



Support to the Circular Plastics Alliance in establishing a work plan to develop guidelines and standards on design for recycling of plastic products

*Background document for webinar
on 27 May 2020*

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This document has been prepared by the contractors for the study "Support to the Circular Plastics Alliance in establishing a work plan to develop guidelines and standards on design for recycling of plastic products", commissioned by the Joint Research Centre of the European Commission (contract no. 938401-2019 BE).

It summarises the work to date undertaken by the study team, led by the Institute for European Environmental Policy (IEEP) and also comprising Ramboll Environment & Health GmbH, Wood (Amec Foster Wheeler E&I GmbH) and Deloitte Conseil.

It does not represent the views of the Joint Research Centre of the European Commission.

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List of abbreviations and acronyms

ABS	Acrylonitrile Butadiene Styrene
CEFLEX	Collaborative initiative of a European consortium of companies representing the whole flexible packaging value chain
COTREP	Comité Technique pour le Recyclage des Emballages Plastiques (France)
CPA	Circular Plastics Alliance
D4ACE	Design for A Circular Economy Guidelines for flexible packaging (CEFLEX)
DfR	Design for recycling
EEE	Electrical and electronic equipment
EFBW	European Federation of Bottled Water
EPBP	European PET Bottle Platform initiative
EPR	Extended producer responsibility
EPRO	European Association of Plastics Recycling and Recovery Organisations
EPS	Expanded polystyrene
EU	European Union
EuPR	European Plastics Recyclers
EUR	Euro (currency)
EXPRA	Extended Producer Responsibility Alliance
HDPE	High-density polyethylene
JRC	Joint Research Centre, European Commission
LDPE	Low-density polyethylene
PA	Polyamide
PE	Polyethylene
PET	Polyethylene terephthalate
PO	Polyolefin
PP	Polypropylene
PPWD	Packaging and Packaging Waste Directive
PRE	Plastics Recyclers Europe
PS	Polystyrene
PUR	Polyurethane
PVC	Polyvinyl chloride
PVDC	Polyvinylidene dichloride
QR-code	Quick Response-code
RECOUP	Recycling of Used Plastics Limited
rPET	Recycled PET
UNESDA	Union of European Beverages Association
US	United States
WEEE	Waste electrical and electronic equipment

1 Introduction

This document provides a summary of the work undertaken to date within the study "Support to the Circular Plastics Alliance in establishing a work plan to develop guidelines and standards on design for recycling of plastic products", commissioned by the Joint Research Centre of the European Commission.

The aim of the document is to provide useful background information to members of the Circular Plastic Alliance in advance of a webinar to be held on 27 May 2020. The chapters are structured around the main study tasks:

1. Establishing a list of priority plastic products or product groups
2. Mapping existing design-for-recycling guidelines and standards
3. Assessment of the existing design-for-recycling guidelines
4. Recommendations on a work plan for design-for-recycling guidelines

The contents of the document are intended to form a useful starting point for discussions during the webinar. As work is still ongoing on the study, this document should not be taken as the final output or conclusions of the study.

2 Task 1: Establishing a list of priority plastic products or product groups

5 The objective of Task 1 is to establish a **list of priority plastic products or groups** to support the CPA in developing, revising or updating guidelines and standards regarding design-for-recycling. It also aims to evaluate whether the proposed list of priority plastic products/product groups is suitable to ensure that EU recycling plants have the necessary feedstock to at least meet the target of 10 million tonnes of recycled plastics used to produce new products in the EU market, as set out in the Pledging Campaign launched under the
10 Plastics Strategy, Annex III, and endorsed by the CPA. The Task further envisages a selection of additional products/product groups that could be added to the list in order to reach or exceed the target of 10 million tonnes of recycled plastics.

The methodology used for the implementation of this Task is based on the following steps:

- 15 1. Selection of the main polymers and sectors for data gathering
2. Quantitative and qualitative data gathering by polymer and sector
3. First selection of priority products and construction of a dynamic mass flow model including all relevant sectors and polymers identified, and development of an inter-sectoral Sankey diagram
- 20 4. Ongoing adjustment of the mass flow model (e.g. closure of data gaps, inclusion of additional products)

In parallel with the above-mentioned steps, a constant consultation and exchange with the CPA Technical Coordinators and the organizations participating in the CPA has been performed, to collect information, close data gaps and ensure that the experience and knowledge of the CPA and its participating organizations are used to the optimum.

25 **The priority polymers and products/product groups selected** are reported in Table 2-1 below.

Table 2-1: Selection of priority products/product groups

Polymer	Products/product groups
Agriculture sector	
LDPE	Mulching and silage films
HDPE	Nets (bale wraps and protections)
PP	Twines
Packaging sector	
LDPE	Flexible packaging
PET	Bottles, trays
HDPE	Necked bottles (e.g. for milk and detergents)
PP	Food containers, caps and closures
PS	PS packaging (cups, trays, dairy packaging)
EEE sector	
PP	Dishwashers, dryers, food processing appliances, hot water appliances, vacuum cleaners
PS	Fridges
PUR	Cooling appliances
Construction sector	
PVC	Window profiles, roller shutters, doors
HDPE	Pipes
EPS	Insulation
Automotive sector	
PP	Bumpers, body side, dashboards
PUR	Seats padding

Polymer	Products/product groups
PVC	Car interiors, cable covers

2.1 Methodology and results

2.1.1 Selection of the main polymers and sectors for data gathering

30 The **selection of the main polymers** for the focus of quantitative and qualitative information collection was **based on the popularity of use, presence in the environment and availability of data** of the different polymers in the identified sources, such as annual Plastics Europe reports, the database for the classification of the voluntary pledges¹ under the Plastics Strategy and the study by Kawecki et al. "Probabilistic Material Flow Analysis of seven commodity plastics in Europe".

35 In particular, comprehensive research on how plastics are defined as a material in general and more specifically as final products has been performed to **identify the most common types of plastics** to be examined in more detail in a dedicated spreadsheet, which intends to provide a holistic picture of the plastic material and recycling market.

40 **The main polymers identified** in this first step are:

1. HDPE - high-density polyethylene
2. LDPE - low-density polyethylene
3. PET - polyethylene terephthalate
4. PP - polypropylene
- 45 5. PVC - polyvinyl chloride
6. PS - polystyrene
7. EPS - expanded polystyrene

The selection of the sectors was driven by the current structure of the CPA's thematic working groups, to allow for an easier data gathering and information exchange process. Therefore, **the study focuses on the following five sectors:**

1. Agriculture
2. Packaging
3. Building and Construction
4. Electric and Electronic Equipment (EEE)
- 55 5. Automotive

It is important to highlight that the selection of the above-listed five sectors **does not imply the exclusion from the mass flow model of the flows going to and stemming from other sectors**. These flows are taken into consideration and mapped whenever possible, depending on the availability of data, in an aggregated form.

60 2.1.2 Data collection on polymers and sectors

The collection of quantitative and qualitative information on the identified sectors and polymers has been performed by means of desk research and direct consultation with the CPA.

65 The information sources analysed comprise legal documents, databases, reports from significant international organizations, and selected scientific papers.

A spreadsheet has been developed to compile all information gathered from the different sources in an aggregated way on the main polymers identified and, when possible, in detail by sector. The **data gathering has been focused on the topics listed in the Table below**.

¹ <https://circulareconomy.europa.eu/platform/en/commitments/pledges>

70 **Table 2-2: Data gathered for selected polymers and sectors**

General
Alternative name(s) used in literature and by the industry
General remarks
Relevant products/product groups
Relevant sectors
Waste and recycling/recyclability
Waste generation in EU (t/y)
Recyclability
Recycling rate (%)
Market share
Virgin material market share (%)
Recycled material market share (%)
Virgin material consumption (t/y)
Recycled material consumption (t/y)
Plastic converter demand (% , t/y)
Obstacles to recycling/recyclability
Key obstacles to greater recyclability of the products
Key obstacles to higher recycling rates
Substances and contaminants hampering the recycling process
Role of additives in the plastics converting process
Technology and innovation
Type of recycling (closed loop/ open loop)
Available cost-efficient innovations
Measures to increase amount of collected material and/or quality of collected material

The spreadsheet has been used to produce a first draft of plastic material flow charts for each sector, that have been shared with the CPA and discussed with the five Technical Coordinators of the CPA's DfR Working Group during guided individual calls.

75

2.1.3 Selection of priority products and construction of a mass flow model

80 The process of selecting the priority products/product groups has been guided by the final **aim of reaching the 10 million tonnes target in the most rapid and advantageous way**, given the current situation and the foreseeable developments in the near future; this translates into the principle of the so-called "low hanging fruit". The construction of the mass flow model and the selection of the priority products have been approached as an iterative process, in which the results from the desk research and the feedback received from the Technical Coordinators have been combined and confronted with the following **key eligibility criteria**:

- 85
- High polymer and product waste generation
 - High recycle production
 - The product is technically or practically recyclable² and has a high potential for increasing the recycling rate in the future, in particular through DfR guidelines and standards

² In this study, a plastic product is considered technically recyclable if the recycling technology is available. A product is defined as practically recyclable when an adequate and economically sound system for the collection, sorting, recycling and reuse of the recycle for the production of new products is in place.

- 90
- The product has a high potential for absorbing a higher amount of recyclate
 - The identified bottlenecks in the mass flow model can be successfully addressed, especially by means of revision or development of DfR guidelines and standards

95 The integrated and “open” approach has been chosen over a systematic multi-level assessment due not only to the very broad range of plastic products on the market and the often qualitative factors to be taken into consideration for the final selection, but mostly due to a general lack of comparable information (quantitative and qualitative). The most relevant constraints and challenges encountered during the collection of data can be summarized in the following points:

- 100
- General lack of publicly available data on specific products/product groups made of plastic or containing plastic components
 - Very high variability in the reporting practices by different sources and heterogeneity of data, e.g. reporting years, data normalization, data aggregation (by sector, polymer etc.)

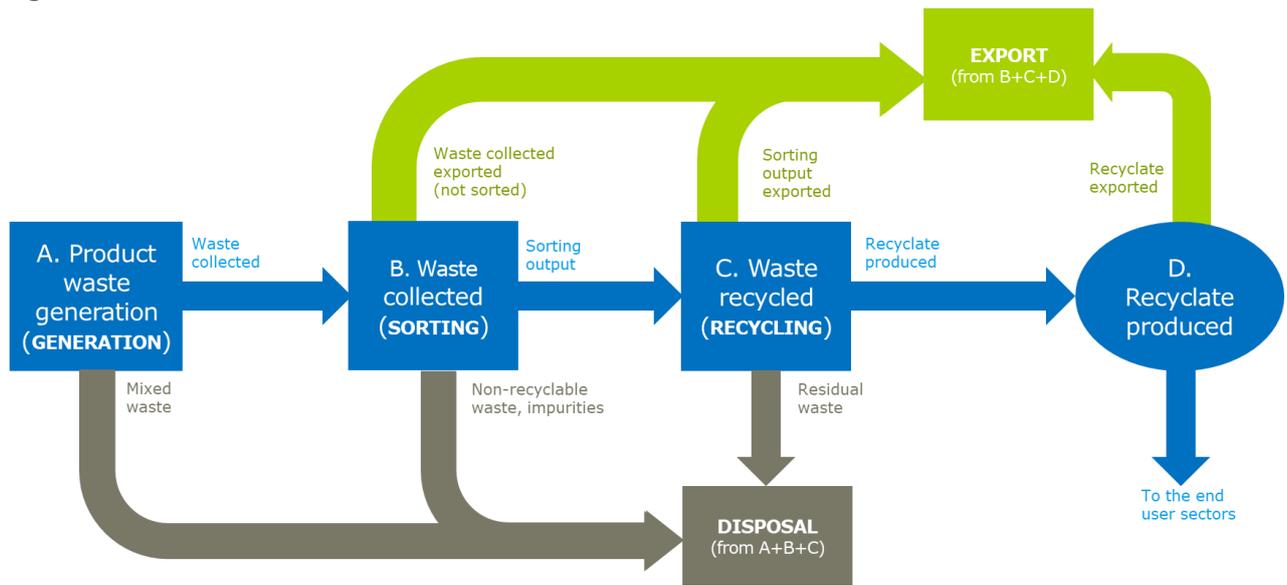
105 Based on the approach described above, **a selection of 28 products/product groups has been made**. The **mass flow model** has been developed in order **to map the plastic materials flows for each of the selected products**, from product waste generation to the production of recyclate. The starting point of the mass flow model is therefore the product waste generation, and the final point is the connection of the recyclate produced from a specific product to the respective end-user sector. The model also addresses the **second life of the plastic materials**, linking the production of recyclate for each of the five sectors to the corresponding end-user sector. The mapping of the relations between first and second life plays a fundamental role in the work of the CPA on the revision/development of DfR guidelines: closed-loop (product to product or sector to sector) recycling should be in fact promoted in order to avoid a future saturation of those markets that don't require particularly high quality standards for the recycled material to be used in new products.

115

The following stages of the plastic material flows are mapped by the model:

- Product waste generation: How much plastic waste is generated by the product?
- Waste collected (to sorting): How much plastic waste is collected and goes to sorting?
- Waste recycling: How much plastic waste goes to recycling facilities?
- 120 • Recyclate production: How much recyclate is eventually produced?
- Recyclate end-user sectors: To which sectors does the recyclate go?
- Amount of recyclate going to the end-user sector: How much of the recyclate produced goes to the identified end-user sector?
- 125 • Amount of recyclate coming from the source sector: How much of the recyclate used in the product comes from the identified source sector?

Figure 2-1: Structure of the mass flow model



130 Based on the data currently included in the model, a **production of a total amount of recyclate equal to 3.8 million tonnes is calculated**³. Thanks to the dynamic structure of the model, this result will be automatically updated when more data is added to the spreadsheet.

135 A **second list of relevant products/product groups that will help to reach the 10 million tonnes target** is envisaged to be included in the model at a later stage, but not within the duration of the current study (which is due to conclude in June 2020). Due to the lack of data for some of the already selected products, a selection of further products is not currently feasible. Nevertheless, this topic will be addressed during the webinar in order to gather further input from the CPA.

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³ Due to current lack of data, the reported amount does not include contributions from all the selected products.

3 Task 2: Mapping existing design-for-recycling guidelines and standards

145 The objective of Task 2 is to **map and scope existing design-for recycling guidelines and standards** relevant to the list of priority plastic products and product groups identified in Task 1. Within Task 2, **information was gathered on specific aspects and features of the identified guidelines and standards** in a two-stage process.

The methodology used for the implementation of this Task was based on the following steps:

- 150 1. Determination of criteria to analyse commonalities, differences and effectiveness of guidelines and standards
2. Scoping and shortlisting of guidelines and standards
3. Additional information gathering on 25 shortlisted guidelines

155 In addition to these steps carried out by the study team, the Thematic Coordinators of the CPA were given the opportunity to comment on the team’s proposed shortlist prior to the additional information gathering phase.

3.1 Methodology and results

3.1.1 Determination of criteria to analyse commonalities, differences and effectiveness of guidelines and standards

160 During the inception phase of the study, the team identified **a set of criteria about which information would be gathered** on the identified guidelines and standards. This was further refined as the work progressed, to respond to requests from the CPA for information on some additional aspects of the guidelines and standards (notably the methodology used for developing the guidelines).

165 To ensure an efficient scoping exercise, a first set of criteria were identified for the team to map a longlist of guidelines and standards, and a second set of criteria were identified for additional information gathering on an agreed shortlist of 25 guidelines. The criteria are outlined in the table below.:

Table 3-1 Criteria for data gathering on existing guidelines and standards

Criterion	Explanation
First phase criteria – for full longlist of identified guidelines and standards	
Name of guideline or standard	Full title of guideline/ standard
Guideline, formal standard or tool?	Is the item: a technical/ formal standard; an industry-led guideline; or a tool to help implement a standard/ guideline?
Issuing body (name)	
Issuing body (type)	e.g. EPR scheme, producer (individual), producer (association), standards body (international), standards body (national), value-chain platform, other
Year issued	
Key focus/objective	e.g. design for closed-loop recycling, design for open-loop recycling, sorting, use of recyclates in specific end-use application, other
Main relevant CPA working group	i.e. Agriculture, Automotive, Construction, EEE or Packaging
Other relevant CPA working groups	i.e. Agriculture, Automotive, Construction, EEE or Packaging
Products/groups in scope	e.g. bottles, trays, films, containers, all packaging, EEE, agricultural plastics etc.
Polymers in scope	e.g. PP, PS/EPS, PVC, PET, LDPE, HDPE, PE, other
Perceived effectiveness: information	Any identified qualitative or quantitative information to indicate actual or potential contribution to achieving high recycling rates

Perceived effectiveness: initial estimate	Initial estimate of perceived effectiveness based on expert judgement: scale of 1 (high) to 3 (low)
Market penetration/uptake: information	Any identified qualitative or quantitative information to indicate extent of implementation by actors in the value chain
Market penetration/uptake: initial estimate	Initial estimate of perceived market penetration/uptake based on expert judgement: scale of 1 (high) to 3 (low)
Validation requirements	e.g. self assessment, validation by issuing body or 3rd party validation
Information source(s)	Links to key sources of information
<i>*Highlighted criteria used to select the shortlist for further information gathering</i>	
Second phase criteria – for agreed shortlist of guidelines	
Definitions/ indicators	How is compliance with the guideline defined? Are specific indicators/ categorisations used (e.g. high/ medium/ low recyclability)?
Technical features covered	Specific design features addressed by the guideline e.g. polymers/resins, colours, inks, labels, direct printing, additives, adhesives, closures/seals, lids, liners, valves, recycled content etc.
Minimum requirements/ restrictions/ targets	Any specific requirements/ targets in the guideline e.g. prohibited features, min/max levels of additives etc.
Information/ labelling requirements	Any associated information/ labelling requirements e.g. Green Dot, QR-code, laser (micro-marking), molecular markers, block chain etc.
Methodology for developing the guideline	Brief description of methodology, evidence/ research used, who developed the guideline, how it is revised etc.
Test protocol/ compliance check	Test protocols or compliance checks used to apply the guidance e.g. random material analysis, sampling
Regulatory obligations/ economic incentives	Does the guideline refer to or help to implement any specific regulatory requirements e.g. targets in EU legislation, impact on price/ purchase volume, eco-modulation within EPR
Total cost and cost breakdown for actors	e.g. membership fees, certification fees, testing costs, compliance costs (e.g. €/tonne to comply with technical requirements of the Guideline), other costs
Material flows	e.g. volume of products/ polymers designed based on the guideline, volume collected/ sorted, outputs of recycling plants, end use applications, loss rate from collection/ sorting/ reprocessing
Recycling rates achieved/ achievable	e.g. data on % rate of recycling (or other indicators) achieved/achievable through implementation of guideline
Barriers/ Challenges to implementation	Any information identified on challenges of implementing the guideline
Best practice/ success factors	Any information identified on potential best practice elements/ success factors for the guidance
Additional information source(s)	Links to key sources of information

170 **3.1.2 Scoping and shortlisting of guidelines and standards**

In the second step of this Task, a range of information sources (including international and regional standards bodies, industry and industry associations, EPR systems, academic and scientific publications, and broader online searches) were consulted to identify relevant guidelines and standards. Information on the first phase criteria (see Table 3-1) was gathered for a total of **110 individual guidelines, standards and tools**. This information was recorded in an Excel spreadsheet format (see Annexes).

Based on the key highlighted criteria outlined in Table 3-1 above (i.e. products/groups in scope, polymers in scope, perceived effectiveness, and market penetration/uptake), **a medium-list of 35 guidelines and standards** was proposed by the study team. Following discussion with JRC and the CPA Technical Coordinators, it was decided that **only industry-led guidelines would be selected for the shortlist**. This would ensure that the most

relevant elements of guidelines could be identified for use in the CPA's future work on developing its own guidelines.

185 Following further discussion within the team and feedback from CPA Technical coordinators, the following shortlist of 25 guidelines was selected for further analysis:

Table 3-2 Shortlist of 25 guidelines selected for further analysis

Name of guideline	Issuing body
Recyclability of plastic packaging: Eco-design for improved recycling	COTREP (Comite Technique pour le Recyclage des Emballages Plastiques), France
RECOUP	Recycling of Used Plastics Limited (RECOUP)
European PET Bottle Platform initiative (EPBP)	European Association of Plastics Recycling and Recovery Organisations (EPRO), European Plastics Recyclers (EuPR), PET Containers Recycling Europe (Petcore), Union of European Beverages Association (UNESDA), European Federation of Bottled Water (EFBW)
Citeo 2020 rate list for recycling household packaging	Citeo (France)
Design Guide for PET Bottle Recyclability	EFBW (European Federation of Bottled Waters) and UNESDA (Union of European Beverages Associations)
Recycled plastics - Practical guide for integrating recycled plastics into the electrical and electronic equipment	Eco-systemes (France)
Design 4recycling. Design plastic packaging so it can be recycled	Der Grüne Punkt
https://circularanalytics.com	Circular Analytics
Packaging 4 Recycling	EXPRA's Sustainability and Packaging Working Group
RecyClass design for recycling guideline for HDPE Natural Containers	RecyClass / Plastics Recyclers Europe (PRE)
RecyClass design for recycling guideline for HDPE Coloured Containers	RecyClass / Plastics Recyclers Europe (PRE)
RecyClass design for recycling guideline for PP Natural Containers	RecyClass / Plastics Recyclers Europe (PRE)
RecyClass design for recycling guideline for PP Coloured Containers	RecyClass / Plastics Recyclers Europe (PRE)
RecyClass design for recycling guideline for PO Pots, Tubs, Blisters & Tray	RecyClass / Plastics Recyclers Europe (PRE)
RecyClass design for recycling guideline for PE Transparent Flexible film	RecyClass / Plastics Recyclers Europe (PRE)
RecyClass design for recycling guideline for PP Transparent Natural Flexible film	RecyClass / Plastics Recyclers Europe (PRE)
RecyClass design for recycling guideline for PE Coloured Flexible film	RecyClass / Plastics Recyclers Europe (PRE)
Designing for a Circular Economy Guidelines (draft)	CEFLEX
cyclos-HTP	Institute cyclos-HTTP
Circular Packaging Design Guideline	FH Campus Wien; Section of Packaging and Resource Management
Reuse and recycling of plastic packaging for private consumers	Network for Circular Plastic Packaging (on behalf of the Danish Plastics Federation)
Borealis 10 codes of conduct for Design for Recyclability for Polyolefin Packaging Design	Borealis

Design for Recycling Guidelines	SUEZ.circpack®
PETCORE Europe Design for recycling guidelines for PET thermoformed trays: Clear transparent to be recycled even in food applications	PETCORE (PET COntainers REcycling) Europe
Round Table Eco Design of Plastics Packaging	IK Industrievereinigung Kunststoffverpackungen e.V. (German Association for Plastics Packaging and Films)

190 It should be noted that **the vast majority of the shortlisted guidelines (24 of the 25) relate to packaging, with only one relating to electrical and electronic equipment.** This is because guidelines in the packaging sector are significantly more developed than those in other sectors. However, for the final report and recommendations, the study team will attempt to draw conclusions and lessons from the analysis that could also be applied in other sectors.

3.1.3 Additional information gathering on 25 shortlisted guidelines

195 Following agreement on the shortlist, the study team collected information on the second phase criteria (see Table 3-1), to gather **data on more of the technical aspects of the 25 shortlisted guidelines.** This information was also recorded in Excel spreadsheet format (see Annexes), and was used as the initial basis for the assessment of guidelines undertaken within Task 3 (see next section).

200

4 Task 3: Assessment of existing design-for-recycling guidelines

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The objective of Task 3 is to **analyse commonalities and differences** between the shortlisted guidelines (Task 2), **relative effectiveness or “success rate” of the guidelines** in terms of their uptake and ability to positively influence recycling rates; and **key driving factors behind success**.

210 The methodology used for the implementation of this Task was based on the following steps:

1. Analysis of commonalities and differences between the existing guidelines
2. Analysis of effectiveness of guidelines
3. Analysis of driving factors behind success

4.1 Analyse the commonalities and differences

215 The objective of this task is to provide an analysis of the **commonalities and differences between 25 guidelines** shortlisted within Task 2. In the following subsections, the approach is briefly described (4.1.1), results are summarised (4.1.2), and conclusions and discussion points are presented (0).

4.1.1 Methodology

220 The task is based on the desktop analysis of relevant information collected during previous study tasks, which is complemented where possible by additional literature review and additional consultation.

225 Information collected during the mapping of design-for-recycling guidelines in Task 2 (see Annexes) that is relevant to this task includes sector, focus, product type/ group, polymers in scope, definitions / indicators, technical features, minimum requirements/ restrictions/ targets, information and labelling requirements, regulatory obligations and economic incentives, validation requirements, protocols and compliance checks and costs. Relevant information from the mapping of material flows from Task 1 was also used: overall polymer demand and waste generated per sector and polymer.

230 Additional data gathering was undertaken to close information gaps with a particular focus on the guidelines' technical features and their minimum requirements/ restrictions/ targets. This was done by carrying out a further review of the guidelines.

4.1.2 Results

235 The results of the assessment of effectiveness of shortlisted guidelines is briefly summarised below against key criteria. This included a comparison of both the applicability and the approach of the shortlisted guidelines. Where applicable, cross reference was made to the longlist of 110 guidelines.

• *Applicability to product types, product groups and polymers*

240 Almost all (24) of the guidelines shortlisted are applicable to the Packaging sector and one to the EEE sector. Of the 25 shortlisted guidelines, eight were produced by a single issuing body.

245 It is noted that the overall **provision of standards and guidelines** around design for recyclability of plastics **maps more closely to the EU plastics waste arisings profile than to EU polymer demand**, e.g. 66% of instruments are aimed at the packaging sector which represents 39.9% of European plastics demand and is responsible for 59% of the waste generated.

Product types, product groups and polymers in scope

250 60% of the guidelines apply to specific product types (e.g. bottles) and 44% apply to product groups (e.g. packaging), whilst one guideline refers to both categories. Of the product types, **20% of the guidelines apply to bottles, 16% to trays and 20% to films**. Three of the

guidelines apply to multiple product types. Of the product groups (or packaging types), 28% apply to all packaging types.

255 Most of the **shortlisted guidelines relate to one or multiple polymers**, although in one case, no polymer type is specified. The majority (80%) of the shortlisted guidelines focus on either PP or PET (or both).

Table 4-3 below provides a summary of applicability according to product types, product groups and polymers.

Table 4-3: Summary of product type/ group and polymer applicability by guideline

Name of guideline/ standard	Product type					Product group				Polymer								
	Bottles	Trays	Films	Containers	Other	All packaging	Light/ flexible	Rigid	Not specified	PP	PS/ EPS	PVC	PET	LDPE	HDPE	PE	Other	Not specified
Borealis 10 codes of conduct for Polyolefin Packaging Design																		
Circular Analytics																		
Circular Packaging Design Guideline																		
Citeo 2020 rate list for recycling household packaging																		
cyclos-HTP																		
Design 4recycling. Design plastic packaging so it can be recycled																		
Design for Recycling Guidelines																		
Design Guide for PET Bottle Recyclability																		
Designing for a Circular Economy Guidelines (draft)																		
European PET Bottle Platform initiative (EPBP)																		
Packaging 4 Recycling																		
PETCORE Europe guidelines for PET thermoformed trays																		
RECOUP																		
Recyclability of plastic packaging: Eco-design for improved recycling																		
RecyClass design for recycling (HDPE Coloured Containers)																		
RecyClass design for recycling (HDPE Natural Containers)																		
RecyClass design for recycling (PE Coloured Flexible film)																		
RecyClass design for recycling (PE Transparent Flexible film)																		
RecyClass design for recycling (PO Pots, Tubs, Blisters & Tray)																		
RecyClass design for recycling (PP Coloured Containers)																		
RecyClass design for recycling (PP Natural Containers)																		
RecyClass design for recycling (PP Transparent Natural Flexible film)																		
Reuse and recycling of plastic packaging for private consumers																		
Round Table Eco Design of Plastics Packaging																		
Practical guide for integrating recycled plastics into EEE																		
Total number:	5	4	5	4	3	7	2	1	3	16	7	2	14	7	9	9	7	1

Key focus or objective

Many (11) of the **guidelines provide a matrix** (see **Error! Reference source not found.**) or **checklist**, split according to product features and/or polymer types. The style used varies (see Figure 4-2: **Examples of the styles used**).

265

Figure 4-1: Example⁴ of a matrix approach

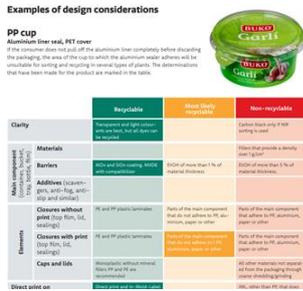


Figure 4-2: Examples^{5,6} of the styles used



The **guidelines apply to different stages of the value chain**: Collection (1); Sorting (4); or Recycling (21 split out by: general (10); closed-loop (9); mechanical (2)).

• Approach taken

Definitions and indicators

Most (23) of the guidelines utilise specific indicators or categorisations along a spectrum to classify the extent of recyclability. The majority provide **classifications related to products or product types** and use a three-choice, “traffic light” style classification system.

270

Figure 4-3: Comparison of classification systems used

	Fully recyclable / no special restrictions			Partially recyclable / restricted recycling			Not recyclable	
	Yes / Full / Good compatibility			Conditional / Limited			No/ Low / Poor	
	Towards 100% recyclable	Efficient recycling		Recycling facilities in development			No recycling channel	

275 Technical features covered

Over **75% of the shortlisted guidelines define design characteristics related to common features such as colours and labels**. More than half also consider resin or polymer type, additives and printing. Different guidelines covering common polymer and product type combinations have similar recommendations although they provide them in different forms and levels of detail.

280

Minimum requirements, restrictions & targets

More than half include some form of **restriction regarding material composition and or specification of particular features** including minimum requirements for achievement of full compatibility. There are seven guidelines which identify targets.

285 Information and labelling requirements

All but four of the shortlisted guidelines provide some form of **information related to labelling**, with 14 providing or relying on achievement of some form of logo or label.

⁴ Circular Analytics, Circular Design Guideline. Retrieved from: https://circularanalytics.com/fileadmin/user_upload/FH-Campus-Wien_Circular-Packaging-Design-Guideline_V02.pdf

⁵ Petco, Designing for the environment. Retrieved from: https://petco.co.za/wp-content/uploads/2019/08/PETCO_Design-for-Recyclability_Guideline-Documents_2019_FINAL.pdf

⁶ Cotrep, Recyclability of plastic packaging. Retrieved from: <https://www.cotrep.fr/content/uploads/sites/3/2019/02/cotrep-guidelines-recyclability.pdf>

Regulatory obligations and economic incentives

290 A significant number of the **guidelines align either to regional or national legislation** or targets.

Test protocols and compliance checks

A total of 13 of the guidelines refer to **evaluation or test protocols** including recyclability / laboratory tests.

Total cost and cost breakdown

295 In some cases, **companies pay a membership fee**, in other cases they pay to access services associated with the guideline. Some of the guidelines are **free to access**.

4.1.3 Conclusions and discussion points

300 Design for recyclability protocols provide guidance on design, labelling, marking, after-use infrastructure and secondary markets for plastic polymers and products leading to improved recyclability. They focus on replacing designs that impede sorting and/ or reprocessing via the use of known, effective alternatives.

The key similarity between the shortlisted instruments is that they **focus predominantly on the packaging sector**.

305 There are also **similarities in the approach** taken by guidelines with many including good practice examples and/ or case studies, and the majority:

- Utilising specific indicators (many of them 3-point systems); and
- Defining key design characteristics.

310 Although there are **variations in the minimum requirements, restrictions and targets** provided, where guidelines cover the same packaging type and/or polymer(s), particularly in combination, they can be seen to provide similar restrictions.

The **key differences** between the shortlisted guidelines are around the approaches taken to:

- Information and labelling requirements;
- Regulatory obligations; and
- 315 ▪ Cost and cost breakdown.

Additional differences exist in the styles used within the guidelines. Whereas most make use of colour (e.g. within a traffic-light type approach) to indicate preferred or required features, some issuing bodies incorporate additional graphics and imagery to accompany the necessary text and data.

4.2 Analysis of effectiveness of guidelines

320 The objective of this task is to analyse the **effectiveness or “success rate”** (e.g. uptake/ market penetration/recycling rates) of the shortlisted guidelines. In the following subsections, the approach is briefly described (4.2.1) and results and key findings are summarised (4.2.2).

4.2.1 Methodology

325 The task is based on the desktop analysis of relevant information collected during previous tasks, which is complemented where possible by additional literature review and additional consultation.

330 Information collected during the mapping of design-for-recycling guidelines in Task 2 (see Annexes) that is particularly relevant includes perceived effectiveness, market penetration/ uptake, material flows⁷, recycling rates achieved/ achievable, best practice/success factors, and minimum requirements/ restrictions/ targets (as a measure against which effectiveness can be assessed). Relevant information from the mapping of material flows from Task 1 was

⁷ E.g. volume of products/ polymers designed based on the guideline/ standard, volume collected/ sorted, outputs of recycling plants, end use applications, loss rate from collection/ sorting/ reprocessing.

also used: the average current recyclability and current content of recyclate in products was calculated for the materials and products relevant for each shortlisted guideline.

335 Additional data gathering was undertaken to close information gaps with a focus on the
guidelines' ability to drive uptake by relevant value chains and increase market penetration,
positively influence recycling rates and underlying driving factors for this. A targeted, brief
email survey of the issuing bodies of the shortlisted guidelines was conducted. A set of
340 questions around the broad themes effectiveness, efficiency, good practices and drivers, and
coherence was developed. The full set of questions and a list of organisations approached is
provided in Annex 4. Prior to drafting of this report, 8 issuing bodies had responded with
additional information regarding 15 of the shortlisted guidelines.

4.2.2 Results

345 The results of the assessment of effectiveness of shortlisted guidelines is briefly summarised
below against key criteria.

- *Perceived effectiveness*

350 Of the 25 guidelines, 5 were initially ranked by the study team in task 2 as "high" **perceived
effectiveness** and 13 as "mid", based on limited information found and expert judgement.
For the remaining guidelines no information was available to make a judgement.

Additional consultation with several of the guidelines' issuing bodies provided the following
examples of indications of effectiveness:

- COTREP guideline "Recyclability of plastic packaging: Eco-design for improved
355 recycling": results of an initial trial in 2016 suggested an 11% increase in lightweight
materials recycled.
- Two issuing bodies provided an indication of recycling rates of specific products in the
EU (the PET packaging recycling rate across Europe is around 50% with PET being the
most recycled packaging polymer) or in specific countries (clear PET mono material
360 trays are now collected and recycled "at scale" in France, with efforts ongoing for tray
recycling implementation in the Netherlands, Belgium, Germany, Italy, Spain and
Portugal), although it is not clear what proportion of this can be attributed directly to
the guidelines.

- *Market penetration/ uptake*

365 Of the 25 guidelines, 16 were initially ranked by the study team in task 2 as "high" perceived
market penetration/uptake and 7 as "mid". For the remaining guidelines no information
was available to make a judgement.

370 Several guidelines have been set up by industry associations, some of which have the **core
aims of improving recyclability and recycling**. Presumably these guidelines could be
taken up by all relevant members of the associations, although typically information was not
available on whether this is the case in practice (and often many members are themselves
recyclers, rather than producers of plastic articles that could implement design for recycling).

Some guidelines are issued by recyclers, who report partnerships with producing companies,
although **market share or uptake are typically not quantified**.

375 Following additional consultation with several of the guidelines' issuing bodies, examples of
quantified indications of market penetration/ uptake include:

- EXPRA stated that their members' compliance schemes in 17 EU Member States are
currently working towards the Packaging 4 Recycling guideline's objectives. The tool
380 aims to facilitate users' access to best practices and guidelines, across Europe, on
packaging design, labelling, collection systems and sorting, thereby helping products
to be designed to enable collection, sorting and recycling.
- RecyClass stated that their online platform/tool is used by over 2,500 product
designers around the world (mainly in Europe and the US), with around 550 product
analyses currently performed each month. Signatories of the Ellen MacArthur
385 Foundation's Global Commitment are using the tool to assess the recyclability of their

products and it is reported that some retailers are beginning to ask suppliers to benchmark their products (including HDPE, PP and PO containers, PP flexible films and PE films) against the RecyClass methodology.

- 390 ▪ The European PET Bottle Platform initiative (EPBP) stated that more than 30 applications have been considered, with 13 approved so far by the technical expert panel. EPBP reports that major brand owners repeatedly state that they require suppliers to comply with the EPBP guidelines, and that the vast majority of PET bottles on the European market now meet the EPBP guidelines.
- 395 ▪ According to the Danish Plastics Federation, in April 2020 all Danish supermarkets prepared a general design manual for packaging, which recommends use of the “Reuse and recycling of plastic packaging for private consumers” design guide for packaging made of plastics.
- 400 ▪ Circular Analytics' Circular Packaging Design Guideline is reported to be used by more than 25 companies from the packaging industry.
- 405 ▪ CEFLEX currently has 160 stakeholders across the full flexible packaging value chain (with over 6,000 European sites). Once launched (summer 2020) CEFLEX will monitor the number of companies/organisations accessing the D4ACE guidelines (Designing for a Circular Economy Guidelines – CEFLEX) and will gather data on number of participants, adoption, volume of products, etc.

- *Material flows and recycling rates achieved/ achievable*

For 24 of the 25 shortlisted guidelines, data on EU-wide recycling rates of the products covered by each guideline was available from Task 1. For each guideline a weighted average recycling rate for the products covered by the guidelines was calculated. The results ranged 410 between 12% and 37%, with a total average across all 24 guidelines of 19%. It should be noted that these **recycling rates are influenced by a wide range of factors** (discussed in further sections) and therefore not a stand-alone indicator of the effectiveness of the guidelines. Furthermore some guidelines: **overlap in the products they cover** (hence making it difficult to distinguish which guideline contributes to an achieved recycling rate); 415 **have only recently been introduced** (hence have not yet had an impact on recycling rates); or are **used only in specific countries** (hence their impact is only reflected marginally in the total EU recycling rates).

Specific information collected for individual guidelines includes:

- 420 ▪ Recycling rates in France (where the respective guideline, CITEO’s eco-modulation of rates for household packaging, is applied) in 2018: total plastic 26.5%, beverage/other bottles 58%, other plastic packaging 4%.
- 425 ▪ For several guidelines, examples of specific products that comply with the guideline (and in some cases their recyclability in percent) are available. For example Der Grüne Punkt’s website includes 20 best practice examples of packaging that meet its “Design 4 recycling” guideline.
- 430 ▪ PETCORE Europe “Design for recycling guidelines for PET thermoformed trays”: Almost 50% of material in PET trays is rPET. However the main source so far has been clear bottle flakes and with pressure for PET bottles to incorporate 30% or more recycled content, available feedstock for trays is diminishing.

430 Regarding **potentially achievable recycling rates**, some of the guidelines refer to specific quantified targets (although no data is available on their success in contributing to those targets):

- 435 ▪ Danish Plastics Federation: working towards a recycling rate of 60% (by 2025) for both rPET of food grade quality and PP and PE for non-food packaging (plastic packaging recycling in Denmark currently stands at 18%).
- 440 ▪ COTREP guideline “Recyclability of plastic packaging: Eco-design for improved recycling”: Extending bottle sorting instructions to all plastic packaging is expected to recycle 20,000 extra tonnes of plastic packaging. The targets are to increase recycling

440 rates as follows (from 2016-2030): bottles 55% to 82%; pots, trays and other rigid packaging 1% to 55%, film 1% to 23%.

- 445 ▪ CEFLEX draft "Designing for a Circular Economy Guidelines": aim for over 80% of collected flexible plastic packaging to be returned to the economy and used to replace virgin materials. The Phase 1 D4ACE guidelines focus on polyolefin-based structures – representing 70-80% of total volume placed on the market. According to CEFLEX, whilst it is too early to assess the uptake of the forthcoming D4ACE guidelines, most of its member brand owners and retailers have already started reviewing their packaging portfolios and are starting to substitute multi-material flexible packaging with mono-material equivalents where possible as recommended in the D4ACE guidelines.
- 450 ▪ PETCORE Europe: has pledged to achieve an average use of 70% recycled PET for sheets and trays, representing use of around 2.07m tonnes recycled PET per year, by 2025 (compared to 1.23m tonnes in 2017).

- *Costs of implementation*

455 Available information on the **different types of costs** of implementing design for recycling guidelines is summarised below:

Membership fees

- 460 ▪ 6 issuing bodies specified that their guidelines **do not require a membership fee** from their users. 3 indicated that the costs are effectively paid for by the members of the issuing bodies.
- 2 further guidelines state on their websites that they are generally **free of charge**, although for one of them country-specific information must be paid for. The other is an informative guide for self-assessment.
- 465 ▪ RecyClass (responsible for 8 of the shortlisted guidelines) offers three levels of membership, based on the level of support (costing €3,000, €5,000 and €10,000 per year, respectively), which are used for undertaking internal tests by the technical committees responsible for the development of the guidelines.
- 470 ▪ Der Grüne Punkt states on its website that it **charges** a one-time €300 fee for accessing the RecyclingCOMPASS online tool for an initial assessment of packaging recyclability. It is however not clear what this entails and if it includes full use of the guideline.

Certification fees

- RecyClass specified that **certification** incurs a €600-800 **charge** by an external auditor.
- 475 ▪ 2 issuing bodies (PETCORE and EPBT) clarified that there are **no certification fees** in their guidelines, however participants pay for their own testing costs that can lead to certification.
- For all other guidelines, **information on certification fees was not available or not relevant** because no certification is provided.

480 **Testing costs**

- Under two guidelines, **companies pay for their own testing**. PETCORE specified this involves evaluation by external laboratory tests for a specific application, estimated at between €20,000-50,000 per test. EPBP stated that tests are based on a testing plan defined by the technical experts and the companies own the results, but the cost was not estimated.
- 485 ▪ RecyClass estimated testing costs of roughly €10,000 depending on the tests performed, charged by independent laboratories.
- Recoup provides testing at sorting facilities **free for members** (although non-members can use the guideline for free and it was not clear if testing costs apply to them).
- 490

- For all other guidelines, **information on testing costs was not available or not relevant** because no testing is undertaken or required.

Compliance costs

495

- Quantitative **estimates of costs** (e.g. Euro/tonne) to comply with technical requirements were **not available for any of the guidelines**.
- Another issuing body stated they expect the compliance costs of recyclable packaging to decrease due to upcoming fee modulation within EPR.

Any other costs

500

- One guideline (Citeo) is a list of € rates (non-binding, for informational purposes) for packaging products that reflect their recyclability (more recyclable products incur lower rates).
- Two issuing bodies (Network for Circular Plastic Packaging and Circular Analytics) responded that the most important costs are **innovation and development costs** for developing circular packaging designs or solutions.

505

Benefits

- One guideline focusing on integrating recycled plastics into electrical and electronic equipment noted that there could be a **net benefit** (i.e. negative compliance cost because recycled plastic can be less expensive than virgin plastic).⁸

510

4.3 Analysis of driving factors behind success

4.3.1 Methodology

515

This task combines the results of previous parts of Task 3 (the key criteria of guidelines, how they differ or have commonalities, and the effectiveness or success of the guidelines) to determine which criteria of the guidelines and which external factors appear to be key drivers of success. It also uses information gathered in Task 2 on the barriers and challenges to implementation of guidelines and of recycling (which can be internal or external factors affecting their effectiveness) as well as the study team's ideas on potential best practices and success factors. This information is complemented by several steps of consultation:

520

- The targeted, brief email survey on effectiveness, efficiency, good practices and drivers, and coherence of guidelines, as discussed in the previous subtask;
- A dedicated session to be held during the webinar on 27 May;
- Further targeted stakeholder interviews which had not yet been conducted at the time of writing. These will focus on validating the potential driving factors identified and assessing their relative effectiveness.

525

The relevant information identified so far from previous tasks and the email survey is summarised in the following subsection.

4.3.2 Results

• *Barriers/challenges to implementation*

530

The following barriers and challenges relating to the **implementation of guidelines** themselves have been identified:

- If guidelines focus on specific countries, their **implementation beyond their focus countries will be limited** and they will be subject to respective national limitations (e.g. certain polymer streams are recycled in some countries but not yet in others).

⁸ The guideline states that in 2016, the difference between recycled material and its virgin version was around €300/t for PP and could reach up to €800/t for ABS (See: <https://www.ecosystem.eco/upload/media/default/0001/01/8c2ad4360265cf963d4c723eb171e8d7938b3284.pdf>). However, it should be noted that prices fluctuate and vary by polymer, so this cannot be assumed to be true in general.

- 535 However, many of the guideline issuing bodies acknowledge the need to take into account local circumstances (e.g. national regulatory requirements, waste collection and sorting).
- **Lab testing and audit costs** could be a **barrier** to achieve higher uptake of guidelines and also to the certification of products.
 - 540 ▪ A **lack of transparency, precision and consistency** regarding the criteria applied in assessments of recyclability could be a potential barrier.
 - Some guidelines do not provide technical specifications, but rather **broad design principles** or checklists.
 - **Uncertainty regarding future developments** and how these will impact on product design in the near future.
 - 545 ▪ In some cases, (full) **functionality of a product** may not be compatible with (full) recyclability.
 - There is a **lack of guidelines for certain applications** (e.g. cosmetics and detergents).

550 Additional barriers and challenges relating to the **implementation of recycling** more generally have also been identified. These constitute external factors that may affect the success of design for recycling guidelines and are summarised below:

- For recycling of plastics from WEEE:
 - **High diversity of polymers** used and the associated requirements for sorting in recycling facilities;
 - 555 ○ **High technical and regulatory requirements** (e.g. restricted additives) of materials used;
 - **Specific substances of concern**: brominated flame retardants, cadmium containing colouring compounds;
 - Export of E-Waste;
 - 560 ○ Small electronic equipment often ends up in domestic waste;
 - **Long lifetime** of products.
- The **performance of the current collection systems**, in general, is **not always adequate** to ensure a high quality and quantity of recycled material. The diversity of these systems at the national and local levels imposes uncertainty and may hamper investments by industry.
- 565

Ellen MacArthur Foundation (2017) identified as **barriers to increased recycling of plastic packaging**: the **small format of some packaging** (10% of plastic packaging by weight), **multi-material packaging** (13% of plastic packaging by weight), **uncommon materials** (10% of plastic packaging by weight) and **nutrient contamination** (not quantified).

570

More specific issues related to the **specific attributes of packaging** are:

- 575 ▪ Full sleeves, or sleeves that cover more than 60% of a container can lead to an **error in the identification of the material used** for the container itself and can also cause quality issues;
- **Top film** which is **not compatible with the main container** e.g. a tray, and is difficult to remove, can cause defects and issues with the quality of the resulting recycled material;
- Technical challenges associated with **opaque/coloured PET**;
- 580 ▪ For HDPE and PP containers, and for PO pots, tubs, blisters and trays, the main challenges for recyclability (both in quantity and quality) relate to **decorations and closure systems**. For the PO items, **sorting behaviours** are also a key challenge;
- For PE and PP films, key barriers to achieving higher quantity and quality of recycled material are the **use of multilayer / multi-materials** (PP coupled with PET, PA, PVC, PVDC), **decorations** (e.g. heavily printed films), and **multilayer PP+PE items**;
- 585

- 590 ▪ When rPET derives from non-food contact applications, it is **not possible to use it in food contact applications**. End-users in general prefer rPET from food contact applications to ensure certain quality standards are met. There is no legislation for food contact applications for PE and PP, which leads to uncertainty as regards their safety;
- 595 ▪ The evolution of packaging, particularly in relation to the selection of polymers in products (e.g. the substitution of PVC with PET on trays, while PET recycling facilities were designed to process bottles);
- 595 ▪ More generally, the **increased complexity of packaging**. Further guidance is needed on more complex, multi-material structures and elements of flexible packaging structures.

600 Several issues related to **recycling infrastructure** have been identified. One issuing body highlighted a **lack of infrastructure** to adequately collect and sort plastic, particularly at a local level. **Making collection/sorting** (particularly of flexible packaging) **economically viable** and **ensuring adequate infrastructures/material separation** is a challenge. Significant investments are required to implement advanced sorting technologies (the average price of a sorting machine is around EUR 300,000).

605 The quantity, composition and quality (level of contamination) of feedstock supply fluctuates. For instance, one guideline issuing body highlighted the **difficulty in sourcing raw materials of sufficient quality and quantity** to achieve food grade recycled PET.

610 There are inherent trade-offs between quality of the recycled material (e.g. safe to use as a food contact material, aesthetic aspects, odour, etc.) and its applicability/practicality (i.e. strict requirements may hamper uptake).

- *Best practice/success factors*

With regards to potential **best practices** contributing to the success of design for recycling guidelines, the following have been identified so far:

- 615 ▪ **General approach to guideline development:**

- 620 ○ **Holistic and harmonised approach** to guideline development, taking into account product design, life cycles, the potential to use the resulting recycled material, as well as national regulations and collection, sorting and recycling infrastructures. Contact with regulatory and legal authorities is helpful to understand the legal framework in which the guideline will operate;
- 625 ○ **Involvement and commitment of the whole value chain** (potentially also including environmental and consumer organisations) in the development and promotion of guidelines, e.g. via collaborative platforms. Some guidelines are developed directly by organisations with practical waste management experience, or draw on the experience of other existing industry-led guidelines;
- 630 ○ **Regular updating of guidelines**, to reflect (inter alia) new data on innovations, technologies, results of product testing (e.g. in laboratories and/or recycling facilities) and market developments, as well as feedback from members of the issuing bodies, to further improve the quality of recycled materials and therefore their uptake by end users;

- 635 ▪ **Specific features/elements of guidelines:**

- 635 ○ Ensuring that guidelines are **clear, concise and easy to follow** (in some cases including developing different versions aimed at different audiences). Providing worked examples of products to show how to apply the guideline (e.g. substituting coloured with clear bottles to enhance recyclability);
- 635 ○ Inclusion of **general design criteria** plus **polymer-/product-specific criteria** that require the definition of different thresholds;

- 640 ○ Consideration of other **elements of eco-design for packaging**, such as recognising the role of optimised resource use, reuse, use of recycled material, sustainable sourcing of materials etc.;
- Development of **guidelines for disruptive technologies** where pilots with promising results exist (e.g. delamination, PET monomer recycling);
- 645 ○ Provision of **simple, and free, self-assessment tools** alongside the guidelines, to allow producers to do an initial quick and simple check of their own products against the guidelines. This may be in the form of online tools or quick laboratory tests;
- Provision of **assessment protocols** to be used to demonstrate compliance with design criteria;
- 650 ○ Provision of **certification or a label**, to be used by products that comply with the requirements of the guideline;

▪ **Supporting external/contextual factors:**

- 655 ○ Major players (e.g. retailers) obliging their suppliers to adhere to a specific guideline;
- **Establishment of collection targets per polymer and product** (such as the newly introduced collection targets for PET bottles in the EU's Single-Use Plastics Directive);
- 660 ○ **Eco-modulation of fees** within EPR schemes according to the recycled content of products, to help to further promote investments on the optimisation of the design of plastic products;
- **Development of an EU label** on the recycled content of products;
- Availability of **modernised infrastructure** to adequately collect, sort and recycle plastics particularly in relation to non-household waste where the performance is lower compared to the treatment of household waste stream;
- 665 ○ Improved sorting of waste through the **application of innovative technologies** such as "water marks" with the involvement of the whole value chain, particularly EPR schemes and waste management entities.
- **Improvements on the safety assessment** process of recycled materials, particularly in relation to food contact packaging;
- 670 ○ Existence of demand for recycled materials: **sustainable end markets** need to be guaranteed and viable for all recycled polymers in order to encourage and justify designing for recyclability;
- Further support and **funding** from legislators for the development and implementation of the guideline.
- 675

• *Coherence with other initiatives and regulatory requirements*

With regards to the extent to which the guidelines fit within existing regulatory requirements, the following responses have been gathered:

- 680 ▪ Six issuing bodies stated their guidelines are **aligned with current regulatory requirements**. One specified their guideline is based on the Austrian Packaging Ordinance. Another collects and makes available information on the existing regulatory requirements. One issuing body responsible for 8 of the shortlisted guidelines specified they are fully aligned with the Circular Plastic Strategy, the Packaging and Packaging Waste Directive (PPWD) and Ecolabel. However, one issuing body noted that in their opinion legislation such as the Single Use Plastics Directive is not helpful, since it does not consider the full environmental impact.
- 685 ▪ One issuing body notes **there is no legislation covering recyclability of products** in the country where its guideline is applied.
- 690

With regards to the support provided by the guidelines to the implementation of legislative requirements or other initiatives, the following information has been obtained:

695

- One issuing body is in contact with other organisations to **ensure that conflicts between guidelines are avoided** (although minor differences may arise between countries with different preferences in packaging). Another says it is endorsed by several stakeholders and respective associations.

700

- One issuing body stated that its **guideline supports the implementation of legislative requirements** by providing the entire industry with an overview of European directives.
- One guideline specifically supports EPR.
- One issuing body explained that tight **regulation could increase recyclability in the short term but should be flexible** enough to allow for the necessary innovation in all steps of the value chain to support the long-term transition to the circular economy.

4.3.3 Discussion points

705

This section has identified a range of potential factors driving the success of design for recycling guidelines, which can be grouped as follows:

Internal (i.e. depending on the guidelines themselves)	External (i.e. outside the influence of guidelines)
Potential barriers and challenges to the implementation of guidelines	Potential barriers and challenges relating to the implementation of recycling more generally
Potential best practices	
Coherence of guidelines with existing regulatory requirements	

710

During the webinar, the study team is particularly interested in CPA members' views regarding:

- Whether any key drivers (barriers, challenges, coherence aspects, best practices and other success factors) have been missed; and
- The relative importance of the different drivers identified.

715 **5 Task 4: Recommendations on a work plan for design-for-recycling guidelines and standards**

720 The sections below provide a list of the study team's initial ideas, that are proposed for discussion during the webinar. These ideas correspond to a set of recommendations concerning the **removal of barriers**, and **creation or reinforcement of drivers**, to achieve **increased effectiveness of guidelines**, as well as more generally the **improvement of the performance of waste management** across the whole value chain.

725 To feed in to the CPA's draft 'Design-for-Recycling Workplan' the recommendations aim to support the enhanced recyclability of plastic products or product parts, thereby also contributing to generating a sufficient quantity of plastic waste that meets the quality required by the industry. These recommendations should therefore help to increase the amounts of recycled material to be absorbed by the EU market.

730 **5.1 Recommendations related to the guidelines and standards**

To date, the review of responses to the stakeholder consultation indicate the following potential recommendations for consideration by the CPA:

- 735 ▪ Enhance the applicability of guidelines in all EU Member States by **considering national specificities** (e.g. legislative requirements, existence of infrastructure per polymer stream, structure and effectiveness of EPR, and waste collection and sorting schemes);
- 740 ▪ Ensure a **holistic and harmonised approach in the development of guidelines** and standards, to address in a comprehensive manner the needs and limitations that exist across the whole value chain;
- 745 ▪ Ensure, and improve, the consistency and precision of guidelines by also improving the **comprehensiveness of technical specifications**, also through the integration of polymer and product-specific criteria;
- 750 ▪ Provide **regular updates to guidelines and standards**, to integrate future developments on plastic product design and disruptive recycling technologies, to also influence the design to ensure high levels of recyclability;
- 755 ▪ Ensure that R&D on product design focuses not only on the functionality of products but also their **recyclability**, by integrating a more comprehensive testing approach and robust scientific methods;
- 760 ▪ Better address the **diversity of polymers and complexity of products** in general, particularly for products with relatively low recyclability or products that reduce the effectiveness of recycling such as certain types of packaging (e.g. coloured bottles, use of sleeves in bottles, films attached to trays) and WEEE in general;
- 765 ▪ **Develop guidelines and standards for products where they are currently lacking** (e.g. agricultural plastics) as well as specific applications (e.g. packaging of cosmetics and detergents);
- 770 ▪ **Reduce the financial burden** imposed by the costs of lab testing and auditing by considering whether products are certified in the design EPR fees, and/or by providing free self-assessment tools;
- 775 ▪ Contribute towards the **development of an EU label for products that meet the requirements of (specified) guidelines** and standards.

5.2 Recommendations related to the performance of plastics waste management

765 Further potential recommendations are provided below in relation to the overall performance of the value chain, covering product design and waste management aspects, other than those related directly to the development of guidelines and standards but affect their effectiveness. They are categorised according to collection and sorting, recycled content, and cross-sectoral links.

- 770 ▪ **Collection and sorting:**
 - Introduce **innovative technologies** to improve the effectiveness of collection and sorting (e.g. watermarks) and request more funding for the development and implementation of such technologies;
 - **Improve the performance of current collection and sorting**, particularly for non-household waste;
- 775 ▪ **Recycled content:**
 - **Develop an EU label** showing the recycled content of products;
- 780 ▪ **Cross-sectoral aspects:**
 - Integrate requirements for certification in **EU and national product and waste-related legislation**;
 - Retailers could demand that their **suppliers provide products with certified recycled content**;
 - Introduce **eco-modulation of EPR fees** according to the recycled content of products, to further encourage investments to optimise the design of plastic products for recycling.

ANNEXES

1. Mass flow model (status at 05.05.2020) – provided as a separate document
2. Sankey diagram (based on mass flow model 05.05.2020) – provided as a separate document
3. Excel spreadsheet of shortlisted and longlisted guidelines and standards (status at 15.05.2020) – provided as a separate document
4. Questionnaire to issuing bodies of guidelines
5. List of issuing bodies consulted

Annexes 1-3 Provided as separate documents

Annex 4 Questionnaire to issuing bodies of guidelines

Evaluation Criteria	Evaluation Questions
Effectiveness	What progress has been made in implementing the Guideline and to what extent have the objectives been achieved?
	What has been the uptake of the Guideline (e.g. number of participants, volume of products/ polymers designed based on the guideline, market share)?
	What have been the (quantitative) impacts on recycling rates and to what extent can these be credited to the Guideline?
	<p>We are interested in the factors/barriers that have influenced the uptake, recyclability and recycling rates and to what extent.</p> <ol style="list-style-type: none"> a. In your opinion, what are the key factors and features of the Guideline that are the most influential to its success (i.e. enabling the uptake, increased recyclability and recycling rates)? b. What are the main challenges and barriers to implementing the Guideline and to achieving greater uptake, increased recyclability and recycling rates?
Efficiency	<p>What are the costs of implementing the Guideline, distinguishing between:</p> <ul style="list-style-type: none"> • Membership fees • Certification fees • Testing costs • Compliance costs (e.g. Euro/tonne to comply with technical requirements of the Guideline) • Any other costs
Good practices and drivers	In your opinion, what external factors have significantly affected recycling rates and quality of recyclates covered by the Guideline and how?
	What has been the impact on recycling rates for recyclates covered by the Guideline?
	In your opinion, what are the main barriers to achieving greater uptake, increased recyclability and recycling rates?

	In your opinion, what can be done and by whom, to increase the recycling rates, the recyclability, and the quality and uptake of recyclates? What levels are achievable?
Coherence	To what extent does the Guideline fit within existing regulatory requirements?
	Does it support the implementation of legislative requirements or other initiatives? Is it supported or hindered by other legislation / initiative(s)?

Annex 5 List of issuing bodies consulted

NB Only those marked with * had provided a response to the email questionnaire by 15 May 2020.

- Borealis
- CEFLEX*
- Circular Analytics*
- Citeo (France)
- COTREP (Comite Technique pour le Recyclage des Emballages Plastiques), France
- Der Grüne Punkt
- Eco-systemes (France)
- EFBW (European Federation of Bottled Waters)
- European Association of Plastics Recycling and Recovery Organisations (EPRO)*
- European Plastics Recyclers (EuPR)
- EXPRA's Sustainability and Packaging Working Group*
- FH Campus Wien; Section of Packaging and Resource Management
- IK Industrievereinigung Kunststoffverpackungen e.V. (German Association for Plastics Packaging and Films)
- Institute cyclos-HTTP
- Network for Circular Plastic Packaging (on behalf of the Danish Plastics Federation)*
- PET Containers Recycling Europe (Petcore)*
- RecyClass / Plastics Recyclers Europe (PRE)*
- Recycling of Used Plastics Limited (RECOUP)*
- SUEZ
- UNESDA (Union of European Beverages Associations)

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