Rethink Plastic feedback on new rules for chemically-recycled content in plastic bottles

Input to the public consultation on the draft Implementing Decision laying down rules for recycled content in single-use plastic beverage bottles, including chemically-recycled content

About Rethink Plastic

The Rethink Plastic Alliance is a coalition of leading European NGOs advocating for ambitious EU policies to tackle the growing crisis of plastic pollution. It brings together the Center for International Environmental Law (CIEL), ClientEarth, the Environmental Investigation Agency (EIA), the European Environment Bureau (EEB), the European Environmental Citizen's Organisation for Standardisation (ECOS), Greenpeace, Seas At Risk, Surfrider Foundation Europe, and Zero Waste Europe. Together, these organisations represent thousands of active groups, supporters and citizens in every EU member State working towards a future free from plastic pollution.

Proportionality of the proposal

The proposed Implementing Decision does not comply with the principle of proportionality[1] and exceeds the scope of the implementing power granted by the Single Use Plastics Directive (SUPD or the Directive)[2].

First, the draft Implementing Decision does not effectively achieve the SUPD's goals as it fails to serve the Directive's principal objectives of protecting the environment and supporting circularity. Indeed, Recital 13 states that *"[..] the objective of the targets is to promote the market uptake of recycled plastic, with the aim to ensure the circular use of plastics [..]"*. However, the draft methodology allows for recycled content claims to be made **without guaranteeing that the material returns to plastic production**, which is clearly inconsistent with the draft Implementing Decision's objective.

In addition, the draft Implementing Decision goes beyond the legal mandate given by the Directive as it introduces new eligibility categories like "*dual-use output*", modifying the content of the act rather than simply implementing it. This extension therefore goes against Article 291 (2) of the Treaty on the Functioning of the European Union, which states that an implementing act cannot modify the essential elements of a basic act. The reference under Recital 6 to "*facilitat*[ing] *the Union chemicals industry's transition to circularity by encouraging the use of alternative feedstocks and reducing dependencies on virgin fossil resources"* appears to be outside of the primary scope of the SUPD.

Furthermore, the proposed methodology to apply mass balance defined under Article 7 is technically complex, lacks transparency, and creates an enforcement burden for Member States at a time when the Commission aims to reduce administrative burden.

---

[1] Treaty of the European Union, Article 5 (4): "*Under the principle of proportionality, the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties*."

[2] Single Use Plastics Directive, Recital 33.

Recycled content should only come from post-consumer waste

The SUPD was developed and introduced to prevent and reduce the impact of certain plastic products on the environment, and to promote a transition to a circular economy. Ensuring a proper waste management system, which contributes to a more efficient use of resources, is an essential enabling condition to prevent litter in the environment. Introducing mandatory recycled content targets for bottles was used as a tool for the uptake of secondary material.

To reach these goals, **the SUPD recycled content targets shall be limited to post-consumer waste as input, in line with the principle of effectiveness**. As established by the CJEU in Commission v France, "*where a provision of Community law is open to several interpretations, preference must be given to that interpretation which ensures that the provision retains its effectiveness*".[3] In particular, when it comes to identifying "*whether a substance is in fact "waste" within the meaning of the directive must be determined in the light of all the circumstances, account being taken of the aim of the directive and the need to ensure that its effectiveness is not undermined*".[4]

The draft Implementing Decision on recycled content indeed underlines the need to tackle post-consumer waste, as stated in Recital 16: *"Recycled plastic should only include material that has been post-consumer plastic waste before entering recycling as there are already sufficient market incentives for the recycling of pre-consumer plastic waste."* This is confirmed in the definition of *"eligible material"* which is described as *"post-consumer plastic waste and material stemming from post-consumer plastic waste"* (Article 1 (7)).

However, the proposal also considers other sources as eligible input. Recital 8 introduces the **possibility of using a mixture of pre-and-post-consumer plastics waste as input for recycled content:** *"Recycled plastic that is obtained by any other recycling technology, including chemical recycling during which the chemical structure of the material is changed, or that is produced from a mixture of pre- and post-consumer plastic waste, should be taken into account in the calculation, verification and reporting of data on recycled plastic content in beverage bottles to be carried out under this Decision"*. Article 6 confirms the possibility for materials other than post-consumer waste to be considered as eligible materials, including using pre-consumer waste, a mixture of pre- and post-consumer waste, or even a combination with primary raw materials, as outlined in Recital 8. **These provisions introduce a loophole in the definition of recycled content that contravenes the principle of effectiveness established by the CJEU.**

Recommendation:

- Exclude pre-consumer waste, even when mixed with post-consumer waste and primary raw material, to meet recycled content targets.

[3] CJEU, Case C-434/97, Commission v France, para. 21.
[4] CJEU, C-194/05, Commission v Italy, para. 41.

Compliance with the definition of recycling

The concept of "*dual-use outputs*" is defined in Article 1 (14) as *"outputs other than losses that can be reprocessed either into fuels or materials other than fuels"*.

Such a concept is not in line with the definition of recycling laid down in Article 3 (17) of the EU Waste Framework Directive (WFD), which is described as *"any recovery operation by which waste materials **are** **reprocessed** into products, materials or substances, whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations."* The definition of "*output category*" should thus refer only to outputs that "***are*** *reprocessed*", not those that "*will be reprocessed*". Accordingly, the outputs shall **actually be reprocessed into materials**, not held for potential future reprocessing.

Hence, **the concept of "*dual-use outputs*" should be removed**. For the same reason, the proposed definition of *"output category*" shall apply to outputs that **are reprocessed** into materials, not outputs that will be reprocessed in the future.

Accordingly, the definition of "*recycling pathway*", defined in Article 1 (19) as *"a process which preserves the potential of eligible material being processed into a non-fuel"*, does not ensure that the input will be effectively processed into recycled materials and support "*the circular use of plastics*", which is one of the targets' stated objectives (Recital 13). This concept can therefore similarly be considered **in breach of the EU WFD** and should also be removed.

Throughout the draft Implementing Decision, several mentions of chemical recycling are made without defining it. While Regulation 2022/1616 on recycled plastics for food-contact application can be used to define recycled content, as outlined in Recital 17,[5] it does not cover all technologies considered in the draft Implementing Decision. Indeed, technologies like pyrolysis are outside of the scope of the Food Contact Materials Regulation, reflecting our position of not considering it as a recycling technology, but rather as a recovery one.[6]

Recommendations:

- Remove the concept of "*dual-use outputs*" and "*recycling pathway*".
- Delete the use of the future tense in the definition of "*fuels*" and "*non-fuels*".

[5] "[...] To keep administrative burden on economic operators minimal, that information should also be used for the calculation of recycled content in beverage bottles, even if the definitions of 'plastic' and 'recycled plastic' that are applicable for Regulation 2022/1616 slightly differ to those that are applicable for this Decision."

[6] DUH, ECOS, ZWE, Chemical Recycling and Recovery, Recommendation to Categorise Thermal Decomposition of Plastic Waste to Molecular Level Feedstock as Chemical Recovery, 2021.

Allocation rules and chains of custody

Other chains of custody should be considered

The draft Implementing Decision aims to define a methodology to determine recycled content in single-use plastic beverage bottles. Transparency and traceability should be the backbone of the proposal to ensure safety, traceability for circularity in the plastic sector, but also to avoid risks of greenwashing practices. Therefore, **segregation and controlled-blending models should always be prioritised when feasible**. Indeed, these two models of chain of custody (CoC) allow for higher traceability.[7]

Regarding the application of mass balance as a chain of custody, it is important to recall that many different approaches exist. We believe **proportional allocation based on a batch-level assessment is the only mass balance model that ensures physical and chemical traceability** along the value chain, thus allowing for reliable and transparent environmental reporting and claims. This methodology requires that, when mixing occurs at the production line, an assessment of the batch is done as per Regulation (EU) 2022/1616, and the recycled content input is allocated proportionally to the process outputs for each batch at the end of the recycling process. This allocation rule is the only approach that ensures a level playing field between different recycling technologies, preventing the undermining of the European recycling landscape. Indeed, the dilution factor applied by this rule is the same for all technologies, allowing for a proper comparison between technologies based on their capacity to keep plastic materials in the loop.

We would also like to recall that, despite claims frequently made by the industry, most of the data concerning decontamination procedures has not been made public and therefore cannot be properly assessed.[8] A report from the European Chemical Agency underlines the discrepancy between recovery substances and safety aspects, as one in four substances recovered from waste was non-compliant with the REACH Regulation.[9] From a safety point of view and to be consistent with EU law, it is key that the traceability of recycled materials is ensured at the highest level possible, also through the use of mass balance.

Recommendation:

- Prioritise segregation and controlled blending models for accounting recycled plastic content. If another model is used, only allow proportional allocation of recycled content to the outputs.

[7] Eunomia, A Comparative Assessment of Standards and Certification Schemes for Verifying Recycled Content in Plastic Products, 2021

[8] ECHA, Chemical Recycling of Polymeric Materials from Waste in the Circular Economy, 2021

[9] ECHA, Forum Report on the pilot project on recovered substances exempted from REACH registration, 2022

Mass balance chain of custody: Setting the record straight

As regards the terminology, a "*mass balance model"* is about monitoring and controlling specified characteristics when mixed with materials or products without that set of characteristics as they move through each step in the relevant supply chain.[10] "*Mass balance*" is therefore not about how the characteristics are attributed throughout the supply chain, which is how the proposal defines it in Article 1 (11).[11] Furthermore, "*mass*" implies a weight basis, which is not the case here and can be misinterpreted. This is why the **term "*mass balance accounting*" should be replaced by "*attribution accounting*".**

The model of attribution rules established in the proposal reflects the so-called "*fuel-use excluded approach*", as described in Recital 20. This allows for substances that are neither reprocessed into plastics products nor into fuels to account as eligible material for recycled content credits. It means that the "*recycling pathway*" taken does not ensure the use of input to participate in plastics recycling, but can be used as input for other chemical production.

Article 7, dealing more specifically with the conditions to apply when using the mass balance models to define recycled content, introduces **safeguards which we welcome.** Indeed, **attribution is limited within each facility,** meaning that there is no possibility to transfer between sites of one company and/or between companies. Such a requirement implies the development of necessary infrastructure to meet collection and recycling targets among the Member States, and respond to the principle of proximity within the waste sector. In addition, the **mass balancing period shall not result in a negative account,** i.e. the amount of recycled content attributed exceeds the amount of input within the system.

Recommendations:

- Replace the term "*mass balance accounting*" with "*attribution accounting*" under the definition laid down in Article 1 (11) and the title of Article 7;
- Support site-based attribution rules and the prohibition of negative credit.

Dual-use output & "maximum acceptable boiling point": Applying the EU's better regulation principle

For mass balance attribution, the Commission proposes to determine the weight of the input eligible material fed into a steam cracker evaporated at the "*maximum acceptable boiling point*", in accordance with a standard test method for boiling range distribution of petroleum fractions by gas chromatography (Article 7 (3)). This method looks very complex and subjective. It is indeed based on analysing peak areas to identify individual hydrocarbon molecules. However, results can

[10] ISO, ISO 22095:2020 - Chain of custody - General terminology and models, 2020

[11] (11) 'mass balance accounting' means a set of calculation rules used to determine the attributed amount throughout a supply chain, where the eligible material is used together with other material as input into the process and the actual amount of eligible material in the individual outputs is unknown

be influenced by different column materials and different temperatures, as well as peak overlaps. This leads to inaccurate estimations of the hydrocarbon mass.

Moreover, pyrolysis oil from plastic waste is very different from virgin naphtha in its hydrocarbon composition. The European standard EN 15199-4:2021 annexe relying on the light fractions of crude oil should thus not be used as a reference to estimate the weight of the input eligible material from pyrolysis oil. Pyrolysis oil quality also varies greatly, limiting the reliability of a small test sample for gas chromatography (about 5g) over many tonnes of oil. All these caveats can induce **inconsistencies and significant deviations in estimating the weight of the hydrocarbons in the process of steam cracking pyrolysis oil, and in turn the components that are further processed to make recycled plastics.**[12]

In addition, the frequency of analysing the composition of "*eligible material*" may differ greatly between plants, as there is no requirement for how frequent the testing should be done. If testing happens once during the three-month mass balancing period as defined in Article 7(6), there is no certainty about the accuracy of the reporting, as each batch of pyrolysis oil varies greatly depending on the composition of the plastics waste processed. A clarification is needed with regard to the frequency of the testing methods.

Furthermore, the methodology developed to assess so-called "*dual-use output*" starts before the "*eligible materials enter a steam cracker*". However, for the methodology to consider losses happening at the different stages, the first calculation point should be when the process itself starts, i.e. with plastic waste. In the case of pyrolysis, it means before waste enters the pyrolysis plant. This extension will enable consideration of treatments that are necessary for pyrolysis oil to meet the steam cracker requirements, such as hydro-treatment and hydrocracking, but also for additional treatments that are necessary to bring "*dual-use output*" back into circulation.

Finally, the calculation points should also discount energy use and losses for the processes after the steam cracking stage, i.e. repolymerisation and plastic pellet shaping. This would ensure the full system boundaries are considered and the processing stages are comparable with mechanical recycling, which include "*sorting, grinding, washing, separating materials, drying, extruding and re-crystallisation*" (Article 1 (20)).

Recommendations:

- Remove the concept of "*dual-use outputs*" and related methodology referring to "*maximum acceptable boiling points*";
- Introduce the first calculation point when the process starts with plastic waste, until the repolymerisation step;
- Add calculation points at each step of the plastic waste processing while discounting related fuel use and energy losses (e.g. from fractional distillation, hydro-treatment, hydro-cracking, steam cracking, repolymerisation and plastic pellet shaping).

[12] Erkmen, B.; Ozdogan, A.; Ezdesir, A.; Celik, G. Can Pyrolysis Oil Be Used as a Feedstock to Close the Gap in the Circular Economy of Polyolefins?, Polymers 2023, 15, 859.

Ensuring robust verification and certification systems

Verifying the application of the "*dual-use outputs*" and "*maximum acceptable boiling point*" will represent significant red tape for auditing companies, especially considering the multiple stages in a petrochemical refinery (i.e. fractional distillation, hydro-treatment, hydro-cracking, steam cracking, etc.). The deviations mentioned above for the gas chromatography analysis of pyrolysis oil will also create uncertainties regarding the audit outcomes. As for imports, it is very questionable that the same verification can be applied to imported beverage bottles and their materials. Last but not least, how can Member States perform their market surveillance duties for checking the application of this complex and subjective method and ensure the accuracy of reporting on recycled plastic content?[13]

Most importantly, the draft Implementing Decision lacks any safeguards to avoid that "*the way in which recycled content is obtained does not cancel out the environmental benefits of using such recycled content in subsequent plastic packaging*", as provided for in the Packaging and Packaging Waste Regulation (PPWR: Recital 45 and Article 7). This is especially true if the mass balance attribution method is used by pyrolysis processes because major gaps have been found in the lifecycle assessment for chemical recycling.[14] **European sustainability criteria on plastic recycling technologies are thus urgently needed before accepting "*chemical recycling technologies*".** This will also help identify the processes that are merely recovering chemicals (such as pyrolysis, considering the high dilution with virgin oil) from those actually helping to recycle plastic waste. Finally, this is **essential for imports of beverage bottles and their materials into the EU for which "*equivalent conditions with regard to emissions and separate collection and sustainability criteria for recycling technologies*"** are needed, as acknowledged in Recital 45 of the PPWR.

Setting a clear framework and ensuring consistency between legislation

Definition of chemical building blocks

The concept of "*chemical building blocks*" is defined under Article 1 (15) as *"chemicals that form the base for polymers, as defined in point 5 of Article 3 of Regulation (EC) No 1907/2006, including monomers and other reactants such as initiators for polymerisation"*. According to this draft Implementing Decision, building blocks are present along the value chain, being *"the inputs, the outputs, or both"* (Article 7 (5) (c)), acting as an intermediate for the production of polymer.

This concept aims to address the chemical processing that potentially results in a polymer at a later stage of production. It should be **replaced with the term "*intermediate*"** as established in Article 3 (15) of Regulation (EC) No 1907/2006 (REACH) : *"a substance that is manufactured for and consumed in or used for chemical processing in order to be transformed into another substance(s)"*. Indeed, this definition from REACH accurately reflects the purpose of an intermediate, which is to be transformed into another substance and consumed in the process.

[13] European Parliament, Market surveillance for effective consumer protection in the EU The role of Market Surveillance Authorities and their cross-border cooperation, 2023
[14] Singla V., Major gaps in chemical recycling life cycle assessments (LCAs), 2025

Using the technically accurate term "*intermediate*", rather than the marketing concept "*chemical building blocks*", would improve scientific precision in describing substances undergoing changes during a chemical process, ensure regulatory alignment with chemical legislation, and clarify the scope and **transitional nature** of the substances within this process.

For the sake of regulatory clarity and scientific accuracy, the concept of "*chemical building block*" should therefore be replaced with "*intermediate*", as defined in REACH. The former encompasses too many chemical processing steps, obscuring the distinct stages of polymer production and neglecting the specific role of monomers. The latter, on the other hand, provides the necessary level of precision and aligns with established chemical legislation.

Recommendations:

- Replace the concept of "*chemical building blocks*" with the concept of "*intermediate*", as defined in REACH;
- Add the definitions of "*polymer*" and "*monomer*" as laid down in Article 3 (5) and (6) of REACH.

"Eligible material" status: A blurry boundary

By defining recycled content coming from plastic waste, the draft Implementing Decision touches on the issue of material transitioning from waste to non-waste. Recital 9 describes this transition as "[d]*epending on the stage within the recycling process, "eligible material" can have the status of waste or non-waste.*" However, it is unclear what this means concretely, especially when the status of non-waste is granted, as there is no definition of recycling process in the draft Implementing Decision. In addition, such a statement is linked to the process of chemical recycling, which is also not defined in the proposal, and does not therefore bring clarity on the shift of material status from waste to non-waste. **It is also outside the scope and goals of this proposal.**

The Joint Research Center is currently working on defining an EU-wide End-of-Waste criteria for plastic waste.[15] However, the scope of the End-of-Waste criteria is limited to "*recycling processes that are able to treat plastic waste without deliberately altering the molecular structure of the polymers*". The current wording of the draft Implementing Decision could pre-empt this other legislative work happening in parallel. Clarification is required to ensure that intermediates are not granted the status of non-waste, given that this would possibly reduce the necessary monitoring around waste management operations.

Recommendation:

- Delete the end of Recital 9 about the waste or non-waste status of "*eligible material*".

[15] PIERRI, E., EGLE, L., MILIOS, L. and SAVEYN, H., EU-wide end-of-waste criteria for plastic waste, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/9234350, JRC139303.

No trust in recycled materials without traceability of harmful chemical contents

The draft Implementing Decision pursues the creation of a market for "*higher quality*" outputs from chemical recycling (Recital 5), implying the absence of harmful substances or traceability of their presence in such outputs. However, neither seems to be the case.

The feedstock for chemical recycling is plastics. There are 16,325 substances associated with plastics, with around 4,200 of these considered harmful.[16] During chemical recycling, harmful substances present in the feedstock may persist through the process, or new harmful substances may form as a result of chemical reactions.[17] Yet, existing chemical recycling technologies are not capable of controlling the presence of hazardous substances or contaminations in its outputs. **Given these uncertainties regarding the presence of harmful chemicals, any output must be considered potentially hazardous to human health or the environment**. **Such outputs, therefore, cannot be deemed to be delivering a "*higher quality*"**. The draft Implementing Decision does not address this issue, however.

Furthermore, the (unintentional) promotion of toxic recycled content is not in line with the objectives of the SUPD as it can have multi-layered negative impacts on human health and the environment. Firstly, there are (eco)toxicological impacts should humans, wildlife or environmental media be exposed to the hazardous content of recycled material. Secondly, the use of material originating from chemical recycling could be restricted to uses where exposure can be excluded (in itself a major limitation) in order to avoid any (eco)toxicological effects, but this would significantly lower the market potential of recycled materials and its chances to compete with virgin material. The question thus arises whether the enormous resources going into chemical recycling would be justified given the relatively low contribution to the objective of reducing negative impacts on human health and the environment.

Moreover, the repercussions extend beyond the scope of the SUPD. Given the uncertainties surrounding the chemical composition of recycled materials, it will be **extremely difficult for downstream users and consumers to trust the quality and safety of these materials.** This lack of confidence would directly undermine the overarching objective of the draft Implementing Decision, namely to "*deliver the full potential of the circular economy*" (Recital 5).[18]

Lastly, relying on the REACH Regulation alone is insufficient to address the concerns outlined. Under Article 68 (1) of REACH, the Commission is required to adopt restrictions when "*there is an*

---

[16] Monclús, L. et al. (2025). "Mapping the chemical complexity of plastics." *Nature*. DOI: 10.1038/s41586-025-09184-8.

[17] Zhou H, Wu C, Onwudili JA, Meng A, Zhang Y, Williams PT. Polycyclic aromatic hydrocarbons (PAH) formation from the pyrolysis of different municipal solid waste fractions. Waste Manag. 2015 Feb;36:136-46. doi: 10.1016/j.wasman.2014.09.014. Epub 2014 Oct 11. PMID: 25312776, Qian, K.; Tian, W.; Li, W.; Wu, S.; Chen, D.; Feng, Y. Catalytic Pyrolysis of Waste Plastics over Industrial Organic Solid-Waste-Derived Activated Carbon: Impacts of Activation Agents. Processes 2022, 10, 2668. https://doi.org/10.3390/pr10122668.

[18] See also Recital 31 of the Ecodesign for Sustainable Products Regulation: "*The chemical composition of products largely determines their functionalities and impacts, as well as the possibility for their reuse or for recovery once they become waste*".

unacceptable risk to human health or the environment, arising from the manufacture, use or placing on the market of substances, which needs to be addressed on a Community-wide basis." However, the significant uncertainties surrounding the chemical composition and toxicity of chemical recycling outputs will make it extremely difficult for authorities to establish whether such a risk exists.

This challenge persists despite the fact that chemical recycling outputs are subject to REACH registration. In practice, it may take decades before the hazardous properties of these substances are fully understood and regulated under REACH. Therefore, the Implementing Decision must address these critical information gaps to enable REACH mechanisms to function effectively and protect human health and the environment.

Recommendations:

- Oblige the industry to create (batch level) full traceability of harmful contents of any process outputs placed on the market;
- Until industry is capable of providing such full traceability, impose a moratorium on the placing on the market of chemical recycling outputs.