

Designing for real recycling, not plastic lock-in

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About 40% of plastic packaging is reported as recycled in the EU.¹ However, this doesn't tell us how much useful recycled plastic is actually produced, and estimates state that the effective recycling rate, i.e. the substitution rate of recycled plastic or the ability to replace the production of virgin equivalent plastics, is closer to 10-15%.² Further, only 5% of the value of plastic packaging material is estimated to be retained in the economy.³ One third of plastic packaging destined for recycling is also shipped outside of EU territory,⁴ where safe and effective recycling cannot be guaranteed. **At the same time, plastic products are increasingly being marketed with misleading claims of being recyclable. In reality, products that claim to be recyclable are not always recycled.**

Due to a lack of a harmonised definition of recyclability, recyclability claims are not necessarily based on real-life conditions such as the availability of recycling infrastructure, market conditions and the financial viability of recycling operations. While waste prevention and reuse efforts must be prioritised, we cannot achieve a circular economy as outlined in the Circular Economy Action Plan without closing this huge gap between recyclability potential, actual collection and sorting, and final recycling.

This also requires a closer look at the processes included in the definition of recycling. **New high-carbon chemical technologies which break plastic down to basic building blocks and fuel- so called chemical 'recycling' or recovery- are secondary to mechanical recycling due to their environmental impact.** The processes are energy-intensive and have so far not proven to be a solution to the plastic waste problem. Due to high costs, lack of adequate feedstock, and challenges related to environmental performance, there are no large-scale industrial chemical 'recycling' plastic-to-plastic plants in operation. As such, **there is a need for safeguards to ensure that design for recycling legislation- followed by standards and claims- refer to mechanical recycling,** and that we continue designing plastics on a pathway to more reusable and recyclable materials, to be processed through sustainable methods.

Allowing for currently unrecyclable plastics to be treated via energy-intensive technologies such as pyrolysis and gasification, instead of being redesigned for mechanical recycling, would mean trapping ourselves into an expensive and high-carbon lock-in situation. This contradicts the EU target of achieving reusable and recyclable packaging by 2030, by maintaining a status quo instead of challenging the market towards producing hazard-free reusable and recyclable plastics with a net positive value as recyclates. **We need a strong push towards a truly circular design that prepares plastics for reuse and recycling according to the most environmentally sound options and avoids carbon-intensive treatments such as pyrolysis and gasification.**

We recommend the following:

- **Establish a clear harmonised definition of recyclability** that consists of a combination of the following three main conditions (see Figure 1 for details):
 - Qualitative definition
 - Quantitative criteria
 - Implementing legislation which specify design-for-recycling criteria
- **Strengthen enforcement of the essential requirements in the revised PPWD Directive** to ensure that ambitious sector or product level standards for recyclability are established, and that a bonus-malus and eco-modulation fee system is complemented with clear restrictions; such as through bans on the use of unrecyclable plastic packaging, including PVC

¹ Eurostat: www.appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

² Material Economics, 2018. Sustainable Packaging: The role of materials substitution, p.4.

³ European Commission: ec.europa.eu/commission/presscorner/detail/fi/MEMO_18_6

⁴ European Court of Auditors, October 2020. Review No 04/2020: EU action to tackle the issue of plastic waste. www.eca.europa.eu/Lists/ECADocuments/RW20_04/RW_Plastic_waste_EN.pdf

and expanded polystyrene, as well as disqualifying criteria for recyclability of plastics (such as the use of carbon black, bio- or oxo-degradable additives, aluminium layers, etc.).⁵

- **Ensure that recyclability is assessed on the basis of best available technology** with respect to a 'waste recycling hierarchy', i.e. priority is given to mechanical recycling with no competition with other technologies for the same plastic waste stream. Introduce such guidelines with reference to establishment of CEN standards. Further:
 - Policy measures and standards for recyclability should include specifications with regard to environmental performance and prepare products for recycling processes which ensure an overall positive environmental and climate performance, from a full life cycle perspective, clearly excluding fuel and energy recovery operations.⁶
 - Policy measures and standards for recyclability should exclude reference to non-commercial recycling processes which are not widely distributed and thus unable to recycle plastic at scale, such as chemical 'recycling'. Such options could potentially be reviewed in the future depending on their achieved level of commercialisation, for example through a review clause in the PPWD revision.
- **Replace the 'green dot' and strengthen recyclability claims towards consumers** by introducing a mandatory, traceable label instead of the 'green dot'. Such a label should be transparent, mandated by the EU, verified by independent parties, and clear in its communication towards consumers. It should give information about where the plastic waste is recyclable, how to separate and dispose of the different components, and if recycling infrastructure is locally available. The certification or labelling should be harmonised across the EU and supported by language in the PPWD and implementing legislation. It should also be reflected in guidelines on unfair commercial practices,⁷ to be followed by certifying bodies, that such a label must be conditioned upon real-life data and availability of separate collection systems and conditions tested on existing and commercial recycling plants.

Conditions to be met for assessing 'recyclability'
In order for a product to be deemed recyclable, an ambitious qualitative definition is needed combined with the fulfilment of a number of key criteria. More specifically:

Qualitative definition reflecting:

- A 'waste recycling hierarchy', i.e. preparing plastics for recycling through the most efficient and environmentally sound options available, producing quality recyclates with high virgin plastic substitution rate, and adapted for existing and widespread recycling technologies;
- The reality of the European recycling and plastic end market, and thus be determined on the basis of recycling processes that are scaled, commercialised and widespread throughout the EU;
- Recyclability in the EU (as all plastic waste exports outside the EU should be banned);
- Recyclability as conditioned by a net beneficial value, from a financial and environmental perspective, in relation to virgin plastic production;
- Exclusion of contaminated (hazardous or non-targeted) material from input to recycling streams.

Quantitative criteria with:

- High minimum thresholds on recyclability (for packaging, at least 95% of the functional unit shall be recyclable, as proposed by Eunomia);
- High thresholds on minimum recycling rate (i.e. 20% until 2025, as proposed by Eunomia, is arguably too low and the basis for such an assessment requires clarification).

Implementing legislation specifying design-for-recycling criteria which:

- Are specific and per product-category;
- Are developed with consideration to existing and widespread recycling technologies;
- Are mandatory;
- Provide the basis for a harmonised standard for labelling and certification of recyclability;
- Include 'disqualification' criteria for recyclability.

Figure 1: Conditions to be met for accessing recyclability

⁵ Examples taken from RecyClass' disqualification criteria

www.recyclclass.eu/wp-content/uploads/2021/04/RecyClass_methodology_UPDATED.pdf

⁶ See for example wording in the EU sustainable chemicals strategy, p.6

ec.europa.eu/environment/pdf/chemicals/2020/10/Strategy.pdf

⁷ Regulated by Directive 2005/29/EC

Are we preparing plastics for recycling?

It has been calculated that design improvements could halve the cost of recycling plastic packaging waste.⁸ In order for plastic products to be recyclable, they need to be designed in line with a certain set of standards and technical requirements. As concerns differ greatly between specific product types and materials, design-for-recycling standards are needed for each product or material group rather than having broad overall principles that cannot be practically applied. Designing for recycling means designing with an end-market in mind and demands an integrated approach where collaboration is key. While design principles often need to be coupled with other parameters such as product safety, shelf life or branding, an important key principle is using fewer types of plastics, as different plastics need to be recycled separately. For packaging, this ideally means moving towards single polymers.

It is clear that the increased complexity of plastic packaging creates a number of challenges for recycling. With increased ambitions in the EU, design-for-recycling principles must be clearly defined and strongly enforced, based on commercial recycling technologies and available infrastructure.

Some common design considerations to take into account when designing plastics for recycling include:

- Separability of components
- Compatibility of materials and material mix
- Choice of materials⁹
- Toxicity of materials and the need to phase out substances of concern
- Form, size and thickness
- Use of additives, fillers and colourants (and their toxicity)
- Product residues (how easy the product is to empty of its content)
- Barriers and coatings
- Design of labelling and sleeves (and adhesives used)
- Use of printing and suitability (non-metallic etc.) or toxicity of inks

Importantly, recyclability must also align with the economics of collection and sorting, financial viability of the recycling operation, availability of end markets for recyclates and ensuring that the full life-cycle environmental impact is significantly less than that of virgin plastic production.

How can we enhance recyclability?

Recyclability can be enhanced by design measures such as for example minimizing printing, using non-toxic ink, avoiding metallic parts and banning multi-layer in certain products. When it comes to additives, there is currently still a wide range of toxic chemicals used as plastic or polymer additives; for example, chemicals that have not yet been controlled (including many endocrine-disrupting chemicals) or hazardous substances such as persistent organic pollutants (POPs) which are allowed under exemptions. The future recycling of products that contain these substances will be impacted, and they should be phased out and substituted with non-toxic alternatives in order to encourage a circular economy.

Figure 2: Enhancing recyclability

⁸ Ellen MacArthur Foundation, The New Plastics Economy: Catalysing action, January 2017.

⁹ Including if the product contains nano-composites, degradable plastics or recycled content etc.

Harmonisation needed on requirements and recyclability claims

What makes recyclability guidelines successful for packaging?

The European Commission, via the Joint Research Centre, recently analysed 24 industry-led design-for-recycling guidelines for packaging which showed that most are polymer-specific and provide a form of checklist with restrictions, requirements or targets for specific product features to increase recyclability. Some also provide a logo or label for compliance. Success factors for such guidelines were considered to be a holistic, transparent, precise and consistent approach developed in cooperation with the whole value chain; striking a balance between an EU-wide harmonised approach and respecting country specificities; and the use of certification or labels for products complying with guidelines.¹⁰

Replacing the green dot

Mandatory, harmonised, European-wide recyclability requirements and subsequent labelling for recyclability are desperately needed. Such a label would replace the green dot, which has proven to be misleading to many consumers. The label should be supported by mandatory requirements for specific products or product-categories, and implemented through a combination of self-declaration and third party verifications to assess recyclability. For packaging this would, among other things, demonstrate to consumers and legislative bodies how the product is intended to comply with the essential requirements of the PPWD and have information on the appropriate waste management option. On the consumer side, there is no EU legislation specifically harmonising environmental marketing. Directive 2005/29/EC on unfair commercial practices regulates such claims to some extent."But it should be clearly specified if the product is reusable, fully mechanically recyclable or not, and whether the claim covers the whole product or only one of its components, while providing clear information on separation of components, disposal and treatment options which are locally available to consumers. Such recyclability requirements are needed for packaging and beyond.

Misleading recyclability claims and logos

Almost two thirds (61%) of consumers state that they find it difficult to understand which products are truly environmentally friendly, with most finding environmental claims unclear. The most commonly identified logo is the Green Dot, found on one in five products across the EU. It is meant to inform consumers that the manufacturer of a product contributes to the cost of packaging recovery and recycling. However, the results of a consumer study by the European Commission indicate that consumers do not know the meaning of this logo and often wrongly assume that the product or its packaging is recyclable. Only 25% of respondents knew the correct meaning.



Source: European Commission, 2014. Consumer market study on environmental claims for non-food products.

Figure 3: Misleading recyclability claims and logos

¹⁰ Joint Research Centre, 2020. Support to the Circular Plastics Alliance in establishing a work plan to develop guidelines and standards on design-for-recycling of plastic products.

www.op.europa.eu/da/publication-detail/-/publication/841c88c5-2a1e-11eb-9d7e-01

¹¹ See guidelines for implementation here: ec.europa.eu/environment/eussd/pdf/green_claims/en.pdf

Existing guidelines leading the way

Several guidelines and tools have already been established which could guide the process or serve as a basis for harmonised EU-wide recyclability requirements and label, such as RecyClass,¹² Sello Reciclabilidad¹³ or the French COTREP guidelines.¹⁴ RecyClass provides different rankings for various levels of compatibility with their design-for-recycling guidelines. For full compatibility with their transparent guidelines for example, the polymeric content should be higher than 90%, the product must be easy to empty, and labels should have water soluble/releasable adhesives at a certain degree, with a size that does not hinder the recognition of the underlying PET-polymer (among other requirements).

Sello Reciclabilidad goes further in ensuring practical recyclability by guaranteeing that currently available and applied recovery and recycling systems are considered in their recyclability certificate and subsequent label. The recyclability of the packaging is practically tested in existing recycling plants in the country most likely to process the waste, and not merely based on lab- or pilot-scale data.

It's interesting to note that none of the two initiatives consider that chemical 'recycling' or recovery technologies can yet be integrated as potential recycling operations for such recyclability claims, due to the lack of commercially available infrastructure.

Avoid designing for chemical 'recycling' and recovery

The EU has set a target that at least 55% of plastic packaging be recycled by 2030. The trade association **PlasticsEurope has announced a planned contribution of 1.2 million tonnes of recycled plastics produced through 'chemical recycling' by 2025**, in order to contribute to the European Commissions' Circular Plastic Alliance target of 10 million tonnes of recycled plastics used in EU products by 2025. **Yet, chemical 'recycling' has proven to be too carbon-intensive and lacks the potential to come near the scale or level of infrastructure needed for such a target.** Due to the nature of the technologies, much of the plastic is also turned to fuel. The majority of EU countries don't even have chemical 'recycling' operations on pilot scale and the countries that do, have not managed to commercialise them. For reference, in Germany in 2015, only 1.7% of packaging waste was chemically recovered (and did not count towards national recycling targets) whereas 39.4% was mechanically recycled.¹⁵ As there is no commercial marketplace or infrastructure for chemical 'recycling', any recyclability claims would be unfounded.

Mechanical recycling is the process most likely to continue to recover important materials in the future and therefore we must ensure plastic products are designed for reuse and are compatible with the needs of the mechanical recycling industry. It should be acknowledged that making collection and sorting (particularly of flexible packaging) economically viable and ensuring adequate infrastructure and material separation is a key challenge for recycling. **Efforts must be directed to overcoming barriers to mechanical recycling, before lowering ambitions and rerouting plastic waste towards less sustainable alternatives.**

Chemical 'recycling' technologies are, in fact, carbon-intensive processes which consume energy, water and chemical resources that increase pollution to water, air and land.¹⁶ As the technologies are not yet commercially mature, the full environmental and climate implications must be understood before determining whether they have a place in a circular economy and to what extent. While there might be potential for certain chemical 'recycling' technologies in the future for niche markets, it is unclear if these amounts would be sufficient to collect the critical masses needed for financially sustainable recycling, without competing for feedstock with mechanical recycling operations.

¹² www.recyclclass.eu

¹³ www.selloreciclabilidad.com/en

¹⁴ www.cotrep.fr/en/steps

¹⁵ Enonomia 2020, Effectiveness of the Essential Requirements for Packaging and Packaging Waste and Proposals for Reinforcement

¹⁶ EEA 2021: www.eea.europa.eu/publications/plastics-the-circular-economy-and

Meanwhile, the chemical 'recycling' industry has long claimed that it could see all types of plastic fed into their processes, regardless of colourants, composites etc. In reality this is not the case, as each technology can only recycle certain types of polymers and is unable to manage various contaminants (such as PVC for pyrolysis). However in theory, this would remove the incentive to design plastic according to design-for-recycling principles and prepare them for mechanical recycling. **Therefore, establishing standards for designing for chemical 'recycling' would threaten efforts to move up the waste hierarchy and result in maintaining the status quo of current plastic design and recycling rates**, as illustrated by the example below.

Black plastics: an obstacle to recyclability

Black plastic is often used for packaging because it enables colours or imperfections to be masked. It also follows the general trend of packaging with more colours to provide striking attributes and offer the potential to give brands differentiation in the marketplace. However, because of the use of carbon black pigments it is then not recycled as optical machines that sort plastics for recycling can't detect the black carbon pigments. The best action would be to phase out such colourings in plastics so that they can be mechanically recycled. Instead, it is sometimes argued that black plastics should be treated with chemical 'recycling' technologies and allowed to count towards recycling targets. This is a clear example of chemical 'recycling' blocking efforts to phase out carbon black which would have allowed that product to be mechanically recycled. Any new technology development that helps detect black carbon in mechanical recycling processes should also be widely available and cost-effective before considering such products recyclable.

Figure 4: Black plastics: an obstacle to recyclability

Fragmented legislative landscape missing the mark

The EU has approached recyclability in a fragmented way, with parallel standards being developed by both official and industry initiatives before the relevant legislation is in place, and essential requirements for designing packaging being considered separately.

For example, plastic packaging is being addressed through the revision of the Packaging and Packaging Waste Directive, while the Commission has committed to make it easier to recycle plastics used in a wide variety of electrical appliances and electronic goods through developing product requirements, including for recyclability, under the Ecodesign Directive.¹⁷ Furthermore, the European Commission has already developed criteria to improve recyclability of plastics in its Ecolabel and Green Public Procurement criteria (e.g. marking large plastic parts to facilitate sorting, designing plastic packaging for recyclability, and designing items for easy disassembly in furniture and computers).

The EU Waste Framework Directive states that Member States should encourage the design of products to ensure that they are recovered and disposed of sustainably and according to the waste hierarchy, in line with the extended producer responsibility.¹⁸ Yet, the solution to the plastic problem has primarily been dealt with downstream from the waste hierarchy. Strong and harmonised

¹⁷ Directive 2009/125/EC; this Directive covers all energy-related products

¹⁸ Such measures may include the obligation to provide publicly available information as to the extent to which the product is reusable and recyclable.

legislation is needed to address recyclability for all materials and products, beyond packaging and essentially beyond plastics, while prioritising substitution for reusable alternatives, wherever possible.

Specific requirements on packaging

The Packaging and Packaging Waste Directive 94/62/CE (last amended by Directive 2018/852) calls for specific standardisation requests and promotes the use of harmonised, refillable and reusable packaging. More specifically, it states in its essential requirements (Annex II) that packaging shall be designed, produced and commercialized in such a way as to permit its reuse or recovery, including recycling, and to minimize its impact on the environment when packaging waste or residues from packaging waste management operations are disposed of.¹⁹ In the PPWD, the Commission is working on a revision of the essential requirements for placing packaging on the market. The objective will be to ensure that, by 2030, all plastics packaging placed on the EU market is reusable or easily recycled, i.e. cost-effectively.

The essential requirements must ensure ambitious sector- or product level standards for recyclability are established, and that a bonus-malus and eco-modulation fee as part of an extended producer responsibility (EPR) system is complemented with clear restrictions; such as through bans on the use of unrecyclable plastic, including PVC and expanded polystyrene, as well as disqualifying criteria for recyclability of plastics (such as the use of carbon black, bio- or oxo-degradable additives, aluminium layers, etc.). For example, the use of carbon black in plastics is primarily aesthetic, with brands aiming to distinguish themselves towards consumers on the market. As optical machines that sort plastics for recycling can't detect the black carbon pigments, such plastics are instead incinerated or landfilled. The same goes for PVC and expanded polystyrene which cannot be widely recycled. Therefore, such alternatives should be banned and packaging should be switched to more easily recycled forms, supported by existing infrastructure throughout Europe.

Conclusion

Today, producers of plastic articles and packaging have few concrete incentives to take into account the needs of recycling or reuse when they design their products. Plastics are becoming increasingly diverse, customised and made from a combination of polymers with a range of additives used to meet not only functional but also merely aesthetic preferences. This complexity is affecting the chances of reaching EU's recycling and circular economy goals, and the quality and value of recycled plastic.

Rather than stepping up efforts in design and recyclability to enhance mechanical recycling, downstream measures are being proposed to treat poorly designed plastics through carbon-intensive chemical recovery processes which have a negative impact on cost, yield and environmental performance of the plastic cycle. While waste prevention and reuse options must be prioritised, improvements in the recyclability of plastic products must be supported with the objective of ensuring that mechanical recycling plants in the EU are provided with enough quality feedstock to at least reach the EU target of 55% of plastic packaging recycled by 2030.

¹⁹ Requirements specific to the manufacturing and composition of packaging

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Zero Waste Europe (ZWE) is the European network of communities, local leaders, experts, and change agents working towards the elimination of waste in our society. We advocate for sustainable systems and the redesign of our relationship with resources, to accelerate a just transition towards zero waste for the benefit of people and planet.



Rethink Plastic, part of the Break Free From Plastic movement, is an alliance of leading European NGOs working towards ambitious EU policies on plastics. It brings together the Center for International Environmental Law (CIEL), ClientEarth, Environmental Investigation Agency (EIA), European Environmental Bureau (EEB), European Environmental Citizen's Organisation for Standardisation (ECOS), Greenpeace, Seas At Risk, Surfrider Foundation Europe, and Zero Waste Europe. Together they represent thousands of active groups, supporters and citizens in every EU Member State working towards a future free from plastic pollution.



ECOS is an environmental NGO with a network of members and experts advocating for environmentally ambitious technical standards, policies, and laws. We ensure the environmental voice is heard at the table where these standards, policies, and laws are developed, challenging policymakers and industry players to implement strong environmental principles.



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