Plastic & Glass Packaging Recycling Business Targets 2016-2020

IA No:

Lead department or agency:
Defra

Other departments or agencies:
Scottish Government, Welsh Assembly Government, Dept of the Environment Northern Ireland, HM Treasury, BIS

Impact Assessment (IA)

Date: 01/11/2015

Stage: Final

Source of intervention: EU

Type of measure: Secondary legislation

Contact for enquiries:
Ian Atkinson

Summary: Intervention and Options

RPC Opinion: Not Applicable

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB on 2014 prices)	**In scope of One-In, Two-Out?**	**Measure qualifies as**
-£27.08m	-£0.94m	£0.20m	No	NA

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

The management and disposal of packaging waste produces environmental externalities such as greenhouse gas emissions and disamenity impacts from landfill, the full social cost of which is not taken into account in production or consumption decisions. Without intervention, there would be overproduction of packaging and insufficient levels of recycling. The EU sets mandatory packaging recycling targets. The UK complies through statutory recycling business targets, achieved through a producer responsibility system. By making packaging handlers and producers pay some of the costs of recycling packaging, these costs are internalised, leading to reduced environmental impacts and a more efficient outcome.

What are the policy objectives and the intended effects?

The policy objectives are to make adjustments to the market-based system that the UK uses to meet the EU targets and internalise the costs of packaging for packaging producers. The intention is to reduce costs for packaging producers and social costs associated with the current targets.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

The full series of business target percentages for each option, each year is presented in a later table.

Option 0 – Do nothing – do not amend legislation, keep all targets already legislated in 2016/17, then let legislation expire in 2018 and have no business targets.

Option 1 – i) Lower existing plastic business target to 49% in 2016 then increase by 2% each year to 2020

ii) Do not amend glass business target then increase from 2018 by 1% each year to 2020

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

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: -1**		**Non-traded: Negligible**

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 SELECT SIGNATORY: ..... Date: .....

Summary: Analysis & Evidence

Policy Option 1

Description: Option 1 – i) Lower plastic target to 49% in 2016, then increase by 2% each year to 2020
ii) Do not amend glass target the n increase by 1% to 2020

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	**PV Base Year** 2015	**Time Period: 5 Years**	**Net Benefit (Present Value (PV)) (£m)**		
			Low: -38	**High: 28**	**Best Estimate: -27**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	**0**		**41.3**	182.8
High	**0**		**41.3**	182.8
Best Estimate	**0**		**41.3**	182.8

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

Cost to society, including business, of collecting and sorting more recycling**.**

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

Cost to society of local environmental impact of sorting facilities.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	**0**		**32.8**	144.4
High	**0**		**47.7**	210.4
Best Estimate	**0**		**35.4**	155.7

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

Benefit to society, including business, of receiving more material revenue.
Benefit to society, including business, of reducing residual collection and landfill.
Benefit to society of avoided greenhouse gas emissions from increased recycling.

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

Benefit to society of reducing landfill environmental impact.

Key assumptions/sensitivities/risks Discount rate (%) **3.5%**

There is a need to have domestic targets in order to ensure the UK continues to meet the recovery and recycling targets from the EU Packaging Directive.
Best estimates assume constant collection and sorting costs and material prices over the next 5 years. This analysis is sensitive to changes in collection and sorting costs, the notional baseline, the split between household and C&I collections, carbon prices and material prices.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			**In scope of OITO?**	**Measure qualifies as**
Costs: 10.7	**Benefits: 10.5**	**Net: -0.2**	No	NA

Executive Summary

Summary tables

The Government is considering 1 option for the plastic and glass business targets from 2016-2020. The business target percentages for the different options, over the next 5 years, are presented in the table below:

Table 1: business target percentages for different options

	2016	2017	2018	2019	2020
Option 0 - plastic baseline: unchanged then no targets	52%	57%			
Option 1 - Lower plastic target to 49% in 2016 then increase by 2% each year to 2020	49%	51%	53%	55%	57%
Option 0 - glass baseline unchanged then no targets	77%	77%			
Option 1 - Do not amend glass business targets then increase by 1% to 2020.	77%	77%	78%	79%	80%

The UK business targets apply only to 'obligated' packaging producers, i.e. those companies which:

- handle 50 tonnes of packaging materials or packaging in the previous calendar year, and
- have a turnover of more than £2 million a year.

Hence, the overall UK recycling rates will be slightly lower than the business targets. The proposed new targets are expected to deliver the following recycling rates(%), due to the number of businesses that fall below the de minimis within the Regulations and so are not obligated. UK recycling rates :

	2018	2019	2020
Option 1 (plastic)	44	46	48
Option 1 (glass)	67	68	69

The result for the options in terms of estimated net benefit to society and annual net cost to business, are presented in the table below.

Table 2: results for combined option1 (plastic and glass targets)

	Net present value best estimate £m	**Annual net cost to business £m**
Option 0 - plastic baseline: unchanged then no targets	0	0
Option 1 - proposed plastic and glass targets	-27.08	-0.2

Option 1 is estimated to have a negative net present value, i.e. cost, to society and a net cost to business.

Scotland and Wales have ambitious targets for recycling of household waste and to ensure these are met cost-effectively it is important for packaging recycling to have commensurately ambitious targets. In particular, having high packaging recycling targets will help to lower the unit costs of recycling infrastructure that these nations require to deliver 70% household recycling by 2020.

There is also a need to set targets to continue to meet the EU Directive minimum recycling rates.

Introduction

The management and production of waste incurs environmental externalities such as greenhouse gas emissions. The full social costs and benefits are not taken into account in production or disposal decisions, resulting in the over production of waste and sub optimal decisions on waste management options. A waste management system that internalises the environmental impacts in pricing of treatment options should result in a more efficient level of waste and allocation to different treatment options.

In the absence of intervention, decisions about the design and production of packaging would likely be made without taking into account the costs of dealing with the discarded packaging at the point of consumption. This would lead to the over-production of packaging as the suppliers of packaging do not face the full costs of dealing with packaging waste. Further, there are environmental benefits of moving packaging waste up the waste hierarchy at end of life that are not reflected in waste management costs and result in a sub-optimal mix of waste management. The waste hierarchy ranks different waste management options broadly according to their environmental impact. For example, shifting waste from landfill to recycling results in environmental benefits from avoided use of virgin materials and associated greenhouse gas impacts. Shifting waste further up the hierarchy to reuse would provide even greater environmental benefits from, for example, reduced reprocessing impacts.

The UK has a statutory producer responsibility scheme for packaging recycling, which implements the EU Packaging Directive. This scheme internalises some of the externalities of dealing with packaging at the end of its life. This reduces the amount of packaging waste going to landfill and reduces the associated environmental impacts. It does so by setting minimum recycling and recovery targets on UK businesses in the packaging supply chain.

In order to comply with the Packaging Regulations, obligated packaging producers must demonstrate a minimum level of recovery and recycling been undertaken on their behalf by obtaining Packaging Waste Recovery Notes (PRNs). PRNs are issued by exporters or recyclers when a tonne of relevant packaging material has been recovered or is exported for reprocessing. This demand for PRNs from obligated producers creates a market for PRNs that can be issued by accredited domestic reprocessors and exporters. The price for PRNs, although volatile, should reflect the marginal cost of meeting the obligation. Specifically, for each PRN it should reflects the additional cost of diverting material from landfill to recycling that is not covered by existing economic drivers. In this way obligated packaging producers and collectors internalise some of the cost of dealing with packaging at the end of its life. A very low PRN level would indicate that little additional incentive is required to deliver the level of recycling set by business targets.

The UK business targets are set to ensure the UK meets the EU Directive recovery and recycling targets, taking into into account the de minimis producers who are not obligated, which are 22.5% for plastic and 60% for glass. Historically, the tonnage of packaging produced or handled by businesses that are out of scope due to de minimis has been relatively steady as a proportion of the total amount of packaging.

This IA reviews the packaging recycling targets with a view to changing the targets for obligated producers. There is one proposed option:

For plastic -

- Option 1 – Amend existing plastic target to 49% in 2016 then increase by 2% each year to 2020 (this would deliver a 48% plastic packaging recycling rate by 2020).

For glass -

- Option 1 – Do not amend glass targets for 2016 and 2017 then increase by 1% each year to 2020 (this would deliver a 68% glass packaging recycling rate by 2020).

These options are based on ensuring we achieve a minimum level of recovery and recycling in order to continue to meet the EU Packaging Directive minimum targets.

The main intention of the proposal is to reduce the possible cost to business by reducing the targets for plastic in 2016 and 2017, based on the new data available whilst still ensuring that the UK continues to achieve the minimum recycling requirements from the EU Packaging Directive in a cost effective manner in 2016-17 and beyond.

Scotland and Wales have ambitious targets for recycling of household waste and to ensure these are met cost-effectively it is important for packaging recycling to have commensurately ambitious targets. In particular, having high packaging recycling targets will help to lower the unit costs of recycling infrastructure that these nations require to deliver 70% household recycling by 2020.

Option 1 is the Government's preferred option for plastic and glass targets as it maintains a high degree of environmental ambition, whilst attempting to keep compliance costs for business low.

Background – the Packaging Directive and producer responsibility in the UK

The environmental externalities associated with packaging waste are greenhouse gas emissions from sending packaging to landfill, disamenity impacts from littering and impacts on land use from landfill sites. Not all environmental externalities are internalised in decision-making by households and businesses. Intervention is required by government to reduce the environmental impact of packaging waste.

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 reducing 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.

The Packaging 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 targets are to be met by Member States by December 2008 and maintained thereafter. After then, Member States must continue to meet these minimum targets, but have the freedom to set higher national targets.

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 amendment of the packaging recycling targets contained in the latter set of Regulations, which are hereafter referred to as 'the Packaging Regulations'.

Using a producer responsibility system to internalise some of the costs of dealing with packaging provides incentives for packaging producers to reduce the environmental impacts of waste and ensure a proportion is recycled. Packaging producers have to pay towards the cost of recycling and are therefore incentivised to reduce the total amount of packaging resulting in a reduction in the environmental impacts of packaging at the end of its life. If set at the efficient level, the recycling target has the potential to reduce the environmental impact of packaging

waste through reduced impacts of virgin material extraction and associated environmental impacts.

In the UK, a "packaging producer" includes any business involved in the packaging supply chain, i.e. one that manufactures raw materials for packaging, converts raw materials into packaging, uses packaging to wrap goods, or sells or imports packaged products. The 'responsibility' for the packaging is split between these actors in the supply chain.

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 acquired by packaging producers. An accredited reprocessor/exporter can issue PRNs/PERNs to the amount of packaging waste reprocessed (e.g. 100 tonnes of packaging steel waste reprocessed allows the reprocessor to 'sell' 100 PRNs in steel).

The evidence notes have two functions. Firstly, they are a 'counting tool' for the amount of recovery/recycling undertaken on the behalf of producers. Secondly, they are a way to channel producer funding to recycling/recovery operations since business pay for these PRNs / PERNs. This internalises the cost of recovery and recycling to the packaging producers.

The Packaging Regulations include a de minimis threshold, exempting businesses which have a turnover below £2m and who handle under 50 tonnes of packaging a year; they are 'not obligated'. However the packaging that is handled by those exempt businesses still counts when calculating the UK's recycling performance. This is because the Packaging Directive targets are set as a percentage of the total packaging waste arising in each Member State. Business targets are therefore set for obligated businesses that are higher than the actual EU minimum target in order to take this exempt packaging into account. The actual amount of exempt packaging changes from year to year. Business targets are therefore set at a level to take into account these fluctuations.

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 takes 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.

The price of PRNs and PERNs varies depending on availability. The Regulations do not mandate the use to which the proceeds from the sale of PRNs/PERNs to producers can be put, though accredited reprocessor and exporters are required to report on the use of these funds as they are intended to finance improvements in the collection and reprocessing infrastructure across the UK.

Rationale for intervention and policy objectives

The main intention of the proposals presented here is to reduce the possible cost to business by reducing the plastic targets for 2016 and 2017, based on the new data available whilst still ensuring that the UK continues to achieve the minimum recycling requirements from the EU Packaging Directive in a cost effective manner in 2016-17 and beyond.

The management and disposal of waste results in environmental impacts such as greenhouse gas emissions and disamenity impacts. The full social cost of producing and dealing with waste is not taken into account in decisions by households and businesses. This results in the over-

production of waste and sub-optimal allocation of waste treatment. Intervention by government can help reduce the amount of packaging waste to a more efficient level and shift the allocation of treatment to a more efficient level. Without government intervention, waste treatment options with better environmental performance may be penalised relative to treatments with poorer performance due to higher costs.

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 provides benefits such as the protection of goods in transit and it helps ensure that products are undamaged. The benefits of packaging should be considered against the extra cost of producing and dealing with that packaging at the end of its life.

Recovery and recycling targets are set at a level to increase the amount of packaging that is recovered and recycled from a sub-optimally low level. There are environmental benefits from a shift from landfill to recycling and recovery. The shift will reduce the adverse environmental impacts of: 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. It would be more efficient to reduce the amount of packaging waste that is sent to landfill, compared to a world with no recycling.

Recycling packaging results in reductions in emissions of greenhouse gases because less energy is used to produce recycled raw materials than in the production of virgin raw materials. It also avoids the extraction of raw materials, which can have a negative impact on the environment and biodiversity. Increased recovery and recycling of packaging waste could have amenity benefits by contributing to a decrease in packaging litter.

Externalities and reaching an efficient level of recycling

All environmental costs and benefits of waste disposal decisions are not reflected in the relative costs of each disposal option. The policy objective is to move towards a more efficient level of recycling.

In the absence of intervention in recycling, there are monetary incentives to move waste away from landfill, due to pre-existing regulation (the Landfill Tax). However, there are no incentives which reflect the *additional* benefits of recycling compared to other non-landfill options. Under landfill tax, all materials are equally incentivised away from landfill, despite the benefits of different waste types moving up the waste hierarchy[1] to recycling being very different. Both these points mean that, in the absence of Government intervention in recycling, levels of recycling are likely not to reach the efficient level for each material.

In this instance, the NPV of each proposed option is negative, implying that the efficient level of intervention has been overshot (i.e. the benefit of the marginal tonne of additional recycling is lower than its marginal cost, despite the savings in GHG emissions).

Achieving targets set by EU packaging legislation

The second policy objective is to ensure that the minimum packaging recycling and recovery targets included in the Packaging Directive continue to be met.

In the absence of intervention, the market prices for recyclates do not ensure UK recycling levels meet EU packaging targets. The costs of collecting and reprocessing a material may be greater than the value which can be earned from selling the material, resulting in no incentives to recycle. To ensure the EU packaging targets are met, Government intervention is required.

[1] https://www.gov.uk/government/publications/guidance-on-applying-the-waste-hierarchy

Background

The business targets for 2013-17 were consulted on in 2011 and final targets announced at Budget in March 2012[2], glass targets were revised in 2014[3]. The targets were set using the best available evidence at the time and this simpler impact assessment (IA) uses the same core methodology and most of the same assumptions, particularly cost assumptions, from the previous IAs. Material revenue price assumptions have been updated.

In 2014 we commissioned a report to review the industry-provided underlying data used to calculate the targets for plastic packaging waste recycling. "PlasticFlow" was published in December 2014[4]. PlasticFlow went back to first principles and produced a new estimate of plastic packaging waste arisings based on a thorough analysis of the market. The report suggested that estimates of the flow of plastic packaging placed on the market were historically too high. This means we could reduce the business target on industry whilst continuing to deliver similar levels of recycling, thereby reducing the costs of compliance for business. The Department accepted the PlasticFlow figure as the most robust data available and consulted from March to May 2015 on the implications of the data as part of our consultation on possible changes to the Packaging and Batteries Regulations.

Analysis

The Government is proposing the following change to the plastic and glass business targets fo 2016-2020. The business target percentages for the baseline and the proposed option, over the next 5 years, are presented in the table below:

Table 3: business target percentages for different options

	2016	2017	2018	2019	2020
Option 0 - plastic baseline: unchanged then no targets	52%	57%			
Option 1 - Lower plastic target to 49% in 2016 then increase by 2% each year to 2020	49%	51%	53%	55%	57%
Option 0 - glass baseline unchanged then no targets	77%	77%			
Option 1 - Do not amend glass business targets then increase by 1% to 2020.	77%	77%	78%	79%	80%

<u>Option 0: Baseline: Do nothing. Do not amend targets, let them expire: have no targets</u>

This option is the baseline for the period 2016-20 in the absence of any changes to policy. Other options are measured relative to this option. It is a 'notional' baseline as the UK is required to meet EU targets and therefore will need legislated targets. A notional baseline is described in more detail in the 2012 IA[5]. This Impact Assessment was used to help set the existing packaging recovery and recycling targets, by analysing the market and using industry estimates and forecasts to model different scenarios.

For glass we estimate there would be an 11% drop in recycling at a UK level, translating to a reduction of 13% at an obligated business level, with no regulatory targets; the 11% assumption is in the mid-range of the assumptions from 2012.

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82441/packaging-ia.pdf

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/294272/packaging-targets-ia.pdf

[4] http://www.wrap.org.uk/content/plastic-packaging-market-study-plastic-flow-2014-0

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82441/packaging-ia.pdf page 13

For plastic, targets have increased more rapidly since 2012, therefore we assume the notional baseline now would be different from that assumed in the 2012 IA.

We estimate from 2018, only PET and HDPE bottles and C&I film would be recycled if there were no targets:

Table 4: Plastic baseline tonnage projected for 2018 in baseline scenario.

Category of plastic	**Recycled tonnes**
Consumer recycled bottles	425,853
Non-consumer (C&I) recycled bottles	114,993
Non-consumer (C&I) recycled film	265,368
Total plastic baseline	**806,214**

Source: The Plastic Packaging Market Study (Plastic Flow) 2014, Rigid Plastic Packaging in the Commercial & Industrial Sectors, WRAP and Valpak 2015.

Placed on market assumptions

Two of the key assumptions include (i) how much material in total is placed on the market and (ii) how much of that is by obligated firms. We use the Plastic Packaging Market Study (Plastic Flow) 2014, the Rigid Plastic Packaging in Commercial and Industrial Sectors Study (2015) & Glassflow (2012) for (i) and the Environment Agency National Packaging Waste Database for the latter (ii); these sets of assumptions are in the table below:

Table 5: Placed on market assumptions (tonnes)

			2016	2017	2018	2019	2020
Plastic	**Placed on market**		**2,220,000**	**2,220,000**	**2,220,000**	**2,220,000**	**2,220,000**
Glass	**Placed on market**		**2,399,235**	**2,399,235**	**2,399,235**	**2,399,235**	**2,399,235**

Sources:
Plastic Packaging Market Study (Plastic Flow) 2014. p2:
http://www.wrap.org.uk/sites/files/wrap/Plastic_Packaging_Market_Study_2014_0.pdf.
Rigid plastic packaging in the commercial & industrial sectors, 2015.
(Publication forthcoming)
Glassflow: http://www.wrap.org.uk/sites/files/wrap/GlassFlow%20Final%20Report.pdf
Tonnage from obligated firms and allocation method comes from NPWD data for 2015.

Costs and benefits of recycling

Costs and benefits are calculated for each additional tonne of recycling[6] and it is assumed the material is diverted from landfill.

The following 3 steps are the core method of this impact assessment:

Step 1: The required recycling tonnes for each material are calculated, compared to the baseline, depending on the targets and projected placed on market tonnages

Step 2: Costs per tonne are calculated: i) recycling collection and sorting costs

Step 3: Benefits per tonne are calculated: i) material revenue
ii) carbon saving
iii) residual collection and landfill saving

As more material is collected and sorted after a certain point, the cost of collecting and sorting starts to rise.

Costs and benefits are per tonne.

Net benefit to society is calculated as:

Additional tonnes x benefits of material (material prices, carbon saving, residual collection saving)

– additional tonnes x costs of material (additional recycling collection and sorting costs)

[6] As per Porter ("The Economics of Waste", 2002)

Exceptions to the methodology:

Landfill tax

Whilst landfill tax has a large behavioural effect on tonnages recycled, tax is a transfer under Government methodology so is not included as a cost or benefit in this IA.

Non-monetised impacts

There are a number of additional impacts which are currently difficult to monetise, with most likely to increase the benefits associated with higher recycling targets (thus suggesting that the NPV calculation for each option represents a lower bound). These are:

- The reduction in waste going to landfill reduces the disamenity impact of landfill sites. However the alternative treatment, recycling, also incurs local environmental impacts. In the absence of accurate information on those impacts, the local disamenity impacts are not monetised. It is assumed the local environmental impact of both landfill and recycling sorting facilities is likely to be negative.
- Higher statutory targets may stimulate investment in infrastructure (for sorting and collecting as well as reprocessing), which may reduce the marginal costs of collecting, sorting, and reprocessing waste. This is likely to be an impact realised over a longer time-scale, and the precise associated monetary benefit is currently unclear.
- Whilst the savings in 'embedded' GHG emissions from recycling (i.e. emissions that would have been created in firms' production processes in the absence of recycled materials) are monetised and included in the methodology, the impact of the loss of scarce 'virgin' resources for future generations that would be the result of lower recycling targets, while likely negative, may not be fully reflected in the current value of those materials, due to uncertainty over the valuation of resources to future generations.
- The effects of 'softer' benefits from higher recycling targets, such as shifts in public attitudes towards recycling and the environment (which are likely to reduce waste collection costs over a longer-time scale) are currently subject to too much uncertainty to be monetised.

Step 1: Differences in amount of recycling needed, compared to the baseline

We calculate the different levels of recycling required for each option by multiplying the proposed targets, under each option, by the tonnage placed on the market by obligated firms. These different levels are then compared to the baseline:

Table 6: Plastic recycling needed (tonnes)

£ m	2016	2017	2018	2019	2020
Plastic - Baseline required recycling (tonnes)	990,696	1,085,354	806,214	806,214	806,214
Option 1 required recycling	933,901	971,764	1,009,627	1,047,491	1,085,354
Option 1 recycling change from baseline	- 56,795	- 113,590	203,413	241,277	279,140

Important note: In 2016/17, option 1 reduces the existing plastic targets. This would reduce the recycling required i.e. recycling collection and sorting costs would fall for these years (a negative cost is a benefit) but material revenue, carbon and landfill savings also fall (a negative benefit is a cost). This difference between 2016/17 and 2018-2020, flows through the rest of this impact assessment, in terms of negative costs and negative benefits.

The 2016 and 2017 targets have been set to ensure that the UK, as a whole, continues to meet the minimum requirements as required in the EU Packaging Directive: 22.5% recycling rate for plastic and 60% for glass. New targets are required beyond 2017 to ensure that the UK continues to meet these levels.

Table 7: Glass recycling needed (tonnes)

	2016	2017	2018	2019	2020
Glass - Baseline required recycling	**1,571,303**	**1,571,303**	**1,307,387**	**1,307,387**	**1,307,387**
Option 1 required recycling	**1,571,303**	**1,571,303**	**1,591,709**	**1,612,116**	**1,632,522**
Option 1 recycling change from baseline	**-**	**-**	**284,322**	**304,729**	**325,135**
Option 1 aggregate glass change from baseline	**-**	**-**	**102,356**	**109,702**	**117,049**
Option 1 remelt glass change from baseline	**-**	**-**	**181,966**	**195,026**	**208,087**

Tonnage calculations assume glass split of 36% aggregate and 64% remelt.

We then take these tonnage differences compared to the baseline, for each option, and multiply them by several costs and benefits described in the sections below.

These new targets are expected to deliver the following recycling rates (%) :

	2018	2019	2020
Option 1 (plastic)	44	46	48
Option 1 (glass)	67	68	69

Step 2: Cost per tonne of recycling collection and sorting costs

Cost: recycling collection and sorting cost

To estimate the average recycling collection and sorting costs per tonne above the baseline, we use the assumptions used in previous IAs and then update them to take account of producer price inflation. The most appropriate price index available appears to be for the waste collection sector. TThe ONS does not publish a price index for the recycling sector.

Table 8: Updating recycling costs in line with producer prices (2015 price base).

		From previous IAs		Uprated:
		2011 Q4	2014 Q1	2015 Q2
Plastic recycling collection and sorting cost		**224**		**229**
Remelt recycling collection and sorting cost			**100**	**97**
Aggregate glass recycling collection and sorting cost			**72**	**69**
Producer price index - Sector 38.11 - Waste disposal		**102**	**108**	**104.6**

Source: Recycling and collection costs uprated using an ONS producer price index for the waste disposal sector.

Step 3: Benefit per tonne of recycling compared to the baseline

NB: In 2016/17 these benefits are negative (i.e. a cost) as explained in the note above.

Benefit: material revenue

To estimate the price of plastic, over the next 5 years, we use data from the Plastic Packaging Market Study (Plastic Flow) 2014 and Rigid Plastic Packaging Study (2015). In the baseline scenario, for the years 2016-17, the price of plastic is based on estimated tonnage composition for 2014, multiplied by current market prices from Letsrecycle.com: this results in £193 per tonne. For the years 2018-2020, however, we estimate that the price of plastic in the baseline scenario would increase to £204 per tonne due to a shift in composition towards more valuable plastics (the resulting composition is estimated via data from the *Rigid Plastic Packaging in the C&I Sector Study* (WRAP/Valpak, 2015). For option 1 2018-2020, given that targets will be present in this scenario, we forecast that the composition of plastic would remain similar to that of 2014, and thus the price of plastic is estimated to be constant over the period 2015-2020 for option 1 at £193.

For glass, we estimated a price of -£9 for glass aggregate (currently a negative price in the market), £12 for glass remelt, from 2015-2020. See annex for calculations.

Benefit: carbon saving

To estimate the carbon benefit of recycling, we take the carbon (C02) saved per tonne of material recycled and multiply it by carbon prices published by DECC.

Table 9: carbon factors (traded)

Per tonne	Glass Mixed	Glass Separated	Plastic
Tons of carbon saved per tonne of material recycled	0.19	0.38	1.12

Source: These carbon factors are from the Packaging IA 2012 and were not updated in the Glass IA 2014. Non-traded carbon impacts are assumed to be negligible.

Table: carbon prices

	2016	2017	2018	2019	2020
CO2 traded price – best	£4.7	£4.8	£5.0	£5.2	£5.4
- low	£0	£0	£0	£0	£0
- high	£20	£21	£27	£34	£40

Source: DECC

Benefit: residual collection and landfill cost saving

We use the residual collection cost and landfill fee assumptions in the 2014 glass impact assessment, they both total to £61.20, and then convert to 2015 prices using the ONS producer price index above.

Discounting

After calculating the costs and benefits for each option we then discount them into today's prices using the standard 3.5% Treasury discount rate.

Plastic options calculations - best estimates – all in £ millions

The table below shows the best estimate for the costs and benefits of the plastic option.

Table 10: Option 1 – Lower existing plastic business target to 49% in 2016 then increase by 2% each year to 2020

£m		2016	2017	2018	2019	2020	Nominal total	Present value total
Costs	Plastic recycling collection and sorting costs change	-13	-26	47	55	64	127	111
Benefits	Residual collection and landfill savings	-3	-7	12	14	17	33	29
	Material revenue change	-11	-22	31	38	45	81	71
	Cost of carbon savings change	0	-1	1	1	2	3	1.5
Net Benefit		-2	-3	-3	-2	0	-10	**-9**

Glass options calculations - best estimates – all in £ millions

The table below shows the best estimates for the costs and benefits of the glass option.

Table 11: Option 1 – Do not amend glass business target then increase from 2018 by 1% each year to 2020

£ m		2016	2017	2018	2019	2020		Nominal total	Present value total
Costs	Aggregate recycling collection and sorting costs change	0	0	7	8	8		23	21
	Remelt recycling collection and sorting costs change	0	0	18	19	20		57	51
Benefits	Residual collection and landfill savings	0	0	17	18	19		54	49
	Aggregate material revenues change	0	0	-1	-1	-1		-3	-3
	Remelt material revenues change	0	0	2	2	3		7	6
	Aggregate carbon savings change	0	0	0	0	0		0	0
	Remelt carbon savings change	0	0	0	0	0		1	1
Net benefit		0	0	-6	-7	-7		-20	**-18**

Calculating the percentage impact on business

This Impact Assessment uses the same methodology as the 2012 Impact Assessement for calculating the impact on business. We have assumed the relevant tonnes of recycling is the commercial and industrial (C&I) collection stream. The C&I stream is dealt with by businesses at all points in the chain, which suggests the overall net benefit or cost for this stream must all fall on business. Household recycling is dealt with by local authorities – collection authorities and disposal authorities. A proportion of net benefits from local authority waste will also accrue to business, where waste is taken to materials recycling facilities. However, it is difficult to estimate the proportion of net benefit which would accrue to business, therefore this analysis assumes only C&I waste. This means the estimate of benefits to business of material revenue may be an underestimate.

A recent study – the *Rigid Plastic Packaging in the C&I Sectors Study* (2015) by WRAP and Valpak – estimates the composition of the recycled plastic stream in 2014. As there is no evidence to suggest that the composition of recycled plastic is likely to change as the total tonnage recycled increases, we assume that for the years 2016-2017, these proportions are constant through projected increases in total recycled tonnage.

	Recycled 2014	Baseline Projected Recycling 2017	Proportion of total (2014)
Consumer Plastic Bottles	337000	434,399	40.0%
Consumer PTTs	137000	176,596	16.3%
Consumer Film	19000	24,491	2.3%
Non-consumer Bottles	91000	117,301	10.8%
Non-Consumer Other Rigids	48000	61,873	5.7%
Non-Consumer Film	210000	270,694	24.9%
Total	842000	1085354	

However, for the baseline scenario in years 2018-2020 (when recycling targets for plastic and glass lapse), evidence suggests that only the most commercially profitable types of plastic will continue to be recycled; thus the composition of plastic in the baseline scenario is estimated to change as shown in the table below:

	Projected baseline recycling 2018-2020	Proportion of total
Consumer Plastic Bottles	425,853	53%
Consumer PTTs	0	0%
Consumer Film	0	0%
Non-consumer Bottles	114,993	14%
Non-Consumer Other Rigids	0	0%
Non-Consumer Film	265,368	33%
Total	806,214	

For the years 2016-2017, the composition of plastic is the same for the baseline and the option. The proportion of C&I recycling is 41% for the baseline and option 1.

For the years 2018-2020, in the baseline scenario the proportion of C&I recycling is 33%, while the proportion of option 1 remains at 41%. This implies that, in option 1 for the years 2018-2020, relative to the baseline scenario, more C&I tonnage is projected to be reprocessed and sold.

For glass, the 2014 IA assumed 35% of tonnage above the baseline is C&I and we use that assumption.

For recycling collection and sorting costs per tonne, in the previous impact assessments, C&I costs were lower than the average costs per tonne for both household and C&I:

	C&I (adjusted for inflation)	Average of household and C&I (adjusted for inflation)
Plastic	£162	£229
Remelt glass	£78	£97
Aggregate glass	£43	£69

Therefore for the recycling collection and sorting costs the percentage impact on business is calculated as the C&I share of the marginal tonnage times the C&I recycling and collections costs as a ratio of average costs:
41% x £162/£229 = 29% for plastic
35% x £78/£97 = 28% for remelt glass
35% x £43/£69 = 22% for aggregate glass

By implication, the remainder percentage that is **not** impacting on business, is the impact on local authorities i.e. a large share of any recycling collection and sorting cost increases, compared to the baseline, would be spread across local authorities.

Sensitivity

The results are sensitive to several assumptions, particularly material price assumptions.

Material Price Assumptions

Glass prices are currently the lowest they have been since 2008. Therefore we use current glass prices for the lowest NPV scenario, as well as the best estimate scenario. We use the highest prices seen since 2008 for the high scenario.

For plastic we assume material prices could be 10% higher or lower than current prices for the high, low and best estimates respectively. This is consistent with the kind of volatility we have seen in recent years. There could be low material plastic prices at the negative extreme or at the positive extreme the material price for PTTs (which will be an increasing proportion of the recycling required if targets increase) may increase if better end markets develop.

The table below summarises the effect on the NPV of each option using the low and high material price assumptions:

Variable	**Best Estimate**	**Low Estimate**	**High Estimate**
Plastic material prices	£193.46 (£204.25 for 2018-20 baseline)	£174.12 (£183.82 for 2018-20 baseline)	£212.81 (224.67 for 2018-20 baseline)
Glass remelt prices	£12	£12	£30
Glass aggregate prices	-£9 (price estimated to be currently negative due to storage costs).	-£9	£35
Net Present Value (£m)	**-£27.68**	**-£38.31**	**£27.68**

Cost of Carbon

We use DECC low and high carbon prices previously stated for the low and high NPV scenarios.

Both these material and carbon price ranges can also act as proxies for other sensitivies such as collection cost and notional baseline uncertainty, within certain boundaries. Real world outcomes may be outside the NPV low-high ranges we have calculated if: carbon and material variables move significantly in the same direction (high or low), and other variables such as costs also move in the same direction. All variables moving in the same direction is unlikely.

Conclusion

The chain of activity in recycling is complex and the impact of these proposals has distributional impacts. For obligated businesses, this will change their costs of complying with the obligations. Reprocessors and exporters will see a corresponding change in their revenues.

The UK Government's overarching aim is to have appropriate targets which ensure that the UK complies with the EU Packaging Directive targets whilst maximising the benefits for consumers, businesses and the environment.

Option 1 is the government's preferred option for plastics and glass packaging recycling targets. It fulfils the Government's objective of increasing packaging recycling targets to a higher level, while minimising the costs of compliance to business.

PRN revenue is classified as a tax and spend measure, rather than a regulatory cost, so this impact assessment is outside the scope of the Regulatory Policy Commitee.

Annex

Estimating material prices

To estimate the future composition of plastic packaging recycling, we use tonnages (in the thousands) from the *Rigid Plastic Packaging in the C&I Sectors Study* (2015) by WRAP and Valpak.

This study provides an estimate of the composition of plastic packaging recycling by type of plastic and consumer/C&I stream for 2014. In the absence of any accurate forecasting data on how the composition of plastic recycling is likely to change as the total tonnage recycled increases, we assume a baseline case where the composition of plastic stays constant from 2014-2017.

The breakdown by tonnage of plastic recycling, along with the estimated price of each type of plastic, is shown below. The prices we used are the mid-point on Letsrecycle.com for August 2015, except for PTTs where the mixed rigids price from the WRAP material prices report is used. We then calculate a weighted price of plastic by multiplying the price of each stream by its proportion and summing:

	Recycled 2014	Share of total	Price	**Weighted price**
Consumer Plastic Bottles	337,000	0.40	£118	
Consumer PTTs	137,000	0.16	£218	
Consumer Film	19,000	0.02	£37	
Non-consumer Bottles	91,000	0.11	£365	
Non-Consumer Other Rigids	48,000	0.06	£42	
Non-Consumer Film	210,000	0.25	£273	
	842,000	1		**£193.46**

This price estimate is used for the baseline (option 0) and option 1 for 2016-2017. However, for the years 2018-2020, we assume that in the baseline case (with no materials targets legislated), only the most commercially profitable streams of plastic will continue to be recycled. Thus in these years the baseline weighted price of plastic changes. The calculation is shown in the table below:

	Baseline Recycled 2018 -2020	Share of total	Price	**Weighted price**
Consumer Plastic Bottles	425,853	0.53	£118	
Consumer PTTs	0	0.00	£218	
Consumer Film	0	0.00	£37	
Non-consumer Bottles	114,993	0.14	£365	
Non-Consumer Other Rigids	0	0.00	£42	
Non-Consumer Film	265,368	0.33	£273	
	806,214	1		**£204.25**

We assume that through 2018-2020, for option 1 (where targets are legislated), the weighted price of plastic will stay constant at £193.46.

A similar procedure is used to estimate the average price of recycled remelt glass.

Remelt Glass	Brown	Green	Clear	Total Remelt Glass
Tonnage (000s)	14	56	48	118
Weighting	12%	47%	41%	100%
Price	£14	£5	£21	**£12**

PRN impacts

PRN costs fall on obligated producers, while PRNs benefit reprocessors and exporters. PRNs are a transfer so result in no net impact on business.

The impact on PRNs of each option is estimated by using the formula:

PRN price per tonne x required recycling tonnage increase

= PRN impact increase

Table: PRN price

	PRN prices, average from September 2014 to August 2015
Plastic	£32
Aggregate	£13
Remelt	£13

Source: Letsrecycle.com – August 2015

We have not forecasted PRN prices. They are uncertain, particularly as the targets are decreasing in option 1 (relative to the baseline) in 2016/17, then increasing from 2018-2020. Proposed target changes are less steep than recent changes, particularly in plastic, so we might expect PRN prices to change less rapidly.

PRN impact estimates

£ m	2016	2017	2018	2019	2020	Total
PRN costs change - plastic option 1	-£ 1	-£ 3	£ 5	£ 5	£ 6	£ 12
PRN costs change - glass option 1	£ -	£ -	£ 4	£ 5	£ 5	£ 14

The PRN cost increases from 2018 compared to a baseline where there is no PRN system. PRN costs fall in 2016/17 if plastic targets are amended down.

EU recovery rates under proposed targets

EU recovery rate section	2016	2017	2018	2019	2020	Current EU recovery target
Option 0 - baseline: unchanged then no busines	52%	57%	41%	41%	41%	
Plastic recovery rate - baseline	45%	49%	35%	35%	35%	23%
Option 1 – Lower plastic target to 49% in 2016 th	49%	51%	53%	55%	57%	
Plastic recovery rate - option 1	42%	44%	45%	47%	49%	23%
Option 0 - baseline: unchanged then no busines	77%	77%	64%	64%	64%	
Glass recovery rate - baseline	65%	65%	54%	54%	54%	60%
Option 1 – Do not amend glass business target t	77%	77%	78%	79%	80%	
Glass recovery rate - option 1	65%	65%	66%	67%	68%	60%

SPECIFIC IMPACT TESTS

Equity and Fairness

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.

Small firms impact test

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 directly affect small businesses below these thresholds, though they may incur indirect costs through changes to costs in the supply chain.

Competition

The proposed target scenarios will affect the recovery and recycling obligations of businesses in the UK (glass producers and reprocessors, exporters). The costs incurred under any new targets (in the same way as for existing targets) will vary between businesses, since the costs are related to the amount and type of packaging the business handles.

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.

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.