

Title: Packaging Targets 2018-2020 for paper, wood, metals and overall recovery and recycling. IA No: DEFRA1875 Lead department or agency: Defra Other departments or agencies: .	Impact Assessment (IA)
	Date: 02/10/2016
	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 in 2014 prices)	In scope of One-In, Two-Out?	Measure qualifies as
£23.30m	£7.69m	-£2.62m	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 costs of which are not taken into account in production and 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 set targets to achieve UK ambition for recycling rates, and to maximise the social benefit and the benefit to business.

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 and each year is presented in a later table:
Option 0 - Do nothing - do not amend legislation, let legislation expire in 2018 and have no business targets.
Option 1 - Sets targets for steel and aluminium in line with option 2 from the consultation, and for paper, wood and overall recovery and recycling with option 3.

Will the policy be reviewed? It will/will not be reviewed. If applicable, set review date: Month/Year					
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 Yes	< 20 Yes	Small Yes	Medium Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)				Traded: 0.301	Non-traded: 0.072

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:

.....Thérèse Coffey.....

Date:7.12.17.....

Description: Option 1 - Sets targets for steel and aluminium in line with option 2 from the consultation, and for paper, wood and overall recovery and recycling with option 3.

FULL ECONOMIC ASSESSMENT

Price Base Year 2016	PV Base Year 2016	Time Period Years 3	Net Benefit (Present Value (PV)) (£m)		
			Low: 15.25	High: 37.97	Best Estimate:23.30

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	0	1.80	5.39
High	0	1.80	5.39
Best Estimate	0	1.80	5.39

Description and scale of key monetised costs by ‘main affected groups’
 Costs of collecting and sorting additional packaging waste to Local Authorities and commercial waste collectors.

Other key non-monetised costs by ‘main affected groups’
 Costs 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	6.88	20.65
High	0	14.45	43.36
Best Estimate	0	9.57	28.70

Description and scale of key monetised benefits by ‘main affected groups’
 Material revenue from sale of recyclate to be reprocessed. Avoided residual disposal cost from diverting packaging waste from landfill into reprocessing. Benefits from avoided carbon emissions from diverting waste from landfill to reprocessing.

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 period 2018-2020. 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
Costs: 0.99 Benefits: 3.64 Net: -2.65	No	NA

Executive Summary

The Government is considering one option for setting packaging recycling business targets for paper, aluminium, steel, wood, overall recovery and overall recycling for 2018-2020. The targets are presented in the table below:

Option 1	2018 Business Target	2019 Business Target	2020 Business Target
Paper	71.0%	73.0%	75.0%
Aluminium	58.0%	61.0%	64.0%
Steel	79.0%	82.0%	85.0%
Wood	38.0%	43.0%	48.0%
Total Recycling	73.6%	74.5%	75.4%
Total Recovery	80.0%	81.0%	82.0%

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 that will be achieved under each option will be lower than the business targets, depending on the split of packaging between obligated and non-obligated businesses. The proposed targets are expected to deliver the following 2020 recycling rates:

Option 1	2020 Business Target	2020 Recycling (% of POM)
Paper	75.0%	85.3%
Aluminium	64.0%	68.0%
Steel	85.0%	48.3%
Wood	48.0%	63.2%
Total Recycling	75.4%	20.5%
Total Recovery	82.0%	48.0%

The net social benefit and equivalent annualised benefit to business estimated for the option are shown in the table below. The impact on business is comprised of those costs and benefits that accrue directly to businesses: sorting and collection costs, avoided residual disposal costs, and material revenues. Waste collected from households by Local Authorities is assumed not to have any direct impacts on businesses. Total costs and benefits are hence apportioned between households and businesses by the share of waste collected under the “household” and “consumer and industrial” collection streams respectively. Approximately 45 per cent of waste is household waste, and is collected by Local Authorities. The remainder is collected by commercial waste collectors – it is the latter that feeds into the calculation of direct business costs. It should be noted that while higher targets will increase compliance costs for packaging producers, these costs are passed on directly to compliance schemes and, ultimately, to reprocessors/exporters; and therefore have no impact on the net social benefit or impact on business.

The key difference between the impact on business and the net social benefit is that the latter includes the carbon savings from recycling. For example under Option 1 the high target for wood recycling leads to a large carbon saving, since wood is diverted away from the Energy from Waste sector. This, however, also reduces the revenues that collectors may earn by selling wood to biomass plants, reducing the benefits to businesses. Together this causes net social benefits and impacts on benefits to diverge under Option 1. However also under Option 1, which has a high target for aluminium, the net social benefit and benefits to businesses move together. The diversion of aluminium away from landfill leads to a sizeable carbon benefit, while for business the high material price for aluminium leads to high material revenues.

	Net social benefit best estimate	Annualised net benefit to business
Option 1	£23.3m	£2.65m

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 additional social 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 recovery and recycling, which implements the requirements of 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 for UK businesses in the packaging supply chain.

In order to comply with the Packaging Regulations, obligated packaging producers must demonstrate that a specified minimum level of recovery and recycling has been undertaken on their behalf by obtaining Packaging Waste Recovery Notes (PRNs) or Packaging Waste Export Recovery Notes (PERNs). PRNs/PERNs are issued by accredited reprocessors or exporters when a tonne of relevant packaging material has been reprocessed or exported for reprocessing. This demand for PRNs/PERNs from obligated producers creates a market, where reprocessors and exporters sell their PRNs/PERNs to obligated producers, or, as is more common, to Producer Compliance Schemes which are contracted by producers to discharge their obligation. In general, the price for a PRN/PERN, for a given material (or for general recycling or recovery) should reflect the additional cost of diverting material from landfill to recycling that is not covered by existing economic drivers. In this way, obligated producers internalise some of the cost of dealing with packaging at the end of its life. A very low PRN price indicates that little additional incentive is required to deliver the level of recycling set by the business targets. On the other hand, a high PRN price implies that existing economic drivers (e.g. the revenue made by reprocessors from selling recyclate in secondary material markets) are not sufficient to push recycling rates of that material to the level set by the business targets.

The UK business targets are set to ensure that the UK meets the EU Directive recovery and recycling targets, taking into account the de minimis producers who are not obligated. The EU minimum targets are set out in the table below:

Table 1: current EU minimum recycling rates

	EU Directive target (in place since 2008)
Paper and board	60%
Glass	60%
Metal	50%
Plastic	23%
Wood	15%
Total recycling	55%

and composting	
Total energy recovery, recycling and composting	60%

Historically, the tonnage of packaging produced or handled by businesses that are out of scope due to de minimis within the UK regulations has been relatively steady as a proportion of the total amount of packaging.

This IA reviews the packaging recycling targets with a view to setting new targets for 2018-2020 for paper, wood, aluminium, steel, and overall recovery and recycling. Targets are currently not legislated for 2018-2020. If targets are not set, there would be a risk of the UK failing to meet the EU minimum material specific targets and/or the EU minimum general recovery and recycling targets.

The proposed option:

Option: Sets targets for steel and aluminium in line with option 2 from the consultation, and for paper, wood and overall recovery and recycling with option 3

This reflects that whilst Option 3 received the largest amount of support, there was also significant support for Option 2.

The majority of respondents agreed that the data used to underpin the proposals was as accurate as possible and represented the best available information on which to base any decision. There were no significant additional sources of information or evidence proposed in the responses, though a number of discrepancies with the Impact Assessment were highlighted. These have now been resolved in the final version which will be published alongside this summary.

In light of the comments received, the Government intends to amend the targets in line with Option 3 for paper and wood packaging plus overall recovery and recycling, but use the targets from Option 2 for aluminium and steel packaging.

The targets in Option 3 received significant support and there is a strong case for setting targets based on the best environmental outcome. For paper and wood packaging, we accept the view that there is limited environmental benefit, and potentially increased costs, for significantly raising targets.

The decision to take forward the targets from Option 2 for metals, despite a number of respondents making the case for even higher targets, is based on the balance of relative costs associated with further increasing the targets. Whilst there would be an environmental benefit, there would also be significant costs which could not be justified at this time.

This decision also reflects the number of respondents who suggested a hybrid set of targets, based on the desire to set challenging targets for materials where there was a strong environmental case.

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 household and businesses. Intervention is required by the 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 freedom to set higher national targets if they choose.

It is implemented in the UK by (i) the Packaging (Essential Requirements) Regulations 2003 (as amended); and (ii) by the **Producer Responsibility Obligations (Packaging Waste) Regulations 2007** (as amended). This IA assesses the 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 material 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 steel PRNs).

The evidence notes have two functions. Firstly, they are a 'counting mechanism' 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 businesses 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 or 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 targets 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 reprocessors 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 set recycling business targets for paper/card, aluminium, steel and wood, as well as overall recovery/recycling, for 2018-2020, so that the UK continues to meet the material specific and overall recycling and recovery minimums set by the EU Packaging Directive. However, this is also an opportunity to set targets at the rate that we think will be socially optimal, based on an assessment of the costs and benefits of diverting additional tonnes of packaging waste out of landfill and other waste disposal options, and up the waste hierarchy to reprocessing.

The management and disposal of waste results in environmental impacts such as greenhouse gas emissions and disamenity impacts. The full social costs of producing and dealing with packaging waste

is not taken into account in decisions by households and businesses. This results in the over-production of packaging waste and sub-optimal allocation to waste treatment. Intervention by the government can help reduce the amount of packaging waste to a more efficient level and shift the allocation of waste to efficient treatment options. 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 the landfill tax, all materials are equally incentivised away from landfill, despite the benefits of different waste types moving up the waste hierarchy 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.

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.

Analysis

Option 0: Baseline: Do nothing. Let targets expire in 2018 and have no targets.

This option is the baseline for the period 2018-2020 in the absence of any changes to policy. The costs and benefits of the 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. The notional baseline has been used in all previous Impact Assessments for setting targets, and we use the same methodology here. More details can be found in the 2012 Packaging Targets IA.

While we anticipate that if there were no targets set for 2018-2020, recycling rates would be affected, we also expect that there would be different effects for different materials. The market for recycling is well-established for some materials, and there are private incentives for recycling which will still be in place even in the absence of statutory targets.

Accredited Recycling

Table 2: Baseline accredited recycling

	2018	2019	2020
Paper	3,853,408	3,950,188	4,049,398
Glass	1,591,709	1,612,116	1,632,522
Aluminium	88,464	88,464	88,464
Steel	351,223	351,223	351,223
Plastic	1,009,627	1,047,491	1,085,354
Wood	292,500	292,500	292,500
Total Recycling	7,186,931	7,341,981	7,499,460
EfW	429,414	429,414	429,414
Total Recovery	7,616,345	7,771,395	7,928,874

Assumptions behind baseline recycling tonnages

Paper: The global market for waste packaging paper and board is a mature one, and reflected in a relatively low PRN price of paper (currently at £0.80 - £1.10 for August 2016, and not rising higher than £2 throughout 2016). Note that the PRN price reflects the additional cost per tonne of waste to make reprocessing it economically viable, with a low PRN price indicating that reprocessing is close to being economically viable based on existing market conditions. Demand for paper recycling has been consistently high over the years. In addition, weight-based landfill diversion targets and the landfill tax act as a strong incentive for collecting and recycling heavy materials such as paper. Therefore we assume that, in the absence of targets, accredited paper reprocessing will continue on its predicted trajectory unaffected (growing by 2.5% p.a.).

Aluminium: Aluminium is highly valuable, and the market for waste aluminium is mature. However, there is evidence to suggest that business targets do play a role in pulling more aluminium packaging waste into reprocessing (the PRN price is relatively high, averaging £26.1 for 2016). We therefore estimate that, in the absence of targets, there would be a small drop in aluminium packaging reprocessing of 2.5% on 2017 levels – however, we expect that the majority of aluminium reprocessing would continue as normal.

Steel: Packaging steel tends to be of lower quality than waste steel from other sources, and it is therefore relatively vulnerable to trading conditions. When targets are in place, this is normally compensated by producer funding topping up the value of the material and incentivising its trading. In the absence of targets, we estimate that there will be a 5% drop in packaging reprocessing on 2017 levels.

Wood: The demand for waste wood as feedstock for EfW has been increasing over time. Responses to previous consultations have indicated that significantly more waste wood packaging would go to EfW if it was not for the packaging recycling targets, because of the financial incentive offered by ROCs. However, there has already been a fairly large shift of wood packaging away from reprocessing and into EfW and biomass over the past 5 years (in 2011 the wood packaging recycling rate was 58.7%; it has fallen to 28.7% in 2015). While we think that, in the absence of targets, even more wood would shift from reprocessing into recovery, we think that the decrease wouldn't be as stark as estimated in previous Impact Assessments. We estimate that there would be a 10% drop in wood reprocessing on 2017 levels through for 2018-2020 in the baseline scenario.

Unaccredited Recycling

Unaccredited recycling is recycling by reprocessors that have not become accredited to issue PRNs. Under the current system unaccredited reprocessing is uncounted, and therefore if there is a large amount of material being reprocessed, but not generating PRNs, the official recycling rate is an underestimate. In the absence of targets (i.e. the baseline), the distinction between accredited and unaccredited recycling becomes irrelevant. However, for the purposes of the analysis, we are interested in the total amount of reprocessing occurring (accredited plus unaccredited), as this allows us to assess whether higher targets will require additional collection. In some cases, higher targets will simply spur previously unaccredited reprocessors to become accredited, and generate PRNs for their reprocessing. This increases the official recycling rate, but has no impact from a social cost-benefit perspective.

Evidence from the Flow reports, a Resource Futures report for Aluminium, and data from CPI, suggest that there are significant tonnages of unaccredited reprocessing occurring for paper, wood, and

aluminium. We estimate that around 300,000t of paper, 150,000t of wood, and 6545t of aluminium packaging will be reprocessed from 2018-2020, on top of our projections of accredited reprocessing.

Table 3: unaccredited recycling

	2018	2019	2020
Paper	300,000	300,000	300,000
Glass	0	0	0
Aluminium	6,545	6,545	6,545
Steel	0	0	0
Plastic	0	0	0
Wood	150,000	150,000	150,000

Total Baseline Recycling (accredited + unaccredited)

The table below shows the *total* predicted baseline reprocessing tonnage, i.e. accredited plus unaccredited.

Table 4: Total baseline recycling

	2018	2019	2020
Paper	4,153,408	4,250,188	4,349,398
Glass	1,591,709	1,612,116	1,632,522
Aluminium	95,009	95,009	95,009
Steel	351,223	351,223	351,223
Plastic	1,009,627	1,047,491	1,085,354
Wood	442,500	442,500	442,500
Total Recycling	7,643,476	7,798,526	7,956,005
EfW	429,414	429,414	429,414
Total Recovery	8,072,890	8,227,940	8,385,419

Sources: NPWD data, Flow reports, Defra internal analysis.

Packaging Placed on the Market – Evidence

The WRAP/Valpak Flow reports (MetalFlow 2014, Paper and Card Flow 2020, WoodFlow 2020, and any subsequent follow up reports based on the original Flow reports) provide evidence for the tonnage of packaging placed on the market (POM), and the Environment Agency National Packaging Waste Database provides evidence for the tonnage of packaging that is *obligated* under Producer Responsibility. These key statistics are displayed in the tables below:

Table 5: Packaging placed on the market

	2018	2019	2020
Paper	4,749,000	4,749,000	4,749,000
Glass	2,399,235	2,399,235	2,399,235
Aluminium	182,000	183,000	183,000
Steel	557,000	556,000	556,000
Plastic	2,260,000	2,260,000	2,260,000
Wood	1,425,082	1,425,082	1,425,082
Other	22,555	22,555	22,555
Total	11,594,872	11,594,872	11,594,872

Sources: PaperFlow 2020, WoodFlow 2020, MetalFlow 2014.

Table 6: Obligated packaging placed on the market

	2018	2019	2020
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Paper	4,023,608	4,059,423	4,095,556
Glass	2,095,807	2,097,843	2,099,880
Aluminium	167,802	170,686	173,619
Steel	482,254	478,087	473,955
Plastic	1,893,159	1,893,159	1,893,159
Wood	1,083,822	1,087,112	1,090,412
Other	21,851	21,932	22,013
Total	9,768,303	9,808,241	9,848,595

Sources: NPWD.

Combining the placed on the market projections with the baseline accredited recycling projections gives baseline recycling rate projections, which can be compared to the recycling rates projected to be achieved in each of the options:

Table 7: Baseline predicted accredited recycling and recovery rates

	2018 Recycling (% of POM)	2019 Recycling (% of POM)	2020 Recycling (% of POM)
Paper	81.2%	83.2%	85.3%
Aluminium	47.8%	47.5%	47.5%
Steel	62.9%	63.0%	63.0%
Wood	21.8%	21.6%	21.4%
Total Recycling	66.5%	67.8%	69.1%
Total Recovery	62.6%	63.9%	65.2%

The Government is proposing the following options for changes to business targets for paper, aluminium, steel, wood, and overall recycling and recovery:

Option 1: Sets targets for steel and aluminium in line with option 2 from the consultation, and for paper, wood and overall recovery and recycling with option 3

The EU Circular Economy Package has proposed minimum recycling rates for Member States that should be achieved by 2025 and 2030. These are more ambitious than current EU minimums, and reaching them would require significant incremental increases in material specific and overall business targets. Aluminium, and to a lesser extent steel, due to their high material value and the large carbon savings that occur if these materials are diverted from landfill to reprocessing, would see large increases in business targets. Targets would be increased incrementally per annum, with the aim being to put recycling rates on course to meet the proposed packaging recycling targets of the Circular Economy Package.

Table 8: Option 1 business targets and recycling rates

Option 1	2018 Business Target	2018 Predicted Recycling Rate	2019 Business Target	2019 Predicted Recycling Rate	2020 Business Target	2020 Predicted Recycling Rate
Paper	71.0%	81.9%	73.0%	84.8%	75.0%	87.8%
Aluminium	58.0%	52.5%	61.0%	55.8%	64.0%	59.5%
Steel	79.0%	68.2%	82.0%	70.4%	85.0%	72.3%
Wood	38.0%	32.5%	43.0%	36.8%	48.0%	41.2%
Total Recycling	73.6%	63.6%	74.5%	65.3%	75.4%	67.4%
Total Recovery	80.0%	68.2%	81.0%	69.3%	82.0%	70.4%

Costs and Benefits of Recycling

Costs and benefits are calculated for each additional tonne of recycling that are diverted, from other disposal routes. For some materials, we expect that packaging waste will be diverted from landfill; for others, we expect that it will be diverted from other disposal options, such as EfW and biomass.

The following 3 steps are the core method of this Impact Assessment:

Step 1: The estimated additional recycling tonnage for each material are calculated, compared to the baseline, depending on the targets and projected placed on the 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 savings

iii) residual collection and landfill saving

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

For wood, there is already a high level of collection (expected to continue through 2018-2020) and the proposed targets are not high enough to spur additional collection. Instead, high targets (e.g. in Option 2) will result in the diversion of packaging wood waste away from being used in biomass as fuel, and towards mechanical reprocessing. Therefore, for wood, we calculate the costs and benefits of diverting an additional tonne away from biomass and into reprocessing (rather than the additional costs of sorting and collecting, as is done for the other materials):

- **Costs:** none

- **Benefits:**

i) Carbon savings.

ii) Material revenue. To calculate the change in material revenue, the price per tonne of wood sold to an energy recover operator is compared with the price per tonne of wood sold to a reprocessor. Due to the low value of wood to reprocessors (collectors currently pay a fee to reprocessors to take wood), and the relatively high value of wood to energy recovery (a positive price), this benefit is negative (i.e. a cost).

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)

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 impact assessment.

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.

Option 1 – Sets targets for steel and aluminium in line with option 2 from the consultation, and for paper, wood and overall recovery and recycling with option 3

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

We estimate the different levels of recycling that will occur under each option through an analysis of the current and projected levels of recycling for each material, and the overall level of recycling and recovery that will be required by the proposed targets. For aluminium and steel, the material specific business targets have historically been ‘binding’ – that is, accredited recycling of aluminium and steel packaging waste usually just reaches the level specified by the business target (this level is determined by applying the business target to the total obligated tonnage in each year). For paper and wood, however, accredited recycling has historically been (and is currently) well above the minimum levels required by the business targets. In 2015, for example, accredited paper and card packaging recycling was 3.67mt; the amount required by the paper and card business target (69.5% applied to obligated tonnage of 3.86mt) was just 2.68mt. The reason that paper (and wood) is recycled beyond the minimum level specified by the material specific business target is that the ‘excess’ paper PRNs go towards satisfying the overall recycling and recovery business targets. The table below illustrates this point with data from 2015:

Table 12: 2015 recycling data

2015	Obligated tonnage	Predicted waste arisings (POM)	Business targets	Tonnage delivered by business targets	% achieved by business target	Actual accredited recycling	% actually achieved (accredited/POM)
Paper	3,855,734	4,749,000	69.50%	2,679,735	56.40%	3,667,387	77.20%
Glass	2,063,121	2,399,235	76.00%	1,567,972	65.40%	1,576,812	65.70%
Aluminium	155,747	179,000	49.00%	76,316	42.60%	76,027	42.50%
Steel	491,207	558,000	74.00%	363,493	65.10%	363,927	65.20%
Metals		737,000		439,809	59.70%	439,954	
Plastic	1,935,642	2,220,000	47.00%	909,752	41.00%	891,141	40.10%
Wood	1,134,251	1,305,000	22.00%	249,535	19.10%	374,991	28.70%
Other	18,033						
Total	9,653,735	11,410,235		5,846,803		6,950,285	
Recycling			70.80%	6,838,706	59.90%	6,950,285	60.90%
Recovery			77.00%	7,433,376	65.10%	7,426,523	65.10%

Sources: Flow reports; NPWD data.

The table shows that for both paper and wood, actual accredited recycling tonnage (column 7) is significantly higher than that which is strictly required by the business targets (i.e. if the business targets are applied to the obligated tonnages – see column 5). The reason for the ‘excess’ paper and wood recycling can be seen by looking at the ‘Total’ row. The 5.85mt recycling is the result of summing across the tonnages delivered for each material specific business target; this falls well short of the 6.84mt recycling which is the minimum required by the overall recycling business target, which implies that there needs to be additional recycling/recovery beyond the material specific business targets to meet the **overall recovery and recycling business targets**. The ‘excess’ paper and wood PRNs generated go directly towards filling the overall recovery and recycling targets. With the additional paper and wood

PRNs, total recycling increases to 6.95mt, which meets the overall recycling minimum of 6.84mt. The overall recovery target of 7.43mt is met by adding recovery PRNs (0.48m) to the overall recycling tonnage.

The significance of this is that while for aluminium and steel, there is a clear relationship between the material specific business targets and recycling tonnages, this is not necessarily the case for paper and wood. Increasing the paper and wood business targets won't have a direct effect on additional recycling; increasing the overall recovery and recycling targets, however likely will, as producers will meet the increased obligation by purchasing the cheapest PRNs – i.e. paper and wood PRNs.

Option 1

Option 1 considers the marginal costs and benefits of obligated an additional tonne of recycling per material, and sets business targets to maximise social net benefits. There are clear benefits to incentivising additional aluminium, and (to a lesser extent) steel packaging collection and recycling due to the high carbon emissions savings and high material revenue generated from recycling these materials increases business targets with the aim of meeting the CEP proposed 2025 packaging recycling target. The tables below show the predicted recycling levels, and the additional recycling estimated above the baseline:

Table 13: Option 1 business targets and accredited recycling

Option 1	2018 Business Target	2018 Recycling (tonnes)	2019 Business Target	2019 Recycling (tonnes)	2020 Business Target	2020 Recycling (tonnes)
Paper	71.0%	3,890,565	73.0%	4,026,735	75.0%	4,167,670
Aluminium	58.0%	97,325	61.0%	104,118	64.0%	111,116
Steel	79.0%	380,981	82.0%	392,031	85.0%	402,862
Wood	38.0%	435,817	43.0%	498,569	48.0%	562,645
Total Recycling	73.6%	7,431,889	74.5%	7,525,886	75.4%	7,777,768
Total Recovery	80.0%	7,822,276	81.0%	7,956,679	82.0%	8,092,388

The table below shows changes in recycling tonnages predicted between Option 1 and the baseline. The predicted recycling tonnages from table 13 are compared with the **total** baseline recycling tonnages from table 4. Note that unless predicted accredited recycling under Option 1 is greater than total baseline recycling, the *additional* recycling is shown to be 0 (i.e. rather than a negative number if the total baseline recycling is greater than predicted accredited recycling). In the case where predicted accredited recycling in the option is less than the **total** baseline, but greater than the **accredited** baseline, it is assumed that the additional PRNs are generated through previously unaccredited reproprocessors becoming accredited. In these scenarios, there is no difference between the *overall* level of recycling in Option 1 and the baseline, and hence no additional recycling above the baseline; however, a proportion of the unaccredited tonnage has become accredited, leading to the increased accredited tonnage.

Table 14: Option 1 additional recycling

Change in recycling tonnage from baseline	2018	2019	2020
Paper	0	0	0
Aluminium	2,317	9,110	16,108
Steel	29,758	40,808	51,639
Wood	0	24,958	80,898

Paper: Accredited paper recycling is predicted to be higher in all years than Option 0, due to increased overall recovery and recycling targets. Paper has historically been the cheapest source of PRNs, and hence increases in the overall recovery and recycling targets have led to increased paper recycling. We predict a 3.5% growth rate of accredited paper recycling on 2017 levels in Option 2, relative to a 2.5% growth rate in the baseline. However, the predicted increase is still low enough to be covered by previously unaccredited reprocessors becoming accredited (300kt in each year 2018-2020 – see table 3). This implies that there will be no additional paper collection and reprocessing above the baseline.

Aluminium: Aluminium targets increase from their 2017 level at 3% per annum, which will lead to increased collection and recycling above the baseline.

Steel: Steel targets increase from their 2017 level at 3% per annum, which leads to a significant increase in estimated collection and reprocessing above the baseline.

Wood: Wood targets increase by 16% on 2017 in 2018, and 5% per annum subsequently. These increasing targets require a significantly increased tonnage of wood recycling in 2019 and 2020. Evidence suggests that this tonnage would likely be diverted from biomass, rather than being additionally collected.

We then take these tonnage differences compared to the baseline, and multiply them by the several costs and benefits described below to estimate the net benefit of setting the targets proposed in Option 1, relative to the baseline.

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 of previous Impact Assessments for target changes, 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. The ONS does not publish a price index for the recycling sector.

Table 15: Sorting and collection costs

	From previous IAs	Uprated:
	2011 Q4	2016 Q1
Aluminium recycling collection and sorting cost	90.0	91.8
Steel recycling collection and sorting cost	25.0	25.5
Paper/card recycling collection and sorting cost	78.0	79.6
Wood recycling collection and sorting cost	26.0	26.5

Source: Recycling and collection costs uprated using an ONS producer price index for the waste disposal sector. Cost estimates from 2011 IA.

Table 16: Option 1 costs – sorting and collection

Sorting and collection costs	2018	2019	2020
Paper	£0.00	£0.00	£0.00
Aluminium	£212,532	£835,756	£1,477,763
Steel	£759,206	£1,041,124	£1,317,444
Wood	£0.00	£0.00	£0.00

Additional aluminium and steel collection above the baseline results in a significant increase in sorting and collection costs. There is also a small cost in 2020 for additional aluminium collection. Note that although there is additional wood recycling above the baseline, there are no sorting and collection costs associated with this. Evidence suggests that a larger proportion of wood packaging waste is being collected than being recycled – much of this goes to biomass – and that the most likely result of higher wood targets would be the diversion of some of this waste away from biomass and into mechanical reprocessing, rather than the *additional* collection of wood packaging.

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

Benefit: material revenue

For every additional tonne of material that is diverted from landfill and towards recycling, there will be a benefit from selling the material to a reprocessor or exporter for processing. To estimate the benefit per tonne we use the WRAP Material Pricing Report, which gives the latest information on market prices for various waste materials. Where possible, an estimate of the likely composition of additional recycling (different types of packaging material have different values – aluminium cans, for example, sell for a higher price than lower quality aluminium packaging) has been used, and a weighted price calculated.

Table 17: Material prices

	2018	2019	2020
Aluminium material prices - best	£ 618	£ 618	£ 618
Aluminium material prices - high	£ 679	£ 679	£ 679
Aluminium material prices - low	£ 556	£ 556	£ 556
Steel material prices - best	£ 53	£ 53	£ 53
Steel material prices - high	£ 58	£ 58	£ 58
Steel material prices - low	£ 47	£ 47	£ 47
Wood material prices - best	-£ 48	-£ 48	-£ 48
Wood material prices - high	-£ 43	-£ 43	-£ 43
Wood material prices - low	-£ 52	-£ 52	-£ 52
Paper/card material prices - best	£ 38	£ 38	£ 38
Paper/card material prices - high	£ 41	£ 41	£ 41
Paper/card material prices - low	£ 34	£ 34	£ 34
Wood to biomass price	£ 63	£ 63	£ 63

Benefit: carbon savings

To estimate the carbon benefit of recycling, we take the CO₂e saved per tonne of material recycled (i.e. traded and non-traded carbon factors) and multiply it by traded and non-traded carbon prices respectively.

Table 18: Carbon factors

Landfill to Reprocessing Carbon Factors

Aluminium - non traded domestic factor	2.565
Aluminium - traded domestic factor	4.034
Aluminium - international factor	3.283
Steel - non traded domestic factor	0.008

Steel - traded domestic factor	1.551
Steel - international factor	0.255
Paper - non traded domestic factor	0
Paper - traded domestic factor	0.089
Paper - international factor	0.067
Wood - non traded domestic factor	0
Wood - traded domestic factor	0.139
Wood - international factor	0.184

Biomass to Reprocessing Carbon Factors

Wood - non traded domestic factor	0.364
Wood - traded domestic factor	0.027
Wood - international factor	0.342

Table 19: Carbon prices

Carbon traded price - best (£/t)	6.12	6.35	6.59
Carbon traded price - high (£/t)	29.85	34.04	39.03
Carbon traded price - low (£/t)	0.00	0.00	0.00
Carbon non traded price - best (£/t)	65.27	66.25	67.24
Carbon non traded - high (£/t)	97.90	99.38	100.87
Carbon non traded - low (£/t)	32.64	33.13	33.62

Benefit: residual collection and landfill cost saving

We use the residual collection cost and landfill gate fee assumptions in the 2016 Plastic and Glass Impact Assessment, and convert to 2016 prices using the ONS producer price index. The 2016 IA estimate was £59 per tonne – uprated to 2016 prices this is £59.3 per tonne.

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.

Table 20: Option 1 benefits – avoided residual disposal costs, value of reduced carbon emissions, material revenue

Avoided residual disposal	2018	2019	2020
Paper	£0.00	£0.00	£0.00
Aluminium	£137,308	£539,945	£954,718
Steel	£1,763,801	£2,418,759	£3,060,709
Wood	£0.00	£0.00	£0.00

Value of carbon saving	2018	2019	2020
Paper	£0.00	£0.00	£0.00
Aluminium	£445,029	£1,781,373	£3,206,278
Steel	£298,005	£423,541	£555,582
Wood	£0.00	£606,144	£1,994,398

Material Revenue	2018	2019	2020
Paper	£0.00	£0.00	£0.00

Aluminium	£1,430,894	£5,626,818	£9,949,202
Steel	£1,562,294	£2,142,425	£2,711,035
Wood	£0.00	-£2,745,394	-£8,898,763

For wood, we assess the costs and benefits per tonne diverted from biomass into mechanical reprocessing. There is a net benefit in terms of carbon emissions savings; however there is a large net cost in terms of material revenue, due to the low value of wood to reprocessors, and the comparatively higher value from sale to biomass.

The high marginal social benefit of collecting and recycling additional aluminium drives the benefits of Option 1. The largest proportion of the benefits is estimated to come from carbon savings and material revenue from increased aluminium recycling.

Option 1 calculations – best estimates – £s

The table below shows the best estimate for the net social benefit of Option 1.

Table 21: Net benefits of Option 1

Net Benefits	2018	2019	2020
Paper	£0.00	£0.00	£0.00
Aluminium	£1,800,699	£7,112,381	£12,632,435
Steel	£2,864,894	£3,943,600	£5,009,882
Wood	£0.00	-£2,139,250	-£6,904,365

Total	£4,665,593	£8,916,731	£10,737,952
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Undiscounted

Total £24,320,276

Discounted

Total £23,303,148

EANCB -£2,614,601

The NPV of Option 1 is driven mainly by the large per tonne benefits of diverting aluminium from landfill to recycling. The value of avoided carbon emissions from recycling aluminium rather than landfilling it is significant; in addition aluminium packaging has a high market value to reprocessors. Additional steel reprocessing also has a positive net marginal benefit and contributes to the increased NPV; however the marginal benefit from additional steel reprocessing is lower than that of aluminium. The net loss of pushing wood from biomass into reprocessing reduces the overall benefits of this option.

Calculating the direct impact on business

This Impact Assessment uses the same methodology as the 2012 Impact Assessment for calculating the direct 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 or disposal authorities. A proportion of net benefits from LA 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, and therefore this analysis assumes only C&I waste. This means the estimate of benefits to business of material revenue may be an underestimate.

To calculate the direct impact on business, we use data on the proportion of costs and benefits that fall to Local Authorities and commercial waste operators respectively. Additional waste collected from households is assumed to affect Local Authority collection services, i.e. no direct impact on business. This applies to both costs and benefits: sorting and collection costs; avoided residual disposal costs, and material revenues. We use the HH and C&I splits from the 2012 Packaging Impact Assessment:

Table 32: Household and C&I splits

	HH stream	C&I stream
Paper/card	54%	46%
Aluminium	45%	55%
Steel	45%	55%
Wood	45%	55%

Carbon benefits do not apply directly to business and are excluded from the EANCB calculation.

The resulting EANCB figures, by option, are:

Table 33: EANCB

Option	EANCB
Option 1	-£2.61m

Note: a negative figure for EANCB denotes a benefit to businesses

Sensitivity Analysis

The results of this analysis are sensitive to several assumptions, particularly material price assumptions and carbon price assumptions.

We calculate low and high NPVs and EANCBs based on high and low material price and carbon price scenarios.

Material prices are difficult to forecast as they depend on multiple interrelated variables. However, historical data suggests that these prices are relatively stable over a short time scale (3 years in this case), and so we use the latest price estimates, and simply calculate high and low scenarios based on a 10% confidence interval around these central estimates. High and low material price estimates are shown in table 17.

The Government publishes forecasts for traded and non-traded carbon prices, as well as high and low scenario estimates. These high and low scenarios are used in this analysis. High and low carbon price estimates are shown in table 19.

Based on the high and low scenario assumptions, we estimate the following NPV ranges for the option:

- **Option 1: £15.25m – 37.97m; central estimate: £23.30m**

SPECIFIC IMPACT TESTS

Small firms impact tests

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. 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 has examined competition in the recycling market, material specific markets (e.g. paper, wood, aluminium, steel), and the end user market (e.g. the market for reprocessed aluminium). 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.

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.

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.

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 Committee.