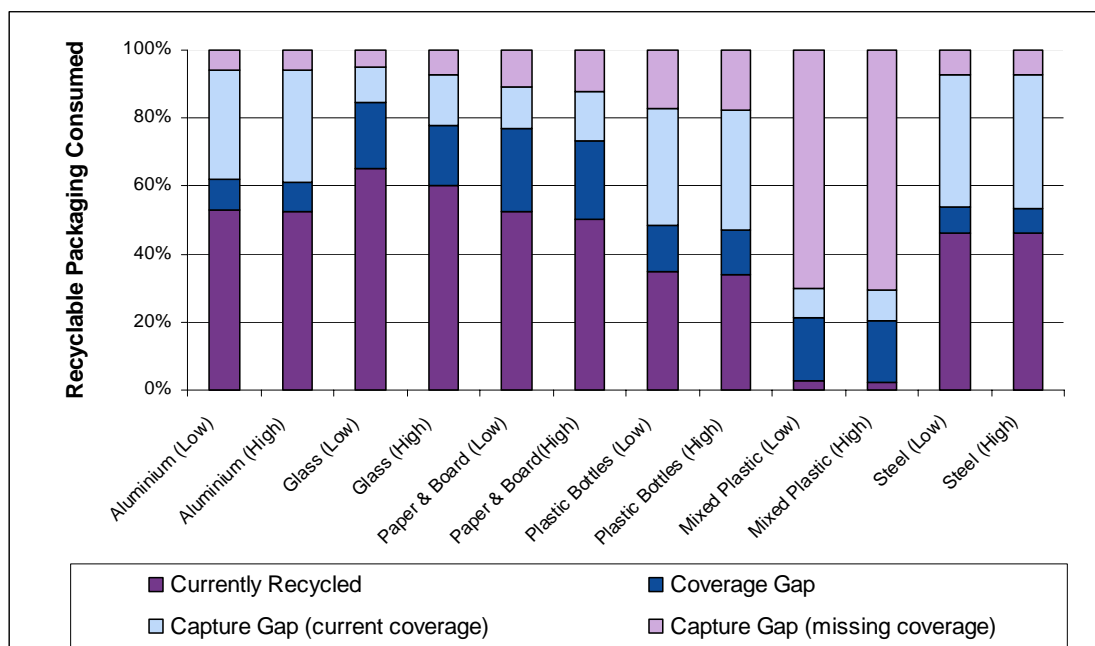
	Household Capture Rate	Kerbside Capture Rate	Bring/CA Capture Rate
Aluminium	42-43%	38%	4-5%
Glass	60-65%*	37-40%	23-25%
Paper & Board	48-50%*	26-27%	23-24%
Plastic Bottles	34-35%*	27%	7%-8%
Mixed Plastics	1%	1%	0%
Steel	46%*	41-42%	5%
TOTAL	42-44%*	27-28%	15-16%

* Does not sum due to rounding

4.29 Therefore, a large amount of packaging material is still not being captured from the household stream. Where collections systems are in place, kerbside collection systems tend to have higher capture rates than bring systems.

4.30 By combining the coverage and capture rate data sets, the Packflow industry report estimates the amount of *untapped* quantities of packaging resulting from a lack of collection infrastructure/coverage and/or poor householder participation and subsequent capture rates (below)¹¹. The report focuses on the 'gaps' in coverage or capture identified in kerbside collections, as this method of collection is considered to present the largest opportunity for improving household collection rates. Improvement or enhancement of existing infrastructure would also appear to provide the most cost effective route for industry to access material to achieve compliance.

Figure 1: Percentage Capture & Coverage Gaps of Recyclable Packaging (2007) (PackFlow)



4.31 Within the Packflow report, the 'capture gap (current coverage)' indicates the potential additional material which could be collected if each household with an existing kerbside service recycled all their recyclable packaging (therefore a 100% yield); the 'coverage gap' indicates potential additional tonnages which could be achieved if all households had kerbside service and all participated at the current average for kerbside yields.

¹¹ http://www.valpak.co.uk/nav/redir.aspx?l=/docs/packaging/packflow_2012_final_report_19_11_2009.pdf

Table 26: Tonnes of packaging waste not captured by household collection (using 2007 data)

	Currently Collected	Coverage Gap	Capture Gap (current coverage)	Capture Gap (missing coverage)
Aluminium	45k	7k	27k - 28k	5k
Glass	1332k	391k	215k - 335k	103k - 160k
Paper & Board	449k	207k	107k - 127k	92k - 110k
Plastic Bottles	185k	72k	182 - 192k	91k - 96k
Mixed Plastic	15k	107k	51k	404k - 419k
Steel	176k	29k	148k - 150k	27k - 28k
TOTAL	2202k	813k	729k - 885k	722k - 818k

4.32 Based on 2007 waste arising data, the report estimates that around 813,000 tonnes of material arising in the household was “not captured”. The report concludes that the most effective way to increase the level of recycling is to address the “capture” gap, by extending collections and by encouraging a more effective use of existing systems, in terms of material yields and overall participation.

4.33 Therefore, it can be concluded that much of the additional packaging material required to meet increased targets could be delivered by a focus on increasing capture and yields from existing systems, and industry working with local authorities to support kerbside systems.

4.34 Previous research has shown that as participation and yields increase there is a commensurate rise in the overall quality of recyclate. An increase in the quality, and the amount of recyclate, will lead to an overall increase in revenue derived from the recovered material.

Behavioural Change

4.35 The costs of **campaigns to achieve behavioural change in householders** are difficult to assess, and the effectiveness of such campaigns is difficult to measure. However, national campaigns such as ‘Recycle Now’ and ‘Love Food, Hate Waste’ have had a significant impact in driving change.

4.36 The ‘Love Food, Hate Waste’ programme is a useful comparator. The budget for the first year is approximately £2.65 million for the core campaign, but this excludes research costs, R&D projects, salaries and overheads and the separate budget Defra has to support the local delivery of the programme. From this investment it is estimated that around 162,000 tonnes of food waste has been diverted from landfill (equivalent to 600kT CO₂ saving).

4.37 Whilst this is only a crude comparison, it provides a useful indicator of the probable costs of a national campaign to influence householders recycling behaviour. For this IA, we have assumed a single, annual outlay of £3m, attributed between the targeted materials.

Improving collections

4.38 To achieve targets, the key changes to existing collection systems are likely to be:

- Addition of cardboard collection to existing system;
- Addition of plastics (either bottles or mixed plastics) to existing system;

- Switch to collection methods for glass which allow optical colour sorting (eg move to bring banks, or two-stream comingled collections, or to kerbside sort systems which do not involve compaction).

4.39 In the absence of tangible, robust data for many of the required changes, the following section seeks to provide expected estimated costs, sometimes derived using a range of illustrative examples of likely cost implications.

Paper/Board

4.40 Very little data is available on the marginal cost of including paper/board (in this case usually the addition of board) to an existing collection system, and only 54% of LAs have a collection system that includes this material (most are restricted to paper only).

4.41 However, based on data from a representative shire district council, the addition of **board and plastic bottles** to an existing single stream collection system cost an additional £300k per annum for an average sized district (c 47,000 households), i.e. around £6-7 per household, or £80-95 per tonne.

4.42 This is in addition to the improvements to the infrastructure needed to cope with higher volumes, namely the purchase of containers (boxes) for households to store and provide the recyclables at the kerbside - the net cost of purchase and delivery for these is around £4-5 per household. A proportion of this stock of boxes will need to be replaced annually at an expected replacement cost of around £1 per household per annum. Around half of which might be expected to be for the plastic collection rather than paper/board.

4.43 To service this requirement, the waste management contractor has had to re-design its vehicle with a "top deck" storage compartment. The capital cost of the new vehicles and the fact more will be needed (because the number of households that can be collected in one day by one vehicle is a bit lower than the under the previous system) a further additional cost per household of around £6-7 (£282k-£329k overall for c. 47,000 households). However, it seems reasonable to assume that at least half of these fixed costs relate to the larger, lighter, plastic items. For paper/board therefore, an additional cost of £3 per household has been included.

4.44 Hence, in summary, for household collections:

- The expected **fixed** costs to collect additional paper/board amount to £5-6 per household (for containers and modifications to vehicles); with
- **Variable**, running costs of £6.5-7.5 (including £0.5 per annum for replacement boxes per household) – equivalent to around £90-100 per tonne¹²;

4.45 For commercial collections, drawing on industry data, the average cost for collections varies between £50 and £110 depending on the type of waste and collection 'density' (i.e. number of sites and quantity of waste within an area) for which there are economies of scale. In general, it is often the case that commercial collections are cheaper than household collections on average. Given this, we have taken the average cost for commercial collection of £80 per tonne.

¹² The median paper/board waste per household is around 73kg - source: Kerbside material-specific dry recycling performance, England 2007/08.

4.46 There is a 55:45 ration between commercial collections and household collections. Using this, the average weighted cost of collections would be between around £85 to £90 per tonne for additional paper/card. This amounts to around £83k to £92k in present value terms for the additional tonnages shown in Table 8.

Plastics

4.47 For plastics, recent work by WRAP shows that the collection cost of adding mixed plastics (including bottles and domestic film) to an existing system is between £224 and £381 for a co-mingled collection stream (one/two stream) and between £331-551 for a kerbside sort system¹³ per tonne. The modelling of kerbside sort costs by WRAP is driven mainly by increases in vehicle loading times, around which there is relatively high uncertainty¹⁴.

4.48 The element of these costs attributed to adding just bottles to an existing collection system is between £74 and £149 for one/two stream co-mingled collection system, £150 to £232 for domestic film. The cost of adding bottles to a kerbside sort system accounts for between £287 and £334, with £44 to £217 attributable to domestic film.

4.49 In practice, to add both mixed plastics and bottles, would not be a simple question of combining the separate costs associated with each. If a Local Authority was intending to add both to its existing system, the combined cost is likely to be significantly lower than the ranges we have shown.

4.50 Furthermore, it should be possible to achieve the targets for 2011 and 2012 by increasing the participation and yields from existing bottle and mixed plastics household collections and the levels from C&I sources. This would mean that the costs modelled above would not actually be incurred until 2012-13 as changes to existing infrastructure was rolled-out to meet new requirements. However, a conservative approach has been used for this IA with additional costs assumed to begin from 2011.

4.51 However, drawing on work from WRAP, we anticipate that the collection of bottles will take precedent (being the cheaper alternative - £212 per tonne), followed by domestic film. Therefore, we have used the average costs for adding bottle collection for additional volumes in the period to 2014/15 and average costs of adding bottles and film for the period thereafter (£278 per tonne).

4.52 For commercial costs, the range in collection costs for materials in general is between £50 to £110 per tonne. Given that plastic collection costs are generally higher than for other materials, this IA uses a figure at the top end of this range of £110 per tonne. For collections of bottles and film, this IA uses the higher cost of £145 per tonne (using the same cost ratio that applied to household collections of £278/£212), i.e. around 33% above the £110 per tonne figure for bottles only.

4.53 Using the ration of 55:45 between commercial and household collections, this gives an average cost of between £155 per tonne to £205 per tonne. Given the range of costs and options available, it seems reasonable that the estimation for this IA should

¹³

http://www.wrap.org.uk/downloads/The_Financial_Costs_of_Collecting_Mixed_Plastics_Packaging.40588df5.7205.pdf

¹⁴ For instance, there may be scale efficiencies in loading vehicles where more than one material is collected. This would mean the costs currently being modelled are too high.

include a variance around this of +/- 10%, though arguably the market might make even better use of the cheaper cost options. Using the central estimate, costs would be expected to increase gradually from an additional £4.1m in 2011 to £178m by 2020. In present value terms, the central estimate would be around £900m over 10 years.

Glass

- 4.54 There are a range of potential options available to ensure that the additional material is collected and reprocessed to achieve compliance with any new recovery and recycling targets.
- 4.55 The least cost option is likely to be a major increase in the use of bottle banks. Whilst bring banks are a relatively cheap option, analysis shows that they produce the lowest yield of any collection system per head of population served (though quality is very high). Any such move would mean the reversal of a general trend by local authorities away from bring systems toward kerb-side systems principally aimed at producing increased yields.
- 4.56 Industry estimates that each bottle bank costs about £350, with an expected 10 year write off period. In order to match the density of bottles banks in other EU member states, the UK would need to achieve a density of 1 bank per 1250 head of population (the current UK ratio is 1:2500). This would mean an increase of around 24,000 bottle banks (at a cost of £8.4m).
- 4.57 A typical bottle bank vehicle with one operator can collect 18 tonnes of colour separated glass per day and up to 100 tonnes per week. It cost £2000 – £2250 a week to run a single vehicle, i.e. £20-£22.5 per tonne. This does not include haulage to processing plant or local storage costs (LA facility). We have allowed a further £5 per tonne for this.
- 4.58 It is not possible to make a more detailed estimation without further data on the volume and distribution of existing bottle banks, pass and empty rates for the collection vehicle and haulage costs, but we consider the above costs to be a reasonable initial approximation.
- 4.59 Another option (that appears more likely to generate the volumes of material required than one based on bottle banks) is to use a kerbside collection, or either a one-stream or two-stream co-mingled collection. WRAP data on gross collection costs indicates that the current cost associated with a kerbside system which collects glass alongside paper, metal cans (steel and aluminium) and plastics would be around £85-120 per tonne (for collection only)¹⁵ in an urban area (£85-140 per tonne for a rural area). It is estimated that a single stream co-mingled system that collects the same materials costs £60-100 per tonne. These are modelled costs around which WRAP acknowledges there is a good deal of uncertainty.

¹⁵ http://www.wrap.org.uk/downloads/Kerbside_collection_report_160608.d9782b78.5504.pdf

4.60 NB For co-mingled systems the increase in yield resulting from collecting glass has the effect of reducing the net cost per tonne of all targeted materials despite the fact that there will be a higher MRF gate fee¹⁶. Collecting glass can increase the yields in a rural area by 42-51 kg/hh/yr and in urban areas by 31-37 kg/hh/yr depending on the residual waste collection frequency. This can result in a reduction in the net cost of collection of:

- around £11 per targeted tonne in urban areas; and
- between £14 and £22 per targeted tonne in rural areas.

4.61 So, whilst a move to kerbside system is likely to cost an additional £85-140 per tonne (depending on the existing system and infrastructure), this can be offset by increased yields and the higher material revenue/reduced gate fee (depending on the precise contractual arrangements of the waste management contract). A conservative approach has been taken for this IA, given the increased targets on all other materials, and no offset made for this additional revenue.

4.62 For commercial collections, we have used the average cost in the range of £50-£110 per tonne, and have applied the 55:45 split between commercial and household collections to derive a weighted average cost per tonne.

4.63 In present value terms, the costs over 10 years for meeting the packaging target would be between £140m and £166m. NB Bottle banks, if successful, would be much cheaper at around £52m over 10 years.

4.64 The actual costs of re-specifying collection systems, would not be a simple question of adding the separate costs associated with a new system for glass to the current costs. The proposed change would most likely be part of a larger, re-specification of the contract and would encompass all materials to be collected.

Steel

4.65 The amount of steel packaging being recycled currently exceeds target and is expected to do so for several years to come. Based on the planned targets in our consultation, steel would be expected to recycle an additional 88-89kT per annum by 2020 (from 417,261 tonnes in 2008 to 505,478 tonnes in 2020).

4.66 Industry information predicts that new technology coming on stream, in combination with joint working with local authorities (to improve kerbside collection from households) should meet the increased demands for packaging recycling. Assuming new investments in [MBT/EfW] last at least an expected 5 years, the annual equivalent cost would be around £20/tonne.

4.67 Based on joint work with around 50-75 Local Authorities, and assuming the upfront costs to improvements to kerbside collection are effective for around 10 years, the expected cost for this element of the change to collection is likely to be in the range of £30-£45 per tonne per annum.

4.68 The expected weighted average cost for additional steel packaging is therefore expected to be around £25 per tonne per annum.

Aluminium and Wood

¹⁶ In many cases, there is a reduced gate fee for colour sorted glass.

4.69 For aluminium, in the absence of better market information, we have used average collection costs of £100 for household collections and £80 for commercial, similar to Option 1. However, it is anticipated that the costs and requirements will be lower than this with innovation and investment along the lines pursued in the steel industry.

4.70 For wood, the collection costs are assumed to be implicit within the negative market value for wood – effectively, producers of waste wood pay around £17 per tonne for wood to be taken away and recycled.

Summary

4.71 In aggregate, the anticipated range in collection costs (including publicity costs) are as set out below in Tables 27 and 28.

Table 27: Collection costs - low

Collection costs - low					
	2011	2012	2013	2014	2015
Paper	0.8	0.0	0.0	0.0	0.0
Glass	4.0	6.2	9.1	11.8	14.4
Alu	1.2	0.9	1.3	1.7	2.1
Steel	0.0	0.0	0.0	0.2	0.5
Plastic	4.6	18.1	32.8	47.1	79.7
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020
Paper	2.7	12.8	18.6	24.1	29.3
Glass	16.8	19.1	21.3	23.3	23.8
Alu	2.4	2.8	3.1	3.4	3.7
Steel	0.9	1.1	1.4	1.7	1.9
Plastic	97.5	115.0	132.1	148.7	165.0
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					1108.8

Table 28: Collection costs - high

Collection costs - high					
	2011	2012	2013	2014	2015
Paper	0.8	0.0	0.0	0.0	0.0
Glass	4.5	7.4	10.8	14.0	17.0
Alu	1.2	0.9	1.3	1.7	2.1
Steel	0.0	0.0	0.0	0.2	0.5
Plastic	5.4	21.9	39.8	57.2	96.9
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020
Paper	3.0	14.3	20.5	26.4	31.9
Glass	19.9	22.6	25.1	27.5	28.1
Alu	2.4	2.8	3.1	3.4	3.7
Steel	0.9	1.1	1.4	1.7	1.9
Plastic	118.6	139.8	160.6	180.9	200.7
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					1325.4

Collection costs assumptions

4.72 In all the above cases, the analysis has generally included additional costs from a short run perspective, even though longer-term planning is possible and may be more cost-effective. In doing so, it assumes there is sufficient spare capacity for the collection and handling of the additional tonnages overall, i.e.:

- No need to increase collection pass rates (i.e. Frequency of collections)
- Similarly, no need to increase emptying frequency of vehicles
- No need for additional compaction infrastructure, or retro-fit bays
- No need to increase staff numbers except where already explicitly included above, e.g. in additional vehicle running costs.

4.73 We would welcome any comments regarding these data assumptions.

Resource savings

4.74 The resource savings of avoided disposal costs equals £711.7m in present value terms over 10 years.

Table 29: Savings in landfill disposal resource costs (£)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	2.0	4.0	6.0	8.1	10.2
Aluminium	0.3	0.5	0.8	1.1	1.3
Steel	0.0	0.0	0.0	0.4	1.1
Plastic	1.4	6.9	12.9	19.3	25.9
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020
Paper	1.1	5.8	10.6	15.4	20.3
Glass	12.3	14.4	16.6	18.9	19.9
Aluminium	1.6	1.9	2.2	2.5	2.8
Steel	1.8	2.5	3.2	3.9	4.6
Plastic	32.8	40.0	47.6	55.5	63.7
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					390.9

Summary

4.75 In summary, the proposed targets would save resources in terms of materials, reduced GHG emissions, and lower disposal costs. These are partly offset by the higher costs of collection, especially for plastics. However, there is an anticipated net benefit of around £32m from this revised target.

Table 30: Summary of Present Value of Costs and Benefits (£)

		2011	2012	2013	2014	2015
Collection costs	Low	(10.5)	(25.2)	(43.2)	(60.8)	(96.7)
	High	(11.9)	(30.2)	(51.8)	(73.0)	(116.5)
Revenues	Materials	5.49	17.44	29.60	41.77	53.86

Savings	Landfill resource costs	1.28	10.63	17.79	25.08	32.39	
Benefits	Carbon	0.47	6.47	11.05	16.16	20.87	
Net benefit	High	(3.26)	9.35	15.28	22.18	10.45	
	Low	(4.66)	4.36	6.63	9.98	(9.34)	
		2016	2017	2018	2019	2020	PV (10 years)
Collection costs	Low	(120.3)	(150.8)	(176.5)	(201.2)	(223.7)	(1,108.8)
	High	(144.7)	(180.6)	(210.7)	(239.8)	(266.2)	(1,325.4)
Revenues	Materials	66.09	79.63	92.69	105.28	117.24	609.08
Savings	Landfill resource costs	40.33	50.84	60.90	70.53	78.90	388.67
Benefits	Carbon	27.61	37.51	47.83	58.64	67.79	294.40
Net benefit	High	13.72	17.20	24.97	33.23	40.25	183.37
	Low	3.03	4.61	15.69	27.89	37.97	(33.21)

4.76 These costs have been measured against a base case of rolling over existing targets. However, the impact of increases in landfill taxes will increase the incentive on handlers of waste materials to divert waste from landfill.

Sensitivity – effect of landfill tax on quantities

4.77 One factor affecting future recycling levels is the relative cost of recovery/recycling rather than disposal. Until recently, disposal has clearly been the lowest cost waste management option. However, with the increases in landfill tax over the period 2010-13, landfill will become a relatively more expensive option compared with alternative waste treatments. Landfilled material would be subject to the following prevailing rates of landfill tax:

- £48/t in 2010/11
- £56/t in 2011/12
- £64/t in 2012/13
- £72/t in 2013/14 (being maintained at this level until 2020)

4.78 On average, landfill will cost around £100 per tonne (rising to £120) based on:

- £30 for the average cost of collection per tonne of mixed waste;
- Landfill tax rates;
- An average gate fee of £22 per tonne (based on the WRAP Gate Fee Survey report¹⁷).

4.79 Comparing this with the average cost of say paper/board collection of between £90-105 per tonne, it can be seen that initially (with landfill tax at £48 per tonne) the cost of disposal is around £103 per tonne. This is broadly in line with the collection for reprocessing option, but this is less the case as landfill tax increases over time, rising a further £24 per tonne or 25% over 3 years.

4.80 Over time therefore, it is anticipated that a larger proportion of waste will be diverted from landfill (into recovery or recycling) based on the relative costs of the end-of-life options for various materials (and thereby the marginal costs of separate collection/sorting and

¹⁷ <http://www.wrap.org.uk/downloads/W504GateFeesWEB.dc5cedfb.7613.pdf>

reprocessing). The responsiveness of waste diverted from landfill to an increase in landfill tax can be measured using an elasticity (i.e. a measure of the % change in waste diverted to a % change in landfill tax). There is a large amount of uncertainty over the estimate of these elasticities, with very limited available empirical data available. However, it is reasonable to assume there is some effect, and that this will be greater in the medium to long term as alternatives to landfill disposal are developed, and waste managers adjust their behaviour in response to the changes in relative prices.

4.81 Given this uncertainty, a relatively conservative estimate of between 0.1 and 0.5 has been assumed for this sensitivity. This would indicate diversion of waste from landfill of between 0.3 million tonnes and 1.6 million tonnes as shown below.

Table 31: Estimated additional waste diverted from landfill due to landfill tax increases

Elasticity	2011	2012	2013	2014	Total
0.1	110,278	90,976	77,706	67,937	346,897
0.3	330,833	261,900	216,341	183,933	993,007
0.5	551,388	418,121	333,656	275,674	1,578,839

4.82 Assuming an elasticity in the centre of this range, i.e. of 0.3, and assuming that this applies equally to all materials, then a landfill tax increase might be expected to encourage the diversion of waste from landfill as shown in Table 32.

4.83 However, this will not happen without the appropriate collection and recycling infrastructure being in place. The costs (and benefits) for the expansion of which have been set out above.

Table 32: Additional waste diverted from landfill per material (tonnes) - assuming an elasticity of 0.3

	2011	2012	2013	2014	Total
Paper	76,568	60,489	49,531	41,724	228,312
Glass	62,315	49,333	40,620	34,417	186,684
Aluminium	5,373	4,245	3,495	2,961	16,074
Steel	18,297	14,333	11,671	9,775	54,076
Plastic	117,740	93,701	78,434	67,602	357,477
Wood	50,540	39,800	32,590	27,454	150,383
Total					993,007

4.84 Deducting the estimates shown in Table 28 from those shown in Table 7 provides a revised estimate of the increase in packaging recycling that is driven 'exclusively' by the revised targets. These figures are shown in Table 33 below.

Table 33: Additional waste recycling attributable to the new targets - after taking into account the effect of landfill tax increases

	2011	2012	2013	2014	2015
Paper	35,033	69,338	107,544	154,366	243,727
Glass	0	0	0	0	8,535
Alu	0	0	0	1,267	5,865
Steel	0	0	0	0	13,142

Plastic	0	0	0	13,084	140,287
Wood	0	0	0	0	10,950
	2016	2017	2018	2019	2020
Paper	333,909	424,918	516,760	609,441	702,967
Glass	49,409	90,913	133,055	175,843	196,314
Alu	10,547	15,315	20,170	25,113	30,145
Steel	26,585	40,029	53,472	66,916	80,360
Plastic	273,277	412,265	557,468	709,108	867,418
Wood	44,167	77,708	111,573	145,766	159,003

Regulatory administration costs

4.85 The administrative cost of the PRN compliance system is currently estimated to be around £2 of the price of a PRN. Most participants are already registered within the scheme, and any additional regulatory administration burden is anticipated to be very low, and not increase materially with increases in volumes.

5. Equity and Fairness

5.1 The proposed changes have no undue effect on rural areas, racial groups, income groups, gender groups, age groups, people with disabilities, or people with particular religious views.

6. Consultation with small businesses: the small firms impact test

6.1 Businesses that do not simultaneously satisfy the two threshold tests in the Regulations (i.e. an annual turnover in excess of £2m and handle more than 50t of packaging) are excluded from the producer responsibility obligations in the Regulations. The proposed changes do not affect small businesses below these thresholds.

7. Competition assessment

7.1 The proposed target scenarios will affect the recovery and recycling obligations of approximately 6,500 businesses in the UK. The costs incurred under any new targets (in the same way as for existing targets) will be greater for some businesses than others, since the costs are related to the amount of packaging the business handles. Therefore, the more packaging a business handles the larger the obligation and the higher the likely costs of meeting that obligation.

7.2 The Government does not expect the proposals to affect the current market structure or change the number or size of firms. New businesses will not face higher charges than existing companies and the proposals should not restrict businesses choice of products. The Government is not aware of the industry being characterised by technological change that would radically alter the state of the market.

7.3 The Government have examined competition in the recycling market, material specific market (e.g. glass and plastic) and the end user market (e.g. the market for bottles). In general, the Government has been unable to identify markets where there are serious competition concerns. Competition in the recycling market is unlikely to be adversely affected as a result of adopting any of the proposed options and related targets. Indeed, the setting of future targets for recycling of particular materials may well increase demand for

recycling and this could lead to new entry in the market and increase competition in recycling services.

7.4 The proposal sets material specific targets and may therefore cause a distortion in the market for particular types of packaging. An example of this is the market for bottles where glass currently faces a higher recycling target than plastic. This recycling differential could put glass manufacturers at a disadvantage, for example when fillers are selecting the container for their goods, although plastics have greater difficulties in terms of collection, sorting and end-use markets. However, the proposed new targets will the targets for all the materials to similar levels and so will counter-act this effect.

7.5 It is anticipated that the increased cost of this regulation will be small in relation to a manufacturers total costs. Therefore, the Government does not believe that competition will be significantly affected in either this or other sectors with potentially high or differing recycling rates e.g. the aluminium and steel markets.

8. Enforcement and Sanctions

8.1 The Packaging Regulations are enforced by the Environment Agency in England and Wales, by the Scottish Environmental Protection Agency in Scotland and by the Northern Ireland Environment Agency.

8.2 The proposed changes to the targets and this Impact Assessment do not include proposals for additional sanctions.

9. Monitoring and Review

9.1 The UK packaging system is monitored continually by Government, the Agencies, the Advisory Committee on Packaging and industry generally.

9.2 The Advisory Committee on Packaging, which represents the packaging industry, also monitors the effectiveness of the Packaging Regulations and advises Government as and when changes are needed. The Government expects the Committee to continue to provide input in the future.

9.3 Accredited reprocessors and exporters are required to provide quarterly returns to the Agencies, which include data on the amount of reprocessing that has taken place that quarter. This enables the Government to track progress throughout the year against packaging targets. This data is also published on the Environment Agency website so that industry too can monitor the UK's performance.

9.4 Each year, the Department produces a Data Note which shows current and historical packaging data including for instance the amount of reprocessing that has taken place each year and the corresponding information on PRN and PERN revenue.

9.5 Furthermore, the UK is required to provide the European Commission with data, 18 months after the end of each year obligation year.

10. Consultation

Within Government

10.1 The Department for Business, Innovation and Skills (BIS), Treasury, DECC, CLG, Scottish Government, Welsh Assembly Government, Department of Environment Northern Ireland,

Environment Agency, Northern Ireland Environment Agency (NIEA), Scottish Environmental Protection Agency (SEPA) have all been consulted.

Public Consultation

- 10.2 This Impact Assessment accompanies a government consultation document and presents overall costs and benefits of the proposals. Government welcomes responses from as wide an audience as possible with respect to the issues set out in the consultation paper.
- 10.3 Informal consultation with the ACP, key materials organisation and trade bodies, other government departments and regulators took place in developing a number of the proposals contained within this Impact Assessment and consultation document.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	<i>Results in Evidence Base?</i>	<i>Results annexed?</i>
Competition Assessment	Yes	No
Small Firms Impact Test	Yes	No
Legal Aid	No	No
Sustainable Development	No	No
Carbon Assessment	Yes	No
Other Environment	No	No
Health Impact Assessment	No	No
Race Equality	Yes	No
Disability Equality	Yes	No
Gender Equality	Yes	No
Human Rights	Yes	No
Rural Proofing	No	No

Annex

PRN/PERNs mechanism and cashflows

1. Over the period of operation of the producer responsibility system and the requirement to show evidence of compliance in the form of Packaging Recovery Notes/ Packaging Recovery Export Notes (PRN/PERNs), the overall cost of PRN/PERNs to producers has remained relatively stable on average; rising slightly as targets have increased. There have been significant variability and price spikes for short periods for particular materials, as would be expected in a market. The relative stability has been regarded as evidence that the system can compensate for incrementally rising targets with costs returning to an 'equilibrium level' that reflects the additional cost to the existing waste management system of extracting the required material from the waste stream.
2. In theory, in a functioning market with few imperfections, the additional PRN/PERN cash flows should reflect the costs of collecting, sorting, and transporting the additional waste to the reprocessor, minus the revenues from the sale of the material collected at the reprocessor gate¹⁸ and the 'costs avoided' of collecting the materials as refuse and disposing these to landfill (see Box 1).
3. It is then left to the market to find the most cost effective ways of working collaboratively across the supply chain to carry out investments in the recycling infrastructure, to be innovative and to exploit new markets. Inevitably, markets are not perfect and the relative costs of compliance with the packaging requirements will depend on the relative knowledge and bargaining powers of producers, waste managers and local authorities and vary across the country depending on relative levels of demand/supply for waste materials.
4. The market mechanism used to achieve targets has delivered compliance with costs associated with PRN/PERNs over the last 5 years that have been between £45m and £64m per year, despite constantly rising targets. Where annual compliance costs have exceeded this range (2005 and 2008/9), the underlying cause can be attributed to factors external to the system (such as global drop in demand for material, or improper activity in the market).

Box 1: Costs for collection of household packaging waste	
A) Cost of collecting and sorting, and delivery of segregated packaging to reprocessor	Say £110 per tonne
<i>Revenues</i>	
B) Avoided landfilling cost of packaging material	Say £50 per tonne
C) Market value (price paid) of packaging material for sale to reprocessor	Say £20 per tonne
Revenue Total	£70 per tonne
D) Net loss	£40 per tonne

To cover (D) revenue needs to come from the PRN system. A number of actions (or combination of actions) can be taken, for example:

- pay capital cost of the system (A) - thus reducing the operational costs;

¹⁸ Alternatively, the value of the reprocessed material could be considered alongside the additional, average re-processing cost.

- invest in technology, develop new markets for recycled material to increase demand, hence the value of packaging waste and price (C);

The decision is in the hands of industry, primarily the reprocessors in collaboration with obligated businesses, on what mixture of support measures is needed for any given material.

Other factors can affect (A), (B) and (C) and hence the deficit (D) the PRN revenues need to cover. For example:

- costs of (A) may change as economies of scale and improvements in sorting technology develop;
- costs of (B) may change due to increases in the tax levy on landfill or mandatory targets;
- the price of (C) is affected by global supply and demand factors in markets for specific recycled materials.

5. As the PRN/PERN system is a market based mechanism, industry opinion suggests that without a degree of 'stretch' in the targets there will be no 'demand-pull' for PRNs and, linked to the belief that similar levels of recycling will occur annually, the PRN/PERN price will be likely to start to drop towards a floor price.
6. This has been seen in the market for PRNs for paper and wood where, due to the existing infrastructure and material price, there has historically been an over-supply of evidence for these materials and so depressed PRN/PERN prices (that have been around £2-4 for long periods in recent times).
7. A long term depression in PRN prices would mean low costs for producers, but would remove an important source of funds for investment and support to collectors/reprocessors/exporters of materials and indirectly to Local Authorities.
8. However, assuming that average, recent PRN prices continue (Table 19), then the cash flow from PRNs would be expected to be as set out in Table 20.

Table 19: Average PRN prices in recent years (£ per tonne) based on spot market

Paper	2.5
Glass	22
Aluminium	30
Steel	15
Plastic	20
Wood	4

Table 1: Costs of PRNs assuming historic costs continue – discounted to present values (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.4	0.7	1.0	1.3	1.6
Aluminium	0.0	0.0	0.0	0.1	0.1
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	0.2	0.3	0.6	0.8	1.0
Wood	0.0	0.0	0.0	0.0	0.0
	2016	2017	2018	2019	2020

Paper	0.0	0.0	0.0	0.0	0.0
Glass	1.9	2.1	2.3	2.5	2.7
Aluminium	0.1	0.1	0.1	0.1	0.1
Steel	0.0	0.0	0.0	0.0	0.0
Plastic	1.2	1.4	1.6	1.8	2.0
Wood	0.0	0.0	0.0	0.0	0.0
Discounted present value over 10 years (£m)					28.1

9. To a limited extent, given market imperfections, these estimated costs for PRNs can be used to cross check the anticipated costs of acquiring additional packaging waste. PRN costs should (in an effective market) broadly equate to the difference between material revenues (at the reprocessor gate) plus avoided costs of disposal, less costs of acquiring the material (collection and sorting).

10. As shown in the example for glass below (Table 21), even now and in 2011, the estimated benefits from recycling outweigh the additional collection/sorting costs such that PRN values might be expected to be near 0. This is not just the effect of landfill tax, which will in fact increase the apparent differential overtime between recycling and disposal of waste to landfill.

11. This would suggest that it is economic for the private sector to recycle materials without additional government intervention beyond the landfill tax. However, this is not the case, either because the estimates for private sector costs are understated or because of additional market imperfections, e.g. asymmetry of market information between waste producers and waste management companies and reprocessors.

Table 22: Estimate of deduced PRN cost compared with estimate based on past prices – present value terms (£m).

Glass	2011	2012	2013	2014	2015
Collection/sorting costs	(1.46)	(2.84)	(4.14)	(5.36)	(6.51)
<i>Revenues</i>					
Avoided landfilling - resource	0.85	1.64	2.39	3.10	3.76
Avoided landfill tax	0.91	2.02	3.31	4.29	5.21
Market value - materials	0.29	0.57	0.83	1.07	1.30
Revenue total	2.05	4.24	6.54	8.46	10.27
Deduced PRN value	(0.59)	(1.39)	(2.39)	(3.10)	(3.76)
PRN estimate from historic prices	0.36	0.70	1.01	1.31	1.59

Glass	2016	2017	2018	2019	2020	Total
Collection/sorting costs	(7.59)	(8.60)	(9.54)	(10.42)	(11.24)	(67.72)
<i>Revenues</i>						
Avoided landfilling - resource	4.38	4.97	5.51	6.02	6.50	39.13
Avoided landfill tax	6.07	6.88	7.63	8.34	9.00	53.66
Market value - materials	1.52	1.72	1.91	2.08	2.25	13.54
Revenue total	11.97	13.56	15.05	16.44	17.74	106.33
Deduced PRN value	(4.38)	(4.97)	(5.51)	(6.02)	(6.50)	(38.61)
PRN estimate from historic prices	1.85	2.10	2.33	2.55	2.75	16.55

Landfill Tax raises the cost of disposal relative to recycling

12. With the increases in landfill tax over the period 2010-13, the cost of disposal of waste to landfill will become a relatively more expensive option compared with alternative waste treatments. On average, landfill will cost around £100 per tonne (rising to £120) based on:

- £30 for the average cost of municipal collection per tonne of mixed waste;
- Landfill tax rates;
- An average gate fee of £22 per tonne (based on the WRAP Gate Fee Survey report¹⁹).

13. Initially (with landfill tax at £48 per tonne) the cost of disposal is around £100 per tonne. This is broadly in line with the collection for reprocessing option, also of around £100 per tonne. But this will be less the case as landfill tax increases over time, rising a further £24 per tonne or 25% over the 3 years to 2013/14.

PRN/PERNs

14. In general terms, with further increases in targets, the costs for producers in terms of the acquisition of PRN/PERNs are likely to increase, simply because any increase in targets will require each producer to acquire more evidence in order to comply. The increased targets set out in Table 7 will create demand-pull pressures that are likely to raise the price of the PRN/PERN evidence.

15. However, this will be offset by investments to improve the recycling infrastructure, the increasing relative cost of disposal, and the value of recycle materials; the dynamics of which were explained previously.

16. Most especially, proper account needs to be made for the effect of some of the improvements in infrastructure set out above, in particular for steel but also paper/card and plastics. Furthermore, the additional demand will be offset to some degree by the current levels of over-achievements in certain materials (paper/wood).

17. Based on past PRN/PERN prices the additional compliance costs may be of the order of an £65m in 2011 rising to around £102m by 2020. These costs are in line with PRN/PERN costs for the period 1999-2008.

18. We have looked at work undertaken by the ACP Taskforce looking at potential 75% targets, to help model likely PRN prices. However, these historic PRN prices are based on market available spot prices. They do not include contract arrangements with compliance schemes or in-house PRNs for material recycled on the premises. These PRN costs are therefore likely to be an overestimate.

Table 3: Expected PRN costs (adjusted prices); all PRNs (£m)

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
102.0	108.9	116.2	123.7	131.5	139.6	147.9	156.5	165.1	173.2

¹⁹ <http://www.wrap.org.uk/downloads/W504GateFeesWEB.dc5cedfb.7613.pdf>

19. However, the additional PRN costs will be equal to the forecast increase in PRN price on all old volumes plus the full, 'new', estimated PRN price for all additional tonnages. This additional set of cash flows would be £550m in present value terms over 10 years.

Table 4: Additional PRN costs (£m)

	2011	2012	2013	2014	2015
Paper	*	6.1	5.9	5.7	5.5
Glass	*	14.1	14.7	15.3	15.8
Aluminium	*	0.8	0.9	1.1	1.2
Steel	*	3.6	3.5	3.3	3.4
Plastic	*	11.6	15.1	18.8	22.4
Wood	*	0.8	0.7	0.7	0.7
	2016	2017	2018	2019	2020
Paper	5.2	5.4	5.6	5.7	5.9
Glass	16.7	17.1	17.5	17.9	17.7
Aluminium	1.5	1.6	1.7	1.9	2.0
Steel	3.7	3.9	4.0	4.1	4.2
Plastic	29.4	32.8	36.1	39.3	42.5
Wood	0.6	0.6	0.6	0.6	0.6
Discounted present value over 10 years (£m)					550.9

*disaggregated figures to be included.

20. However, this is almost certainly an **overestimate** given the investments in collection infrastructure set out above. Taking account of the infrastructure improvements in steel, paper and plastics, the additional PRN costs are likely to be much lower.

21. For steel there is likely to be no additional costs. In fact they are likely to fall below historic levels. Similarly, given the large outlays allowed for paper and plastics, these are also unlikely to increase above historic levels. Adjusting for this gives the following revised set of possible additional PRN costs, with aluminium and wood rising.

Table 5: Additional PRN costs (£m)

	2011	2012	2013	2014	2015
Paper	0.0	0.0	0.0	0.0	0.0
Glass	0.8	1.6	2.3	3.0	3.6
Aluminium	0.8	0.9	1.1	1.2	1.4
Steel	0.0	0.0	0.0	0.1	0.3
Plastic	0.5	2.5	4.5	6.5	8.4
Wood	0.8	0.7	0.7	0.7	0.7
	2016	2017	2018	2019	2020
Paper	0.0	0.2	0.4	0.5	0.7
Glass	4.2	4.8	5.3	5.9	6.0
Aluminium	1.5	1.6	1.7	1.9	2.0
Steel	0.4	0.6	0.7	0.8	0.9
Plastic	10.3	12.1	13.9	15.7	17.4
Wood	0.6	0.6	0.6	0.6	0.6
Discounted present value over 10 years (£m)					155.2

22. Of these total figures, it is estimated that 55% would be associated with household packaging and therefore the subsequent funds derived would flow into the system to support the collection of household packaging waste.