

Title: Statutory Packaging Recycling Targets 2013-17 IA No: 1368 Lead department or agency: DEFRA Other departments or agencies: Scottish Government, Welsh Assembly Government, Dept of the Environment Northern Ireland, HM Treasury	Impact Assessment (IA)		
	Date: 19/03/2012		
	Stage: Final		
	Source of intervention: EU		
	Type of measure: Secondary legislation		
Contact for enquiries: Ian Atkinson, 020 7238 4345			
Summary: Intervention and Options		RPC Opinion: out of scope	

Cost of Policy			
Total Net Present Value	Business Net Present Value	Net cost to business per year (EANCB on 2009 prices)	In scope of One-In, Measure qualifies as One-Out?
£182m	£95m	£22.2m	No
			NA

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

Targets to recycle more packaging are needed in order to deal with packaging at the end of its life in a way that ensures better outcomes for the environment and natural resources, compared to sending it to landfill. This helps to reduce greenhouse gas emissions. Mandatory statutory recycling targets help to address the imbalance and inefficiencies within the packaging supply chain.

The EU Packaging Directive seeks to address some of these issues, and specifies minimum targets to obligate packaging producers to recycle a proportion of the materials they make. New targets are needed as the legislation for the current targets only runs until the end of 2012. The new targets will be in place from 1 January 2013 until 2017.

What are the policy objectives and the intended effects?

The new statutory targets which are higher than the EU minimum levels address the environmental and economic market failures and supply chain inefficiencies to achieve a higher level of recycling and recovery for key materials. They also ensure that the UK continues to meet the EU Packaging Directive. Higher targets also maintain momentum in the recycling market and support businesses which benefit from an increase in the amount of recyclates in the supply chain, reducing reliance on virgin materials, lowering costs to business. The targets will incentivise infrastructure investment by giving greater certainty over growth in the recycling industry thereby reducing risk on investment.

What policy options have been considered, including any alternatives to regulation?

During the consultation which ran from December 2011 to February 2012, voluntary as well as statutory targets at either the EU minimum levels or at higher levels were considered.

At Budget 2012, the Chancellor of the Exchequer announced the following statutory targets from 2013-17:

- Higher recycling rates for aluminium, plastic and steel increasing annually by respectively 3, 5 and 1 percentage points.
- The glass recycling rate will be split by end use and increasing annually by 1 percentage point in proportion to end use of remelt from 2013.
- The overall recovery rate increases by 1 percentage point per year

(Corresponding to option 3a in the Consultation Document and IA) Other options considered are detailed on page 8. The chosen option delivers the highest net present value and has significant economic benefits for both the waste and the packaging manufacturing industries, compared to the current EU minimum levels. This option is classed as tax-and-spend and is therefore out of scope of One In, One Out process required for regulation

Will the policy be reviewed? It will be reviewed. If applicable, set review date: May/2013

Does implementation go beyond minimum EU requirements?			Yes		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	Micro No	< 20 No	Small No	Medium Yes	Large Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded: -2.0		Non-traded:

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 3a

Description: (Chosen Policy) Higher statutory targets for aluminium, steel and plastic (3%, 1% and 5% annual increases) with split target for glass

FULL ECONOMIC ASSESSMENT

Price Base Year 2012	PV Base Year 2012	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: - £7.5m	High: £250m	Best Estimate: £181.9

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	n/a	44.2	192.7
High	n/a	57.2	249.6
Best Estimate	0.11	50.8	221.1

Description and scale of key monetised costs by 'main affected groups'

Costs assessed relative to a baseline of EU minimum targets.

Additional costs will be either directly or indirectly paid for by obligated businesses: Additional collection/sorting costs of £274m over 5 years. Less waste to landfill creates savings in resource costs of £53m, leading to total additional costs of recycling compared to landfill of £221m.

IT costs of £0.11m for the Environment Agency to include split glass target.

Other key non-monetised costs by 'main affected groups'

Impacts of waste treatment options on local environment quality have not been included. The net impact would depend on the balance of local impacts of different treatment options.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	n/a	55.5	242.1
High	n/a	101.4	442.5
Best Estimate	n/a	92.4	403.1

Description and scale of key monetised benefits by 'main affected groups'

Benefits assessed relative to EU minimum targets.

Revenue from recycled materials of £394m, considered as part of the 'additional costs of recycling' calculation which falls to obligated business. Carbon savings benefits of £9m, from material diverted from landfill.

Savings in disposal costs are included as part of the additional costs of collecting material for recycling, detailed above.

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

Discount rate (%)

3.5

Headline assumptions detailed in Annex 4. Costs and benefits compared to the EU minimum targets.

The 'best estimate' takes current prices for material revenues and a best estimate of costs, rather than a mid-way point between low and high prices assumed for the analysis.

BUSINESS ASSESSMENT - PRN transfer from obligated business to reprocessors:

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: £28.7	Benefits: £50.9	Net: £22.2	No	NA

Evidence Base

References

No	Legislation or publication
1	WRAP research (2009): Financial costs of collecting Mixed Plastics Packaging http://www.wrap.org.uk/downloads/The Financial Costs of Collecting Mixed Plastics Packaging .782ae00c.7205.pdf
2	WRAP research (2008): Kerbside Recycling: Indicative Costs and Performance – Report and Technical Annexes: http://www.wrap.org.uk/local_authorities/research_guidance/collections_recycling/kerbside_recycling.html
3	Eunomia research (2010): Background spreadsheets accompanying analysis for feasibility of landfill bans. Report: http://www.wrap.org.uk/downloads/FINAL_Landfill_Bans_Feasibility_Research.957bfa79.8796.pdf
4	Defra consultation IA (2011) Proposal to introduce packaging recovery and recycling targets for 2013 to 2017. IA no 1368. http://www.defra.gov.uk/consult/files/packaging-ia.pdf
5	Department for Energy and Climate Change (2011): Update short term traded carbon values for UK public policy appraisal http://www.decc.gov.uk/assets/decc/11/cutting-emissions/carbon-valuation/3137-update-short-term-traded-carbon-values-uk.pdf

Overall policy objective

1. The Government's long term policy objective is to improve the efficiency of packaging waste management, by addressing the environmental externalities and the market failures in the supply chain that prevent the efficient level of recycling from taking place. This means achieving a higher level of recycling and recovery than would take place in the absence of government intervention.
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, and more efficient use of natural resources. Despite recent successes in increasing the amount of packaging that is recycled, there is still a perception amongst both householders and businesses that more packaging should be recycled. It is a very visible presence in our bins.
3. In the June 2011 Review of Waste Policy for England, Defra announced its intention to consult on higher targets. This consultation ended on 10 February 2012 and received 101 responses. The majority of respondents supported option 3a, higher statutory recycling targets. This was also the Government's stated preferred option. Further detail of these responses can be found in Defra's formal summary of responses
<http://www.defra.gov.uk/environment/waste/>.
4. At Budget 2012 the Government announced that the new targets will increase from their current levels. Higher targets are anticipated to maintain momentum in the recycling market and support businesses that benefit from increasing the amount of packaging in the supply chain in order to increase the amount of recycled content in their products. The targets will incentivise investment in for example collection and recycling infrastructure by giving greater certainty over growth in the recycling industry thereby reducing risk on investment.

Detailed description of the targets and their impacts

In summer 2012, Defra will legislate to increase statutory business recycling targets for packaging waste through the Packaging Recovery Notes (PRN) system, focussing on key materials. This legislation will:

- Increase the aluminium target by 3 percentage points per year from 2013, rising to a rate of 55% by 2017.
- Increase the plastic target by 5 percentage points per year from 2013, rising to a rate of 57% by 2017.
- Increase the steel target by 1 percentage points per year from 2013, rising to a rate of 76% by 2017.
- Glass is held on the assumption that the target will be split by end use.
- The 2012 EU material specific targets will be rolled forward for paper and wood.
- The overall recovery rate increases by 1 percentage point per year, rising to a rate of 79% by 2017.

These changes will apply from 1 January 2013.

Who is likely to be affected?¹

Business

5. **Packaging producers and handlers:** The PRN system transfers revenue directly from packaging producers and handlers to reprocessors. The producers and handlers of packaging pay and recycling reprocessors gain. A “packaging producer” includes any business involved in the packaging supply chain, i.e. that manufactures raw materials for packaging, converts raw materials into packaging, uses packaging to wrap goods, or sells packaged products. The ‘responsibility’ for the packaging is split between these actors in the supply chain. This is monetised on page 11 ‘Costs to Business’, in the ‘obligated business’ sub-heading.
6. **Little marginal administration costs** for higher targets compared to EU minimum: Since the PRN system is in place in order to meet the EU minimum targets, businesses will already be registered for the scheme, with systems in place for administering PRNs. This means that the *marginal* administration costs of higher targets beyond the EU minimum will be minimal (the main costs to business will be the costs of the PRNs themselves). This is not quantified.
7. **No negative impact on small business:** Businesses which have a turnover below £2m and who handle under 50 tonnes of packaging a year are not obligated and therefore exempt from these regulations. No negative responses came directly from medium *obligated* businesses. The split of positive and negative responses from trade bodies incorporate comments from SMEs, as part of their membership discussions. Small reprocessing companies (who stand to gain from PRN revenue) provided support for the targets.
8. **Recycling market:** Reprocessors use the PRN revenue either to invest in reprocessing or collection infrastructure, or to increase the price paid for recyclates and incentivise collection. Organisations such as Coca Cola Enterprises, British Glass, Corus, British Retail Consortium and the Food and Drink Federation are supportive of higher packaging recycling targets. Their main reason for higher targets is to increase the amount of packaging in the supply chain, so that they can access higher quality and higher volume of recyclates to increase the amount of recycled content in their products. This is a non-monetised benefit, not possible to quantify for this IA.

Other Impacts

9. **Local Authority recycling collection:** PRN revenue is used either to directly finance collection or can be used in ‘price support’, i.e. to increase the price paid for recyclates so that Local Authority (LA) collection of recycling is financially viable. This is indirectly monetised –the IA calculates the additional collection costs associated with higher levels of recycling. The balance of the additional costs associated with recycling would be covered by obligated business. See box 1.

¹ This additional section was added in response to queries, to clarify the distribution of impacts.

10. **Householders:** are likely to benefit from improved collection infrastructure for recycling. Improvements to recycling infrastructure will not be restricted to collecting packaging waste only and therefore any improvements will drive improvements to recycling of non-packaging streams (e.g. non-packaging paper and plastic). This is a non-monetised impact.
11. **Operational impact (£m):** The Environment Agency currently administers the scheme. The marginal administration costs are fairly small, so an increase in targets will not result in a large impact on operation. The accounting of the split glass target will require a one-off change to the Environment Agency's computer database, which will cost £112k.

Summary of quantified impacts

Costs and benefits additional to EU minimum (present value, £m)

Cost / benefit to...	Cost / Benefit	2013	2014	2015	2016	2017	Total
Theoretically covered by obligated business: all contribute to 'net additional costs of recycling'	Collection costs*	- 16.01	- 32.49	- 55.72	- 75.05	- 94.35	- 273.62
	Revenues	26.24	55.83	79.12	104.35	128.70	394.25
	Resource Savings (reduced mixed waste)	4.69	9.13	8.89	12.98	16.86	52.55
Society	Carbon Benefits	0.69	2.18	0.26	1.95	3.78	8.87
Delivery bodies	IT costs	- 0.11					- 0.11
	Total NPV	15.49	34.65	32.55	44.24	55.00	181.93

* Average collection costs of high and low scenario

Business impacts

Equivalent annual net benefit of £22.30m; £95m PV over 5 years.

See costs and benefits section for calculation and methodology.

Background – the Packaging Directive and producer responsibility in the UK

12. The UK has had since 1997 a statutory producer responsibility scheme for packaging recycling, which implements the EU Packaging Directive. This scheme sets minimum recycling and recovery targets on UK businesses in the packaging supply chain.
13. The EC Directive on Packaging and Packaging Waste (94/62/EC, as amended by Directive 2004/12/EC, and 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 across the Internal Market.
14. It is implemented in the UK by (i) the Packaging (Essential Requirements) Regulations 2003 (as amended); and (ii) the **Producer Responsibility Obligations (Packaging Waste) Regulations 2007** (as amended). This IA assesses options relating to the statutory targets contained in the latter set of Regulations, which are thereafter referred to as 'the Packaging Regulations'.
15. A "packaging producer" includes any business involved in the packaging supply chain, i.e. that manufactures raw materials for packaging, converts raw materials into packaging, uses packaging to wrap goods, or sells packaged products. The 'responsibility' for the packaging is split between these actors in the supply chain.
16. Under the Packaging Regulations, to show they have discharged this legal obligation, businesses must obtain evidence in the form of Packaging Waste Recovery Notes (PRNs) or Packaging Waste Export Recovery

Notes (PERNs). These evidence notes are issued by accredited packaging waste reprocessors and exporters, respectively and are bought by businesses. An accredited reprocessor/exporter can issue PRNs/PERNs to the amount of waste reprocessed (e.g. 100 tonnes of steel reprocessed allows the reprocessor to 'sell' 100 PRNs in steel).

Packaging Recycling Targets through Packaging (Export) Recovery Notes (PRN/PERN) System: detail

17. PRN/PERNs are a deficit neutral tax-and-spend measure, used to implement statutory packaging recycling targets. Producers and handlers of packaging materials buy PRNs to show evidence of recycling of packaging waste to achieve statutory targets. Targets and associated PRNs are material-specific and in tonnes. Packaging material is assumed to divert from landfill to recycling by the amount of increased obligation.
18. The price for PRNs/PERNs is set by the market created by accredited processors selling and the obligated packaging companies buying certificates. The revenue from PRNs/PERNs flows directly to recycling reprocessors, who spend the revenue on specified measures (e.g. infrastructure, collection systems) to improve the supply chain. This income to reprocessors closes the gap between recyclates revenue and the cost of collecting and recycling.
19. The evidence notes have two functions. Firstly, they are a 'counting tool' for the amount of recovery/recycling undertaken on behalf of producers. Secondly, they are a way to channel funding from packaging producers to recycling/recovery operations, since packaging producers can buy for the PRNs/PERNs directly from recyclers. In this way the polluter pays.
20. Businesses obligated under the Regulations have a choice as to how they comply. They can undertake the recycling/recovery themselves in order to obtain the required PRNs; they can contract directly with reprocessors/exporters and acquire evidence of compliance in the form of PRNs and PERNs (known as individual registration) or they can pay to join one of several registered compliance schemes, who take on the regulatory reporting and contractual duties, with greater market clout than individual producers. The majority of packaging producers have chosen to join a compliance scheme.
21. Their price varies depending on the availability of evidence. The Regulations do not mandate the use to which the proceeds from the sale of PRNs/PERNs to producers is put, though accredited reprocessor and exporters are required to report on the use the funds as they are intended to finance improvements in the collection and reprocessing infrastructure across the UK.
22. Annex 2 fully explains the PRN mechanism and cash flows.

The rationale for action

23. The management of waste has significant environmental and economic implications. Many waste materials are valuable resources: moving waste from landfill to recycling leads to savings in greenhouse gas (GHG) emissions but also has a financial value, as landfill tax and gate fee payments are avoided and revenue is gained from the sale of material. For waste management at the efficient level, the net costs associated with sending an additional tonne of material to each alternative disposal or treatment option should be equal, when all costs and benefits are considered.
24. However, without government intervention, the 'optimal' amount of waste is not allocated to each option: prevention, recycling, energy recovery and landfill. For certain materials, less waste goes to recycling than is optimal. There are market failures:
 - i) The additional social and private benefit of recycling compared to other residual options is not factored into private decision-making;

- ii) The relative value at the disposal end of the chain, created through taxes, material values etc is not maintained for all actors throughout the preceding stages of collection.
25. There are existing interventions to address the environmental externalities. Landfill tax is applied on each tonne of waste sent to landfill and the EU Emissions Trading Scheme (EU ETS) accounts for the carbon emissions associated with the energy required for recycling and raw material production in Europe and the UK. However, there is a rationale for *additional* intervention in the recycling market:
26. **Environmental externalities:** Firstly, the landfill tax provides an incentive to move waste away from landfill to 'non-landfill options', but no incentive to move waste further up the hierarchy to gain the higher carbon benefits of recycling. Secondly, landfill tax is flat for all materials, however each material has different carbon benefits. The carbon benefit of recycling aluminium is over £200 / tonne, which is significantly higher than the landfill tax level. The EU Emissions Trading Scheme does not include international transport emissions, emissions involved in extraction and production outside the EU. This means there is still a proportion of carbon benefit unaccounted for by both the landfill tax and EU ETS. Finally, the landfill tax and EU ETS only have an impact at the 'end' of the chain of recycling, but their price signal is not maintained throughout the chain of agents involved. See paragraph 20 below.
27. **Market imperfections:** The incentive provided by the landfill tax does not impact the behaviour of every individual or company involved throughout the chain of product purchase to disposal. Landfill tax is only applied to waste at the final, disposal stage, but decisions that influence the final destination of waste (such as business waste decisions, or local authority collection infrastructure) are made throughout. The organisations who make costly decisions to enable recycling are not necessarily those who benefit from the additional material revenue from the recycling, or the reduction in landfill tax or EU ETS (due to costs or difficulties with monitoring as well as rigid contracts). This means that even with existing interventions, we do not have the level of recycling which would be best for society as a whole.
28. Fully addressing these market failures in the supply chain would require high levels of measurement and monitoring, as well as continual contract changes, i.e. large transaction costs, see Annex 3 for further information. Material specific targets, the way in which the UK currently tackles the issues set out above, are a second-best solution, in the presence of transaction costs and distortions. Increasing targets through the PRN system (described below) means that packaging producers have to focus on specific materials, even when incentives are not maintained throughout the chain.
29. The EU Packaging Directive seeks to address some of these issues, and specifies minimum targets to obligate packaging producers to recycle a proportion of the materials they make. New targets are needed as the legislation for the current targets only runs until the end of 2012. The new targets will be in place from 1 January 2013 until 2017.

Detailed Policy Description

Current law

30. The EC Directive on Packaging and Packaging Waste (94/62/EC, as amended by Directive 2004/12/EC, and hereafter referred to as 'the Packaging Directive') is implemented in the UK by (i) the Packaging (Essential Requirements) Regulations 2003 (as amended); and (ii) the Producer Responsibility Obligations (Packaging Waste) Regulations 2007 (as amended). The Directive sets a minimum overall recovery target of 60% (of which a minimum of 55% must be recycling), 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. Member States must continue to meet these minimum targets, but they have the freedom to set higher targets.

Proposed revisions

31. Options explored in the packaging consultation which ran from December 2011 until February 2012 included three levels of recycling targets, with different options of achieving these:

- Option 1 – Renew packaging recycling and recovery targets at the EU minimum.
- Option 2 – EU minimum PLUS:

Higher recycling rates for key materials: Increase recycling for aluminium & plastic. Aluminium recycling rate increasing by 1 percentage points per year from 2013; plastic rate increasing by 2 percentage points per year from 2013.

- a. Higher targets achieved through statutory recycling targets.
- b. Higher targets achieved through setting targets to EU min plus negotiated voluntary responsibility deals with industry to recycle more plastic and aluminium packaging.

- Option 3 – EU minimum PLUS:

Higher recycling rates for aluminium, plastic and steel, with glass recycling rate split by end use. Aluminium increased by 3 percentage points per year from 2013; plastic rate increased by 5 percentage points per year from 2013; steel increased by 1 percentage points per year from 2013. Glass recycling rate split by end use, with proportion for remelt increasing by 1 percentage point per year.

- a. Higher targets achieved through statutory recycling percentages
- b. Higher targets achieved through setting targets to EU minimum plus negotiated voluntary responsibility deals with industry to recycle more plastic, aluminium and steel packaging and encourage more glass available for remelt.
- c. Achieved through setting targets as in Option 1 plus a mandated DRS for drinks containers.

These targets are set for 5 years. New legislation will be required after 2017 to comply with EU minimum, since the legislation runs only to 2017.

32. **There is a clear rationale for increasing recycling levels through *statutory* targets**, rather than voluntary agreements. Higher statutory targets will increase the revenue flows to reprocessors, resulting in a real flow of revenue to the collection and reprocessing of recyclates. Statutory targets mean that the responsibility is shared by all packaging producers and handlers above a certain size ensuring a level playing field.

33. Under a voluntary agreement, it is assumed that only the top 30 companies would sign up. These companies would therefore have to achieve a much greater increase in recycling to achieve the same levels of recycling that would be achieved spread over all obligated businesses under a statutory target. In plastic, the top 30 obligated companies only represent 42% of the plastic currently recycled, which means that the levels of recycling proposed would not be achievable with only the cooperation of the largest 30 businesses. For steel, aluminium and glass, an achievement close to that which matches higher targets would not be expected. Since the recycling would be spread over fewer businesses, these fewer companies would need to undertake significantly more recycling than under a statutory target spread over the entire obligated businesses.

Costs and Benefits

34. Costs and benefits are assessed for a 5 year period, from 2013-2017. Costs of the proposal include the collection costs, minus savings in resource costs due to less waste to landfill. Benefits include material revenue and carbon savings. Since the PRN revenues are a transfer payment, flowing directly from obligated business to reprocessors,

the associated costs and benefits are considered to cancel out and are not included in the assessment of overall social cost / benefit. The cost for packaging producers and handlers and the gains for reprocessors is detailed in the business costs and benefits.

Box 1: Who pays the additional costs of recycling under the PRN system?

In theory, the balance of the costs and benefits of additional recycling will **fall to packaging producers**, since the obligation is on them to pay for the evidence of additional recycling.

Packaging producers pay indirectly:

Where it is more costly to achieve recycling (if, for example, additional collection is required), this is likely to lead to a raised PRN price paid to reprocessors. If collection is the limiting factor for additional recycling, this should lead reprocessors to pay higher prices for the collection of materials, which will incentive additional collection by business or Local Authorities (indirectly covering these additional costs). Even though the costs of additional collection may seem to initially fall on local authorities, and the benefits of revenue may flow directly to local authorities (via e.g. reduced gate fees), the *balance* of additional costs compared to landfill should be covered by the packaging producers. Reprocessors may also choose to spend the PRN revenues on collection e.g. infrastructure such as bring-banks, bins/containers, trucks and collection vehicles. It should be clear that this is an *indirect* flow – Local Authorities will not see this cash as a separate payment.

Packaging producers pay directly

Alternatively, packaging producers may directly pay for the collection of recyclates. Packaging producers can choose to meet their statutory requirements through responsibility deals, i.e. by a group of packaging producers striking a funding arrangement to improve recycling rates with selected local authorities, in return for ownership of the material thus collected (and the PRN). This has taken part in the past, for meeting previous statutory targets.

Reprocessors are required to report on the use of PRN revenues, which is split between collection infrastructure, capacity, end-use markets and future spend in each of these categories.²

Costs

Additional costs of Recycling Collection

35. For this level of targets, the main requirement is to improve waste collection as, for most materials, there appears to be sufficient reprocessing capacity. The relevant additional cost is the additional costs of collecting and sorting the material for recycling, minus the savings in the collection of residual waste. This does not include landfill tax, which is a transfer payment.
36. 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. Due to responses in the consultation, the costs for collecting plastic were reviewed, with more detailed modelling separating the different types and proportions of plastic. The overall additional costs of collecting and sorting plastic are £285.1m. As per the consultation IA, this estimate takes a conservative estimate that there is no slack in the system - additional household rigid plastics collections are required from 2013, with rigid and film collection required from 2016. However, this is taking a cautious approach, since we estimate that the majority of the plastics target could actually be met by plastic bottles and there is likely to be slack in the existing system due to previous investment in years of increasing targets - targets were then held constant for a number of years. (It should be noted that the 57% target for obligated businesses represents a total plastic recycling rate of 42.3%, since obligated businesses are responsible for only a proportion of all packaging).

² For example, in 2008, 56% of the PRN revenue for plastic was spent on collection, in 2009, 24% of the PRN revenue for plastic was spent on collection and 38% on capacity, with the remainder split between other categories.

37. There are no changes to the assumptions for other materials, which resulted in a total present value of the collection costs of £5.4m for aluminium; £1.5m for steel; £5.9 for changes to glass collections to enable an end-use of remelt (all present value (PV) over the 5 years from 2013-2017). Since the material specific targets are increasing faster than the overall recycling rate, there will be a decrease in 'general recycling', which is filled from the options with the lowest PRNs – i.e. usually paper and wood. See annexes page 22 for more detail. This leads to a reduction in collection costs of £24.2m (PV over the 5 years).
38. The overall **savings in resource costs** for residual waste remain calculated as per the consultation, at £53m PV over the 5 years (note that the slight changes in tonnages due to changes in growth rates used, mean that the figures are slightly different from the consultation IA). With higher costs of collecting recycling of £274m, and a reduction of £53m in the costs associated with these tonnes being collected for landfill, the **overall additional costs of recycling collection** (compared to residual) are therefore £221m.
39. **IT / Database costs:** The split glass target will be achieved by having separate targets for aggregates and re-melt (with separate PRN notes). There will be IT and database costs associated with this split. The Environment Agency administers the PRN scheme and has estimated a transition cost of £0.112m (which would take place in the 1st year).

Benefits

40. The monetised benefits consist of the material revenues and the value of the GHG emission savings:

Material revenue: The additional revenues for the higher volumes have a PV over the 5 years of £394³.

Carbon benefit: The additional tonnages of recycled material has a carbon value of £9m⁴.

Other, unmonetised, benefits

41. Higher targets could help the UK develop its recycling markets by giving certainty for investors developing collection, reprocessing and treatment infrastructure. This will enable the UK to build expertise in such activities. It is particularly pertinent in relation to plastics: the IA currently assumes that a large proportion of the plastics recycled are from collections of plastic bottles. For future years, the costs of expanding the range of products collected (e.g. tubs, pots and trays) will be determined by the costs of collection and treatment – as more local authorities collect, there are likely to be economies of scale.
42. Statutory targets maintain a level playing field between signatories and non-signatories to responsibility deals. Without the spur of targets, participation in responsibility deals could not be secured, whereas the combination of statutory targets and continued work on additional responsibility deals (on metals and plastics) would allow leveraging and pooling of resources across a sector.
43. 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.

Changes from Consultation Stage IA

44. The consultation, asked for the views on the projections for waste arisings. Several responses – including from a number of local authorities and plastics producers were concerned that the data used in the consultation on estimated **growth of plastics packaging was too high**. We have therefore amended the IA to reduce the growth projection from 2.5% increase to 1.5% increase. This does not have a big impact on the achievability of

³ This reduction from the consultation IA reflects the change in material price assumption for plastic as well as the change in tonnages due to revised growth rates.

⁴ This reduction from the £19m in the consultation IA is due to the changes in the valuation of the traded price for carbon, and the change in assumptions of the split in traded vs untraded carbon, reflecting revised information. This changes the valuation of different aspects of the carbon, but does not impact the overall carbon emissions.

the targets, and as it will be applied to a smaller obligated tonnage the absolute tonnage required to meet the targets will be lower and so more easily achieved.

45. **Plastic material price:** in a follow-up to the British Plastic Federation response, there were concerns of the plastics material price used. Analysis was amended to include a compositional split of plastic prices, ranging from £340/tonne to £40/tonne, to reflect the varying quality of plastic, including proportions from C&I and inclusion of lower quality from households.
46. **Plastic PRN price:** some plastic producers have concerns that the estimated PRN price for plastic is too low. The IA assumes a PRN price of £20/tonne. This is based on historical prices and is the most likely scenario. Some respondents think that the price is likely to go up to £40-£100/tonne. It is very difficult to accurately predict what PRN prices will do, but £20/tonne is still reasonably accurate and the central, most likely estimate. We also have estimates for a high scenario, which is currently estimated at £25/tonne, but we will increase this to £40/tonne in case of a higher scenario, which we can provide to HMT for the Office of Budget Responsibility estimations. This is only relevant for the impact on *obligated* business.
47. Kent Waste Partnership (KWP) responded – representing 9 local authorities – supporting the Government’s preferred option, but with several caveats. KWP also had some concerns about infrastructure, noted above, and also wanted more dialogue on **improving recycling through the supply chain**. This is something that we are working on in the responsibility deals on metals and plastics. KWP and the LGA have also expressed some concern on the **transparency of PRN funding** and feel that LAs do not receive a “fair share” of the PRN revenue. This can partly be addressed through better contract negotiation and management, but is also something that we will look at when the Packaging Regulations are reviewed later this year.

Aspect	Detail: consultation IA	Detail: final IA	Source
Admin costs to change computer systems (for split glass target)	One-off costs of £0.075m	Change to £0.112m	Environment Agency email exchange (further information from IT partners)
Projections of plastic in waste stream	Annual growth of 2.5%	Change to 1.5% (lower)	British Plastics Federation consultation response; RECOUP, Kent Waste Partnership, several Compliance Schemes, 360 Environmental
Plastic material price	£300/tonne	Change to compositional split of prices ranging from £340/t to £40/t, to reflect the varying quality of plastic, including proportions from C&I and inclusion of lower quality from households.	British Plastics Federation email response Letsrecycle material prices, Jan 2012 and Dec 2011.
Baseline data for aluminium	Detail in consultation IA	Detail in annexes	Alupro

Resulting changes to Impact Assessment

Overall

- The method of calculation remains the same as the consultation IA. The price base year has been updated to 2012 from 2011 and the changes in assumptions detailed above change the tonnes *additional* to EU minimum and the scale of costs and benefits.
- The text in this final IA is shortened to a more concise document, with full detail and background available in the consultation IA document.
- The consultation was used to gather evidence from small and medium businesses. The only direct responses from SMEs were from reprocessors and recycling companies, who generally supported the preferred option. The responses from overarching trade bodies, representing obligated businesses as well as reprocessors, include the views of the SMEs in their membership group.

Costs, Benefits and Net Present Values

Option	NPV and breakdown in consultation IA	NPV and breakdown with changes, reflecting changes in tonnages and breakdown of composition.
Option 3a: Statutory targets for aluminium, plastic, steel and a split target for glass end use This is the preferred option	NPV of £257m Costs Additional collection costs of £219m <i>(Of which: additional recycling costs £272m minus reduction in collection and disposal of landfill waste of £53m)</i> Admin cost of £0.07m to set up IT for split glass targets. Benefits Revenue benefits of £446m. Carbon benefits of £19m	NPV of £182m Costs Additional collection costs of £221m <i>(Of which: additional recycling costs £274m minus reduction in collection and disposal of landfill waste of £53m)</i> Admin cost of £0.112m to set up IT for split glass targets. Benefits Revenue benefits of £394m ⁵ . Carbon benefits of £9m ⁶

Summary of Costs and Benefits (£m) A summary is presented on page 7

Risks

48. On collection costs, it is assumed that there is sufficient spare capacity in the market for the collection and handling of the additional tonnages overall i.e.
- No need to increase collection pass rates (i.e. frequency of collection)

⁵This reduction from the consultation IA reflects the change in material price assumption for plastic as well as the change in tonnages due to revised growth rates.

⁶ Reflecting changes in valuation of traded carbon and changes in calculation of proportions of traded and non-traded carbon – no change to the overall carbon emissions per tonne.

- No need to increase emptying frequency of vehicles
 - No need for additional compaction infrastructure, or retrofit bays
 - No need to increase staff numbers (except where explicitly included, e.g. as part of additional vehicle running costs).
49. There is considerable uncertainty in the collection costs, especially for plastics. The modelling of kerbside sort costs by WRAP is driven mainly by increases in vehicle loading times, around which there is relatively high uncertainty⁷. The consultation response specifically asked for additional cost information, but there has been no further information. Sensitivity analysis for high and low cost estimates considered +/-10% of the plastics collection costs.
50. There was some concern from plastics producers about whether there was sufficient infrastructure to cope with plastics. Responses from MRF operators, plastics reprocessors and WRAP indicate that there is sufficient infrastructure to cope with the extra volume of plastics – especially for plastic bottles which will make up most of the target. Infrastructure for other plastics, such as films, tubs, pots and trays may be more challenging, but the higher targets will provide revenue to invest in new technology and infrastructure.

Sensitivity Analysis

51. The efficient recycling rate depends on a number of factors, including volatile material prices and uncertain costs of collection. This means that we cannot guarantee exactly where the efficient level of recycling will lie. The targets for each material are therefore set at a balance between what is considered achievable in terms of infrastructure and an *improvement* in efficiency. We carried out the sensitivity analysis below to test the risk of 'overshooting' on these targets – the risk that the costs would outweigh the benefits overall.
52. Material prices are volatile, however the price of importance is the *average* price over a business cycle, since the 5 year time period of analysis is likely to follow the length of a business cycle. For **plastics**, if the material price dropped to £117/tonne, the sign of the overall NPV would switch to negative. This would have to be a drop in the average price of all the plastic which is collected from both C&I and households, including plastic bottles and rigid plastic. This would suggest a 50% drop in price for C&I plastic (representing 40% of plastic waste); 36-63% drop for plastic bottles (representing the majority of household waste collection). It is assumed that the majority of waste collection will come from C&I and household bottles and film.
- The 'switching point' for plastics collection costs was also tested. Collection costs would need to increase 70% in the years 2013-2015 and 39% in 2016-2017 to change the sign of the overall NPV. Although we have attempted to be conservative in accounting costs of collection, there is limited evidence available and this sensitivity may be realistic for later years.
53. For **aluminium**, and **steel** material prices would have to drop to below 0 in order to switch the NPV of the whole option; collection costs would have to increase 20-fold, which are unrealistic changes.
54. The low scenario on the summary sheet shows a scenario of high collection costs (+10%) combined with low material revenues for plastic and aluminium (a drop of 44% for plastic and a drop of 10% for aluminium).
55. However, it may be the case that *aspects* of the option have a net negative or positive effect, depending on the collection costs for each: for example, the additional tonnages of one of the materials may have a net negative effect, but this will not impact the overall direct of the NPV. Currently as modelled, each additional material contributes a positive NPV to the overall total.

⁷ 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.

Direct Cost to Business

Overall 'Bottom-up'

56. The overall cost benefit analysis is a 'bottom-up' analysis. This calculation suggests a positive net present value to business of £95m over the 5 years as a result of the higher targets, when only the private costs are included (i.e. removing the social value of carbon; plus considering only waste managed in the C&I rather than LA stream). I.e. If there was only one player managing the waste stream all the way from household / business through collection to disposal decision, there would be a clear incentive to recycle. The benefits of recycling these key materials outweigh the costs.
57. However, the many agents in the chain from household / business through to disposal decision mean that this incentive to recycle key materials is reduced and removed (see annex 3). In short, longer term contracts are required in order to bring certainty to investment decisions, but this can inhibit quick responses to changes in market conditions. Also, contracts do not tend to vary with composition of recyclate (i.e. even if there was additional aluminium or plastic in a bag of recyclates, the price paid would not tend to reflect this). This is an important point for this analysis of recycling key materials. At certain stages, the costs involved in monitoring this (transaction costs) would be prohibitively high. Even though there would be a business benefit to varying contracts according to composition of each sack, there may not be business benefit resulting from this in imperfect markets, with transaction costs. This monitoring does not take place, due to the costs involved.
58. This means that even though there is an *overall* net benefit to business (when additional levels of key materials are recycled), PRNs are still required to incentivise the additional recycling throughout the chain. This reasoning can be checked by assessing the value of likely transaction costs at each stage in the chain, i.e. the costs involved in checking each bag, assessing the tonnage and quality of each material and paying according to this. If these costs of monitoring and varying prices are greater than the benefit received per tonne of recycling, there would *not* be a business benefit to carry out these actions at each point where recyclate has changed hands., if these costs were around £10 per tonne of recycling for each 'step' in the chain, all value from recycling would be lost to these transaction costs (see Annex 3).
59. There are also distortions in the recycling 'chain' due to set-price long term contracts. These longer term contracts bring certainty to investment decisions, however distort the changing signals provided by the market. It is therefore reasonable to assume that there is an *overall* net benefit to business when additional levels of key materials are recycled. This higher level of recycling does not take place when the market is left to itself due to the transaction costs involved in monitoring and the further distortions from longer term contracts.

Obligated Businesses 'Top-Down'

60. Obligated business are the packaging producers, handlers and importers who are obligated to buy PRNs. Obligated businesses are therefore one sub-set of all business who will be impacted by the change in recycling targets. The impact on these *obligated* businesses remains calculated as per the consultation IA. This is the 'top-down' estimate of the increase in PRN revenues. The analysis assumes that there is an increase in PRN prices with higher targets. Note that this additional PRN revenue flows straight to reprocessors (business) to finance the additional costs of recycling compared to the next alternative.
61. The PV of this additional PRN revenue is £58.0m over the 5 years. This additional PRN revenue comes from the increase in number of PRNs issued (due to higher targets) as well as the assumed increase in PRN prices for key materials. These PRNs have to be purchased by obligated companies, therefore this is a cost of £58.0m to packaging producers and handlers (over the £2million de minimis threshold).
62. Since this PRN revenue is a direct gain to recycling reprocessors, there is a business benefit of £58.0m over the 5 years to reprocessors. The PRN revenue flows straight to the reprocessors who issue the PRNs. The

Equivalent Annual Net Cost to Business is **£11.7m** (with **£11.7m** for the equivalent benefit). The net effect of this to business overall is **£0m**, which involves a redistribution from obligated business (i.e. large packaging producers and handlers) to reprocessors. Note that this PRN transfer is only one transaction between two parties in the supply chain of recycling, whereas the NPV on the cover sheet is an estimate of costs and benefits to business overall.

63. These additional direct costs to obligated businesses are one of the many complex factors influencing business decisions on design and pricing. Businesses may take the decision to reduce packaging, reduce other costs or pass the costs to consumers or other businesses through higher prices. The extent to which the costs are passed down to consumers or other businesses depends on the industry subsector and the level of competition. Where costs *are* passed down, PRN costs are a small proportion of total packaging costs⁸ and packaging costs are a small proportion of total product costs.

One In One Out

64. The Office for National Statistics has classified the PRN system as tax-and-spend rather than regulation. For this reason it does not come within the scope of One In One Out.

⁸ With the assumed increase in PRN prices, the aluminium PRN is 3% of the material price; for plastic and steel, the PRN price is less than 10% of the material price.

SPECIFIC IMPACT TESTS

Equity and Fairness

65. This policy concerns the taxation of businesses and there will be no direct impact on individuals. As such it is very unlikely that there will be any impact on equality.

Small firms impact test

66. Businesses that do not simultaneously satisfy the two threshold tests in the Regulations (i.e. an annual turnover in excess of £2m and handling more than 50t of packaging) are excluded from the producer responsibility obligations in the Regulations. The proposed changes do not directly affect small businesses below these thresholds though they may incur indirect costs through overall increased costs in the supply chain.

Competition

67. 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 and type 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.

68. 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.

69. The Government has examined competition in the recycling market, material specific markets (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.

70. 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 put the targets for all the materials to similar levels and so will counter-act this effect.

71. 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.

72. Competitiveness in producer packaging relative to European counterparts is unlikely to be adversely affected, even where all other member states are meeting EU minimum only. Firstly, many of the systems which other member states have put in to ensure compliance with EU minimum are more expensive, since producers are required to finance the full cost of collection as well as reprocessing – under the PRN system, producers only pay the ‘top-up’ costs of recycling compared to landfill. Furthermore, other member states focus regulations only on producers, whereas the obligation is split between producers, handlers and fillers in the UK.

Annex 2: PRN/PERNs Mechanism and Cash Flows

73. 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.
74. 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 gate¹ and the 'costs avoided' of collecting the materials as refuse and disposing these to landfill.
75. 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.
76. 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).
77. 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.
78. 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).
79. 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.
80. To a limited extent, given market imperfections, the 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).

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>	

¹ Alternatively, the value of the reprocessed material could be considered alongside the additional, average re-processing cost

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;
- 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.

81. **PRNs and PERNs:** Packaging recovery notes are issued to accredited reprocessors within the UK who create evidence that recycling has taken place. Packaging export recovery notes are issued to accredited exporters of packaging for each tonne reprocessed overseas.

Annex 3: If there are benefits of recycling, why are these not reflected in decision-making?

82. If there was only one player managing the waste stream all the way from household / business through collection to disposal decision, there would be a clear incentive to recycle – the benefits of recycling these key materials outweigh the costs. However, the many agents in the chain from household / business through to disposal decision mean that this incentive to recycle key materials is reduced and removed.

Market Failures in the supply chain of recycling: The recycling market fails to pass on the full *material specific*, private value all the way through the chain. A tonne of aluminium or plastic may have a higher market value than a tonne of 'average' material, but this is not reflected in incentives passed through the system, at various points.

83. There are a number of market failures:

- a. **Misaligned incentives in waste disposal:** the financial benefits of recycling at the final point of disposal are not reflected in the relative cost and benefits which influence decisions earlier in the chain. One party pays additional costs, but the benefits of this are realised by a different party

For example, with C&I waste, the waste contractor will benefit where more of a business' waste is moved from landfill to recycling. However, smaller businesses are often charged a set fee *per lift* for their residual / recycling bin. The business will face the additional resource costs involved in separating waste for recycling, and will receive none of the benefits of waste moving from landfill to recycling.

- b. Misaligned incentives are particularly relevant where considering the differences between materials: One party pays additional costs *for focussing on a certain material*, but the benefits of this are realised by a different party. For example, MRFs will benefit from the sale of additional plastic, but it will be Waste Collection Authorities (WCAs) who will incur the additional costs of collecting plastic. Plastic is relatively costly for WCAs to collect per tonne (since it is a relatively low density material and fills up trucks quickly), however, recycling credits and gate fees depend on the overall tonnage of recycling rather than the

quantities of specific materials. This means WCAs incur additional costs without any financial benefit from focussing on this particular material.

- c. These misaligned incentives are partially due to the **transaction costs** involved in monitoring the quantities of different materials in a bag of recyclate at each transaction point in the chain (Households to WCAs to WDAs to MRFs or recycling collection points). The resources involved in separating, monitoring and recording the quantities of different types of waste throughout the chain would be substantial.
- d. Additionally, many transactions take part under **longer term contracts**. These longer term contracts are required in order to bring certainty to investment decisions, but this can inhibit quick responses to changes in market conditions and changes in the composition of recyclate. This further distorts the incentives from disposal to further up the chain.

Material-specific targets are a second best solution in the presence of transaction costs and distortions. Targets mean that packaging producers have to focus on specific materials. This may be through e.g. paying for a plastic collection system for a LA, or ‘price support’, providing additional incentives for certain materials.

More detail is available in the consultation Impact Assessment <http://www.defra.gov.uk/consult/files/packaging-ia.pdf>

Annex 4: Data sources, Methodology and Headline Assumptions

Data sources and research

- Consultation Document *Packaging Targets*, published on 10th December 2011 on the website of the Department for the Environment, Food and Rural Affairs (DEFRA).
- **Base Data:** derived from PackFlow (http://www.valpak.co.uk/Libraries/Packaging_Compliance_Documents/PackFlow_2012_Summary_Report_and_Recommendations.sflb.ashx) and from sales/production data provided by materials organisations
- **Split glass target** The split glass target would be achieved by splitting the PRN market for re-melt and aggregates. Evidence for aggregates would be separate from evidence for re-melt, though derived from the producer’s overall glass obligation .
- **Collection Costs:** WRAP (2009), WRAP (2008), Eunomia (2010), as referenced above
- **Material revenues:** Letsrecycle.com correct at September 2011 for consultation IA.
- **PRN prices:** Letsrecycle.com correct at September 2011

Packaging tonnages and Obligated tonnages

The targets only apply to businesses who are obligated, however the EU regulations apply to *all packaging*. We need to calculate the targets on obligated companies that will achieve *overall* packaging rates.

Assumptions

- i. the amount of packaging flowing into the UK waste stream, by material
- ii. the level of packaging that is ‘obligated’ on the UK market

These figures have been verified by industry during the consultation and are based on the following growth in waste arisings:

	2011 / 2012	2013 onwards
Paper	0.8%	0.5%
Glass	1.0%	1.0%
Alu	0.8%	1.0%
Steel	-0.5%	-0.5%
Plastic	1.5%	1.5%
Wood	0.0%	0.5%
Other	0.5%	0.0%

Obligated tonnages are based on actual arisings and are assumed to follow the same growth rates as overall packaging.

These growth rates lead to the following tonnes of packaging in the waste stream:

Total tonnes of packaging in waste stream

	2013	2014	2015	2016	2017
Paper	3,867,645	3,886,984	3,906,419	3,925,951	3,945,580
Glass	2,795,062	2,823,013	2,851,243	2,879,756	2,908,553
Alu	163,785	165,423	167,078	168,748	170,436
Steel	642,269	639,057	635,862	632,683	629,519
Plastic	2,591,850	2,630,728	2,670,188	2,710,241	2,750,895
Wood	1,029,058	1,034,204	1,039,375	1,044,572	1,049,795
Other	22,555	22,555	22,555	22,555	22,555
Total	11,112,225	11,201,964	11,292,720	11,384,505	11,477,333

Targets

Since obligated tonnages of packaging are a proportion of total packaging, the obligated targets lead to the following *overall* recycling level for packaging:

Obligated and overall recycling rates

	Obligated Targets					Overall Rate of Recycling				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Paper	69.5%	69.5%	69.5%	69.5%	69.5%	66.1%	66.1%	66.1%	66.1%	66.1%
Glass	81.0%	81.0%	81.0%	81.0%	81.0%	62.1%	62.1%	62.1%	62.1%	62.1%
<i>Remelt</i>	61%	62%	63%	64%	65%					
<i>Aggregates</i>	39%	38%	37%	36%	35%					
Alu	43.0%	46.0%	49.0%	52.0%	55.0%	41.8%	44.7%	47.7%	50.6%	53.5%
Steel	72.0%	73.0%	74.0%	75.0%	76.0%	54.2%	55.0%	55.7%	56.5%	57.2%

Plastic	37%	42%	47%	52%	57%		27.4%	31.2%	34.9%	38.6%	42.3%
Wood	22.0%	22.0%	22.0%	22.0%	22.0%		21.6%	21.6%	21.6%	21.6%	21.6%
Total Recycling	69.0%	69.9%	70.8%	71.8%	72.7%		58.5%	59.2%	60.0%	60.7%	61.5%
Total recycling and recovery	75.0%	76.0%	77.0%	78.0%	79.0%		63.5%	64.4%	65.2%	66.0%	66.8%

Additional tonnes of packaging recycled through targets

Additional tonnages	2013	2014	2015	2016	2017
Aluminium	1,593	9,652	14,623	19,692	24,861
Steel	4,835	9,621	14,359	19,050	23,693
Plastic	96,121	195,126	297,080	402,048	510,098
Glass-end use of remelt	-	17,429	35,207	53,339	89,788

Calculating Costs and Benefits of Recycling

Costs and benefits are calculated for each additional tonne of recycling as per Porter ("The economics of waste", 2002).

1. The **additional tonnes of each material are calculated**, depending on the targets.

The gap between a producer's material specific target and overall recycling target is filled by 'general recycling'. This means that, as material specific targets increase, the tonnes of general recycling changes under some options – this depends on the changes to the *overall* recycling target. This general recycling can come from any material and therefore tends to focus on the materials with the lowest PRN costs (i.e. paper and wood).

2. The benefits per tonne are: the **material revenue** and the **value of the carbon benefit**;
3. The costs per tonne of each material are the additional costs of recycling (**collection and sorting costs** minus **savings in residual waste costs**)

Costs and benefits are per tonne.

The Social NPV is calculated as:

Additional tonnes x benefits of material (material prices & carbon)

– additional tonnes x costs of material (additional recycling collection costs, compared to residual route)

for each material.

Benefits	Detail	Assumptions and source
Material prices	Value of each material	As per previous IAs, current material price is used, with sensitivity of low and high material prices.

Carbon	Carbon benefit of recycling each material compared to landfill.	<p>A] Carbon split into traded and non-traded calculated by zerowastescotland. See values below. Marginal tonnes of plastic are assumed to be closed loop (information from WRAP).</p> <p>B] Assumption that LAs and businesses will divert marginal tonnages of waste from landfill rather than incineration, since i) tonnages to incineration are tied into contracts (with the 'slush' falling to landfill) ii) landfill (including tax) tends to be higher than incineration gate fee.</p>
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Costs	Detail	Assumptions and sources
Collection and sorting costs		<p>Ratio of HH:C&I collection 0.45 (Packflow)</p> <p>Ratio of Household Urban: rural collections 0.50 (WRAP)</p> <p>Ratio of comingled: kerbside sort 0.50 (WRAP)</p> <p>Tonnages up to EU calculated as average collection costs</p> <p>Tonnages above EU minimum have higher marginal costs.</p> <p>For plastic, higher marginal collection costs for final years with conservative assumption that more expensive infrastructure will be required.</p>
Savings in resource costs	<p>Reduction in residual ('black bag') collection</p> <p>Reduction in resource costs associated with landfill</p>	<p>Residual collection costs £38.05 (Eunomia, 2011, average of household and C&I refuse collection cost)</p> <p>Landfill gate fee £19.93 (average figure from WRAP gate fees survey, 2011)</p> <p>Note: landfill tax is <i>not</i> included, since it is a transfer payment</p>

Overall Costs and Benefits to Business

Even though appropriate incentives are not maintained throughout the path of recycling (see annex 3), there is likely to be an overall net benefit. Businesses at any one point are unlikely to observe the net benefits calculated in the body of the text, but overall, the net of the benefits will be received by agents at some point in the chain.

For costs the business, the relevant tonnes of recycling is the tonnes of C&I waste. C&I waste is dealt with by businesses at all points in the chain, which suggests that the overall net benefit must all fall to business. Household waste is dealt with by LAs – collection authorities and disposal authorities. A proportion of the net benefits from LA waste will also accrue to business, where waste is taken to materials recycling facilities. However, it is not possible to estimate the proportion of net benefit which would accrue to business, therefore this analysis only considers the C&I waste. This does mean that the estimate of the overall net benefit to business may be an under-estimate.

The costs to business are calculated as:

C&I waste:

Additional tonnes x benefit of material (material revenue)

- additional tonnes x costs of material (additional recycling collection costs compared to residual route),

For each material.

The material revenue, collection costs and residual resource cost savings lead to an overall net benefit to business, which suggests that businesses should have the incentives to focus on these key materials without Government intervention. However, this is only the case in a perfect market. In reality, it is likely that the transaction costs throughout the chain of recycling (described above) mean the incentives for key materials are not maintained at every stage. The costs of monitoring are likely to stop businesses varying their rates with quality and quantity of different types.

As an analytical 'check' of this theory, we have estimated the costs of monitoring (as described in annex 3) – the level of costs which would mean that full monitoring doesn't take place, therefore higher levels of recycling are not incentivised by the market, and incentives (PRN revenues) are required to encourage additional recycling.

These monitoring costs would apply to all tonnes of recycling (not just the higher value key materials).

On average, a tonne of additional recycling has a net benefit of: **£38.48** (taking the private benefits and costs, using the proportions of each material in the waste stream)

It can be estimated that the costs of monitoring at each transaction cost may be around £10 per tonne. There are around 4 or more transaction 'points' in the chain of recycling from household / business to disposal. This means that, if monitoring at each stage did take place, the value gained per tonne of recycling would be: £38.48 – 4*£10 i.e. no longer any benefit.

This therefore suggests that it is reasonable to assume that there are overall net benefits gained from business by recycling (especially for key materials). The system as a whole benefits when additional levels of key materials are recycled. However, the transaction costs involved in monitoring are resulting in the current system continuing (i.e. no differentiation in materials in contracts).

Check:

Net benefit per tonne of average recycling – transaction costs of full monitoring

Costs to Obligated Business

Costs to obligated business are calculated as per the consultation IA:

The costs to obligated business are calculated as:

Change in PRN price x tonnes up to EU minimum +

Higher PRN price x additional tonnes,

For each material

Assumptions

Material Price

Material	Price per tonne (£)*	Price per tonne (£)
	Current: used for 'best estimate'	Low: used for 'low' estimate on summary sheet
Paper	90	30
Glass – colour separate	24	21
Glass – mixed	5	0
Aluminium	985	900
Steel	185	90

Plastic	Range from 340 – 40 for varying compositions of plastic, taking 40% plastic bottles; 40% C&I and 20% film and rigid plastics	150
Wood	(12)	(16)

* Figures as of September 2011 from WRAP materials pricing report

Carbon factors (CO₂ equivalent)

Material	Carbon factor (Tonnes of CO ₂ equivalent benefit / tonne of material recycled)	Carbon factor (Tonnes of CO ₂ equivalent benefit / tonne of material recycled)	Carbon factor (Tonnes of CO ₂ equivalent / tonne of material recycled)
	Traded	Untraded	Total
Paper	0.22	0.52	0.74
Glass (separated)	0.38	0.01	0.39
Glass (mixed)	0.19	0.01	0.19
Aluminium	9.32	0.05	9.27
Steel	1.72	0.01	1.72
Average Plastic	1.12	0.01	1.20
Wood	0.56	0.75	1.32

Source: Zerowaste Scotland calculations, based on WRAP/Zerowaste Scotland England carbon factor

DECC traded and non-traded carbon values used

Collection and sorting costs

Material	EU minimum Recycling up to current levels: collection costs will be flat, given that there is assumed to be sufficient collection capacity			Higher targets Recycling beyond current levels: marginal collection costs depend on type of material			Higher Targets Marginal costs where there may be a 'tipping point' change		
	HH	C&I	Overall	HH	C&I	Overall	HH	C&I	Overall
Paper	£115	£80	£96	£107	£44	£78	n/a	n/a	n/a
Glass (mixed)	£115	£80	£96	£107*	£36	£62	n/a	n/a	n/a
Glass (separated))	£115	£80	£96	£113	£95	£103	n/a	n/a	n/a
Aluminium	£115	£80	£96	£102	£80	£90	n/a	n/a	n/a
Steel	£115	£80	£96	£25**	£25**	£25	n/a	n/a	n/a
Average Plastic	£115	£80	£96	£212***	£148	£183	£295***	£159	£224

Wood	£115	£80	£96	£12	£38	£26	n/a	n/a	n/a
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Sources:

EU minimum

HH Kerbside Sort: WRAP – "Kerbside Recycling: Indicative Costs and Performance. Technical Annex." (2008)

HH Comingled: Eunomia – Background spreadsheets to Eunomia landfill bans work (2010)

In order to obtain both kerbside and co-mingled costs as gross figures (rather than net of material sales), the Eunomia figures have been taken for co-mingled collections and the WRAP figures have been taken for kerbside sort. (The WRAP co-mingled figure is net of material sales).

C&I: Eunomia (as above)

Higher:

All Eunomia (as above) apart from where marked:

*Household Average kerbside collection figures from WRAP (2008) indicative costs and performance

**Corus solution (correspondence in 2010)

***WRAP (2009) Financial costs of collecting Mixed Plastics Packaging

Sensitivity: +/- 10% of collection costs for plastic

Savings in resource costs

Mixed Waste collection Costs	£38.05	Source: Eunomia (2011) Landfill bans model
Landfill gate fee (average)**	£ 19.93	Source: "WRAP 2011 gate fees report"

PRN Prices

Material	Current PRN price (£)	Estimated PRN price with higher targets (£)
Paper	£1.50	£1.50
Glass	£10.50	Increase to £22
Aluminium	£12	Increase to £30
Steel	£6	Increase to £15
Plastic	£5	Increase to £20
Wood	£1.50	£1.50
'General Recycling'	£1.50	£1.50
Energy from Waste	£1	£1