

Title: Regulatory Triage Assessment on the proposal to ban the sale and supply of plastic drink stirrers in England IA No: Defra/ENV/021 RPC Reference No: 4317 Lead department or agency: Department for Environment, Food and Rural Affairs (Defra) Other departments or agencies: N/A	Regulatory Triage Assessment (RTA)			
	Date: 27/04/2020			
	Stage: Final			
	Source of intervention: Domestic			
	Type of measure: Secondary Legislation			
	Contact for enquiries: Dan Quinlan or Raminta Brazinskaite			
Summary: Intervention and Options				RPC Opinion: Fit for purpose

Cost of Preferred Option (in 2019 prices, 2020 present value)			
Total Net Present Social Value	Business Net Present Value	Net cost to business per year	Business Impact Target Status
--£0.33m	-£0.12m	£0.01m	Non-Qualifying Provision

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

Plastic drink stirrers are not commonly recycled, causing multiple environmental harms particularly when they are discarded incorrectly, including harm to marine animals and visual pollution. Even if disposed of correctly plastic stirrers may be incinerated, generating high levels of carbon emissions. These are negative externalities as they are experienced across society and are not accounted for within the market price of plastic drink stirrers. Providers of drink stirrers do not have incentives to address the externality costs. A ban will move consumers towards stirrers made from materials that impose lower environmental and disamenity costs on society and reduce the impact on marine wildlife.

What are the policy objectives and the intended effects?

The objective is to help protect our environment for future generations, improve the quality of the environment and reduce harm to human health and wildlife. The ban is intended to ensure that drink stirrers are no longer plastic and are made of materials that will decompose much quicker and have lower life-cycle impacts on the environment. The ban is expected to encourage businesses to invest in cleaner alternatives to plastic. The ban also intends to increase consumer and business awareness of the environmental harms drink stirrers can cause after use and to signal government's intent to reduce unnecessary plastic waste.

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

The options that are considered for consultation include 'do nothing' (option 0) and a ban on plastic stirrers in England (option 1, preferred). A ban is preferred as it would have the maximum impact in reducing the social costs of plastic drink stirrers. Alternative options such as taxes and information campaigns were considered but rejected as they would be more costly and less effective than a ban. A ban has little administration costs and will have minimal costs to businesses. As there are suitable alternatives to plastic drink stirrers already available (assumed to be wood for the purpose of this analysis), policies such as subsidies for environmentally friendly alternatives are not necessary, and there is no need for a ban to include any exemptions.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** 5 years post implementation

Does implementation go beyond minimum EU requirements?		Yes		
Is this measure likely to impact on trade and investment?		No		
Are any of these organisations in scope?	Micro Yes	Small Yes	Medium Yes	Large Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)		Traded:		Non-traded: -0.0001

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

Signed by the responsible Minister Rebecca Pow Date: 18/05/20.....

Description:

FULL ECONOMIC ASSESSMENT

Price Base Year 2017	PV Base Year 2020	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -£0.50m	High: -£0.04m	Best Estimate: -£0.32

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant)	Total Cost (Present Value)
Low	£0.10	£0.03	£0.322
High	£0.10	£0.05	£0.548
Best Estimate	£0.10	£0.04	£0.434

Description and scale of key monetised costs by ‘main affected groups’

We have monetised the cost of additional emissions expected from landfilling wooden drink stirrers (the expected substitute for plastic single use stirrers), as plastic emits less carbon dioxide equivalent (CO2 e) emissions when placed in landfill relative to wood; the cost to the enforcement agency; a familiarisation cost to retailers; a small additional fuel cost to businesses and associated emissions cost. We have also monetised an additional cost associated with waste management which mainly falls to businesses.

Other key non-monetised costs by ‘main affected groups’

Some consumers may lose out if they prefer plastic drink stirrers. There will be fuel cost from wooden stirrers being heavier, this will also have a carbon impact. Any production costs to English businesses are likely to be small and not easy to evidence, or do not exist as drink stirrers are predominantly imported and wooden drink stirrers are already sold at comparable prices to plastic drink stirrers.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant)	Total Benefit (Present Value)
Low	£0.00	£0.01	£0.048
High	£0.00	£0.03	£0.283
Best Estimate	£0.00	£0.01	£0.117

Description and scale of key monetised benefits by ‘main affected groups’

Alternative drink stirrers are expected mainly to be wooden. As wood decomposes much quicker than plastic, we expect to see a small reduction in the presence of litter on beaches. Clean beaches are highly valued by the public. Wooden drinks stirrers are also cleaner to incinerate than plastic, resulting in environmental savings. There is also an increase in landfill tax revenue as heavier wooden stirrers will cost more to dispose of via landfill.

Other key non-monetised benefits by ‘main affected groups’

Plastic drink stirrers contribute to marine litter which impacts wildlife as materials can entangle or be ingested by both marine and terrestrial wildlife, causing injury and loss of life to marine animals. Marine litter has a disamenity cost, affecting pristine seascapes and quality of life which impacts those who use marine environments and also impacts those who value knowing that there is a pleasant environment available to them and to others.

Key assumptions/sensitivities/risks	Discount rate	3.5%
We expect that some retailers will switch away from plastic anyway. Should this assumption be wrong, this would increase the net positive impact of the ban. We assume that wooden drink stirrers will replace plastic drink stirrers rather than other materials. Given the international production of stirrers, and evidence that familiarisation and administration costs are expected to be minimal, we have put a conservative estimate of £0.1m pa cost to business. These assumptions have been tested at consultation.		

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: £0.01	Benefits: £0	Net: £0.01	
			Not applicable, low-cost measure

Evidence Base (for summary sheets)

Problem under consideration

Plastic drink stirrers are rigid single-use products used to mix drinks in a single container or to help sugar dissolve in hot drinks. They are typically discarded to general waste or littered, rather than recycled, due to the effort required to segregate them from drink containers and then clean them.

It is estimated that 316 million drink stirrers are consumed in England each year¹. Single use plastics, including plastic drink stirrers, are associated with negative effects on the environment. High levels of greenhouse gas emissions are also associated with plastics production since they are oil based. Once made, plastic drink stirrers have impacts on land and in seas and rivers if they are littered or discarded incorrectly after their use. There are costs associated with their clean-up and externality costs imposed on the tourism and fishing industries from littering and the transfer of littered plastics into the environment. They can damage terrestrial and marine life. As such, there is widespread and significant public concern regarding plastics and litter. It is estimated that there are over 150 million tonnes of plastic in the world's oceans, and every year one million birds and over 100,000 sea mammals die from eating and getting tangled in plastic waste². All of these impacts contribute towards negative well-being. Every drink stirrer, if not properly disposed of can contribute towards these social costs over a long period of time as it can take plastic 300 years to decompose³.

Rationale for Intervention

Plastic drink stirrers are not commonly recycled due to the effort required to segregate and clean them, and because their small size and flexibility means that they are more likely to fall between recycling machinery. Most plastic stirrers will therefore end up either being incinerated for energy or landfilled, with the former releasing carbon dioxide emissions. In addition, plastic drinks stirrers can be disposed of incorrectly as litter. Litter costs the taxpayer money to clean-up and imposes a number of other costs on society including visual pollution and environmental harm.

The social and environmental costs of this are not accounted for within the market price. This means that businesses and end-consumers are not currently incentivised to limit their use and disposal of plastic drink stirrers appropriately, or to switch to stirrers made of less environmentally harmful materials. Intervention is required to ensure businesses and consumers can make well informed decisions that account for the negative impacts of plastic stirrer use. Drink stirrers made from materials like wood are readily available alternatives. Wooden stirrers decompose more quickly and therefore cause less environmental damage, and are also cleaner to incinerate than plastic. Government intervention will ensure a full shift in the drink stirrer market away from plastic.

A research report commissioned by Defra to Resource Futures looks at the current market trend, and estimates that plastic stirrer usage is likely to decrease regardless of a ban being implemented, based on the current rate of business switching. If this rate continues, then plastic stirrer use is likely to reach very low levels by 2025/26 (see Figure 1). However, despite the predicted trend, there is a rationale for government to intervene to ban these items ahead of that time to address the negative environmental effects these items have on the environment as soon as possible. In addition, it is important to note that the projected trends are estimates, and there is no guarantee that plastic stirrer usage will decrease by as much as predicted.

¹ Estimate based on an assumption made by [Resource Futures](#) that 10% of the estimated annual single-use takeaway coffee cup sales include stirrers, and estimates for coffee cups used per year ranging from 2.5 – 5 billion.

² <https://www.wwf.org.au/news/blogs/plastic-in-our-oceans-is-killing-marine-mammals#qs.2hijex>

³ Taking an average based on estimates of 200 years for plastic straws from WWF, The Life Cycle of Plastics and 400 years from Wessex Water. This contrasts with wood, the expected substitute material for plastic stirrers, which based on estimates for plywood by US National Park Service takes 1 – 3 years to decompose.

The ban on straws, cotton buds and drink stirrers is in line with the EU Single-Use Plastics (SUP) Directive, who are bringing their regulations into force in July 2021. Having left the EU, the UK is not legally obliged to meet the SUP directive, however we are focused on matching and exceeding the ambition of the Directive in ways that work best for us. Government action to ban the supply of these items to the end user means that the change needed to reduce harmful and unnecessary plastic pollution is secured more widely (both domestically and internationally). Although stirrers make up just 0.1% of marine litter by item count, when viewed in tandem with policies to ban plastic straws and cotton buds, the cumulative impact of the bans is highlighted as it is estimated that all three items together contribute around 5.7%.

Consultation support for a ban: In addition to the above, consultation responses showed significant support for this intervention, with 90% of 1,546 respondents supporting the ban. Only 2% of respondents did not support the ban. Many responses highlighted the availability of alternatives, and that drinks stirrers are a replaceable commodity rather than a vital one.

Policy objective

The objective is to help protect our environment for the future generations, improve the quality of the environment and reduce harm to human health and marine life. These objectives are set out in the government's 25 Year Environment Plan that was published on 11 January 2018, which includes new measures to eliminate all avoidable plastic waste by the end of 2042 and a target to significantly reduce and where possible prevent all kinds of marine plastic pollution.

The government published its Resources and Waste Strategy⁴ in December 2018. The strategy aims to make the UK a world leader in resource efficiency and resource productivity. It sets out how we will work towards our ambitions of doubling resource productivity and achieving zero avoidable waste by 2050, maximising the value we extract from our resources and minimising the negative environmental impacts associated with their production, use and disposal. Single use plastics, including plastic stemmed cotton buds, plastic drinking straws and plastic drinks stirrers, are associated with negative effects on the environment if they are littered or discarded incorrectly after their use. The strategy commits to ban plastic products where there is a clear case for it and alternatives exist.

This ban is intended to ensure that drink stirrers sold in England are made of less environmentally harmful materials that will decompose quicker and will have lower life-cycle impacts on the environment. It is also intended that banning plastic drink stirrers will foster increased consumer confidence that the products they buy will not harm wildlife and the environment, and will also increase consumer awareness of the environmental harm stirrers can cause when they are not correctly disposed of.

Changes made to this analysis following consultation:

- The implementation date for the ban on plastic drinks stirrers has been moved from October 2019 to October 2020, in line with Government's official response to the consultation and the Covid-19 outbreak.
- The analysis now incorporates familiarisation costs for businesses, and enforcement costs for the regulating authority⁵.
- We have also monetised an additional cost associated with waste management, which mainly falls to businesses (90%). The remaining 10% is attributed to local authorities⁶.
- The analysis no longer includes carbon emission savings from production, as the majority of production occurs abroad so is not included in UK production emission savings.
- Consultation evidence has been incorporated throughout, refining and justifying assumptions.

⁴ <https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england>

⁵ Sourced from <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=20086&FromSearch=Y&Publisher=1&SearchText=EQ0115&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>

⁶ Defra's estimates based on the Resource Futures report that was commissioned to inform this analysis.

In addition to the consultation responses, a number of evidence points have been sourced from research undertaken by the consultancy Resource Futures for Defra. This research was conducted between March and April 2018 to specifically develop understanding of the markets for plastic straws, drinks stirrers and plastic-stemmed cotton buds, and the potential impacts of bans. This included engagement with key stakeholders, an evidence review and preliminary impact modelling. Evidence from this research has been combined with stakeholder engagement, Defra research and consultation responses. Given that the stirrers market is relatively small, there is limited evidence available. A Defra commissioned research was necessary and is referenced frequently throughout this analysis.

Options under consideration

This analysis considers a baseline scenario and a ban option. **The preferred option is to ban plastic drink stirrers in October 2020.** A ban will be the most effective option to reduce the social and environmental costs associated with plastic drink stirrers.

Option 0: Do nothing

The **do nothing** option would allow plastic stirrers to continue being used with little incentive for consumers or retailers to switch products. As this option requires no action, there would be no costs or benefits.

Some businesses are voluntarily moving away from plastic drink stirrers and this will be factored into the do nothing scenario. The problem associated with this option is that relying on voluntary action will mean that reduction is not guaranteed, will happen at a slower rate, and that there will still be some percentage of plastic drink stirrers that will continue to be used and disposed of incorrectly. This means the environmental costs associated with plastic stirrers will continue to persist into the future.

Option 1: Implement a regulatory ban of plastic drink stirrers in England from October 2020 (preferred option)

The preferred option is to ban plastic drink stirrers with no exemptions and without time delay as this would be the most effective option to reduce the social and environmental costs associated with drink stirrers.

A delay would reduce the environmental savings of a ban because plastic stirrers would be in use for longer. The availability of alternative drink stirrers suggests that switching costs would be small and that therefore a transition period would not be necessary. The preferred option seeks to implement a ban for October 2020.

The impacts of a ban are proportionate to secure the environmental benefits without any major costs given the current trend to move away from plastics and the availability of alternatives. As described in the rationale for intervention section, this intervention will secure the change and associated environmental benefits more quickly, and ensure that these are sustained into the future. The ban will foster increased consumer confidence that the products they buy will not harm wildlife and the environment, and will also increase consumer awareness of the environmental harm plastic can cause when not correctly disposed of.

Disregarded options

The following options were considered but were rejected as they would not reduce the impacts to the environment in the same speed and scale as a ban would.

Information and education could be used to encourage industry to move away from plastic drink stirrers. However there is evidence that consumers are already acutely aware of the harms of single-use plastics through many recent campaigns, including the BBC's Blue Planet II series, Daily Mail's Break the habit, Turn the Tide on Plastic and the Stir-Crazy Campaign, as well as the carrier-bag 5p charge in supermarkets. The additional impact of further information being provided on top of these campaigns may be marginal, and is unlikely to eliminate the use of plastic drink stirrers.

Subsidies towards the development of non-plastic drink stirrer alternatives are not considered necessary as stirrers are simple in design and suitable non-plastic drink stirrers have already been developed and are available at the same market price. For the same reasons we also consider that subsidies to encourage the use of non-plastic drink stirrer alternatives would not be necessary to cover any business costs and that such subsidies would not be value for money for use of taxpayer funds.

A taxation or charge policy was rejected, as although this would likely be effective in reducing consumption, it would not be as effective as a ban in reducing consumption. Taxation and charge policy instruments can be effective in reducing plastic, for example, the 5p charge on single use plastic carrier bags delivered significant behaviour change, with data showing an 86% drop in the number of single use plastic carrier bags between 2014 and 2017/18⁷, and Government is consulting on the introduction of a tax on plastic packaging with less than 30% recycled content. However, in this case, a ban was chosen as the most appropriate instrument to achieve the maximum environmental benefits, because single-use plastic drink stirrers are deemed as avoidable plastic, which cause environmental harm and are easily replaceable. The consultation responses agreed with that rationale.

A ban with exemptions was also considered but rejected as, given the suitability of available non-plastic drink stirrers, there is no evidence that any groups would be unduly disadvantaged by a wholesale ban. This was supported by evidence from the consultation, where many respondents highlighted the suitability of readily available alternatives.

In addition, it is worth noting that a ban on plastic drink stirrers is not the only Government intervention in addressing the environmental impacts of the waste we produce, and this measure should be viewed as part of a wider package of reforms, which uses different policy instruments, in the Resources and Waste Strategy. A ban was chosen as the most appropriate instrument as single use plastics drinks stirrers were deemed as avoidable plastic, which cause environmental harm and are easily replaceable. Furthermore, a taxation or charge would place an additional financial burden on businesses which could be passed on to consumers. The consultation responses agreed with that rationale.

Alternatives to plastic drink stirrers

Research undertaken on behalf of Defra identifies wood as the most substitutable material to plastic for stirrers⁸ as these are comparable in price to plastic stirrers and are also disposable. In this analysis we also assume that wooden drink stirrers are the substitute for plastic drink stirrers. It is a conservative assumption to assume that consumers will continue using single use stirrers, as if consumers switch to reusable stirrers the environmental benefits of the ban would be greater.

Other materials were considered. There exists a small market for heavier cocktail stirrers to be used (such as glass) in pubs, clubs, restaurants or at home⁹. Glass makes up a small portion of the market, are primarily used at home and are often re-used. Therefore, glass is not expected to replace single use plastic stirrers.

Summary of Impacts and NPVs – Preferred Option

⁷ [Single-use plastic carrier bags charge: data in England for 2017 to 2018](#)

⁸ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers.](#)

⁹ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers.](#)

Table 1 below gives a summary of the monetised costs and benefits and total Net Present Value (NPV) estimates for the preferred option to ban plastic drink stirrers, compared to what we believe would happen if there were no government intervention (i.e. under the 'do nothing' option). The central NPV estimate is -£0.32m.

Table 1 - Summary		10 Year NPV estimates, £'000s		
		Low	Central	High
Benefits	Disposal incineration emission benefit	5.12	7.67	10.13
	Landfill tax revenue*	5.19	3.93	2.62
	Reduced coastal clean-up costs	3.74	7.55	15.17
	Beach well-being benefit	34.40	98.30	255.49
Costs	Disposal landfill emission cost	-4.80	-3.63	-2.42
	Waste management costs to business	-20.03	-13.62	-8.07
	Waste management costs to LAs	-2.23	-1.51	-0.90
	Enforcement cost	-418.81	-314.11	-209.41
	Business implementation cost	-100.00	-100.00	-100.00
	Fuel cost	-2.32	-1.55	-0.77
	Fuel emissions cost	-0.03	-0.02	-0.01
	Total	-499.77	-317.00	-38.17

*Note that the landfill tax revenue represents a transfer of money between relevant parties. It is an additional revenue to Government and a cost to businesses and local authorities. This means that we have used the same estimates for each scenario in our NPV calculations.

All figures are in 2017 prices. The range between the low and high estimates reflects the estimate ranges for the number of drink stirrers consumed in England, how long each stirrer would take to decompose, the proportion that end up on beaches and differing values in the literature placed on having cleaner beaches.

Despite the fact that the NPV shows a small cost to society, the non-monetised benefits such as the reduction in animal entanglement and ingestion, reduced cost to the fishing industry and the reduced consumption side carbon footprint outweigh this slightly negative monetised NPV.

Counterfactual

In order to assess the costs and benefits of the preferred option to ban plastic drink stirrers in October 2020, we have set out what we estimate would happen to the drink stirrer market if there were no ban (i.e. we 'do nothing'). Resource Futures estimate that 50% of disposable drink stirrers currently consumed are plastic stirrers¹⁰.

We expect it would be unrealistic to assume that plastic stirrers would keep this market share in the 'do nothing' scenario given the current campaigns and movements away from single use plastics¹¹ as well as movements specific to stirrers¹². The scenario analysis section below maps out how we expect the market share of plastic stirrers to change. If we did assume that plastic stirrers consumption remained high without a ban, this would likely overstate the value of the costs and benefits a ban would bring. Therefore, we have attempted to model what is likely to happen in the market without a ban. These modelling assumptions make the overall net present value lower than maintaining a constant market share so this is a conservative approach to the analysis.

¹⁰ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

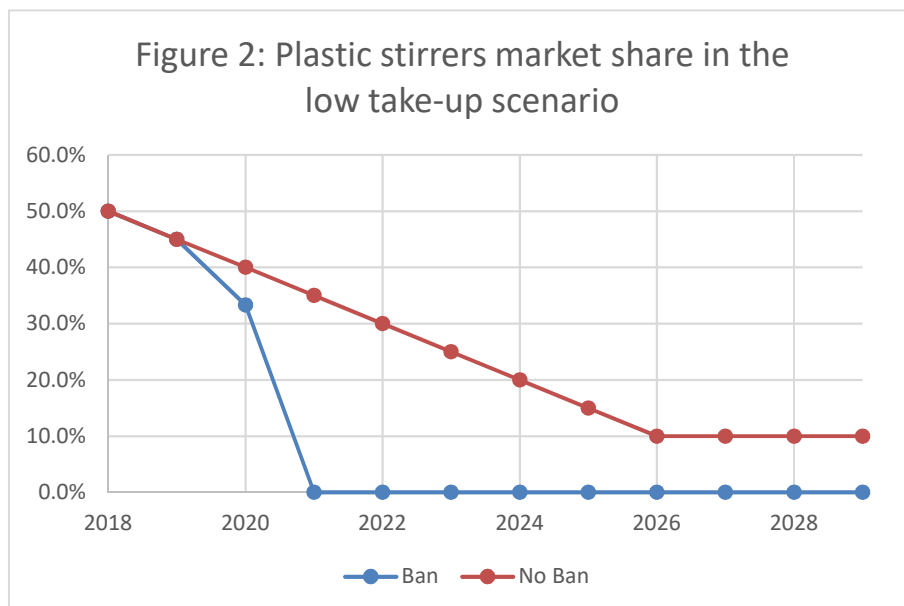
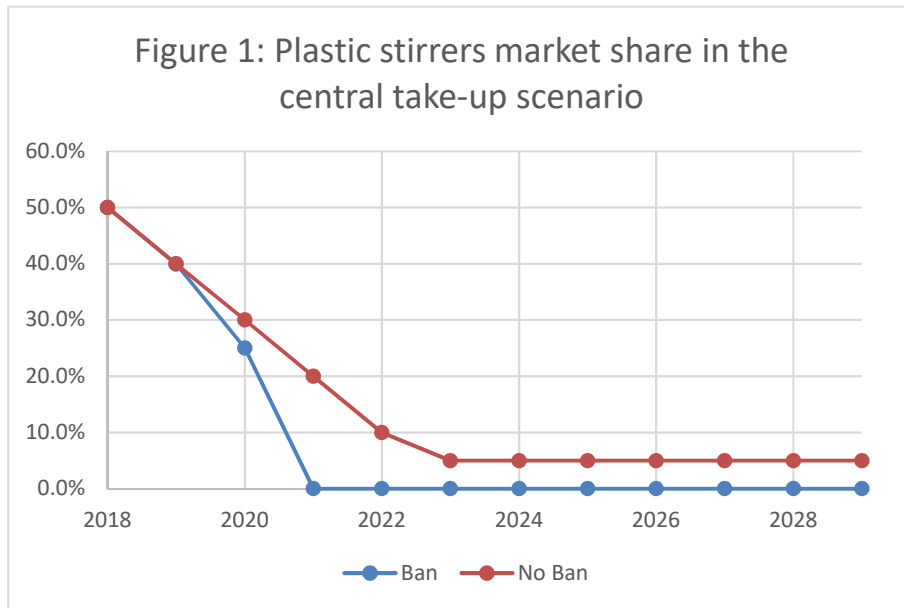
¹¹ The movements away from single use plastics are currently quite prominent in the market for cotton buds, straws and coffee cups (which stirrers are commonly used with), with numerous commitments having been made by retailers since 2017.

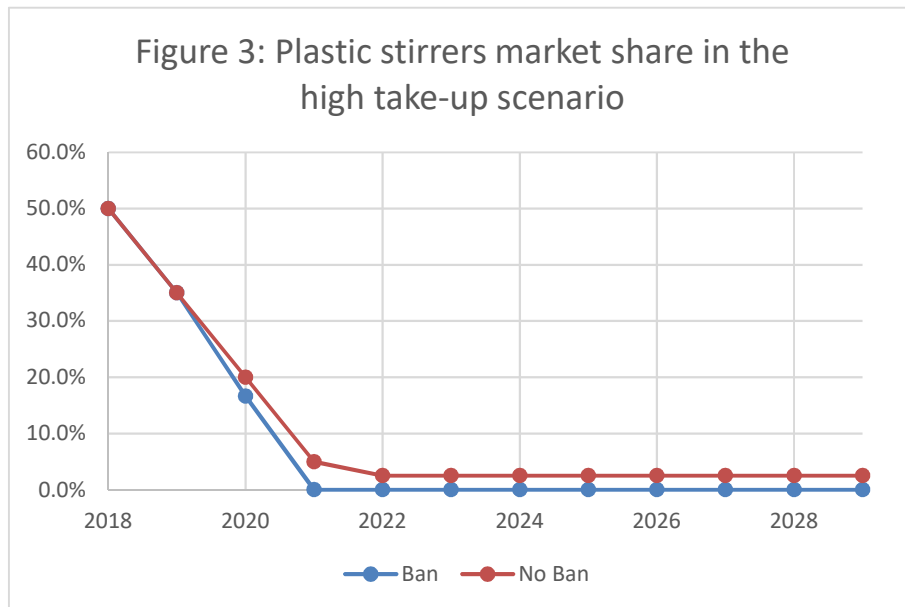
¹² [Recycling waste world – Stir Crazy](#)

The value of the costs and benefits of the ban are sensitive to the number and size of providers that switch to wooden stirrers voluntarily, and the time it would take them to switch without the ban in place. A limitation of this analysis is that it is very difficult to predict what the market will do if no ban on plastic stirrers were imposed.

Scenario Analysis

In order to allow for the evidence gap in forecasting what would happen to plastic stirrers without a ban, we have provided an illustration of three scenarios for take up of alternatively made stirrers in the ‘do nothing’ (no-ban) scenario and compared these against the ‘ban’ scenario, all of which are shown in the graphs below and in table format in Annex 1. They show the percentage of the market share forecast to still be plastic over the next 10 years.





The 'ban' and 'no ban central' scenarios are based on modelling estimates made by Resource Futures. High and low sensitivities reflect the uncertainty of this forecast. The differences in the scenarios start from 2020 as the ban is planned to be enacted October 2020.

In the ban scenario, the market share of plastic stirrers will be 10/12ths of the no ban scenario market share in 2020 (representing the 10/12ths of the year before the ban is implemented), falling to 0% after the implementation of the ban. In the 'no ban high' scenario, take up of alternatively made drink stirrers is very high, leaving plastic with a 5% market share for drink stirrers by 2022. The 'no ban central' and 'no ban low' take up scenarios follow similar paths but each with slightly higher proportions of plastic market share throughout.

Research by Resource Futures found that many wholesalers were announcing switching to plastic-free alternatives at the time the research was conducted. The current observed trends were projected to continue, with the assumption that this would be in a linear fashion. This is recognised as a simplified representation of the market, and in reality it is likely that switching would occur in a non-linear fashion, however, it is difficult to provide a robust forecast of this. These scenarios have therefore been utilised for modelling purposes in order to provide a comparison for the "ban" scenario, where change is implemented earlier and faster, to avoid overstating the impacts of the regulation. These projections are inevitably uncertain, and therefore sensitivity analysis around the central scenario has been undertaken to explore this risk.

The difference between the 'ban' and 'no ban central' scenario is used to calculate the final net present value (NPV) estimate in this analysis. The NPV of introducing a ban is highest in the 'low take-up' scenario, which reflects the fact that the ban would have the biggest impact if society is assumed to remain using plastic drink stirrers at a higher rate without government intervention. Table 2 below provides a sensitivity analysis to show how the NPV would change across the 'no ban' scenarios:

Table 2 - Scenarios for plastic take up if there were no ban:	10 Year NPV estimates, £'000s		
	Low	Central	High
Central Scenario NPVs	-£499.8	-£317.0	-£38.2
Low take up Scenario NPVs	-£400.6	£360.1	£606.6
High take up Scenario NPVs	-£506.6	-£362.7	-£168.8

All of the 'no ban' scenarios are similar in that they suggest that the majority of the market for drink stirrers will soon move away from plastic. This limits the scope of the costs and benefits in this impact assessment significantly. This is a conservative approach, as Table 2 shows that if we assumed that plastic retains a greater market share (i.e. the low take up scenario) then the ban would have greater net benefits, resulting in higher net present value estimates.

Costs

The costs of a ban on plastic drink stirrers include landfill disposal emission costs, increased waste management costs, enforcement costs, a small familiarisation cost to businesses and the cost to business of the additional fuel needed for wooden stirrers and the additional associated emissions cost.

Summary of Monetised Costs

Table 3 shows the monetised costs, with our central total present value (TPV) estimate over 10 years being £434,450. These costs are: the additional emissions expected from the disposal of wooden drink stirrers; an increase in landfill tax and disposal gate fees as wooden stirrers are heavier; an enforcement cost to the regulation authority; a one-off transition cost to retail businesses; a fuel cost to businesses from transporting heavier wooden stirrers; and the associated fuel emissions cost.

Table 3	10 Year NPV estimates, £'000s		
	Low (worst case)	Central	High (best case)
Total Costs:			
Disposal landfill emission cost	-£4.80	-£3.63	-£2.42
Waste management costs to business	-£20.03	-£13.62	-£8.07
Waste management costs to LAs	-£2.23	-£1.51	-£0.90
Enforcement cost	-£418.81	-£314.11	-£209.41
Business implementation cost	-£100.00	-£100.00	-£100.00
Fuel cost	-£2.32	-£1.55	-£0.77
Fuel emissions cost	-£0.03	-£0.02	-£0.01
Total Costs:	-£548.22	-£434.45	-£321.58

Summary of Non-monetised Costs

Switching materials may create costs for producers, but very few drink stirrers are produced in the UK¹³ and therefore any such costs would be out of scope of this analysis. Wooden drink stirrers are already available at comparable prices to plastic stirrers, implying that there will be no costs passed onto retailers (or to consumers to absorb). There may be a disutility cost to consumers having to use wooden stirrers when they may have preferred plastic drink stirrers, but no evidence was put forward during the consultation to suggest this.

The monetised and non-monetised costs will be presented side-by-side in this section, grouped under the following headings:

- Environmental emissions
- Monitoring and enforcement
- Costs to businesses

¹³ Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers

- Costs to consumers

Environmental Landfill Emission Cost

Relative to plastic, wood emits more kilograms of carbon dioxide equivalent (CO₂e) emissions when placed in landfill (819kg CO₂e per tonne of wood, in comparison to just 5kg CO₂e per tonne of plastic polystyrene). Evidence suggests that the majority of drink stirrers are not recycled¹⁴. It also suggests that for waste that goes to landfill, plastic performs better than wood due to the CO₂e emissions released by wood in landfill. Given that each tonne of CO₂e has an environmental cost associated with it, this causes wood based alternatives to have an increased negative contribution towards the environment when sent to landfill.

Monetisation and Assumptions

We have monetised this cost using the following figures and assumptions:

- We have estimated that 316 million drink stirrers are consumed in England each year. We assumed 211 million for our low estimate and 421 million for our high estimate. These estimates are based on estimates for the number of coffee cups consumed in the UK¹⁵ scaled down for the population of England¹⁶, and an assumption that 10% of disposable coffee cups come with stirrers¹⁷.
- Wooden drink stirrers weigh 1.09g versus 0.32g per unit for plastic versions¹⁸.
- For each tonne of material placed in landfill, plastic polystyrene emits 5kg of CO₂e, whereas wood emits 819kg¹⁹. It is possible that there are impacts of plastic landfill disposal that are not included within the 5kg estimate as plastic has not been around for as long as its own estimated decomposition rate, but analytically this would reduce the emission cost of switching materials.
- We assume that the cost of one tonne of CO₂e in 2020 is £68.08, which increases up to £79.43 in 2030²⁰.
- 99.9% of drink stirrers are given to waste or are littered, and then collected by local authorities, with 0.1% ending up in marine environments²¹. Only a small proportion are thought to reach marine environments as only a fraction of stirrers are used outdoors, littered and not street cleansed²². We assume zero recycling occurs, which is based on the effort required to segregate them and clean them from disposable cups. This assumption is also to give a conservative estimate, as if any drink stirrers were recycled wood stirrers would emit fewer carbon equivalent emissions than plastic stirrers²³, leading to a higher NPV for the policy to ban plastic drink stirrers.
- 29% of the 99.9% of drink stirrers collected by local authorities are sent to landfill²⁴.
- These assumptions are used to compare the scenarios where differing proportions of stirrers are modelled to be plastic vs. wood.

¹⁴ Confirmed via Defra discussion with recycling and recovery industry stakeholder when talking about straws, responsible for significant share of the waste management market. We assume this will be the same for stirrers given their similar shape and use within hospitality.

¹⁵ [House of Commons Environmental Audit Committee](#), Disposable packaging: Coffee Cups

¹⁶ [ONS](#) figures for population of England and UK

¹⁷ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

¹⁸ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

¹⁹ Government conversion factors. Confidential data from WRAP, which underpins published [government greenhouse gas reporting figures](#).

²⁰ Green Book Supplementary [Guidance from BEIS](#), which states that emissions for landfill should use non-traded values.

²¹ This estimate is based on an estimate by [Resource Futures](#) that 0.001% of plastic stirrers enter marine environments, which we have taken as our low estimate, with 0.1% as our central estimate and 1% as our high estimate. The overall benefit from incineration emissions is not sensitive to our range given for stirrers that enter marine environments.

²² [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

²³ Government conversion factors. Confidential data from WRAP, which underpins published [government greenhouse gas reporting figures](#).

²⁴ Estimate based on figures by <https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables>. Local authority collected waste generation from April 2000 to March 2018 (England and regions) and local authority data April 2016 to March 2017

- When comparing the central “no-ban” scenario to the ban scenario, we see an additional net cost caused by an increase in landfill emissions of £3,632 over the ten-year appraisal period due to the higher number of wooden stirrers.

It is assumed above that 0.1% of stirrers end up in marine environments. There will be emissions costs associated with an increased number of wooden stirrers biodegrading in this environment, however we have not been able to quantify the carbon impact of this because we do not have associated carbon emission estimates. It is expected that this will be very small scale given the very low weight of stirrers and because this estimate would apply only to 0.1% of stirrers.

Monitoring and Enforcement Costs

There will be costs associated with inspection and law enforcement services to support the ban. The ban will be enforced through civil sanctions set out in part 3 of the Regulatory Enforcement and Sanctions Act 2008.

Many respondents to the consultation proposed that Trading Standards authorities would be best placed to enforce the ban. We will work closely with Local Authorities to establish the most effective and efficient way of enforcement.

Local Authorities in England spent £113m on trading standards in 2017/18²⁵. We have allowed for around 2 days of one enforcement officer’s time at 190 trading standards authorities per year, costed at £130/day²⁶, and applied this annually over the 10 year period. This gives an overall net present cost estimate of £0.3m. This approach is based on the analysis for banning plastic microbeads²⁷, where 2 days of staff time were allowed in year 1 for enforcement familiarisation. Due to the relatively high-profile nature of the plastic stirrers ban and the larger number of businesses involved, we have extended this to an annual basis in order to provide a conservative estimate, allowing for familiarisation and active enforcement if required. This is also consistent with the estimate made by Resource Futures for Defra.

Costs to Businesses:

Production Costs

Some English businesses may lose business if they are unable to switch to alternatively made drink stirrers, or may face costs investing in alternative products in order to continue business. It is not clear what costs, if any, will be encountered by businesses switching away from plastic drink stirrers, however evidence suggests that wooden drink stirrers production costs will be small given that wooden drink stirrers are already available on the market and at a price equivalent to 0.5 pence per unit²⁸, which is comparable to the cost for plastic stirrers. Wooden drink stirrers are unlikely to be technically difficult to produce instead of plastic stirrers as they are small, consist of a single material and are formed in a simple shape. Prices of wooden stirrers may rise following an upturn in demand around the time of the plastic stirrer ban, but our scenario analysis shows that there is already a trend away from plastic. Given that prices of wooden stirrers have started at the same price as plastic stirrers, an increase in production of wooden stirrers to replace plastic stirrers may lead to economy of scale benefits which could decrease the production price of wooden stirrers.

Any costs to businesses are unlikely to hit English businesses as our best evidence shows that the stirrers are predominantly imported into England²⁹. This is supported by an EU study which found that

²⁵ <https://www.gov.uk/government/statistics/local-authority-revenue-expenditure-and-financing-england-2017-to-2018-individual-local-authority-data-outturn> (RO5)

²⁶ Based on ONS wage for local government staff at £12.48/hour + 30% on-costs

²⁷ https://www.legislation.gov.uk/ukia/2017/160/pdfs/ukia_20170160_en.pdf

²⁸ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

²⁹ Resource Futures assumed in their central estimate that 95% of stirrers are imported

'an internet search for suppliers of plastic stirrers by location reveals 127 suppliers located in the EU, compared with 214,112 in China, 4,982 in Hong Kong and 1025 in Vietnam'³⁰. We do not have figures for the number and size of businesses in England that produce drink stirrers. Our best evidence suggests that only a very small proportion of stirrers consumed in England might be made in England³¹. This leads us to believe that English businesses will be predominantly unaffected by a ban on plastic drink stirrers. As such, we have assumed that all stirrers are imported.

Our consultation found that of the categorised responses from both members of the public and organisations, a majority believed that there would be no additional costs to industry, as alternatives are already readily available on the market. In support of this assumption, there were no responses to the consultation from any England-based manufacturers. As we have not been able to evidence any costs to English businesses involved in production we have assumed for our NPV estimates that there are zero production costs.

Fuel Costs

There will be an increase in fuel costs for transporting drink stirrers as wooden drink stirrers weigh more than plastic drink stirrers (1.09g compared to 0.32g per unit), so this will add to transportation costs (both the fuel cost to businesses and associated environmental costs of emissions) when the travel from production line to consumer is considered.

A number of important factors are unknown, which makes it difficult to form a reliable estimate of these costs:

- The average distance travelled by each stirrer in England
- The number of stirrers carried on average in a truck
- The mode or modes of transport used to transport stirrers and the vehicles used
- The fuel cost of the additional weight per mile, which will depend on the mode of transport and the weight a vehicle is already transporting

We have estimated this cost using the information that is available:

- Wooden drink stirrers are assumed to weigh 1.09g in comparison to 0.32g for plastic
- Applying this weight difference to all drink stirrers placed on the market (316m) would mean that there would be an additional weight of 243 tonnes per year if all stirrers were wooden in comparison to plastic
- A Massachusetts Institute of Technology (MIT) study estimated that removing 10kg of weight from a truck can save 80L of fuel over 200,000km³²
- This would imply that adding 10kg weight to a truck would require an additional 0.04L of fuel over 100km, costing 5p at fuel prices of £1.30/L diesel³³. As the type of vehicle and weight already being transported are important variables here, this should be taken as an indicative estimate rather than a definite costing
- This would suggest that adding 243 tonnes would require an additional 973L of fuel over a distance of 100km, costing £1,264.

Due to the uncertainty surrounding a number of the inputs to this estimate, we have included this figure as the low scenario estimate, and doubled it to provide a conservative central scenario estimate (£2,529). For the high scenario estimate, the estimated fuel costs have been tripled to reflect the uncertainty and to account for the extreme end of the scale (£3,793). These costs are then multiplied by

³⁰ [European Commission](#) impact assessment, Reducing Marine Litter; action on single use plastics and fishing gear

³¹ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

³² <http://www.nrcan.gc.ca/node/16755>

³³ [1L diesel = £1.30, average annual estimate in 2018, https://www.gov.uk/government/statistical-data-sets/oil-and-petroleum-products-monthly-statistics](https://www.gov.uk/government/statistical-data-sets/oil-and-petroleum-products-monthly-statistics)

the difference in the market share of plastic and non-plastic stirrers in the baseline and policy scenario to determine the effect of the ban on fuel costs.

These numbers illustrate that any additional fuel costs from the ban are expected to be minimal, particularly considering that the impact would be experienced across a number of companies, with many likely to be transporting a small number of drink stirrers at a time within each truck load. The assumptions used for this calculation were tested with a representative of the British Retail Consortium³⁴ with regards to plastic straws (where the impacts are the largest), who agreed that additional costs to businesses are likely to be accounted for within the range provided.

In addition to the fuel costs to businesses (which have been included in the NPV and EANDCB calculations), the use of additional fuel would also incur additional greenhouse gas emissions. Using an average of 2.4 kg CO₂ equivalent per litre of diesel burned³⁵, we would expect an additional 3 tonnes CO₂e from the 1,459 litres of diesel required over the ten year appraisal period in the central scenario. Using Green Book non-traded carbon prices³⁶, this would be worth £210 discounted over 10 years. Again, these costs are then multiplied by the difference in the market share of plastic and non-plastic stirrers in the baseline and policy scenario to determine the effect of the ban on fuel costs.

Waste Management Costs

As stated in the fuel costs section, wooden stirrers weigh more than plastic stirrers (1.09g compared to 0.32g per unit). This will increase the waste management costs as landfill tax and landfill/incineration site gate fees are calculated by weight.

Local authorities and businesses are expected to share the additional waste management cost burden. We assume that the majority of stirrers are disposed of in commercial establishments, with some in public bins. This means that businesses will bear most of the burden of the additional gate fee and landfill tax. Only a small proportion of that cost will be to local authorities. We expect businesses and local authorities to bear 90% and 10% respectively of the additional costs³⁷.

Monetisation and Assumptions

We have monetised the waste management costs using the following figures and assumptions:

- Wooden drink stirrers are assumed to weigh 1.09g in comparison with 0.32g for plastic
- 315.75m stirrers are consumed a year in the England³⁸
- Our assumption is that 29% of stirrers will be taken to landfill and 71% incinerated^{39,40}:
 - o Assuming all stirrers are plastic, these percentages result in 29 tonnes going to landfill and 72 tonnes going to incineration respectively.
 - o Assuming all stirrers are wooden, they result in 99 tonnes going to landfill and 244 tonnes going to incineration respectively.
- Our central estimates are that the landfill gate fee is £23 per tonne, the incineration gate fee is £91.4 per tonne⁴¹ and the landfill tax is £94.15 per tonne⁴².
- This results in an estimated total additional waste management cost of £25,296 per year.

³⁴ Stakeholder discussion with the British Retail Consortium, August 2019. 70% of the UK retail industry, by turnover, are members of the BRC: www.brc.org.uk.

³⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/696677/Data_tables_1-19_supporting_the_toolkit_and_the_guidance_2017__180403_.xlsx

³⁶ Green Book Supplementary Guidance from BEIS, which recommends that non-traded sector carbon prices should be used for direct fuel use in non-aviation transport.

³⁷ Defra's estimate based on the Resource Futures report

³⁸ Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers

³⁹ Estimate based on figures by <https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables>. Local authority collected waste generation from April 2000 to March 2018 (England and regions) and local authority data April 2016 to March 2017

⁴⁰ <https://www.wrap.org.uk/sites/files/wrap/Difficult%20to%20recycle%20products.pdf>

⁴¹ <https://www.letsrecycle.com/prices/efw-landfill-rdf-2/efw-landfill-rdf-2020-gate-fees/>

⁴² <https://www.gov.uk/government/publications/rates-and-allowances-landfill-tax/landfill-tax-rates-from-1-april-2013>

- We assume that 90% will fall to business and 10% will fall to local authorities. Resulting in an annual cost of £22,943 to business and £2,549 to local authorities over the appraisal period.

These costs are then put in 2017 prices, discounted, and multiplied by the profile to use which compares the ban and the no ban scenario to reflect the change in societal value caused by the policy. The resulting present value is £13,625 of additional waste management costs to business and £1,514 of additional waste management costs to local authorities over the 10 year appraisal period.

Retail and Hospitality Sector Costs – Business Implementation and Familiarisation Cost

The price comparability of wooden drink stirrers to plastic drink stirrers implies that businesses that provide stirrers to consumers are unlikely to be hit by a change in materials.

Businesses that sell stirrers (usually to other businesses) that have not made commitments to switch material may face costs that they would not have done under a ban. Such costs may also occur to coffee shops that currently provide plastic stirrers (often free of charge). There may be a cost to those with surplus stocks of plastic stirrers. Switching costs may include the staff administration and procurement cost of finding alternative suppliers of drink stirrers. The ban has been delayed from October 2019 to October 2020, which should assist with this process. Switching costs may not exist at all for retailers or coffee shops if their suppliers agree to switch material.

The assumption of minimal cost to business was tested and supported at the consultation. Respondents did not provide evidence of any expected additional costs or constraints to industry, with a number of respondents indicating the availability of alternatives such as wood stirrers or metal spoons.

We have estimated an additional £0.1m business implementation cost to retailers in year 1 of the ban, based on research for Defra by Resource Futures. This is in comparison with the costs that would be incurred anyway in the counterfactual scenario. This cost is expected to cover familiarisation costs, and has been included in this post-consultation analysis in order to provide a conservative analysis on the impact to business.

Costs to Consumers:

It is difficult to evidence the costs that might be passed onto consumers as stirrers are not typically sold business-to-consumer. Often stirrers are provided free at the point of use to consumers as complimentary with drinks they have already paid for.

If consumers are looking to purchase their own drink stirrers, wooden drink stirrers are already available on the market and at a price equivalent to 0.5 pence per unit⁴³, which is comparable to the cost for plastic stirrers. This implies that consumers would not face any additional costs if single use plastic stirrers ceased to be available. It is also possible that an increase in production of wooden stirrers to replace plastic stirrers may lead to economy of scale benefits which could decrease the price of wooden stirrers.

Disutility from using a different product

There may be concerns that stirrers not made from plastic could be flimsier, harder to use with precision or may have an inferior shape for stirring, creating a disutility cost to consumers. However, evidence so far suggests that wooden based alternatives are considered to be just as good to use, with Resource Futures having found from their research that 'no evidence was identified that indicated the plastic-free alternatives were less effective than their plastic counterparts', and there are campaigns that argue

⁴³ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

'there is no situation in which a plastic stirrer is necessary'⁴⁴. This suggests that any disutility experienced by consumers from the ban may be small or may not exist. Furthermore, consumers may gain a well-being benefit from using stirrers that they believe are environmentally friendlier than plastic version. Although stirrers were not singled out, a recent report by YouGov found that the majority of the public were in favour of banning a large number of single use plastic items⁴⁵.

Benefits

The benefits of a ban on plastic drink stirrers include reducing the carbon emissions associated with incineration of drinks stirrers, an increase in landfill tax revenue, improvements to marine environments and well-being benefits to society from litter reduction. The benefits that stem from the reduction in marine litter are reinforced by the ban on plastic straws and plastic cotton buds which will also be implemented in October 2020. These products which are included in this package of single-use plastic bans are estimated to make up 5.7% of marine litter.

Summary of Monetised Benefits

Table 4 shows the value of the benefits we have quantified. In our central total present value (TPV) estimate over 10 years we expect approximately £117,450 of benefits to come from a ban of plastic drink stirrers.

The largest benefits are associated with improvements to beach environments which saves clean-up costs and has well-being benefits. Plastic drink stirrers contribute towards polystyrene pieces which are commonly found on beaches, but clean beaches are highly valued by the public. A switch away from plastic drink stirrers should help to reduce plastic debris on beaches as wooden alternatives that might reach the beaches will decompose much quicker.

	10 Year NPV estimates, £'000s		
Total Benefits:	Low	Central	High
Disposal incineration emission benefit	5.12	7.67	10.13
Landfill tax revenue*	5.19	3.93	2.62
Reduced coastal clean-up costs	3.74	7.55	15.17
Beach well-being benefit	34.40	98.30	255.49
Total Benefits:	48.45	117.45	283.41

*Note

that the landfill tax revenue represents a transfer of money between relevant parties. It is an additional revenue to Government and a cost to businesses and local authorities. This means that we have used the same estimates for each scenario in our NPV calculations.

The other quantified benefits are from emission savings which come from wooden based alternatives being cleaner to incinerate (each tonne of wood burnt actually saves carbon dioxide equivalent (CO₂e) emissions through energy conversion). Each tonne less of CO₂e produced has an estimated benefit saving to the environment from abatement costs. Also, the government receives higher landfill tax revenue as wooden stirrers are heavier than plastic and will therefore cost more in landfill tax to dispose of via landfill.

Summary of Non-monetised Benefits

There are several benefits, particularly associated with improvements to marine environments, that have not been quantified. Marine litter has a disamenity cost, affecting pristine seascapes and quality of life

⁴⁴ [Recycling waste world](#) – Stir Crazy

⁴⁵ [YouGov](#) finds overwhelming support for banning 'problem plastics'.

which impacts those who use marine environments and also impacts those who have a non-use value of marine environments, as people value knowing that there is a pleasant environment available to them and to others. Marine litter impacts marine life as materials can entangle or be ingested by marine wildlife. Harm to marine wildlife may be a strong public concern and a significant part of the rationale for a ban. A ban on plastic drink stirrers will help to reduce the amount of plastic content reaching and causing harm to marine environments, reducing the scope of environmental costs associated with marine litter.

The monetised and non-monetised benefits are presented side-by-side in the following section, grouped under the category headings:

- Environmental emissions benefits
- Additional landfill tax revenue
- Reduced damage to marine life
- Reduced damage to fishing industry

Environmental Emissions Benefits

Production Emissions Savings:

Wooden drink stirrers are more environmentally friendly to produce than plastic drink stirrers as for each tonne of wood produced, less carbon dioxide equivalent (CO₂e) tonnes are emitted than for each tonne of plastic. However, as the vast majority of drink stirrers are produced outside England⁴⁶, the emissions saving from producing wooden stirrers instead of plastic will not directly benefit England. This benefit is not included in the NPV as they are not UK benefits as measured in production emissions, but accrue abroad. Nevertheless it should be noted that moving towards wooden stirrers should reduce the UK's overall consumption carbon footprint.

Incineration Savings:

A benefit of moving away from plastic based goods is that plastic emits more carbon dioxide equivalent (CO₂e) emissions when it is incinerated (642kg of CO₂e for each tonne of plastic polystyrene). This contrasts with wood which actually saves 514kg of CO₂e for each tonne incinerated as the energy is recaptured⁴⁷. While the process of incineration is the same for both materials, the respective emissions factors are very different. This is because the CO₂ released by burning wood is biogenic, meaning it is considered as part of the natural carbon cycle. This means the CO₂ released is not counted as additional. Meanwhile, carbon released from burning fossil-based plastic has the opposite effect ⁴⁸.

Given that each tonne of CO₂ has an environmental cost associated with it, this causes wood based alternatives to make a relatively positive contribution towards the environment in comparison with plastic drink stirrers when they are incinerated.

Monetisation and Assumptions

We have monetised this cost using the following figures and assumptions:

- 316 million drink stirrers are consumed in England each year. We assumed 211 million for our low estimate and 421 million for our high estimate. These estimates are based on estimates for

⁴⁶ Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers.

⁴⁷ See Annex 2 for carbon conversion factors used

⁴⁸ IPCC protocol for incineration and open burning of waste https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_5_Ch5_IOB.pdf

- the number of coffee cups consumed in the UK⁴⁹ scaled down for the population of England⁵⁰, and an assumption that 10% of disposable coffee cups come with stirrers⁵¹.
- Wooden drink stirrers weigh 1.09g, compared to 0.32g per unit for plastic drink stirrers⁵².
 - As above, each tonne of plastic emits 642kg CO₂e when incinerated, in comparison to a saving of 514kg CO₂e for wood
 - We assume that the cost of one tonne of CO₂e in 2020 is £68.08, which increases up to £79.43 in 2030⁵³.
 - In our central estimate 99.9% of plastic stirrers are given to waste or are littered, and then collected by local authorities, with 0.1% ending up in marine environments⁵⁴. Only a small proportion are thought to reach marine environments as only a fraction of stirrers are used outdoors, littered and not street cleaned⁵⁵. We assume zero recycling occurs, which is based on the effort required to segregate them and clean them from disposable cups. This assumption is also to give a conservative estimate, as if any drink stirrers were recycled, wooden stirrers would emit fewer carbon equivalent emissions than plastic versions⁵⁶, leading to a higher NPV for the policy to ban plastic drink stirrers.
 - Of the 99.9% of drink stirrers collected by local authorities, it is assumed that 71% are sent for incineration, with the rest sent to landfill⁵⁷.
 - These assumptions were used to generate monetised emissions projections for the scenarios, by calculating the emissions related to the differing proportions of plastic vs. wooden stirrers.
 - The central baseline scenario (where the proportion of plastic stirrers on the market declines gradually from 50% market share to 5% by 2023) was compared to the ban scenario (with a ban in October 2020) – see page 8.
 - Over the ten year appraisal period, there is a net benefit of £7,670 for the ban scenario in comparison with the baseline.

Additional Landfill Tax Revenue

As mentioned previously, wooden alternatives are more heavy than plastic stirrers. This will result in an increase in government landfill tax revenue. The increase in revenue is calculated based on additional weight from the market switching to wooden stirrers.

The additional landfill tax revenue is also reflected in our calculation of the additional waste management costs to business and local authorities (as outlined in the costs section). This means that the net present value removes the landfill tax effect from the overall societal costs.

The additional landfill tax revenue has an estimated present value of £3,926 over the 10 year appraisal period. The cost section (on page 15) sets out our calculations and assumptions related to this impact.

⁴⁹ [House of Commons Environmental Audit Committee](#), Disposable packaging: Coffee Cups

⁵⁰ ONS figures for population of England and UK

⁵¹ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers.](#)

⁵² This estimate is based on an estimate by [Resource Futures](#) that 0.001% of plastic stirrers enter marine environments, which we have taken as our low estimate due to the evidence available covering the contribution stirrers make to beach litter, e.g. [Eunomia](#): leverage points for reducing single-use plastics.

⁵³ Green Book Supplementary [Guidance from BEIS](#): non-traded carbon values are used for emissions from household disposal.

⁵⁴ This estimate is based on by [Resource Futures](#) that 0.001% of plastic stirrers enter marine environments, which we have taken as our low estimate, with 0.1% as our central estimate and 1% as our high estimate. The overall benefit from incineration emissions is not sensitive to our range given for stirrers that enter marine environments.

⁵⁵ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#)

⁵⁶ Government conversion factors. Spreadsheet used [here](#), which underpins published [government gas reporting figures](#).

⁵⁷ Estimate based on figures by <https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables>. Local authority collected waste generation from April 2000 to March 2018 (England and regions) and local authority data April 2016 to March 2017

Marine Benefits

Summary

Marine litter damages marine life as materials can entangle or be ingested by marine wildlife. Marine litter negatively affects societal wellbeing because it affects pristine seascapes and those who use marine environments. It also impacts those who do not use the marine environment themselves but value the fact that there exists a pleasant environment available to them and to others. There is a market failure as the ocean acts as a free open access resource with no direct private costs of disposal (with only a small chance of being caught and fined). The costs are experienced by all users and especially hits groups such as fishermen, water sports enthusiasts, beach goers and animal lovers. As a contributor to marine litter, banning plastic stirrers will help to reduce these social costs. Coastal clean-up cost reduction and litter disamenity reduction have been monetised. Other benefits are assessed qualitatively.

Prevalence of Drink Stirrers in Marine Environments

It is estimated that 1.5 – 4.5% of all global plastics production ends up in the oceans every year⁵⁸. These items are ingested by marine life (with potential knock-on effects further up the food chain), captured as marine debris in fishing equipment and washed up on beaches. The Marine Conservation Society has been monitoring the levels of plastic and polystyrene pieces (0 – 50cm) found on beaches in the UK since 2004. Polystyrene pieces continue to feature in the top ten, ranking first in most common marine litter items in beach clean surveys with an average of 225.3 for every 100m of beach surveyed in 2017⁵⁹. Plastic drink stirrers contribute to these pieces as they are made of polystyrene.

It is difficult to evidence the prevalence of drink stirrers in marine environments as they are a very specific item with little data collected about them. Our best estimate for their prevalence comes from an estimate that drink stirrers and straws together make up 2% of marine litter⁶⁰. We estimate that stirrers make up 5% of the group of straws and stirrers, based on estimates of the number of stirrers consumed compared to straws⁶¹. However, this policy should be viewed as part of a package of wider single-use plastic bans. This ban will be introduced alongside a ban on plastic straws and plastic cotton buds. These products make up 5.7% of beach litter by item count.

The ban on plastic drink stirrers is expected to reduce the prevalence of marine litter as the ban will help inform consumers of the damages they can cause; fewer stirrers will reach marine environments, and those that do will stay for less time, as wooden stirrers will decompose quicker than plastic stirrers. These effects will contribute towards a positive well-being impact.

Coastal Clean-up Cost Reduction

Harbours and marinas have litter cleared in order to ensure that their facilities remain clean, safe and attractive for users. Mouat et al. (2010)⁶² estimated that UK municipalities spend approximately £15.8 million each year removing all forms of beach litter, and £2.1 million each year on harbours.

Our central estimate for the prevalence of drink stirrers in marine environments is that they make up 0.1% of marine litter⁶³. The ban will reduce marine litter clean-up costs on beaches and harbours. This is because alternatively made disposable drink stirrers (which are expected to be wood) will decompose much more easily, so each stirrer will be present on beaches for less time and therefore there will be

⁵⁸ <http://www.sciencemag.org/news/2015/02/here-s-how-much-plastic-enters-ocean-each-year>

⁵⁹ [Marine Conservation Society](#)

⁶⁰ [Report](#) by Eunomia for Seas at Risk, supported by EU funding, 2017, taking the estimate for North Eastern Atlantic.

⁶¹ [Resource Futures: Preliminary assessment of the economic, environmental and social impacts of a potential ban on plastic straws, plastic stem cotton buds and plastic drink stirrers](#). Estimates for the number of stirrers and straws consumed in England vary, and so we have assumed stirrers makeup 2.5% of the total of straws for our low estimate, 5% in our central estimate and 10% for our high estimate.

⁶² Mouat, Lozano, Bateson: Economic Impacts of Marine Litter, 2010. Figure based on €18m estimate, with exchange rate of £1 = EUR 1.14. For context, overall street cleaning cost local governments £778m in 2015/16 – [The Litter Strategy for England](#), 2017.

⁶³ See earlier section on prevalence.

fewer of them. Plastics can take hundreds of years⁶⁴ to decompose, whereas wood can take just a couple of years⁶⁵ to decompose.

Monetisation and Assumptions

It has been possible to monetise the benefits of reduced clean-up costs following a plastic drink stirrer ban, using a series of assumptions for our central estimate:

- Our central estimate for the prevalence of plastic drink stirrers in marine environments is that they make up 0.1% of marine litter (based on beach litter count), with a low estimate of 0.05% and a high estimate of 0.2%⁶⁶.
- Annual litter clean-up costs are £15.8m for beaches and £2.1m for harbour sides (2010 prices). These figures are for the whole of the UK, so are likely to overestimate impacts for England (it was not possible to deduce how much of these costs are attributable to England only).
- We assume that if stirrers were no longer present on beaches and harbour sides that there would be a litter clean-up cost saving equivalent to the portion of litter that plastic stirrers contribute. We take this approach based on the evidence collected by Mouat et al. (2010), who found that the majority of litter removal costs are variable costs.
- In our central estimate we assume that decomposition for wood takes 2 years, 0.67% of the time taken for plastic drink stirrers which take 300 years. We have used a range of estimates for decomposition from 1 – 3 years for wooden stirrers⁶⁷ and 200 – 400 years for plastic stirrers⁶⁸ to reflect the fact that rates vary according to oxygen, light and moisture levels.
- It is assumed that litter clean-up costs are linearly reduced by having fewer items on the beach to pick up. As wooden stirrers take just 0.67% of the time taken by plastic stirrers to decompose it is assumed that there will be proportionally fewer stirrers remaining on the beach overall
- We assume that these benefits will not be seen for the first 2 years after the policy is implemented. This means that the benefit that was seen in year 1 of the pre-consultation IA is now delayed to year 3, giving 2 years fewer benefits across the 10-year appraisal period. This is to reflect that decomposition for wood takes 2 years.
- These estimations were used to calculate the cost savings achieved in the ban scenario in comparison with the baseline (i.e. where switching away from plastic stirrers happens at a slower rate and they are not completely eliminated) – see page 8.
- The central net present benefit is £7,552 over the ten-year appraisal period for the ban, in comparison to the baseline.

We have modelled this benefit because we believe that as wood decomposes significantly quicker than plastic this will reduce litter on beaches and therefore reduce clean-up costs.

It is assumed that because most litter clean-up costs are variable and beach cleaning is usually carried out manually in the UK⁶⁹, a reduction in the number of items will linearly reduce these costs. In practice, the relationship between clean-up costs and the amount of litter on the beach will likely depend on a number of factors that will vary between locations, such as how frequent and thorough beach clean ups are. It is also possible that some fixed costs (such as hourly/daily contracts) could mean that cost reductions manifest in terms of workers having more time to spend picking up other items of litter on the beach, therefore increasing the overall efficiency of the clean-up rather than reducing the amount of cleaning time overall. Although drink stirrers make up just 0.1% of marine litter, when viewed in tandem with policies to ban plastic straws and plastic stemmed cotton buds, the cumulative impact of the bans is quite significant. It is estimated that all three items together contribute to around 5.7% of marine litter.

⁶⁴ Wessex Water: it's time to switch the stick

⁶⁵ US National Park Service

⁶⁶ Based on stirrers making up 2.5% of the total of straws for our low estimate, and 10% for our high estimate, and straws and stirrers together making up 2% of marine litter. See earlier section on prevalence.

⁶⁷ US National Park Service, based on estimate range for plywood.

⁶⁸ Low estimate from WWF, *The Life Cycle of Plastics* and high estimate from Wessex Water. Average taken for central estimate.

⁶⁹ Mouat, Lozano, Bateson: *Economic Impacts of Marine Litter*, 2010.

Amenity benefits of reduced litter on beaches

Summary

A ban on plastic drink stirrers is expected to have positive amenity benefits. We have monetised the well-being impact of reduced litter in beach environments.

The impacts of litter on amenity well-being:

- 89% of people are concerned by plastic pollution in the ocean⁷⁰.
- Initially people may gain a satisfaction from knowing that something is being done to support marine environments (beaches and seas).
- Non-plastic drink stirrers that end up in marine environments will decompose faster and will not break down into micro-plastics, leading to fewer drink stirrers being found across all environments, and therefore the well-being costs associated with beach litter will be reduced.
- The presence of litter can contribute to a fear of crime and injury, both of which have a negative well-being impact.
- Litter can discourage the use of public spaces and reduce our enjoyment of marine environments.
- There is a negative well-being impact experienced when harm to marine environments and the wildlife in them is observed (this was explored in the marine section).
- Clean environments have a value to people who care for the welfare of wildlife and other people, and littered environments affect people's sense of safety, enjoyment and willingness to use public spaces, and therefore there is a social disamenity cost associated with litter.

Monetisation and Assumptions:

Valuing the disamenity of litter is a complex and under-researched area. In order to estimate the disamenity value of reducing beach litter, stated willingness to pay to see "some" litter on the beach in comparison to "none" was used⁷¹. This provides an estimate that respondents were willing to pay £6-£11 per household per year to see litter-free beaches (in 2002 prices). Although these figures are uncertain, they are relatively conservative in comparison to other estimates. They are also likely to be higher now than when the study was conducted in 2002 due to recent increased public awareness of the problems of marine litter.

We have estimated the benefit of reduced plastic drinks stirrer litter on beaches following the ban with the following assumptions and calculations:

- As above, based on beach litter count data, we estimate that plastic drink stirrers contribute towards 0.1% of marine litter⁷², which we assume is representative of the litter found on beaches.
- The annual well-being loss caused by beach litter in England is £193m, based on a willingness to pay between £6 and £11 per household
- There is no relevant empirical data on the precise nature and strength of the relationship between litter and litter disamenity, so a linear relationship has been assumed. This assumption does not change the overall direction of NPV estimates, and the uncertainty that is here is well covered for within the scope of the scenario analysis.

⁷⁰ [Populus](#): Ocean Plastic Survey

⁷¹ [Eunomia](#), using willingness to pay per household, P65. The estimate for the number of households in England is from [ONS](#).

⁷² Based on stirrers making up 2.5% of the total of straws for our low estimate, and 10% for our high estimate, and straws and stirrers together making up 2% of marine litter. See earlier section on prevalence. This estimate is based on the count of stirrers collected in beach litter clean-ups, and has been used to provide an estimate of the visual impact of the litter. Data on the volume of litter that plastic cotton buds comprise was not readily available to estimate this impact. The European Commission IA on '[Reducing Marine Litter](#)' (pg. 8/9) states that "beach litter item counts are internationally accepted as a reasonable indicator of the composition of marine litter", and that "[this] is the best indicator for the overall environmental, social and economic impacts".

- As it is estimated that drinks stirrers make up 0.1% of beach litter, we assume that if they were all cleared, this would reduce the litter disamenity costs on beaches by 0.1%
- In our central estimate we assume that decomposition for wood takes 2 years, 0.67% of the time taken for plastic drink stirrers which take 300 years. We have used a range of estimates for decomposition from 1 – 3 years for wooden stirrers⁷³ and 200 – 400 years for plastic stirrers⁷⁴ to reflect the fact that rates vary according to oxygen, light and moisture levels.
- As with the litter clean-up cost calculations above, the amount of items remaining on beaches is estimated to be directly proportional to the decomposition rate, and these benefits have been delayed by 2 years after the policy is implemented to account for the time taken for wooden stirrers to decompose.
- These assumptions were used to calculate the disamenity associated with the proportion of plastic vs. wooden stirrers that reach beaches (in line with the proportions produced – see page 8) in each scenario.
- In comparison to the baseline, the central net present benefit is estimated to be £98,299 over the 10 year appraisal period.

We have modelled this benefit because we believe that as wood decomposes so much quicker than plastic that this will reduce litter on beaches and therefore reduce both clean-up and disamenity costs. These savings may be overestimated as savings would be affected by factors such as how frequently and how thorough beach clean ups are. However, the reduction of damaging marine plastic is likely to be a significant factor in the disamenity benefit achieved by the ban. In addition, this benefit does not quantify the effect for stirrers that decompose in other marine settings, for example, in the open ocean. Therefore, these figures are likely to underestimate the overall well-being benefit that would be achieved by a ban.

Plastic Entanglement Reduction

Entanglement in marine litter is thought to cause the death of 100,000 mammals each year in the North Pacific alone, a rate that appears to be increasing^{75, 76}. Recording deaths is difficult as many casualties are likely to go unrecorded as they either sink to the ocean floor or are eaten by predators. Entanglement in nets, ropes and other debris poses a significant risk to marine animals and has been recorded in over 130 species of marine animals including 6 sea turtle species, 51 seabird species and 32 marine mammal species⁷⁷. Entanglement causes external cuts and wounds leading to infection, suffocation, drowning and impaired mobility and fitness.

A ban on plastic drink stirrers should help reduce the number of cases of entanglement as the ban will reduce plastic debris in the seas. This benefit is difficult to quantify particularly due to the difficulties of placing a value on sea life, and we don't know how much plastic drink stirrers currently contribute to entanglement. Alternatively made drink stirrers may also contribute to marine litter and entanglement but we think this would be reduced in comparison as wooden stirrers decompose much faster than plastic.

Plastic Ingestion Reduction

All plastic items fragment overtime and it has been estimated that 50% of marine mammals, 40% of seabirds and all turtle species have been known to ingest plastic fragments⁷⁸. Plastic can be retained in animals' stomachs and can impede dietary habits, either by making them feel full and therefore

⁷³ US National Park Service, based on estimate range for plywood.

⁷⁴ Low estimate from WWF, The Life Cycle of Plastics and high estimate from Wessex Water. Average taken for central estimate.

⁷⁵ Thompson, R.C., et al. Plastics, the environment and human health: current consensus and future trends. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 2009.

⁷⁶ Mouat, J., R.L. Lozano, and H. Bateson, *Economic Impacts of Marine Litter*, 2010.

⁷⁷ Ten Brink, 2009, referenced in Mouat, J., R.L. Lozano, and H. Bateson: [Economic Impacts of Marine Litter](#), 2010

⁷⁸ Estimates from Centre for Environment, Fisheries & Aquaculture Science

preventing them from eating, or by impeding their digestion, resulting in malnutrition and eventual starvation⁷⁹.

Plastic drink stirrers are particularly risky for digestion due to their long thin form. This can cause physical damage to an animal's entire digestive system. If broken, plastic drink stirrers can be even more dangerous with ragged and sharp edges.

We would expect a reduction in plastic ingestion following a ban in plastic drink stirrers, but as we have not been able to monetise the cost of marine animals being injured or lost to plastic ingestion we have not been able to monetise the benefit of reduced plastic ingestion.

Damage to Fisheries

The European commission⁸⁰ estimated that the cost of marine litter to the fishing industry could be €60 million. We have not quantified the effect the ban would have on reducing these costs as it is not clear the extent to which drink stirrers contribute to fishery damage, but even a small contribution by plastic drink stirrers could cost thousands or millions of pounds each year, which could be prevented.

Risks

Risks of imposing a ban

- **Increase in littering:** There is a risk that a change in material may encourage consumers to believe that the consequences of not disposing of drink stirrers correctly will be reduced and therefore consumers will litter more. However we expect that the ban will raise people's awareness of the environmental damage drink stirrers can cause, and that consumers will therefore dispose of them correctly and reduce their use of drink stirrers.
- **Increase in prices:** Even though our evidence suggests that wooden drink stirrers are no more expensive to produce than plastic drink stirrers, some suppliers may be forced to increase prices in the short term due to excess demand around the ban. There may also be an incentive to use the forced change in material following the ban as an opportunity to impose price rises on consumers.

Risks of not imposing a ban

- **Environmental costs get worse:** If we don't place a ban on plastic stirrers, the environmental impacts may worsen including harm to marine wildlife, high incineration emissions and high beach litter clean up and disamenity costs.
- **Businesses and consumers keep choosing plastic:** Even though wooden drink stirrers are available to consumers there is a risk that consumers will still opt for plastic drink stirrers without a ban. They could do so inadvertently if products are not well labelled, or consumers may find that they prefer plastic drink stirrers. It may be that there is a time inconsistency problem where consumers are willing to state that they should not use plastic drink stirrers because of their associated environmental harms, but upon purchase they discount future and indirect environmental costs too strongly in favour of a plastic product that they may prefer to use now.
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⁷⁹ [Cotton bud project](#)

⁸⁰ http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm

Monitoring

We are required under section 67 of the Regulatory Enforcement and Sanctions Act 2008 to publish a review every 3 years after entry into force of these regulations, of the operation of the provisions in these regulations and the Schedule in the regulations. The review will consider whether the provision has implemented its objectives efficiently and effectively.

We will also publish a review of the regulatory provision contained in these Regulations before five years after entry into force of these regulations has passed, and publish subsequent reports at intervals not exceeding five years. This review will set out the objectives intended to be achieved by the regulatory provision; assess the extent to which those objectives are achieved; assess whether those objectives remain appropriate; and if those objectives remain appropriate, assess the extent to which they could be achieved in another way which involves less onerous regulatory provision.

Equality Impact Assessment

The public sector equality act introduced the requirement for public bodies to assess whether policy proposals will unlawfully discriminate against a group of people. We consulted on our proposals to restrict the supply of plastic drink stirrers on the 22 October 2018 to the 03 December 2018 and have continued to engage with stakeholders throughout the development of these regulations. The consultation asked a number of questions regarding the impact that restrictions may have, and whether there were suitable alternatives on the market and provided a space for responders to highlight any particular concerns which they may have had. No respondents supplied any opinions or evidence that the ban could disproportionately affect any groups of people. We are confident that the restrictions to the supply of plastic drink stirrers will not disproportionately affect any segment of society.

SAMBA - Small and Micro sized Business Assessment

Costs to producers in England are expected to be very small as we do not believe many stirrers are produced in England. An EU study found that 'an internet search for suppliers of plastic stirrers by location reveals 127 suppliers located in the EU, compared with 214,112 in China, 4,982 in Hong Kong and 1025 in Vietnam'⁸¹, and no consultation responses were received from any England-based manufacturers reporting additional costs.

Resource Futures estimated a £0.1 million business implementation cost in year 1 for all retailers. The assumption of minimal cost to business was tested and supported at the consultation. Respondents did not provide evidence of any expected additional costs or constraints to industry, or evidence that small and micro businesses would be impacted disproportionately. Small and micro retailers are likely to purchase drinks stirrers from wholesalers, in this way acting more like consumers. As the prices of plastic and wooden stirrers are estimated to be comparable, small retailers are not expected to face any additional costs here.

There may be a cost to those with surplus stocks of plastic stirrers, however as the implementation date of the ban has also been delayed from October 2019 to October 2020, this should reduce any switching costs and allow small businesses more time to prepare.

Additional fuel costs caused from wooden stirrers being heavier than plastic stirrers will fall to businesses involved in transportation services, a portion of which may be small sized businesses. The additional fuel costs are likely to be insubstantial given that current prices for wooden stirrers are comparable to plastic stirrers despite being heavier. In the fuel costs section we demonstrated that overall additional annual fuel costs would be low, and only a portion of this would be attributable to smaller businesses.

⁸¹ [European Commission](#) impact assessment, Reducing Marine Litter; action on single use plastics and fishing gear

Similarly, we do not expect additional waste management costs to affect small sized businesses disproportionately. The total estimated cost to businesses is very small and would be shared across numerous businesses, with larger ones expected to bear a higher share of that cost (based on potentially higher usage of stirrers).

Carbon Impact

Banning plastic drink stirrers will reduce carbon emissions. These are picked up in the monetised sections on disposal emissions. Table 5 provides an estimate of the net CO₂ equivalent change in greenhouse gas emissions, globally and to England, and whether the emissions count as traded or non-traded emissions.

Table 5 - Carbon emission savings over 10 years (CO₂e tonnes)	Global Emissions	Emissions in England	Traded	Non-traded
Production emission savings	106.98	0	Y	
Incineration emissions savings	120.17	120.17		Y
Landfill emission savings	- 56.90	- 56.90		Y
Fuel emissions savings	- 3.29	- 3.29		Y
Total saving:	166.95	59.97	106.98	59.97

Emissions from production count as traded emissions (covered under the European Emissions Trading Scheme), whereas emissions released in disposal (incineration and landfill) count as non-traded emissions⁸².

Savings from production emissions are counted as zero in England as we have assumed that drink stirrers are imported. Globally, wooden drink stirrers will add emissions compared to plastic through being heavier and through emitting more emissions when placed in landfill. However there is a net saving due to wood being significantly cleaner to produce than plastic, and through having an emission reduction impact through energy conversion when it is incinerated.

⁸² For guidance on this, see Green Book Supplementary [Guidance from BEIS](#).

Annex 1

Annex 1 shows the scenario analysis described in the counterfactual section. The table shows the percentage of the market share forecast to still be plastic over the next 10 years. The counterfactual described in the 'no ban central' scenario has been used to calculate the net present values in Table A1.

Table A1 Year	Ban			No Ban		
	Low	Central	High	Low	Central	High
2018	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
2019	45.0%	40.0%	35.0%	45.0%	40.0%	35.0%
2020*	33.3%	20.0%	16.7%	40.0%	30.0%	20.0%
2021	0.0%	0.0%	0.0%	35.0%	20.0%	5.0%
2022	0.0%	0.0%	0.0%	30.0%	10.0%	2.5%
2023	0.0%	0.0%	0.0%	25.0%	5.0%	2.5%
2024	0.0%	0.0%	0.0%	20.0%	5.0%	2.5%
2025	0.0%	0.0%	0.0%	15.0%	5.0%	2.5%
2026	0.0%	0.0%	0.0%	10.0%	5.0%	2.5%
2027	0.0%	0.0%	0.0%	10.0%	5.0%	2.5%
2028	0.0%	0.0%	0.0%	10.0%	5.0%	2.5%
2029	0.0%	0.0%	0.0%	10.0%	5.0%	2.5%

*With the ban coming into force in October 2020, there will still be a proportion of plastic drinks stirrers used until this point.

Annex 2

Table A2: UK only GHG emissions for polystyrene and wood, in kg CO2e per tonne of material⁸³

Waste Streams	Production Emissions* (kg CO2 eq per tonne material)	Energy Recovery (combustion) (kg CO2 eq per tonne material)	Landfill (kg CO2 eq per tonne material)
Plastics: PS	2,306	642	5
Wood	233	-514	819

*This analysis assumes all drinks stirrers are imported, therefore the production emissions savings from producing plastic instead of paper is 0, as GHG savings don't accrue to the UK.

⁸³ WRAP data