

Plastic Packaging Tax - chemical recycling and adoption of a mass balance approach

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Wildlife and Countryside Link (Link) is the largest environment and wildlife coalition in England, bringing together 80 organisations to use their strong joint voice for the protection of nature. Our members campaign to conserve, enhance and access our landscapes, animals, plants, habitats, rivers and seas. Together we have the support of over eight million people in the UK and directly protect over 750,000 hectares of land and 800 miles of coastline. This response is supported by the following Link members:

- Environmental Investigation Agency (EIA)
- Marine Conservation Society
- Whale and Dolphin Conservation
- WWF-UK

Introduction

We have approached this consultation through the lens of a simple question: should chemical recycling receive new tax exemptions from the UK Government and if so under what conditions? Our response explains how this emerging technology can theoretically play a limited role in a circular economy for plastics but only if it is able to achieve an adequate framework of conditions. With current industry estimates that non-mechanical recycling is set for a 60-fold increase in the UK by 2030 compared to current levels,¹ it is vital that the full potential environmental impacts of increased chemical recycling and the associated consequences on resource use are considered before locking ourselves into a less-environmentally sound approach to enabling a circular economy for all plastics. In addition to prioritising measures that result in the reduction of plastic consumption, every effort should be made to ensure whatever is placed on the market is safe, easily recycled and consumers are not misled by claims made by businesses.

As such, given the current best available evidence and strong arguments against its adoption, we strongly encourage for mass balance not to be taken up, however if it is to be used at all the mass balance method should be applied with strict criteria to minimise the potential for abuse.

Significant concerns with regards to chemical recycling

It is first crucial to acknowledge the significant concerns with regards to policy measures that will enable the expansion of chemical recycling. This includes:

¹ <https://www.bpf.co.uk/press/chemical-recycling-position-statement.aspx>

- **Less environmentally-sound than mechanical recycling** - Chemical recycling processes such as pyrolysis and gasification for plastics are associated with significant adverse environmental impacts, especially due to high mass losses, high energy requirements and the output of hazardous substances. Pyrolysis requires large amounts of energy to operate, with research finding that recycling a kilogram of high-density polyethylene plastic using pyrolysis requires nearly seven times the amount of energy needed to make a kilogram of virgin plastic.² In comparison, a recent study shows that electricity consumption and waste usage of mechanical recycling results in a 17% share of global warming potential, whilst coke oven and gasification have a global warming potential of 51% and 32% respectively.³
- **Generally requires homogenous feedstock** - Despite being advertised as a technology that can handle all types of plastic waste, especially hard-to-recycle plastics that are currently not recyclable, studies show that this technology requires a certain level of homogeneity and decontamination in terms of feedstock and excludes certain substances which are not handled by this technology. In addition, the feedstock's quality significantly affects the quality of output this technology yields. And although proponents of these technologies maintain that they will not compete directly for feedstock currently suited to mechanical recycling, there is a risk that future capacity may result in competition further down the line. For example, a 2022 study published by the Alliance to End Plastic Waste established that pyrolysis recyclers require well-sorted, clean, and largely homogeneous feedstock, free of contents or free-flowing liquids and rinsed. Feedstock requirements for pyrolysis are the following - minimum threshold of about 85% polyolefins (PO), polyethylene (PE) and polypropylene (PP) -, with a maximum moisture content of 7% and an overall total contamination of 15%. Regarding contaminants more specifically, the following requirements must be respected otherwise the technology cannot run - PVC/PVDC: 1%, PET/EVOH/Nylon: 5%, PS: 7%, Rigid metal/glass/dirt/fines: 7%, and Paper/organics: 10%.⁴
- **Lack of transparency** - There is currently little to no data on chemical recycling's ability to ensure decontamination thresholds. By way of example, the chemical recycling industry has yet to evidence that it can achieve decontamination threshold/requirements as defined in the EU legislative framework, e.g. POP Regulation thresholds or the Regulation 2022/1616 on recycled plastic for food contact application. In addition, despite claims frequently made by the industry, most data concerning decontamination procedures has not been made public, and therefore cannot be properly assessed, as outlined by the European Chemical Agency. This is evidenced further in the EU JRC's 2023 report on the environmental and economic assessment of plastic waste recycling, whereby operational and economic data on chemical recycling was not shared by the industry for input. In one of their latest publications regarding the issue of waste, ECHA underlines the discrepancy between recovery substances and safety aspects - one in four substances recovered from waste was non-compliant with the REACH Regulation.

² <https://www.theguardian.com/us-news/2023/apr/10/exxon-advanced-recycling-plastic-environment>

³ <https://www.mdpi.com/1996-1073/16/5/2199>

⁴ Alliance to End Plastic Waste, Feedstock Quality Guidelines for Pyrolysis of Plastic Waste, 2022

As evidenced by current developments in the EU, it is therefore necessary to take a precautionary approach in any measures providing tax exemptions for this technology. This lack of transparency was also found to be very concerning by the Chem Trust and Eunomia in their Chemical Recycling: State of Play report.⁵

- **Diverts focus away from upstream measures** - Given the current available evidence regarding expected environmental and human health impacts from chemical recycling technologies, the utmost caution must be afforded when considering their inclusion only on the basis of their “potential” to increase recycling rates and recycled content of plastic packaging in the UK. Attention must also be paid to the objective that increasing the supposed quantity and polymers of plastics recycled does not compromise other important factors such as the quality and composition of materials that could play a key role in the UK’s circular economy commitments. Thus, priority should not be afforded to facilitating the production of secondary raw material/recyclate ‘at any price’ but rather the placement of safeguards and incentives so that industry will make efforts to shift towards plastic polymers and product designs for which effective recycling processes have been proven, while eliminating hard-to-recycle polymers in tandem.

Waste hierarchy

We cannot recycle our way out of the current waste crisis. The situation requires a reduction-led strategy to phase out all non-essential, single-use packaging and an enabling environment to support the transition to a refillable, reusable society. We believe the Government must do much more to prioritise waste prevention measures, thereby driving down overall waste generation and harm reduction if it wishes to achieve a genuine circular economy, aligned to the waste hierarchy.

Although an efficient and environmentally sound recycling system is one of the key enabling factors in the shift towards a circular economy, recycling should only be leveraged after avoiding material use in the first place and developing reuse models. Furthermore, every possible step must be taken to ensure that packaging materials and formats are easily recyclable and that the recycling process itself is conducted in the most environmentally-sound manner possible. We note that the consultation states that “The plastics waste hierarchy, endorsed by Defra, confirms that recycling can be either a mechanical or chemical process.” This position has been informed by WRAP’s 2022 report on “The Plastic Waste Hierarchy”⁶, however the report states further that *“it should be noted that the environmental impacts of each management option can vary. Typically, LCAs reviewed in this report identified that mechanical recycling was preferable to energy recovery and disposal for most environmental impact indicators.”* This additional note omits mentioning chemical recycling. However, a report by the European Commission’s Joint Research Centre recommends that *“Future studies should focus on collecting more detailed information on the specific quality of the feedstock used for chemical recycling.... in order to better assess to what extent these technologies can complement mechanical recycling by*

⁵ <https://chemtrust.org/wp-content/uploads/Chemical-Recycling-Eunomia.pdf>

⁶ [WRAP. 2022. The Plastics Waste Hierarchy](#)

handling challenging plastic waste streams.”, further underlining the lack of data to enable a full assessment of the impacts of chemical recycling technologies.⁷

Furthermore, chemical recycling has not played a central role in waste and resources policy developed by Defra, with the recent Waste Prevention Programme containing no references to chemical recycling and the 2018 Waste and Resources Strategy for England defining chemical recycling as a treatment that “recovers the base chemical constituents of which [waste plastic] is made” .⁸ We acknowledge it is challenging yet vital for policymaking to keep up with fast-emerging technologies which could be of benefit for specific issues. However, enabling relatively under-developed downstream solutions to be considered favourably within key policy decisions must not distract from developing policies to incentivise a change in upstream behaviours. This concern is highlighted in WWF’s chemical recycling principles paper,⁹ which notes that these technologies may “divert attention away from upstream solutions, and create an incentive to keep generating plastic waste, by building new supply chains that are dependent on this waste for inputs” .¹⁰

We would strongly caution against placing mechanical and chemical recycling as equal on the waste hierarchy. There has been a lack of transparency from organisations entering this space regarding impacts of their processes and the outputs yielded. However, thus far, what is clear is that:

- In principle, the pyrolysis technology does not convert any plastic into new plastic products, nor into new materials; instead, pyrolysis is recovering feedstock substances, used to manufacture plastic materials and articles. This is the reason why such technology is not covered by recycling legislation such as EU Regulation 2022/1616.
- Chemical recycling converts waste into carbon molecules, of which a large amount is used for fuel production. This goes directly against agreed definitions of what constitutes recycling. This could underpin a case for certain chemical recycling technologies to be categorised as “chemical recovery” processes where the majority of the output is not suitable for further processing as virgin-quality plastics.
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⁷ Garcia-Gutierrez, P., Amadei, A.M., Klenert, D., Nessi, S., Tonini, D., Tosches, D., Ardente, F. and Saveyn, H., Environmental and economic assessment of plastic waste recycling A comparison of mechanical, physical, chemical recycling and energy recovery of plastic waste, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/0472, JRC132067.

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<https://www.gov.uk/government/publications/waste-prevention-programme-for-england-maximising-resources-minimising-waste/the-waste-prevention-programme-for-england-maximising-resources-minimising-waste> and

<https://assets.publishing.service.gov.uk/media/5c18f11740f0b60bbee0d827/resources-waste-strategy-dec-2018.pdf>

⁹ [WWF Position: Chemical Recycling Implementation Principles | Publications | WWF \(worldwildlife.org\)](#)

¹⁰ [Limited evidence that chemical recycling can help tackle the issue of plastic waste, says WWF | Article | Packaging Europe](#)

- In addition, the overall carbon efficiency of these processes is low given that over half of the carbon is lost throughout (53%)¹¹. The aim of recycling is to ensure the highest amount of material is kept within a closed loop and therefore requires a certain conversion efficiency threshold. Several organisations are calling for a carbon efficiency threshold of at least 80% of the carbon content of plastic waste in new products when discounting all pre-treatment and post-treatment processes until polymerisation.

Government policy context

This forms part of a wider picture of the Government approaching the waste hierarchy the wrong way round, always focussed on waste policy and rarely at the top of the hierarchy with prevention.¹² This is at odds with how the hierarchy should operate, as laid out in [UK legislation](#), [2011 Defra guidance](#), the 2018 [resources and waste strategy](#) and also the recent [waste prevention plan](#), which explains (correctly): “The waste hierarchy ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for reuse, then recycling, then recovery ... and last of all disposal.”

Generally, the UK has failed to show ambition in tackling many of the waste streams for which chemical recycling is now offered as a solution. More conventional solutions, delivered in the right manner, could achieve similar goals without the negative environmental consequences. For example, given that much of the feedstock for chemical recycling will be “hard-to-recycle” packaging waste,¹³ there is a risk that fiscal action to support chemical recycling will draw attention and finance away from measures to tackle packaging waste at source, such as reuse/refill systems.

Further, the consultation specifically outlines “thin films” as ideal for chemical recycling as they are “often contaminated as well as being difficult to mechanically recycle.” However, if the Government enacted its Simpler Recycling (formerly known as ‘Consistent Collection’) reforms to schedule, there would be a much higher quality waste stream of films. The Government consultation in 2021 proposed that local authorities should adopt the collection of plastic films from all households, including flats, no later than 2026/27, however the Government has yet to publish its response to the consultation. Indeed, in the absence of kerbside collections for these materials, retailers have introduced specific take back schemes to collect films (beyond carrier bags), collecting volumes beyond their expectations. This demonstrates consumer appetite to return these packaging formats for recycling.¹⁴

¹¹

<https://packagingeurope.com/news/greenhouse-gas-emissions-are-9-lower-in-mechanical-than-chemical-recycling-says-oeko-institut/8821.article>

¹² See

<https://greenallianceblog.org.uk/2023/09/13/does-defra-know-how-the-waste-hierarchy-works-evidence-suggests-not/>

¹³ <https://www.bpf.co.uk/press/chemical-recycling-position-statement.aspx>

¹⁴ <https://www.letsrecycle.com/news/tesco-expands-soft-plastic-collection-scheme/>

Because of a lack of investment in UK facilities, little soft plastic waste is recycled in the UK. For example, it was recently found that none of Sainsbury's flexible plastic waste was recycled in the UK, and Tesco also exported a substantial amount of what was collected in store - both hiring a company with a history of mismanagement.¹⁵ There are substantial concerns with regards to the greenwashing taking place in industry's current attempt to recycle soft plastic packaging, much of which is non-essential, and could be phased-out or transitioned to reuse/refill packaging formats.¹⁶ Most recently, KitKat has relaunched its two-finger product with claims on front of pack stating "*Now made with recycled plastic and recyclable*", based on the ISCC mass balance approach.¹⁷ This is ahead of the curve given that this consultation to seek views on whether the mass balance approach should be adopted has not even concluded.

Additionally, the outcome of this consultation could have implications for the current proposals on Extended Producer Responsibility for Packaging (pEPR).¹⁸ Defra has circulated to stakeholders its proposed list of materials for which modulated fees would be upweighted and this includes "some plastic films e.g. multi-material". This wording implies that mono-material films would not face higher modulated fees despite the delayed introduction of kerbside collections for these materials/formats in 2026/27. Furthermore, careful consideration must be given to whether chemical recycling will be considered in scope when determining pEPR modulated fees.

There is a specific risk in relation to plastic waste exports (which cause environmental and human health harm). More generally, the Government should consult on phasing out plastic waste exports, but given that they are still permitted under the current PRN and proposed pEPR policies, safeguards need to be put in place to ensure claims that materials have been chemically recycled by the receiving country are evidenced. Waste having undergone chemical recycling treatment outside of the UK should only count as recycled content in packaging placed on the UK market if the receiving party can provide evidence to demonstrate it has met the same strict requirements including an 80% carbon efficiency threshold, decontamination thresholds aligned with food contact material obligations and that material output is intended for use in new plastic products vs. going towards other uses e.g. fuel.

Conditions for chemical recycling within the UK

Given these wider policy concerns, not least the continued emphasis on end-of-life approaches versus addressing waste prevention upstream as the priority, we believe that the Government should set strict criteria for chemical recycling to play a meaningful role in a circular economy for plastics. These should include:

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<https://eandt.theiet.org/content/articles/2022/04/none-of-sainsbury-s-flexible-plastic-recycled-in-the-uk/>

¹⁶

<https://eia-international.org/wp-content/uploads/2022-EIA-The-Great-UK-Soft-Plastics-Scandal-Full-Brief.pdf>

¹⁷ [Recycled Packaging | KitKat®](#)

¹⁸ [EPR Consultation Government response template \(publishing.service.gov.uk\)](#)

- Eligibility criteria for plastic waste used for chemical recycling to **avoid competition with mechanical recycling feedstock** for chemical recycling. No mechanically recyclable waste input (such as PET beverage bottles) should be permitted as feedstock for chemical recycling processes. Should these materials be used in these processes, they should not be eligible for ‘recycled content’ claims. Because of the cost and complexity of sorting and separating and the capacity coming online, the concern is that chemical recyclers may eventually target mechanical recycling feedstocks. Due to the technical and environmental limitations of chemical recycling technologies, we recommend strict eligibility criteria so that plastics waste streams fit for mechanical recycling are not diverted to chemical recycling processes.
- Government should implement regulation to ensure that **mechanical recycling generally remains the default recycling option**, given its environmental advantages including for CO2 reduction.
- If chemical recycling is considered as a valid source for recycled content, it is essential that the only chain of custody model permissible for calculating recycled content being produced by these technologies be **proportional allocation at batch-level**, essentially rejecting the concept of credit-transfers, since this is the only approach capable of ensuring a proven chemical and physical route between the input feedstock and the final product. Allowing any less robust, less transparent, non-proportional mass balance chain of custody models will provide an unfair advantage for pyrolysis and gasification versus technologies meeting criteria to apply segregation and controlled-blending models. Indeed, permitting such approaches would also enable companies to freely allocate recycled content to higher-priced materials/products, allowing for the possibility of additional income generation that is not available for those companies (e.g., mechanical recyclers) that are credibly supporting claims using transparent, robust and traceable methodologies, such as segregation and controlled-blending.

Consumer confidence

While mass balance could be used for industry/Government reporting, it is also relevant for the claims made at product level to consumers, as it is highly likely that industry will argue that whichever chain of custody model is used can then support product-level claims to consumers.

The decisions made on mass balance will either ensure that product-level claims are trustworthy and supported by robust and transparent corporate practices or risk undermining consumers’ trust in green claims. For consumers, it would be a better reflection of reality for product level claims to note that the packaging contains “feedstock recovered from chemical processes” rather than simply “recycled content”. While the KitKat example provided above attempts to do this by signposting consumers to read about the ISCC mass balance approach, it is unlikely consumers will engage with this level of technical detail and will accept the “recycled plastic” claim on front of pack.

Consumers should be able to rely on environmental claims made on products. Indeed, this is why the CMA released guidance to tackle the growing problem of misleading environmental claims or “greenwashing”. Given that regulators are already concerned about consumer confusion over terminology, it is clearly a risk that firms could begin to display recycled content on individual products that does not accurately reflect the proportion of recycled content in the plastic used to make that specific product. For this reason, any product-level claims to consumers made using mass balance approaches other than proportional allocation with a batch-level assessment, segregation and controlled-blending should not be permitted.

Concerns about support for fossil fuel industry

Government support for chemical recycling will subsidise petrochemical industries which maintain the status quo of high greenhouse gas pollution. Early research suggests that creating plastic-based oil is worse for the climate than extracting crude oil from the ground.¹⁹

We note the risk of these processes being adopted in the UK, for example with the Virgin Group working in partnership to develop waste-to-fuel production facilities, starting in the US, with the intention for the program to roll out in the UK and other countries.²⁰ This will use a pyrolysis process to break down mixed plastic waste and convert it to synthetic crude oil which will be further refined for use as a fuel.

While there may be potential CO₂ benefits of chemical recycling for fuel compared to some incineration processes, we would again note that the greatest benefits come from reduction and that the CO₂ benefits are less clear with regards to landfill.

Product design and improved mechanical recycling

Greater action is needed to reduce the amount of waste being created in the first instance. Product design will be crucial and policy must incentivise design for reduction and reusability, as well as sustainable sourcing (with different standards depending on the packaging material). As EPR for packaging evolves, the Government should consider how these (often offshored) wider environmental and social costs could be internalised into the scheme through modulation.

Further, we require much greater investment in reuse/refill and deposit return schemes in the UK. Following that, increased recycling infrastructure that is most environmentally-sound. Technology innovations, such as Greyparrot’s AI sorting solution which claims to enable effective sorting of nine flexible plastic formats,²¹ can unlock greater potential for

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<https://www.google.com/url?q=https://e360.yale.edu/features/advanced-plastics-recycling-pyrolysis&sa=D&source=docs&ust=1695136414389967&usg=AOvVaw3PwNfOrcNjX7DXwEzA5oTX>

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<https://www.virgin.com/about-virgin/latest/virgin-group-and-agilyx-to-form-strategic-partnership-to-produce-lower>

²¹ <https://www.greyparrot.ai/>

mechanically recycling flexible films within existing waste management infrastructure, hence reducing the need for costly investment into novel chemical recycling technologies which are not yet proven to be beneficial overall. However, the fundamental flaw underpinning this situation is the unabated use of these complex materials for packaging, the failure to recover and reprocess these materials domestically given they are not collected at kerbside, the reliance on voluntary industry take-back schemes where there are no obligations to be transparent about volumes collected nor the fate of the materials, and the continued reliance on exports. Tackling these waste streams through adopting upstream circular economy principles such as reuse and investment in improving mechanical recycling should be given priority for Government financial support.

Conclusion

In summary, the proposal to provide new tax exemptions for chemical recycling goes against the waste hierarchy and should be assessed more holistically within the context of wider policy failures. Furthermore, there is a risk of disrupting existing recycling markets and undermining consumer confidence in recycled content claims, as well as the risk that giving the green light to chemical recycling may be interpreted as the Government propping up polluting petrochemical firms. Most significantly, it could divert vital funding from waste prevention measures, such as scaling up reuse and refill business models, and maintain the status quo of a resource inefficient economy saturated with badly designed plastic products dependent on chemical recycling at end-of-pipe.