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REFERENCE COMPENDIUM OF RECYCLABILITY GUIDELINES FOR PLASTIC PRODUCTS AND PACKAGING

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NOTE TO READER

This document is based on an unpublished report prepared in 2021 under contract to CCME by JTL Squared Consulting Inc., in partnership with GreenEarth Strategy and Policy Integrity, and has been revised and edited by CCME's Waste Reduction and Recovery Committee. CCME would like to thank the individuals and organizations that contributed input and expertise during the development of this work.

EXECUTIVE SUMMARY

In 2018, the Canadian Council of Ministers for the Environment (CCME) released the *Strategy on Zero Plastic Waste* (the Strategy) which sets the overall vision for zero plastic waste in Canada and is rooted in a circular economy approach. To implement the Strategy, ministers approved the *Canada-wide Action Plan on Zero Plastic Waste* (CAP-ZPW) in two phases: phase 1 (CCME 2019) and phase 2 (CCME 2020).

This reference compendium of recyclability guidelines and related tools fulfills one of the actions in phase 1 of CAP-ZPW. It was designed to:

- summarize, analyze and compare reliable recyclability guidelines for plastic products and packaging
- consolidate guidelines that could support design choices that improve the recovery of plastic products and packaging when those items reach end-of-life
- provide a tool for governments and other actors along the value chain to inform the development of policies and actions that could improve the recyclability of plastic products and packaging.

To develop this compendium, recyclability guidelines were sought for plastic products and packaging and for the full range of recycling technologies (mechanical and chemical). However, the bulk of the recyclability guidelines available to date focus only on the design of plastic packaging in mechanical systems.

Methodology

To create the compendium, the following tasks were completed:

- a literature scan to identify publicly available recyclability guidelines directly relevant to North America or informative for North America
- outreach to stakeholders across the plastics value chain (e.g., plastic processors, retail associations, waste associations, recycling councils, provincial governments or their delegated authorities) to identify additional guidelines
- review, summarization and assessment of the guidelines
- interviews with select recyclability guideline authors to better understand the content of the guidelines.

The summary and assessment of each guideline includes:

- a summary of its basic contents
- its uptake by industry (where possible)
- its gaps and limitations
- its strengths and weaknesses, including scope of product coverage, sector coverage, ease of use, level of technical detail and update frequency.

How This Compendium Is Organized

This compendium is divided into four sections:

1. **Section 1: Background** introduces the compendium and how to use it effectively to identify resources of interest.
2. **Section 2: Recyclability Design Guidelines** includes a review of existing plastics recyclability guidelines (i.e., documents specifically developed to provide design advice to improve recyclability).
3. **Section 3: Recyclability Reports** includes a few additional reports that do not fit the definition of a recyclability guideline but do provide relevant research and information on the state of plastics recyclability.
4. **Section 4: Other Supporting Tools** includes additional tools that might assist the reader in understanding design for recyclability (e.g., international standards relevant to North America, labelling systems and software tools).

Table 3 provides a visual comparison of the key distinguishing features of each guideline, to assist the reader in navigating the guidelines or resources of most interest to them.

How the Recyclability Guidelines Are Assessed

The review of each guideline includes a high-level assessment of the guideline for Canadian users. It covers the relevance, clarity, reliability, accessibility and technical detail as outlined in Table I, and identifies the strengths, weaknesses and gaps that make it distinct from the other guides included in this compendium. The order of the assessment criteria does not indicate their relative importance.

Table I: The five guideline assessment criteria

ASSESSMENT CRITERIA		
<u>RELIABILITY</u> Is the advice based on data or methods that have been vetted by experts?	<u>RELEVANCE</u> Was the guide developed for use in Canada or the United States?	<u>CLARITY</u> Is there a direct link between specific product or packaging attributes and the recyclability guidance?
<u>ACCESSIBILITY</u> Is the guidance free of cost and accessible to non-members?	<u>TECHNICAL DETAIL</u> Does the guidance include significant data and/or testing protocols?	

For each assessment criterion, the guideline was given a ranking as detailed or clear, or limited or unclear, except for the criterion of “level of technical detail,” which was given a ranking of high or low as outlined in Table II.

Table II: Assessment ranking

ASSESSMENT RANKING	
Detailed or clear	
Limited or unclear	
High	 Applies to level of technical detail only.
Low	 Applies to level of technical detail only.

Table 3, in Section 1, provides a high-level comparison of the content of each recyclability guideline.

Recyclability Design Guidelines Review

In total, 16 recyclability guidelines were reviewed. The list of guidelines and an overview of their assessments are provided in Table III.

Table III: Overview of recyclability design guidelines assessment

	AUTHOR and DESIGN GUIDELINES	ASSESSMENT CRITERIA				
		Reliability	Relevance	Clarity	Accessibility	Technical detail
1	The Association of Plastic Recyclers • APR Design® Guide • Design Guide for Foodservice Plastics Recyclability					
2	Australian Packaging Covenant Association • Sustainable Packaging Guidelines • Quickstart Guide to Designing for Recyclability—PET Packaging					

	AUTHOR and DESIGN GUIDELINES	ASSESSMENT CRITERIA				
		Reliability	Relevance	Clarity	Accessibility	Technical detail
3	Canadian Produce Marketing Association • Preferred Plastics Guide					
4	CEFLEX: Circular Economy for Flexible Packaging • Designing for a Circular Economy Guidelines—Recyclability of polyolefin-based flexible packaging					
5	Citeo and Adelphe • TREE: Test de la Recyclabilité des Emballages					
6	Consumer Goods Forum • The Golden Rules of Plastic Packaging Design					
7	Cotrep: Comité Technique pour le Recyclage des Emballages Plastiques • Recyclability of Plastic Packaging—Ecodesign for improved recyclability					
8	Eco Design of Plastic Packaging Round Table • Eco Design of Plastic Packaging Round Table Management Guidelines					
9	Éco Entreprises Québec • ÉEQ Materials Guide					
10	European PET Bottle Platform • Design guidelines—PET bottle					
11	Healthcare Plastics Recycling Council • Design Guidelines for Optimal Hospital Plastics Recycling					

	AUTHOR and DESIGN GUIDELINES	ASSESSMENT CRITERIA				
		Reliability	Relevance	Clarity	Accessibility	Technical detail
12	Petcore Europe • Design for Recycling Guidance for PET Thermoformed Trays					
13	RecyClass • Design for Recycling Guidelines					
14	RECOUP: • Recyclability by Design					
15	Walmart • Walmart Recycling Playbook					
16	WRAP • Rigid plastic packaging-design tips for recycling • Defining what's recyclable and best-in-class polymer choices for packaging					

Highlights of the assessment provided in Table III include:

- The majority of the guidelines (13 of 16) were assessed as reliable. Three guidelines (Canadian Produce Marketing Association, Eco Design for Plastic Packaging Round Table Management Guidelines and Healthcare Plastics Recycling Council) were assessed as less reliable for different reasons. The Healthcare Plastics Recycling Council's guidelines have not been updated since 2016, refer to dated resources, and do not identify how their guidelines were vetted. The Canadian Produce Marketing Association and Eco Design for Plastic Packaging Round Table Management Guidelines do not identify how their advice was vetted.
- For relevance, six out of 16 of the guidelines were assessed as directly relevant, meaning that they were designed for North American recycling systems. However, any of the guidelines could be reviewed and updated (if necessary) for use in Canada. The interviewees contacted for this project suggest that there is significant consistency in recyclability design advice globally, due to commonalities in recycling technologies.
- For the clarity criterion, most guidelines (14 of 16) were assessed as having a clear and detailed direct link between packaging attributes and the guidance. Only two of the guidelines were assessed as providing a limited explanation of the relationship between the packaging or product attribute and its recyclability. These include Healthcare Plastics Recycling Council and Éco Entreprises Québec (ÉEQ) because they provided only general references to good and best practices, whereas the other guidelines provided advice in a “yes, no or conditional” format on specific packaging or product attributes and how those would behave in a recycling system. For example, the ÉEQ guideline provides general

considerations on design (e.g., consider “spoonability” in container design, avoid certain resin combinations) but it does not provide an in-depth review of specific problematic materials or attributes.

- For accessibility, all of the guidelines reviewed except Citeo and Adelphe’s TREE were freely accessible (i.e., available online and free of cost) though most of the organizations had further resources behind member-only or user-pay portals.

Recyclability Reports

In addition to the recyclability guidelines, four additional reports were reviewed that provide or summarize recent research on recyclability. A list of the reports and an overview of their assessments are provided in Table IV.

Table IV: Overview of recyclability report assessment

	AUTHOR and RECYCLABILITY REPORTS	ASSESSMENT CRITERIA				
		Reliability	Relevance	Clarity	Accessibility	Technical detail
1	CSA Group • A Roadmap to Support the Circularity and Recycling of Plastics in Canada – Technical Standards, Regulations and Research					
2	Mepex Consult • Basic Facts Report on Design for Plastic Packaging Recyclability					
3	Pet Sustainability Coalition • Packaging supplier checklist					
4	Zentrale Stelle Verpackungs Register: • Guidance on the assessment of the recyclability of packaging subject to mandatory scheme participation - Aligned with the German Federal Environment Agency • Minimum standard for determining the recyclability of packaging subject to system participation pursuant to section 21 (3) VerpackG					

Other Supporting Tools

This section provides a number of additional resources that are not recyclability guidelines or reports but are likely to be helpful resources for policymakers, procurers of goods, and packaging designers interested in learning more about design for recyclability. This includes recyclability labelling systems and software tools that provide more information on design for recyclability.

As these other tools were not a focus of this work, an extensive search was not undertaken to ensure that the list is comprehensive. Instead, the tools included were those found during the research to complete this compendium of recyclability guidelines. These resources have not been assessed or compared.

The resources include the following labelling systems:

- [How2Recycle](#)
- [On-Pack Recycling Label](#)
- [Australasian Recycling Label](#)

The resources include the following software and decision-making tools:

- [PIP 360°](#)
- [Ecodesign Studio](#)
- [EasyD4R -Evaluation Tool](#)
- [Ecolizer 2.0](#)
- [PREP / PREP UK](#)
- [TREE](#)
- [UP Scorecard](#)
- [The Recyclability Framework](#)

Conclusions

Preparing this compendium and speaking to experts revealed the following observations:

- The Association of Plastic Recyclers (APR) is recognized by Canadian stakeholders as the trusted North American expert in recyclability assessment and is considered an international leader by other leading experts (e.g., RECOUP).
- Producers and designers in North America do not have the same access to the breadth of tools to inform recyclability that are available to companies in Europe and Australia.
- Globally, both packaging designs and recyclability guidelines are evolving quickly. Commitments by companies to reduce plastic pollution, such as under Plastics Pacts, are contributing to new investment in research, updates to design advice and advances in technologies, infrastructure and collection systems.

Tools that exist abroad to help companies make better decisions to improve the recyclability of their plastic products may be useful for Canada to consider. Examples include:

- a national survey of collection, sorting and processing infrastructure
- online, free software tools that provide designers with ready access to a method to test their designs before a product or package is produced or marketed

- a labelling program that would be recognized or endorsed by governments.

Recyclers would benefit by having a harmonized list of materials collected and recycled across Canada. This would:

- enable more consistent communications to consumers about how to recycle
- increase the feedstock reaching recyclers and make it more economical for them to recycle some low-volume streams.

As more Canadian jurisdictions adopt extended producer responsibility (EPR) systems, this activity could help to harmonize the list of materials collected and recycled within each province and territory. However, additional cross-jurisdiction harmonization efforts would be required in order to achieve a consistent list of materials across Canada, such as the adoption of clear, harmonized and inclusive definitions (i.e., definitions that are not easily made obsolete with changes in product or packaging design or new technologies).

Given the rapid pace of industry change in packaging design and recyclability guidance, it is also recommended that users check for updates of the materials referenced in this compendium.

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LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
AIOx	Aluminum oxide
APR	Association of Plastic Recyclers
APCO	Australian Packaging Covenant Organisation
ASTM	ASTM International (formerly known as American Society for Testing and Materials)
CAP-ZPW	<i>Canada-wide Action Plan on Zero Plastic Waste</i>
CCME	Canadian Council of Ministers for the Environment
CEFLEX	A Circular Economy for Flexible Packaging
CEN	European Committee for Standardization
Cotrep	Technical Committee for the Recycling of Plastic Packaging
CPMA	Canadian Produce Marketing Association
CSA	CSA Group (formerly known as the Canadian Standards Association)
ÉEQ	Éco Entreprises Québec
EPBP	European PET Bottle Platform
EPR	extended producer responsibility
EPS	expanded polystyrene
EU	European Union
EVOH	ethylene-vinyl alcohol copolymer
FTC	Federal Trade Commission
HDPE	high-density polyethylene

ABBREVIATION	MEANING
HPRC	Healthcare Plastics Recycling Council
ISO	International Organization for Standardization
LCA	lifecycle assessment or lifecycle analysis
MRF	materials recovery facility
NIR	near-infrared spectroscopy
LDPE	low-density polyethylene
OPP	oriented polypropylene
OPRL	On-Pack Recycling Label
PCR	post-consumer recycled content post-consumer resin
PE	polyethylene
PET cPET aPET rPET	polyethylene terephthalate crystallized PET amorphous PET recycled PET
PETG or PET-G	polyethylene terephthalate glycol
PLA	polylactic acid
PO	polyolefin
PP Rpp	polypropylene recycled polypropylene
PS	polystyrene
PTTs	pots, tubs and trays
PVC	polyvinyl chloride
PVCD	polyvinylidene chloride
PVDC or PVdC	polyvinylidene dichloride

ABBREVIATION	MEANING
PVOH (also PVA or PVAI)	polyvinyl alcohol
RFID	radio-frequency identification device
SiOx	silicon oxide
SPC	Sustainable Packaging Coalition
UNEP	United Nations Environment Programme
UK	United Kingdom
ZSVR	Zentrale Stelle Verpackungs Register

1 BACKGROUND

In 2018, the Canadian Council of Ministers for the Environment (CCME) released the *Strategy on Zero Plastic Waste* (the Strategy), which sets the overall vision for zero plastic waste in Canada and is rooted in a circular economy approach. To implement the Strategy, ministers approved the *Canada-wide Action Plan on Zero Plastic Waste* (CAP-ZPW) in two phases: phase 1 (CCME 2019) and phase 2 (CCME 2020).

As committed to in phase 1 of CAP-ZPW, this document is a reference compendium designed to identify and summarize existing plastics recyclability guidelines. Recyclability guidelines are publications developed to provide guidance on which packaging and product formats and material types are recyclable under specific conditions (e.g., locally available infrastructure to sort and ultimately process materials). This compendium identifies recyclability guidelines that could help actors along the plastics value chain prevent, reduce and better manage plastic waste. For example, designers might use the guidelines to inform the manufacture of items that will be more recyclable at end-of-life, and service providers might use the guidelines to better educate their customers on how to manage their materials and which plastics they can accept for recycling.

This compendium was designed to meet the following objectives:

- summarize, analyze and compare reliable recyclability guidelines for plastic products and packaging
- consolidate guidelines that could support design choices that improve the recovery of plastic products and packaging when those items reach end-of-life
- provide a tool for governments and other actors along the value chain to inform the development of policies and actions that could improve the recyclability of plastic products and packaging.

For the development of this compendium, recyclability guidelines were sought for 1) plastic products and packaging and 2) current recycling technologies (mechanical and chemical). However, the bulk of existing recyclability guidelines focus only on the design of plastic packaging in mechanical systems.

This compendium does include three guidelines that specifically target plastic products:

- RECOUP has developed a guideline for plastic plant pots.
- The Association of Plastic Recyclers has developed a guideline for foodservice items.
- The Healthcare Plastics Recycling Council has developed a guideline for healthcare products and packaging.

However, while existing guidelines generally address packaging, interviews confirmed that this has less to do with whether item is a product or a package and more to do with the reality that packaging makes up the bulk of the material collected for recycling and sent to material recovery facilities (MRFs). Interviewees suggested that the existing guidelines could apply to (or be adapted for) products made of the same plastic materials but each product would need to be tested on a case-by-case basis to understand how it would perform in MRFs and in processing facilities. See the “At a Glance” table for each guideline (Section 2) to understand which plastics and items it targets.

When considering the advice provided in any of the guidelines included in this compendium, it is important to understand that the science and technologies used to recycle plastics are rapidly evolving as is the collection and sorting infrastructure in place in Canada. Readers should expect that new guidelines and updated content of existing guidelines will be released. As a result, while this compendium provides a review of existing recyclability guidelines at the time of publication, it should be considered as a starting point for investigation and not a definitive resource. CCME guidelines are voluntary. Readers are advised to consult with the appropriate federal, provincial or territorial authority having jurisdiction on whether a CCME guideline applies to their area of interest.

1.1 Methodology

The following tasks were completed between December 2020 and March 2021 to create the compendium:

- a literature scan to identify publicly available recyclability guidelines directly relevant to North America or informative for North America
- outreach to stakeholders across the plastics value chain (e.g., plastic processors, retail associations, waste associations, recycling councils, provincial governments and their delegated authorities) to identify additional guidelines
- review, summarization and assessment of the guidelines
- interviews with select recyclability guideline authors to better understand the content of the guidelines.

The summary and assessment of each guideline includes:

- a summary of its basic contents
- its uptake by industry (where possible)
- its gaps and limitations
- its strengths and weaknesses, including scope of product coverage, sector coverage, ease of use, level of technical detail and update frequency.

A full assessment of sector coverage was not possible due to limited availability of data on industry usage, but where available, the total number of members subscribing to the organization was provided as an indicator. Further, none of the guidelines reviewed published a set timeline for updating their guidance. In some cases, publishers committed to updating their guidance as new information becomes available, which was noted where applicable.

While not the focus of this compendium, additional recyclability resources were also identified during the course of the study team's research, including:

- Several reports on recyclability that are not guidelines per se nonetheless offer readers helpful background or information on plastics recyclability. These are provided in Section 3.
- Other supporting tools were identified, including labelling systems and software that could help the reader assess recyclability or identify recyclable plastic packaging. These are provided in Section 4.

1.2 How This Compendium Is Organized

This compendium is divided into four sections:

1. **Section 1: Background** introduces the compendium and how to use it to effectively to identify resources of interest.
2. **Section 2: Recyclability Design Guidelines** includes a review of existing plastics recyclability guidelines (i.e., documents specifically developed to provide design advice to improve recyclability).
3. **Section 3: Research Reports** looks at a few additional reports that do not fit the definition of a recyclability guideline but do provide relevant research and information on the state of plastics recyclability.
4. **Section 4: Other Supporting Tools** includes additional tools that might assist the reader in understanding design for recyclability (e.g., international standards relevant to North America, labelling systems and software tools). However, a thorough review of these additional tools was not undertaken and they were not assessed, as they were not the focus of this compendium. Links to resources associated with each are provided.

Sections 2 and 3 provide a review of each recyclability guideline or recyclability report to give the reader a high-level understanding of the guideline's content so they can determine whether they would like to conduct further research into a specific guideline or report. Each review begins with an "At a Glance" table with links to key information and resources and concludes with an assessment table (see Section 1.3). Table 3 provides a visual comparison of the key distinguishing features of each guideline, to assist the reader in navigating the guidelines or resources of most interest to them.

Most guidelines identify plastics and their additives exclusively by their acronyms (i.e., abbreviations) and not their full resin or chemical names. To assist the reader in reviewing each guideline, the acronyms for the types of plastics and additives referred to in this compendium are provided in the List of Abbreviations.

1.3 How the Recyclability Guidelines and Reports Are Assessed

This compendium provides a high-level assessment of each recyclability guideline (Section 2) and each recyclability report (Section 3) for Canadian users. The assessment covers the relevance, clarity, reliability, accessibility and technical detail as outlined in Table 5, and identifies the strengths, weaknesses and gaps that make it distinct from the other guides included in this compendium. The assessment criteria are not ranked. Instead, they are ordered based on the logical flow of questions a reader might ask in determining whether they want to learn more about the guideline or report. Specifically:

- Is the guideline reliable?
- Was it developed for local use (i.e., Canada or North America)?
- Is the link between packaging or product attribute and its recyclability clear?
- Can I freely access the guideline or is it behind a user-pay or members-only portal?
- Is the guideline highly technical or written for the layperson?

Table 1: The five guideline assessment criteria

ASSESSMENT CRITERIA		
<u>RELIABILITY</u> Is the advice based on data or methods that have been vetted by experts?	<u>RELEVANCE</u> Was the guide developed for use in Canada or the United States?	<u>CLARITY</u> Is there a direct link between specific product or packaging attributes and the recyclability guidance?
<u>ACCESSIBILITY</u> Is the guidance free of cost and accessible to non-members?	<u>TECHNICAL DETAIL</u> Does the guidance include significant data and/or testing protocols?	

The relevance criterion deserves further elaboration. In general, the recyclability guidelines were developed to provide guidance on whether plastic materials are recyclable using locally available technologies, including whether a material can be effectively sorted at local MRFs or processed effectively by local downstream processors. Technologies that exist on the ground vary by locale (sorting technologies often vary on a municipality-by-municipality basis and processing technologies tend to vary by region), as do sorting and processing capabilities. Regardless, any of the recyclability guidelines could be adapted to inform local recyclability based on the technology that is locally available. The experts interviewed for this work confirmed that leading organizations developing recyclability guidance (e.g., the Association of Plastic Recyclers, RECOUP and RecyClass) are collaborating on the assessment of recyclability, testing protocols and solutions and so the recyclability guidance provided across their platforms is already relatively similar regardless of their geographic focus (e.g., the types of disruptors identified, recommendations to improve recyclability).

For each assessment criterion, the guideline was given a ranking either as detailed or clear or as limited or unclear, except for the criterion of “level of technical detail,” which was given a ranking of high or low as outlined in Table 2.

Table 2: Assessment ranking

ASSESSMENT RANKINGS		
Detailed or clear		
Limited or unclear		
High		Applies to level of technical detail only.
Low		Applies to level of technical detail only.

Table 3: Comparison of design advice provided by guidelines, reports and labelling systems

GUIDELINE, REPORT or TOOL	RECYCLABILITY DESIGN ADVICE ATTRIBUTES							
	Specific to North America	Leading authority for locale on plastics recyclability	Covers all plastic packaging	Covers a specific plastic product or type of packaging	Provides a desktop screening tool	Provides lab or in situ testing methodologies	Has a certification system	Has a labelling system
Ecodesign Studio			√		√			
The Association of Plastic Recyclers (APR)	√	√ North America	√		√	√		
Australasian Packaging Covenant Association (APCO)		√ Australia	√		See PREP			
Australasian Recycling Label		√ Linked to APCO	√		See PREP			√
Canadian Produce Marketing Association CEFLEX	√			Produce packaging Flexible packaging				
CITEO and Adelphe		√ France	√		See TREE			
Consumer Goods Forum	√		√					
Cotrep		√ France	√					
COMPASS®/EcolImpact					√			
CSA Group	√		√					
EasyD4R			√		√			
Eco Design of Plastics Packaging Round Table			√					

GUIDELINE, REPORT or TOOL	RECYCLABILITY DESIGN ADVICE ATTRIBUTES							
	Specific to North America	Leading authority for locale on plastics recyclability	Covers all plastic packaging	Covers a specific plastic product or type of packaging	Provides a desktop screening tool	Provides lab or in situ testing methodologies	Has a certification system	Has a labelling system
Ecolizer 2.0			√	Plastic products in general	√			
Éco Entreprises Québec (ÉEQ)	√	√ Québec	√					
European PET Bottle Platform		√ Europe (harmonized with RecyClass)		PET bottles		√		
Healthcare Plastics Recycling Council	√			Healthcare products and packaging				
How2Recycle			√		√			√
Mepex Consult			√			√		
On-Pack Recycling Label (ORPL)		√ UK	√		See PREP UK		√	√
Pet Sustainability Coalition	√			Pet food packaging				
Petcore Europe		√ Europe (harmonized with RecyClass)		PET packaging				
PREP / PREP UK			√		√			
RecyClass		√ Europe	√		√	√	√	

GUIDELINE, REPORT or TOOL	RECYCLABILITY DESIGN ADVICE ATTRIBUTES							
	Specific to North America	Leading authority for locale on plastics recyclability	Covers all plastic packaging	Covers a specific plastic product or type of packaging	Provides a desktop screening tool	Provides lab or in situ testing methodologies	Has a certification system	Has a labelling system
RECOUP (including RecyClassUK)		√ UK	√		√	√	√	
TREE					√			
Walmart	√		√					
WRAP		√ Works with RECOUP and OPRL	√		See OPRL	Refers to RECOUP	See OPRL	See OPRL
Zentrale Stelle Verpackungs Register		√ (Germany)	√			√		

2 RECYCLABILITY DESIGN GUIDELINES

This section provides key information about 16 recyclability guidelines and their related tools published by major organizations in North America and select organizations abroad.

2.1 The Association of Plastic Recyclers

AT A GLANCE	
TITLE	APR Design® Guide for Plastics Recyclability (APR Design® Guide) Design Guide for Foodservice Plastics Recyclability
PUBLISHED BY	The Association of Plastic Recyclers (APR)
DATE PUBLISHED	- APR Design® Guide: last updated 2018–2021 (revision history varies by topic) - Design Guide for Foodservice Plastics Recyclability: first published in 2020 but neither its publication date nor the date of any revisions are listed in the document
TOOL TYPES	- design guide, including testing protocols (APR Design® Guide) - checklist (Design Guide for Foodservice Plastics Recyclability)
SOURCES	APR Design® Guide (Association of Plastic Recyclers 2018–2021) Design Guide for Foodservice Plastics Recyclability (APR and The Foodservice Packaging Institute n.d.) Other Biopolymer Use in Bottles: Critical Mass Levels Still Needed for System-Wide Reclamation (APR n.d.a) Degradable Additives Use in Bottles, Forms, And Films: The Degradation of Otherwise-Recycled Plastics Means Lost Opportunities for The Repeated Use of Molecules Through Recycling (APR n.d.b) Plastics Recycling Glossary (APR 2018) Crash Course: APR Design® Guide for Plastics Recyclability. Webinar, May 19, 2021 (APR 2021a)
OVERVIEW	
Target audiences	Packaging designers
Target materials	Plastic packaging, foodservice items
Target plastics	PET, HDPE, PP, PE film, PS/EPS, PLA, PVC
Geographic scope	North America
Sector coverage	Total number of members not identified, represents plastics recyclers
Update frequency	Commitment to update frequently and as developments emerge

The Association of Plastic Recyclers (APR) is an international trade association with its head office in North America. APR's primary goal is to promote the development of the plastics recycling industry by increasing the supply, enhancing the quality, expanding the demand for, and communicating the value of recycled plastics (APR 2021b). Its board includes members that represent product designers.

This guide is referred to interchangeably as the APR Design® Guide for Plastics Recyclability or the APR Design® Guide. The guide provides design guidance by resin (i.e., PET, HDPE, PP, PE film, PS/EPS, PLA, PVC) and by packaging components, which are listed in Table 4.

Table 4: Packaging components addressed by APR Design® Guide

PACKAGING COMPONENTS
Colour
Closures and dispensers
Labels, inks and adhesives
Sortation: NIR (near-infrared), metals, size
Attachments

Source: APR 2018-2021.

Each of these is assessed against industry-accepted recycling criteria to ensure that a package is truly recyclable and ranked as outlined below. If a product requires testing, APR has developed various testing protocols that vary by resin, including:

- screening
- benchmark
- critical guidance
- application guidance
- in-plant production scale evaluations
- specialized equipment evaluations.

APR’s test methods include references to specific APR lab practices, APR screening methods, and ASTM International (ASTM) testing methods. APR also offers one-on-one help through the APR Design® for Plastics Recyclability Training Program.

Directions to package designers on using the design guide are as follows (APR 2018–2021):

1. Review APR’s definition of “recyclable.”
2. Understand the four categories of recycling compatibility (Table 5.)
3. Identify the resin of the body of the package that they want to assess and then navigate to the “Guidance by Resin” section.
4. Review the details for each specific design feature (e.g., labels, adhesives, inks).
5. Evaluate the recycling category of each design feature.
 - a. Where all of the design features fall into the “preferred” category, the package has been designed for recyclability.
 - b. If any of the design features fall into the “detrimental” category, then APR considers the package “recyclable with detrimental features” and advises the designer to revise those specific features of the package design.
 - c. If any of the design features fall into the “renders package non-recyclable” category, then APR considers the package not recyclable and advises the designer to revise those specific features of the package design.

The possible results of the APR assessment are provided in Table 5.

Table 5: Possible results from APR Design® Guide assessment of recyclability

ASSESSMENT	DEFINITION
APR Design® Guide preferred	Features readily accepted by MRFs and recyclers since the majority of the industry has the capability to identify, sort and process a package exhibiting this feature with minimal or no negative effect on the productivity of the operation or final product quality. Packages with these features are likely to pass through the recycling process into the most appropriate material stream with the potential of producing high-quality material.
Requires test data	To determine a recycling category, testing per an APR testing protocol is required. APR provides a library of peer-reviewed, technically rigorous test methods that should be used to evaluate package design features with an unknown impact on recyclability. APR's tests are designed to encourage companies to strive for preferred.
Detrimental to recycling	Features that present known technical challenges for the MRF or recycler's yield, productivity or final product quality, but are grudgingly tolerated and accepted by the majority of MRFs and recyclers. A plastic item may be considered recyclable with detrimental features with the understanding that package manufacturers should use the detailed guidance provided by APR to change their design and achieve preferred status.
Renders package non-recyclable as per APR definition	The majority of MRFs or reclaimers cannot remove these features to the degree required to generate a marketable end product, or the package cannot be captured at a majority of MRFs or reclaimers due to typical machinery settings or equipment capabilities. Ultimately, a package exhibiting this design feature will be completely discarded even if it has other preferred features.

Source: APR 2018-2021

2.1.1 Design Guide for Foodservice Plastics Recyclability

In partnership with the Foodservice Packaging Institute, APR has also published a design guide specifically for the foodservice industry. It draws from the APR Design® Guide but provides a specific focus on plastic foodservice packaging and other items entering postconsumer collection and recycling systems. The purpose of the guide is to introduce the concepts of recycling and recyclability to the foodservice industry and encourage them to design or select products and packaging that are suitable for recovery.

The information in this guide provides (APR and the Foodservice Packaging Institute n.d.):

- an introduction to the APR Design® Guide and the four categories of recycling compatibility (i.e., preferred, detrimental to recycling, renders package non-recyclable, and requires testing)
- links to the APR Plastics Recycling Glossary (APR 2018), which is not directly referenced as a resource on the APR website, and APR testing methods
- a detailed overview of the stages of recovery, including sorting, separation, reprocessing and end use (absent from the APR Design® Guide)
- general guidance that is specific to the foodservice industry (e.g., colour, density, resin identification codes and dimensions)

- checklists for the recyclability of specific resins common to the foodservice industry (e.g., PET, PP, EPS, PLA).

Table 6: APR Design® Guide assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in North America.
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free. More resources available on members-only platform: industry trends and forecasts, toolkits, discussion and networking forums, company listings (buyers and sellers directory) and media kits.
Level of technical detail		Includes significant data or testing protocols.
Other strengths • APR is the recognized expert for plastic recyclability testing in North America. • APR provides specific advice on components that could interfere with recycling, including the testing protocols that substantiate assessments. Other gaps or limitations • APR's definition of recyclability is 60% collection coverage, but it does not provide advice for how a designer could obtain this data. Similar organizations in Europe (e.g., RECOUP) are completing work to survey, assess and report on collection coverage in their jurisdictions.		

2.2 Australian Packaging Covenant Organisation

AT A GLANCE	
TITLE	Sustainable Packaging Guidelines (version 3) and Tools
PUBLISHED BY	Australian Packaging Covenant Organisation (APCO)
DATE PUBLISHED	2020
TOOL TYPES	• Design advice (Sustainable Packaging Guidelines) • Design guide (Quickstart Guide PET Packaging) • Quickstart guides • Checklist (Excel format) • PREP (design guide software tool)
SOURCES	• Sustainable Packaging Guidelines (APCO 2020a) • Quickstart Guide to Designing for Recyclability: PET Packaging (APCO 2021e) Other • Sustainable Packaging Checklist (APCO 2019a) • Quickstart Guide to Design for Recovery: Reuse, Recycling & Composting (APCO 2021d) • Quickstart Guide to Labelling for Recovery (APCO 2019b) • Quickstart Guide to Designing for Recyclability: Glass Packaging (APCO 2019c) • Quickstart Guide, Designing for Recyclability: Rigid HDPE Packaging (APCO 2020b) • Quickstart Guide, Designing for Recyclability: Rigid PP Packaging (APCO 2020c) • Quickstart Guide, Designing for Recyclability: Household Consumer Soft Plastics (APCO 2020d)
OVERVIEW	
Target audiences	APCO members (i.e., producers obligated under the Australian Packaging Covenant)
Target materials	Packaging
Target plastics	All
Geographic scope	Australia
Sector coverage	• Nearly 2,000 member companies • 95 companies have either opted out of the Covenant or have been removed for non-compliance.
Update frequency	Unknown

The Australian Packaging Covenant Organisation (APCO) is the entity in charge of managing and administering the Australian Packaging Covenant (the Covenant), which is an industry-led agreement between Australian federal, state and territory governments and the packaging supply chain (APCO 2021a). APCO represents producers and other supply chain participants and is charged with delivering against targets established in the Covenant.

As of March 31, 2021, APCO had almost 2,000 members as signatories to the Covenant and that were implementing the SPGs (APCO 2021b). Between APCO's inception in 2017 and September 2020, 37 members were removed from the Covenant for non-compliance and 58 producers opted out and are regulated instead by state or territorial governments under the National Environment Protection Measures (APCO 2021c).

Some APCO resources are publicly available, such as those in the “At a Glance” section. Other resources are only available via a members-only portal, such as (APCO 2021b):

- case studies
- webinars
- technical guides
- an Annual Reporting Tool
- the Packaging Sustainability Framework
- access to events, industry roundtables, advisory and working groups, training
- access to the Australasian Recycling Label (ARL) Program
- access to the Packaging Recyclability Evaluation Portal (PREP) funded by APCO, which is a software tool that enables producers to assess their packaging recyclability (collectability, sortability, processability and marketability) in Australia.

2.2.1 Sustainable Packaging Guidelines

APCO’s Sustainable Packaging Guidelines provide general advice for producers on improving the design and manufacture of packaging. The Sustainable Packaging Guidelines are referenced in both Australia’s Used Packaging Materials National Environment Protection Measures and the Covenant, and their development is required by the Covenant (APCO 2020a). APCO retains responsibility for consulting on, maintaining and updating the guidelines and providing information to government on any changes.

The Sustainable Packaging Guidelines (APCO 2020a) are founded on 10 principles:

1. designing for recovery
2. optimizing material efficiency
3. designing to reduce product waste
4. eliminating hazardous materials
5. using recycled materials
6. using renewable resources
7. designing for minimizing litter
8. designing for transport efficiency
9. designing for accessibility
10. providing consumer information on environmental sustainability (e.g., labelling).

For each of these principles, the advice provided includes:

- explaining the primary aim and why it is important
- identifying considerations when assessing packaging
- identifying producers’ minimum obligation under each principle
- identifying resources that could assist producers in implementing the principle
- links to additional APCO resources (e.g., Packaging Sustainability Framework, Annual Reporting Tool).

2.2.2 Quickstart Guides

The following APCO Quickstart Guides are publicly available and provide high-level packaging design guidance related to plastics:

- Quickstart Guide: Designing for Recyclability—PET Packaging (APCO 2021e)
- Quickstart Guide: Design for Recovery—Reuse, Recycling or Composting (APCO 2021d)
- Quickstart Guide: Labelling for Recovery (APCO 2019b)
- Quickstart Guide: Designing for Recyclability—Rigid HDPE Packaging (APCO 2020b)
- Quickstart Guide: Designing for Recyclability—Rigid PP Packaging (APCO 2020c)
- Quickstart Guide: Designing for Recyclability—Household Consumer Soft Plastics (APCO 2020d).

A brief outline of each is provided below.

1. The Quickstart Guide: Designing for Recyclability—PET Packaging (APCO 2021e) includes:
 - an introduction to the key barriers to PET recycling
 - tips for best practice design for recycling
 - a guide to selecting materials for PET packaging design.

The best practice tips for PET packaging design include:

- Use mono-materials and lightweight where possible.
- Minimize colours or select preferred colours.
- Ensure compatibility of closures for recycling.
- Incorporate recycled content.
- Include labelling for recyclability.

The guide provides design guidance for the packaging components listed in Table 7. For each component, advice is provided on materials that are:

- preferred (e.g., monolayer PET)
- recyclable with reduced value (e.g., non-PET barriers or coatings)
- not compatible with PET recycling (contaminants to avoid).

Table 7: Packaging components addressed by the Quickstart Guide: Designing for Recyclability—PET Packaging

PACKAGING COMPONENTS
Bottle or container colour
Cap or lid material
Label material
Label inks
Label adhesives

Source: APCO 2021e

2. The Quickstart Guide: Design for Recovery—Reuse, Recycling or Composting (APCO 2021d) includes:
 - an introduction to the waste hierarchy
 - encouragement to avoid compostable packaging unless the packaging will be food-soiled or could better facilitate the recovery of waste organics

- advice on proper labelling
 - questions to guide decision-making (e.g., are there opportunities to reduce the amount of packaging?)
 - definitions for key terms (e.g., compostable packaging, recoverability, reusable packaging).
3. The Quickstart Guide: Labelling for Recovery (APCO 2019b) includes:
- an overview of common labels, including the Australasian Recycling Label (Section 4.1.3), the Australian Composting Logo and Home Composting Logo, Resin Identification Codes, Tidyman logo and the Mobius Loop
 - additional resources (e.g., guidance on claims on plastic bags).
4. The Quickstart Guide: Designing for Recyclability—Rigid HDPE Packaging (APCO 2020b) includes:
- tips for best practice design for recycling
 - a guide to selecting materials for rigid HDPE packaging components.

The tips for best practice design for recycling include:

- Use mono-materials to maximize recyclability.
- Minimize colours or select preferred colours.
- Ensure the compatibility of closures for recycling.
- Ensure the compatibility of labels for recycling.
- Incorporate recycled content.
- Include labeling for recycling.

The guide provides design guidance for selecting materials for the packaging components listed in Table 8. For each component, advice is provided on materials that are:

- preferred (e.g., single monomer PE)
- recyclable with reduced value (e.g., barrier layer)
- not compatible with HDPE recycling (contaminants to avoid).

Table 8: Packaging components addressed by the Quickstart Guide: Designing for Recyclability—Rigid HDPE Packaging

PACKAGING COMPONENTS
Bottle or container material and surface or barrier layers
Bottle or container colour
Closure (e.g., cap, lid, trigger) material
Label or sleeve material (adhesive label)
Label or sleeve inks
Label or sleeve adhesives
Direct print

Source: APCO 2020b

5. The Quickstart Guide: Designing for Recyclability—Rigid PP Packaging (APCO 2020c) includes:
- tips for best practice design for recycling

- a guide to selecting materials for rigid PP packaging.

The tips for best practice design for recycling include:

- Use mono-materials to maximize recyclability.
- Minimize colours or select preferred colours.
- Ensure the compatibility of closures for recycling.
- Ensure the compatibility of labels for recycling.
- Incorporate recycled content.
- Include labeling for recycling.

The guide provides design guidance for selecting materials for the packaging components listed in Table 9. For each component, advice is provided on materials that are:

- preferred (e.g., single monomer PP, and no coatings)
- recyclable with reduced value (e.g., barrier layer)
- not compatible with PP recycling (contaminants to avoid).

Table 9: Packaging components addressed by the Quickstart Guide: Designing for Recyclability—Rigid PP Packaging

PACKAGING COMPONENTS
Bottle or container material and surface or barrier layers
Bottle or container colour
Closure (e.g., cap, lid, trigger) material
Label or sleeve material (adhesive label)
Label or sleeve inks (adhesive and direct print in-mould)

Source: APCO 2020c

6. The Quickstart Guide: Designing for Recyclability—Household Consumer Soft Plastics (APCO 2020d) includes:

- tips for best practice design for recycling
- a guide to selecting materials for household consumer soft plastics

The tips for best practice design for recycling include:

- Use mono-materials and lightweight materials where possible.
- Minimize colours or select preferred colours.
- Ensure the compatibility of labels for recycling.
- Incorporate recycled content.
- Include labeling for recycling.

The guide provides design guidance for selecting materials for the packaging components listed in Table 10. For each component, advice is provided on materials that are:

- Preferred: Best practice design of household consumer soft plastic packaging, aligned with the global threshold of the CEFLEX Guidelines.
- Recyclable with reduced value: Detail on what will be accepted for existing soft plastics recycling in Australia.
- Avoid: Things to avoid when designing household consumer soft packaging.

Table 10: Packaging components addressed by the Quickstart Guide: Designing for Recyclability—Household Consumer Soft Plastics

PACKAGING COMPONENTS
Primary material
Secondary material as a laminate
Secondary material as an additional component (e.g., labels, wires and so on)
Colours and inks

Source: APCO 2020d

Table 11: APCO assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts (PREP).
Relevance		Designed for use in Australia (i.e., different infrastructure context). PREP tool could be tailored for use in Canada. (It has already been adapted for use in the United Kingdom and Singapore by PREP Design in conjunction with local advisory committees.)
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free. More resources available on members-only platform (i.e., member-only APCO programs, educational resources and access to PREP).
Level of technical detail		Includes significant data or testing protocols (PREP tool).
Other strengths - Provides specific advice on components that could interfere with recycling. - Over 90% of Australia's obligated businesses are reporting performance against the guidelines. - APCO provides a range of tools and resources to support implementation of the guidelines. - APCO offers an online tool that provides direct advice to producers about options to improve recoverability and recyclability. - The guidelines are linked to the Australasian Packaging Label, which provides direct advice to consumers on whether a package or component is recyclable (see Section 4.1.3). Other gaps or limitations - n/a		

2.3 Canadian Produce Marketing Association

AT A GLANCE	
TITLE	Preferred Plastics Guide
PUBLISHED BY	Canadian Produce Marketing Association (CPMA)
DATE PUBLISHED	2020
TOOL TYPES	Design guide
SOURCES	Preferred Plastics Guide (CPMA 2020a) Other Plastics Research (2019) [behind member login] (CPMA 2019a) CPMA Plastics Packaging Roadmap (Complete Roadmap) (CPMA 2019b) A Landscape Review of Plastics in the Canadian Fresh Produce Sector, CPMA Technical Report (2019) [full report behind member login] (Value Chain Management International Inc. 2019) Produce Packaging Executive Framework (Roadmap Overview) (CPMA 2020b)
OVERVIEW	
Target audiences	CPMA members
Target materials	Plastic packaging
Target plastics	All
Geographic scope	Canada
Sector coverage	International and Canadian members are responsible for 90% of the fresh fruit and vegetable sales in Canada.
Update frequency	Unknown (first publication), commits to frequent updates

The Canadian Produce Marketing Association (CPMA) is a not-for-profit organization that represents companies active in the marketing of fresh fruits and vegetables in Canada (CPMA 2021). It has formed a Plastics Packaging Working Group.

2.3.1 Preferred Plastics Guide

This guide was written by a CPMA working group to help Canada's produce industry make more informed decisions about plastic packaging, including supporting the increased use of recyclable plastic packaging. The guide was developed after the CPMA surveyed its members to determine their plastic usage and assessed domestic and international packaging trends. The guide provides advice on the use of plastics as shown in Table 12.

Table 12: Possible results from CPMA assessment of recyclability

ASSESSMENT	DEFINITION
Preferred	Given the potential or existing capability to recycle or reuse, CPMA members will continue to use the identified plastics and consider them as viable replacements for plastics identified as unfavourable. Includes: PET, HDPE, LDPE, PE, rPET and other PCR-containing preferred plastics
Minimize	Although some recyclability or reuse may be possible, CPMA members will investigate alternatives or substitution for the identified plastics or continue their use where required. Includes: oriented polypropylene or OPP, polypropylene or PP, complex laminates or multi-layer films, polyvinylidene dichloride or PVdC.
Unfavourable	Due to a lack of recyclability or effective reuse, CPMA members will seek to eliminate or replace the identified plastics within a defined period. Includes: PVC, polystyrene, oxy-degradable, rigid water-soluble, polycarbonate, acrylic, and black or dark-coloured plastic

Source: CPMA 2020a.

The guide also highlights the following considerations for producers when making decisions about plastic packaging (CPMA 2020a):

- labels (i.e., choice of material and adhesives to avoid inadvertently contaminating the recycling stream)
- packaging design and form factors (i.e., consider light-weighting or alternative designs that reduce the packaging-to-product ratio)
- plastic substitutes, bioplastics and renewable-based packaging (i.e., discuss lifecycle impacts with vendors, including the availability of local infrastructure to process these materials).

Table 13: CPMA assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Unclear. Sources, data, methods and reviewers not identified. The recycling advice is based on a technical report prepared for CPMA, but it is not clear whether the report or advice has been vetted by recycling experts.
Relevance		Designed for use in Canada.
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free. More resources available on members-only platform (e.g., access to technical reports, industry research and working group documents).
Level of technical detail		No data or testing protocols are provided.
Other strengths - Provides easy-to-follow, yes-or-no advice to packaging designers based on material. Other gaps or limitations - Limited packaging focus (i.e., just produce packaging).		

2.4 Circular Economy for Flexible Packaging

AT A GLANCE	
TITLE	Designing for a Circular Economy Guidelines: Recyclability of polyolefin-based flexible packaging
PUBLISHED BY	CEFLEX: Circular Economy for Flexible Packaging (CEFLEX)
DATE PUBLISHED	2020
TOOL TYPES	Design guide
SOURCES	Designing for a Circular Economy Guidelines: Recyclability of polyolefin-based flexible packaging These guidelines include three documents: a guidelines summary table (CEFLEX 2020a), an executive summary (CEFLEX 2020b) and a technical report (CEFLEX 2020c). Other Designing for a circular economy: An introduction (CEFLEX 2020d) Flexible packaging design requirements (CEFLEX 2020e) 5 steps to build a circular economy for flexible packaging (CEFLEX 2020f)
OVERVIEW	
Target audiences	Producers, technology suppliers, waste processing chain, end users
Target materials	Flexible packaging
Target plastics	Polyolefin-based structures: flexible PE, PP and PO mixes
Geographic scope	Europe
Sector coverage	160 European companies
Update frequency	Unknown, commitment to update annually is suggested

Circular Economy for Flexible Packaging (CEFLEX) is a collaboration of European companies, associations and organizations representing the entire value chain of flexible packaging (CEFLEX 2020g).

2.4.1 *Designing for a Circular Economy Guidelines: Recyclability of polyolefin-based flexible packaging*

These guidelines are Phase 1 of CEFLEX’s intended release. Phase 1 provides guidance on the types of polyolefin-based flexible packaging that can currently be described as “designed for recyclability” because they can be sorted and recycled using existing industrial-scale technologies and processes (see Table 14). Evidence to support the claim of “designed for recyclability” includes widely accepted principles, industry practices and actual testing to verify the sorting and recycling limits of flexible packaging structures. These guidelines also discuss material preferences, material choices and disruptors. Advice is based on sortability, recyclability, design choices and emptyability.

Table 14: Plastic packaging structures addressed in Phase 1 of CEFLEX

PACKAGING STRUCTURES
Mono-PE and mono-PP structures (should be a minimum of 90% PE or PP)
PE/PE and PP/PP laminate structures (should be a minimum of 90% PE or PP)
PE/PP (mixed PO) laminate structures (should be a minimum of 90% PO materials)
PE and PP structures with coatings and layers such as ethylene-vinyl alcohol copolymer (EVOH), polyvinyl alcohol (PVOH), acrylic, silicon oxide (SiOx) and aluminum oxide (AlOx)
PE and PP structures with laminated and printed metallization
Aluminium-based structures (where aluminium is the dominant material)
Paper-based structures (where paper is the dominant material)

Source: CEFLEX 2020c.

For each of these categories, the guide addresses the recyclability of specific design features as outlined in Table 15.

Table 15: Packaging components addressed by CEFLEX

PACKAGING COMPONENTS
Material composition—thresholds by resin
Barriers
Size and shape
Density
Adhesives
Pigments
Additives and fillers
Inks and lacquers (printing)
Labels
Additional features (zippers, spouts, closures, valves and taps)
Recycled content

Source: CEFLEX 2020c.

Each of these are assessed against industry best practices or testing and ranked as outlined in Table 16.

Table 16: Possible results from CEFLEX assessment of recyclability

ASSESSMENT RESULTS CATEGORY
Compatible with PE or PP mechanical recycling
Limited compatibility with PE or PP mechanical recycling
Not compatible with PE or PP mechanical recycling

Source: CEFLEX 2020c.

The Phase 2 release is identified as a next step but a date for that release is not specified. It will focus on polyolefin-based flexible packaging that is not widely sorted or recycled.

Table 17: CEFLEX assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in Europe (i.e., a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided.
Other strengths - Provides advice specific to issues and factors that can affect the recyclability of flexible packaging recycling. Other gaps or limitations - Advice limited to flexible packaging.		

2.5 Citeo and Adelphe

AT A GLANCE	
TITLE	TREE: Test de la Recyclabilité des Emballages
PUBLISHED BY	Citeo and Adelphe
DATE PUBLISHED	2021
TOOL TYPES	- Recyclability decision tree to diagnose the recyclability of packaging (TREE) <u>Other complementary tools</u> - Environmental impact assessment calculator (BEE) - Guides - Online training webinars
SOURCES	TREE: Test de la Recyclabilité des Emballages (Citeo and Adelphe n.d.a) <u>Other</u> BEE: Bilan Environnemental des Emballages (Citeo and Adelphe n.d.b) Comment mesurer les bénéfices environnementaux de vos actions d'éco-conception? (Citeo 2018) BEE Guide méthodologique (Version 4.1) (BEE, Citeo and Adelphe 2019) Recyclabilité des emballages en plastique: Innovations et pistes de travail issus des projets de R&D 2015–2018 (Citeo 2019)
OVERVIEW	
Target audiences	Producers of packaging
Target materials	Packaging
Target plastics	All
Geographic scope	France
Sector coverage	Unknown
Update frequency	No set schedule; BEE has been updated four times since 2011

Citeo is a not-for-profit company founded from the merger of Eco-Emballages and Ecofolio that works to reduce the environmental impact of packaging and paper in France (Eco-Emballages 2017). Adelphe is a subsidiary of Citeo that manages packaging recycling on behalf of wine, spirits and pharmaceutical drug companies (Citeo n.d.).

2.5.1 TREE: Test de la Recyclabilité des Emballages

TREE is an online decision tree that helps producers improve packaging recyclability, facilitate the development of sustainable recycling streams and reduce the cost of end-of-life waste management (Citeo and Adelphe n.d.a). The tool allows producers to diagnose the recyclability of their packaging and test alternative solutions. The output of the tool includes guidance for producers on design changes they could make to avoid financial penalties in France's regulated packaging recycling system. Producers are given a green dot (green smiley face) if the packaging

is fully recyclable and a red dot (red frowny face) if the packaging will result in penalties. The new version of TREE, released in 2021, is available to Citeo clients only.

Other complementary tools offered by Citeo include:

- BEE: A free online tool that can be used to calculate the environmental impact of packaging based on lifecycle assessment. The output of the tool is an action plan that producers can use to reduce specific environmental impacts identified through the assessment. The user has to establish a BEE account to access the tool; the account set-up function does not allow users with a North American URL to create an account. The methodological guide behind the tool is freely available.

Table 18: TREE assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in France (i.e., a different infrastructure context than Canada).
Clarity		TREE provides a clear link between the packaging attribute and its effect on recyclability.
Accessibility		The 2021 version of TREE is available to clients only. BEE is free but seem to be only fully accessible in Europe (i.e., a European address and IP login are needed in order to access them).
Level of technical detail		Includes significant data or testing protocols (i.e., includes Lifecycle Assessment (LCA) methodology).
Other strengths • Provides specific advice on components that could interfere with recycling. • TREE gives Citeo clients with access to information about recyclability of their packaging. • Covers the full range of packaging materials. Other gaps or limitations • Does not seem to be available in North America.		

2.6 Consumer Goods Forum

AT A GLANCE	
TITLE	The Golden Rules of Plastic Packaging Design
PUBLISHED BY	The Consumer Goods Forum
DATE PUBLISHED	2021
TOOL TYPES	Report
SOURCES	The Golden Rules of Plastic Packaging Design (Consumer Goods Forum 2021a) Other Plastic Waste Coalition of Action (Consumer Goods Forum 2021b) - The Consumer Goods Forum Packaging Design webpage, including podcasts, blogs, case studies, videos and other publications (Consumer Goods Forum 2021c) - The Consumer Goods Forum “Commitments & Achievements: Creating a Blueprint for Success” webpage (Consumer Goods Forum 2021d).
OVERVIEW	
Target audiences	Producers
Target materials	Plastic packaging
Target plastics	All
Geographic scope	North America
Sector coverage	Unknown
Update frequency	n/a

The Consumer Goods Forum aims to help the world’s consumer goods retailers and manufacturers come together to collaborate with other key stakeholders to find solutions to issues, secure consumer trust and drive changes that increase shared business value (Consumer Goods Forum 2021e).

The organization established a Coalition of Action on Plastic Waste (also called the Plastic Waste Coalition), which developed its Golden Design Rules for Optimal Plastic Design, Production and Recycling. The Plastic Waste Coalition includes members from 41 large global brands (Consumer Goods Forum 2021e).

2.6.1 The Golden Rules of Plastic Packaging Design

The Consumer Goods Forum has not published a design guide. Instead, it has provided general design advice through its release of the Golden Design Rules for Optimal Plastic Design, Production and Recycling. These rules provide design advice to increase the circularity of their members’ packaging portfolios. The design guides were informed by research and simulation modelling undertaken by SYSTEMIQ and McKinsey that compared collection and recycling rates, material flows and social and financial implications (Consumer Goods Forum 2021d).

The design rules were released in July 2021. These include (Consumer Good Forum 2021a):

- 1) Increasing the value of PET recycling by:
 - using transparent and uncoloured PET or transparent blue or green in all PET bottles
 - ensuring that material choice, adhesive choice, and size of sleeve or label are not problematic for recycling.
- 2) Removing problematic elements from packaging by ensuring:
 - no detectable carbon black
 - no PVC or PVDC
 - no EPS or PS
 - no PETG in rigid plastic packaging
 - no oxo-degradable plastic.
- 3) Eliminating excess headspace for all flexible pack types, such that the maximum headspace is 30% across the product categories outlined in the rule.
- 4) Reducing plastic overwraps by only using them when necessary.
- 5) Increasing the recycling value for PET thermoformed trays and other PET thermoformed packaging:
 - Regional design guidelines to fit existing recycling programs shall be met wherever possible
 - For packaging that is not accepted by existing recycling programs, and where there is a clear pathway for a future recycling system by 2025, the following requirements apply:
 - use transparent and uncoloured (preferred), or transparent blue or green PET
 - ensure that material choice, adhesive choice, inks and size of sleeve or label are not problematic for recycling
 - use only mono-material PET
 - use minimal or moderate direct printing
 - ensure that material choice and adhesive choice of lidding films, insets or other components are not problematic for recycling.
- 6) Increasing the recycling value in flexible consumer packaging made mostly from plastic
 - Regional design guidelines to fit with existing recycling programs shall be met wherever possible.
 - For packaging that is not accepted by existing recycling programs, and where there is a clear pathway to a future recycling system by 2025, the following requirements apply:
 - maximize polyolefin content:
 - preferable >90% mono PE or >90% mono PP
 - minimum >80% mono PE, >80% mono PP or >80% mixed polyolefin
 - density <1 g/cm³
 - each barrier layer should not exceed 5% of the total packaging structure weight
 - no PVC, PVDC, fibres, aluminum foil or PET.

- 7) Increasing the recycling value in rigid HDPE and PP packaging:
- For all labels, ensure that material choice, adhesive choice, inks and size are not problematic for recycling.
 - Use minimal or moderate direct printing.
 - For closures, ensure that material choice, liners and seals are not problematic for recycling.
 - Do not use fillers that increase the density of the packaging to $>1 \text{ g/cm}^3$.
- 8) Reducing virgin plastic use in business-to-business (B2B) plastic packaging in a way that is environmentally beneficial by:
- eliminating unnecessary plastic (defined as unnecessary if it can be removed without compromising supply chain or operational efficiencies)
 - using post-consumer recycled content (where plastic is necessary)
 - switching to reuse models or alternative materials.
- 9) Using on-pack recycling instructions by including recycling or reuse instructions on consumer plastic packaging.

For each of the problematic plastics, an explanation is provided as to why they are problematic. For example: “Oxo-degradable plastics contribute to microplastic pollution and are not suited for long-term reuse, recycling at scale or composting. Uses include shrink and stretch film, carrier bags, blister packs, bottles, labels and caps. This element of Golden Design Rule 2 applies to all oxo-degradable plastics as defined by CEN¹, the European Standards authority, unless use is required by law” (Consumer Goods Forum 2021a).

¹ CEN is the name of the European Committee for Standardization.

Table 19: Consumer Goods Forum assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts. Consultation and implementation are being led by Canada Plastics Pact.
Relevance		Designed for use in North America.
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free. More resources available on members-only platform (e.g., access to toolkits, guidelines, member-led webinars and working group information).
Level of technical detail		No data or testing protocols are provided.
Other strengths Provides easy-to-understand and simple rules for designers to follow.		

2.7 Cotrep: Comité Technique pour le Recyclage des Emballages Plastiques

AT A GLANCE	
TITLE	Recyclability of Plastic Packaging: Improved Recycling Through Eco-Design
PUBLISHED BY	Cotrep: Technical Committee for the Recycling of Plastic Packaging
DATE PUBLISHED	2022 (document)
TOOL TYPES	Design guide
SOURCES	Recyclability of Plastic Packaging: Improving Recycling Through Eco-Design (Cotrep 2022) Other Our Guidelines for Your Packaging (online version of the above guidelines) (Cotrep n.d.a) Fiche recyclabilité PE souple (example sheet for PE recyclability) (Cotrep 2016a) Recyclability of plastic pots and trays (Cotrep 2018) Recyclabilité des emballages en plastique (2015–2018) (Citeo 2019) Test Protocols (Cotrep 2010 and 2019) Technical studies (Cotrep 2014-2020)
OVERVIEW	
Target audiences	Designers, public
Target materials	Plastic packaging
Target plastics	HDPE, clear PET, colored and opaque PET, PP, PE and other
Geographic scope	France
Sector coverage	Unknown
Update frequency	Unknown (no update since 2022)

The Technical Committee for the Recycling of Plastic Packaging (Cotrep) was established by Citeo (representing brand owners and distributors), ELIPSO (representing manufacturers of plastic packaging), Valorplast (representing producers of virgin plastics and additives) and SRP (the National Union of Plastic Regenerators in France) to assist manufacturers develop recyclable plastic packaging solutions in France (Cotrep n.d.b).

2.7.1 *Recyclability of Plastic Packaging: Improving Recycling Through Eco-design*

The following is an outline of the report contents (Cotrep 2022):

Part 1: “Extension of sorting instructions in full swing” (p. 6) provides an overview of:

- France’s sorting bins for plastic bottles
- extension of sorting instructions
- steps to speed up plastic recycling
- new harmonized sorting info – compulsory label

Part 2: “Recycling rates set to rise” (p. 7) provides a detailed overview the current recycling rates in France, and explains how the extension of sorting instructions will prompt a rise in the recycling rate for plastic packaging.

Part 3: “Processes at sorting centers” (p. 8) outlines how different packaging items are separated and prepared for recycling.

Part 4: “Focus on 2 issues at sorting centers” (p.9) outlines difficulties with sorting small/low-capacity packaging items (e.g. pods, films etc.), and in detecting and sorting dark packaging (e.g. certain items containing carbon black).

Part 5: “Regeneration streams with different levels of maturity” (p.10) outlines the different regeneration streams such as:

- clear PET bottles (e.g. transparent/light blue transparent bottles)
- coloured and opaque PET bottles (e.g. coloured transparent and opaque bottles)
- rigid HDPE packaging (e.g. bottles, pots and trays and other rigid packaging)
- rigid PP packaging (e.g. bottles, pots and trays, and other rigid packaging)
- non-lidded clear PET rigid packaging (e.g. pots, trays and other non-lidded clear PET rigid packaging)
- PE films and flexible packaging (e.g. flexible packaging, films, nets and bags)

Streams under development include:

- lidded PET rigid packaging
- flexible PP packaging
- rigid PS packaging

No available streams:

- PVC packaging
- compostable packaging
- non-PET, PE, PP, or PS packaging

Part 6: “Regeneration processes” (p.12) outlines the regeneration process by which packaging sorted at sorting center is used to produce recycled materials ready to be reincorporated in new products. The table outlines the steps with descriptions and examples of practices to avoid.

Part 7: “Recycling, a second life” (p. 14) discusses the applications for certain recycled plastics (e.g. clear PET, coloured PET, Rigid PE, rigid PP, flexible PE) through mechanical recycling.

Part 8: “Chemical recycling” (p.16) outlines the process of chemical recycling.

Part 9: “Design principles for recyclable packaging” (p.17) outlines 3 principles that should be applied to ensure that packaging is recyclable throughout France. These include:

- The priority is to recycle the main packaging component, i.e. the bottles, tray body, pot body or film.
- Barriers, additives and fillers should not compromise sorting and recycling
- None of the associated components should disrupt recycling of the packaging body

Part 10: “Eco-design guidelines” (p.18) provides an overview of the guidelines which are split into 4 categories. Each packaging component is assessed in light of sorting and regeneration constraints for the various streams. The categories are:

- full compatibility – ideal
- tolerated compatibility
- limited compatibility – conditional
- non-compatible and or/disruptive

The last sections: “How to use the Cotrep guidelines” (p.19) outlines the steps in which assessments should be performed; “Get started” (p. 20) outlines where to find information on the technical committee for the recycling of plastic packaging, and the packaging recyclability test and “Further resources” (p. 21) provides sources to:

- learning about eco-design
- measuring and validating environmental benefits
- securing backing for your environmental process

Table 20: Cotrep assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Developed for use in France (i.e., a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		Limited technical detail provided.
Other strengths • Provides a thorough introduction as to why design is important for recyclability. • Provides an overview of the recycling and sorting system in France. Other gaps or limitations • Written specifically for the French system and what is acceptable within that system.		

2.8 Eco Design of Plastic Packaging Round Table

AT A GLANCE	
TITLE	Eco Design of Plastic Packaging Round Table Management Guidelines
PUBLISHED BY	Eco Design of Plastics Packaging Round Table (Eco Design)
DATE PUBLISHED	2019
TOOL TYPES	• Design guide • Checklists
SOURCES	Eco Design of Plastic Packaging Round Table Management Guidelines (Eco Design 2019) (These are the core guidelines.) Other • Instruction: Design for Optimised Resource Use (Eco Design n.d.a) • Instruction: Design for Sustainable Sourcing (Eco Design n.d.b) • Instruction: Design for Recycling (Eco Design n.d.c) • Instruction: Design for Environmentally Sound Use (Eco Design n.d.d) • Instruction: Environmental Targets for Eco Design Projects (Eco Design n.d.e) • Checklist: Design for Optimised Resource Use (Eco Design n.d.f) • Checklist: Design for Recycling (Eco Design n.d.g) • Checklist: Design for Environmentally Sound Use (Eco Design n.d.h) • Eco design of plastic packaging (main website) (Eco Design n.d.i)
OVERVIEW	
Target audiences	Packaging designers
Target materials	Packaging
Target plastics	All
Geographic scope	Europe
Sector coverage	• Provides advice to the packaging, food, consumer goods and retail industries. • Has five sponsors (BKV: Kunststoff Konzepte Verwertung, Plastics Europe, Borealis, Elipso and Valorplast).
Update frequency	Unknown

The Eco Design of Plastic Packaging Round Table is an “initiative of experts from businesses operating along the entire plastics packaging supply chain (packaging manufacturers, food and consumer goods sector, retailing) as well as scientific and consumer protection organisations” (Eco Design 2021).

2.8.1 Eco Design of Plastic Packaging Round Table Management Guidelines

The guidelines include four strategies (Eco Design 2019):

1. design for optimized resource use (reducing use of natural resources and carbon footprint)
2. design for sustainable sourcing
3. design for environmentally sound use (reducing littering; ability to be portioned, safely resealed and completely emptied to avoid product waste)

4. design for recycling (enabling high-quality recycling).

For each of these strategies there are series of downloadable English tools (instructions, checklists, and practical examples). The instruction tools provide:

- an overview of the issue (e.g., sustainable sourcing discusses the benefits of using bio-based polymers and recycled content to reduce carbon footprint and the use of non-renewable resources)
- identification of the approaches to implement the strategy (e.g., linking optimization to specific environmental goals such as demand for fresh water, negative effects on soil or biodiversity)
- a procedure (checklist or steps) to implement the strategy (the downloadable checklists support this exercise).

Table 21: Eco Design of Plastic Packaging Round Table assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Unclear. No data or testing methodology is provided to support the advice.
Relevance		Designed for use in Europe (i.e., for a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided.
Other strengths • Provides a detailed explanation of the strategies and how to implement them. • Discusses design to reduce littering. Other gaps or limitations • The reader's decision-making is guided by a series of questions that imply value-based judgements as opposed to science-based decisions, and the advice is general as opposed to specific (e.g., avoid small parts in order to prevent littering).		

2.9 Éco Entreprises Québec

AT A GLANCE	
TITLE	ÉEQ Materials Guide
PUBLISHED BY	Éco Entreprises Québec (ÉEQ)
DATE PUBLISHED	2018
TOOL TYPES	• Design advice
SOURCES	• ÉEQ Materials Guide (ÉEQ 2018)
OVERVIEW	
Target audiences	Québec packaging stewards
Target materials	Packaging
Target plastics	Any
Geographic scope	Québec
Sector coverage	• All Québec regulated packaging stewards • 3,400 companies and organizations
Update frequency	Unknown

Éco Entreprises Québec (ÉEQ) is a private non-profit organization that represents companies that place containers, packaging and printed paper into Québec's market and are obligated by law to finance municipal curbside recycling services (ÉEQ 2021).

2.9.1 ÉEQ Materials Guide

This document is not a detailed design guide. Its primary purpose is to help stewards classify their containers, packaging and printed matter to better report into Québec's regulated packaging and paper products recycling system. It also includes tips to encourage the eco-design of responsible packaging.

The materials guide identifies the four areas of activity for eco-design (ÉEQ 2018):

- procurement of sustainable materials including recycled content
- design
- end-of-life management
- communication.

For each of these areas of activity, the guide provides tips to improve eco-design. For example, using recycled content, ensuring the label and cap can be separated, and checking for spoonability, which is the ease with which a container can be emptied (ÉEQ 2018, p. 18).

Table 22: ÉEQ assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on ÉEQ data about their own system.
Relevance		Designed for use in Canada.
Clarity		Limited detail provided to explain the link between the packaging attribute and its effect on recyclability. The guide includes encouragement to consider, for example, the factors listed in Section 2.9.1), but does not provide specific details as to how these affect recyclability.
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided.
Other strengths - Gives simple, practical advice to increase recyclability in Québec's system. Other gaps or limitations - Does not provide advice on where to go for further investigation into improved packaging design. - Designed for use in Québec.		

2.10 European PET Bottle Platform

AT A GLANCE	
TITLE	Design for Recycling Guidelines
PUBLISHED BY	European PET Bottle Platform (EPBP)
DATE PUBLISHED	Not listed; states that it is continually updated
TOOL TYPES	Design guide
SOURCES	Design Guidelines (EPBP n.d.) Other EPBP website (users are referred here for updates, test procedures, test results) (EPBP 2021)
OVERVIEW	
Target audiences	PET bottle designers
Target materials	PET bottles
Target plastics	PET
Geographic scope	Europe
Sector coverage	Unknown
Update frequency	Unknown, but commitment made to continually update

The European PET Bottle Platform (EPBP) is a voluntary industry-led organization focusing on advancing the recycling of PET bottles. It was formed by the European Association of Plastics Recycling and Recovery Organisations, the European Plastics Recyclers, PET Containers Recycling Europe, the Union of European Beverages Association and the European Federation of Bottled Water (EPBP 2011). It provides guidelines that inform design for recycling, evaluates packaging solutions and recycling technologies, and works to facilitate an understanding of how new PET bottle innovations affect recycling processes.

2.10.1 Design Guidelines

The online design guide was developed to provide general guidance and recommendations on the design of the PET bottle body, label and cap.

The guidance is divided into three categories (EPBP n.d.):

- transparent clear or light blue PET bottles
- transparent coloured PET bottles
- opaque PET bottles.

For each of these categories, the guide addresses the recyclability of specific design features as outlined in Table 23.

Table 23: Packaging components addressed by EPBP

PACKAGING COMPONENTS
Size
Colour
Barriers and coatings
Additives
Closures and dispensers
Liners, seals and valves
Labels
Sleeves
Tamper evidence wrap
Adhesives
Inks
Direct printing
Other components

Source: EPBP n.d.

Each attribute is assessed as outlined in Table 24.

Table 24: Possible results from EPBP assessment of recyclability

ASSESSMENT	DEFINITION
Yes	Full compatibility: materials that passed the testing protocols with no negative impact, or materials that have not been tested (yet) but are known to be acceptable in PET recycling.
Conditional	Limited compatibility: materials that passed the testing protocols if certain conditions are met, or materials that have not been tested (yet) but pose a low risk of interfering with PET recycling.
No	Low compatibility: materials that failed the testing protocols, or materials that have not been tested (yet) but pose a high risk of interfering with PET recycling.

Source: EPBP n.d.

Most, but not all, of the components (e.g., PET labels and sleeves) and materials (e.g., foam) listed in the online table included additional embedded information and references that can be accessed by hovering over the words for more background information.

EPBP states that its information is based on the best available information at the time and calls upon all companies developing new resins, additives, technologies and novel processes for PET bottles to bring their bottles to the EPBP to get an objective third-party assessment of their recyclability. EPBP further states that, while the assessment is free, testing carried out by accredited laboratories is at the user's cost. The testing protocols are provided on their website.

Table 25: EPBP assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in Europe (i.e., in a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		Includes significant data or testing protocols.
Other strengths - Provides specific advice on components that could interfere with recycling, and includes the testing protocols that substantiate the assessment. Other gaps or limitations - Limited to PET bottles.		

2.11 Healthcare Plastics Recycling Council

AT A GLANCE	
TITLE	Design Guidelines for Optimal Hospital Plastics Recycling
PUBLISHED BY	Healthcare Plastics Recycling Council (HPRC)
DATE PUBLISHED	2016
TOOL TYPES	Design guide
SOURCES	Design Guidelines for Optimal Hospital Plastics Recycling (HPRC 2016) Other Helping Health Care Film Recycling (2014) (Mott et al. 2014) Environmental Impacts of Recycling Compared to Other Waste Disposal Methods (2015) (HPRC 2015) Design Guidance: Design Guidance: Best Practices for Recyclable Products and Packaging (HPRC 2020a)
OVERVIEW	
Target audiences	Manufacturers and users of disposal medical devices; waste haulers and recyclers
Target materials	Healthcare products and packaging
Target plastics	All
Geographic scope	North and South America, Europe, Asia-Pacific
Sector coverage	Unknown
Update frequency	Unknown

The Healthcare Plastics Recycling Council (HPRC) is a private technical consortium of industry peers across the healthcare, recycling and waste management industries seeking to improve the recyclability of plastic products and packaging within healthcare (HPRC 2020b).

2.11.1 Design Guidelines for Optimal Hospital Plastics Recycling

The guide was developed to identify design considerations that could enhance the recycling potential and value of waste healthcare products and packaging. HPRC states that the purpose of the guide is to make recycling easier and to help users reap financial benefits from recycling. The target audiences of the guide are product and packaging designers, hospital staff and waste haulers.

The recommendations provided in the guide were informed by the results of two pilot studies conducted at the Cleveland Clinic and the Stanford University Medical Center and expert interviews. HPRC encourages users of the guide to supplement the information provided by reviewing other sustainability guidelines, including advice from APR and the Sustainable Packaging Coalition's Design Guidelines for Sustainable Packaging (2006). The Sustainable Packaging Coalition has archived this guideline and now refers users to the How2Recycle recyclability assessment and labelling system (see Section 4.1.1).

HPRC's design recommendations include criteria for desirable and less design practices for healthcare plastics (see Table 26).

Table 26: HPRC's desirable and less desirable design practices

DESIRABLE PRACTICES	LESS DESIRABLE PRACTICES
designing with mono-material whenever possible	Using a rubber seal on a polypropylene bottle
Using polyolefin seals or gaskets on polypropylene bottles	Combining incompatible bioplastics and petroleum-based plastics into one product
Combining chemically compatible or jointly processable plastics, if multiple materials are required	Welding, gluing or molding two components of unlike plastics
Using materials that are easily separated during automated recycling processes, if multiple materials are required	Combining plastic film with paper in packaging
Using breathable plastics as an alternative to paper	Using metallized plastics, metal screws <u>or</u> grommets in plastic
- Minimizing paper labels and components - Using water-based adhesives	Using lead
Allowing for bottles and bags to be fully drained with ease before disposal	Using PVC
Providing information on contents that allows for easy identification of residual liquids	
Minimizing pigments	

Source: Healthcare Plastics Recycling Council 2016.

Table 27: HPRC assessment

ASSESSMENT	RATING	RATIONALE
Reliability		It is not clear whether the advice was reviewed by experts. The advice has not been updated since 2016 and refers to dated resources (e.g., Sustainable Packaging Coalition Design Guidelines (2006), which has been archived by the author).
Relevance		Designed for use in North America.
Clarity		Limited detail is provided to explain the link between the packaging attribute and its effect on recyclability (i.e., only general advice is provided).
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided.
Other strengths - Advice is based on findings from pilot studies and interviews with experts. Other gaps or limitations - While APR is referred to in the publication, it is not clear whether APR was consulted on or reviewed the guide (see Section 2.1). - The guide has not been updated since 2016.		

2.12 Petcore Europe

AT A GLANCE	
TITLE	Design for Recycling Guidance: PET Trays Clear Transparent
PUBLISHED BY	Petcore Europe
DATE PUBLISHED	2020
TOOL TYPES	Design guide
SOURCES	• Design for Recycling Guidance for PET Thermoformed Trays (Petcore Europe 2020a) Other • Recyclability Evaluation Portal for PET Trays (Petcore Europe 2020b) • Adhesives / Labels Wash-off Testing Protocol (Petcore Europe 2017) Coming soon • Design for Recycling: Coloured trays • Design for Recycling: Multi-layer trays
OVERVIEW	
Target audiences	Designers
Target materials	PET thermoform trays (clear, transparent)
Target plastics	PET
Geographic scope	Europe
Sector coverage	Number of members is not listed, PET stakeholders
Update frequency	Unknown, but commitment to keep current

Petcore Europe (formerly Petcore – PET Container Recycling) is an association that represents the complete PET value chain in Europe. Its board and membership represent European industry associations and individual companies involved in the PET value chain. Key industry associations involved include:

- Committee of PET Manufactures in Europe (PET manufacturers)
- European Plastics Converters, Forum PET Europe and EuPET (packaging manufacturers, which are also called packaging converters)
- Plastics Recyclers Europe (the recyclers) (Petcore Europe 2019 and 2021).

2.12.1 Design for Recycling Guidance for PET Thermoformed Trays

The guide addresses the recyclability of specific design features or components of PET thermoform trays as outlined in Table 28.

Table 28: Packaging components addressed by Petcore Europe

PACKAGING COMPONENTS
Size
Colour
Barrier
Unprinted lidding films—closure systems (with glue not harming the recycling process)
Printed lidding films—closure systems (with glue not harming the recycling process)
Labels (with adhesive not harming the recycling process)
Labels with adhesive
Adhesives on parts different than lidding films and labels
Inks
Direct printing
Other

Source: Petcore Europe 2020a.

Each of these is assessed against industry-accepted recycling criteria to ensure that a package is truly recyclable and ranked as outlined in Table 29.

Table 29: Possible results from Petcore Europe assessment of recyclability

ASSESSMENT	DEFINITION
Yes	Full compatibility: materials that passed the testing protocols with no negative impact or materials that have not been tested (yet) but are known to be acceptable in PET recycling.
Conditional	Limited compatibility: materials that passed the testing protocols if certain conditions are met or materials that have not been tested (yet) but pose a low risk of interfering with PET recycling.
No	Low compatibility: materials that failed the testing protocols or materials that have not been tested (yet) but pose a high risk of interfering with PET recycling.

Source : Petcore Europe 2020a.

Table 30: Petcore Europe assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in Europe (i.e., in a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		Includes significant data or testing protocols.
Other strengths - The guide has been adopted by RecyClass (see Section 2.13) for a harmonized approach across Europe. Other gaps or limitations - The one-page guide is sparse and there is little information if the user has further questions.		

2.13 RecyClass

AT A GLANCE	
TITLE	Design for Recycling Guidelines
PUBLISHED BY	RecyClass
DATE PUBLISHED	Each sub-material has its own published date. They range from 2017-2021.
TOOL TYPES	Design guide—online, including testing protocols and methodologies
SOURCES	Design for Recycling Guidelines: a range of guidance documents on numerous sub-topics (RecyClass 2017–2024) Other RecyClass website (RecyClass n.d.c) RecyClass Recyclability Methodology (RecyClass 2020a – last update February 2024) Recyclability Evaluation Protocols for PE, HDPE, PP containers and PP films; see RecyClass 2022a, b, c and d RecyClass Online Tool (RecyClass n.d.a)
OVERVIEW	
Target audiences	Designers
Target materials	Plastic packaging
Target plastics	All
Geographic scope	Europe
Sector coverage	46 members, raw material producers, labels manufacturers, converters, and brand owners
Update frequency	Unknown, but some guidance has been updated as recently as 2021

RecyClass is a Europe-wide initiative, operated by Plastics Recyclers Europe, that works to connect industry actors along the value chain (e.g., brands, retailers, converters, raw material producers and recyclers) in an effort to advance plastics recyclability and establish a harmonized approach towards the use of recycled material across Europe (RecyClass n.d.c).

RecyClass offers design guidance in a number of ways:

- an online screening tool
- design guidelines for specific material types
- recyclability evaluation protocols
- recyclability certification.

To support its certification program, RecyClass has established several accredited certification bodies across Europe. In 2021, RecyClass expanded to the UK by establishing RECOUP (see Section 2.14) as an accredited certification body for RecyClass UK.

2.13.1 Design for Recycling Guidelines

The guidance provided in this document was developed by various bodies and then adopted by RecyClass as follows:

- European PET Bottle Platform (EPBT) developed the PET bottles guidance.
- Petcore Europe developed the PET Thermoform Trays guidance.
- RecyClass developed all other guidance.

The guidelines are provided on an online platform. It is divided first by material type and subtype as shown in Table 31.

Table 31: Plastic resins and materials subtypes addressed by RecyClass

MATERIAL TYPE	MATERIAL SUBTYPES
PET	• Clear PET bottles • Coloured PET bottles • Clear thermoforming trays
PE	• Natural PE-HD containers and tubes • Coloured PE-HD containers and tubes • Natural PE flexible films • Coloured PE flexible films
PP	• Natural PP containers and tubes • Coloured PP containers and tubes • Natural PP flexible films • Coloured PP flexible films
Pots, tubs and trays (PTTs)	• PP and PE pots, tubs and trays
Crates and pallets	• PE-HD and PP crates and pallets

Source: RecyClass 2017–2021.

The guide addresses the recyclability of specific design features or components of plastic packaging as outlined in Table 32.

Table 32: Packaging components addressed by RecyClass

PACKAGING COMPONENTS
Container resin
Material composition (percent of resin)
Colour
Size
Product residues—"easy to empty" index (PET, PE and PP only)
Barrier
Additives
Closure systems
Liners, seals and valves
Labels
Sleeves
Adhesives
Inks
Direct printing
Other components
Recycled content

Source: RecyClass 2017–2021.

Each of the features or components is assessed against industry-accepted recycling criteria to ensure that a package is truly recyclable. Two types of assessments are available:

- The design for recyclability assessment is an online self-assessment tool that “provides an analysis of the technical recyclability of a plastic packaging according to the state-of-the-art recycling technology in Europe. The evaluation results in a class ranking from ‘A’ to ‘F.’ The Audit Report output from the assessment provides specific indications and recommendations on how to improve the design of the package to make it compatible with recycling” (RecyClass 2020a).
- The recyclability rate assessment “provides a quantitative evaluation of recyclability. The rate is calculated as a ratio between the weight of the recyclable plastic extracted from the package and the total weight of the package, according to the formula described in Annex I. The rate is determined as a percentage. Design aspects of the packaging that will result in material losses in the sorting and recycling processes, or that will result in a downgrading of the recycled plastic quality, will impact the rate” (RecyClass 2020a).

The output of the design for design for recyclability assessment is outlined in Table 33.

Table 33: Possible results from RecyClass assessment of recyclability

ASSESSMENT	DEFINITION
Yes: full compatibility	Materials that passed the testing protocols with no negative impact OR materials that have not been tested (yet) but are known to be acceptable in PE-HD or PP recycling.
Conditional: limited compatibility	Materials that passed the testing protocols if certain conditions are met OR materials that have not been tested (yet) but pose a low risk of interfering with PE-HD or PP recycling.
No: low compatibility	Materials that failed the testing protocols OR materials that have not been tested (yet) but pose a high risk of interfering with PE-HD or PP recycling.

Source: RecyClass 2017–2021.

Each of these assessments (yes, conditional, no) is further assigned a class ranking (except for crates and pallets) as shown in Table 34. Class B can be reported as full or limited compatibility due to nuances in design and how the item behaves in a recycling system (see the design guide for more details).

Table 34: Possible RecyClass rankings of recyclability

ASSESSMENT	RANK	DEFINITION	COLOUR CODE
Yes: full compatibility	A or B	- Class A: The packaging does not pose any recyclability issues and the recycled plastics can potentially feed a closed-loop scheme to be used in the same quality application. - Class B: The packaging has some minor recyclability issues that slightly affect the quality of the recycled plastic generated. However, the majority of recycled plastics from this packaging can still potentially feed a closed loop.	Green
Conditional: limited compatibility	B or C	- Class B: The packaging has some minor recyclability issues that slightly affect the quality of the recycled plastic generated. However, the majority of recycled plastics from this packaging can still potentially feed a closed loop. - Class C: The packaging presents some recyclability issues that affect the quality of the recycled plastics or lead to material losses during recycling. In the first case the recycled plastic could be used in a cascade open-loop scheme, whereas in the latter case the plastic could potentially feed a closed-loop scheme.	Yellow
No: low compatibility	D, E or F	- Class D: The packaging has significant design issues that highly affect its recyclability or imply large material losses. In both cases the recycled plastic can only be fed into low-value applications (i.e., the packaging will be downcycled). - Class E: The packaging has major design issues that jeopardize its recyclability or imply severe material	Red

ASSESSMENT	RANK	DEFINITION	COLOUR CODE
		losses. The packaging is not considered recyclable and can only be used in incineration with energy recovery. Class F: The package is not recyclable at all, because of either fundamental design issues or a lack of specific infrastructure for collection, sorting and recycling in European Union (EU) 28+2.	

Source: RecyClass 2020a.

2.13.2 Certifications Available

Companies can seek certification through RecyClass as follows:

- Design-for-Recycling Certification: This considers the sorting and recycling infrastructure available in Europe.
- Recyclability Rate Certification: This considers collection schemes as well as sorting and recycling infrastructure in the audited area.
- Recycled Content Traceability Certification: This verifies recycled content.

Table 35: RecyClass assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in Europe (i.e., in a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free. Certifications and quantitative assessments are at a cost.
Level of technical detail		Includes significant data or testing protocols.
Other strengths • Provides specific advice on components that could interfere with recycling, including the testing protocols that substantiate the assessment. • The guidance is harmonized with other recognized organizations (e.g., the European PET Bottle Platform). • Certifications are available. Other gaps or limitations • n/a		

2.14 RECOUP

AT A GLANCE	
TITLE	Recyclability by Design
PUBLISHED BY	RECOUP
DATE PUBLISHED	2020
TOOL TYPES	• Design guide • Case studies • Reports
SOURCES	• Recyclability by Design (RECOUP 2023a) <u>Other</u> • Recyclability by Design Summary (British Plastics Federation and RECOUP 2019) • RecyClass Pack Certification (RECOUP n.d.) • UK Household Plastic Packaging Collection Survey 2022 (RECOUP 2022a) • Rigid plastic packaging – Design tips for recycling (RECOUP 2020a) • UK Plastic Packaging Sorting & Reprocessing Infrastructure (RECOUP 2022b) • Recycling of Coloured PET (RECOUP 2020b) • Recyclability by Design: Beauty & Personal Care Case Studies 2020 (RECOUP 2020c) • UK Household Plastic Packaging Collection Survey 2023: Data Summary (RECOUP 2023b) • Recyclability by Design: On-the-Go Case Studies (RECOUP 2021a) • Recyclability by Design: DIY Case Studies 2021 (RECOUP 2021c) • Recyclability by Design: UK Consumer Health Care Case Studies 2021 (RECOUP 2021d) • Recycled Content Verification Systems (RECOUP 2022c) • Deposit Return Schemes (RECOUP 2018)
OVERVIEW	
Target audiences	Designers, specifiers, users of plastic packaging
Target materials	Plastic products (e.g., gardening and personal care) and packaging
Target plastics	All
Geographic scope	United Kingdom
Sector coverage	197 members, entire plastics value chain
Update frequency	Annually or as needed

RECOUP is a registered charity focussed on improving UK plastics recycling. There are four pillars to their work: citizen and stakeholder engagement; education; packaging technology and design overview; and policy and infrastructure (RECOUP 2021b).

RECOUP conducts research, responds to plastic packaging material and design questions, tests materials for sortability at UK materials recycling facilities (MRF practical pack tests) and offers an online certification program for plastic packaging recyclability in the UK called RecyClass Pack Certification or RecyClass UK. RECOUP is the accredited certification body in the UK for RecyClass' Recyclability Product Certification, which has been branded RecyClass UK.

2.14.1 Recyclability by Design

The guide includes the following sections (RECOUP 2023a):

- introduction (e.g., background to document and scope, EU legislation, the waste hierarchy, importance of recycling)
- where to find more information
- sector specific guidelines and case studies
- general guidelines (e.g., residues; composite materials and barrier layers; colour; closures, closure liners, caps, sleeves and seals; labels, safety seals and adhesives; pigments and inks; other components; material identification; other components; material identification, markets for recycled plastics; and integration of environmental and legal aspects into the packaging design process)
- material-specific guidelines: PET
- coloured PET fact sheet
- material-specific guidelines: HDPE
- material-specific guidelines: PP
- the recyclability of post-consumer PP fact sheet
- material-specific guidelines: PS
- guidelines for other plastic packaging
- film recycling
- film fact sheet
- compostables summary
- what is the problem with oxo-degradables
- recycling of plastic packaging
- sorting technology is key to meeting demand for high quality PCR
- end products
- case studies
- legislation and targets

For material-specific guidelines, each section begins with a general explanation and issues of concern specific to the polymer (e.g., PET). These address the recyclability of specific design features or components of the package as outlined in Table 36.

Table 36: Packaging components addressed by RECOUP

PLASTIC PACKAGING COMPONENTS ADDRESSED
BODY
Colour
Barriers and coatings
Additives
CLOSURE
Caps
Seals
Lidding film
DECORATION
Direct printing on pack
Labels
DECORATION
Sleeves
Adhesive
Ink
Other elements (e.g., trigger sprays, inserts)

Source: RECOUP 2023a.

Each of these is assessed against industry-accepted recycling criteria to ensure that a package is truly recyclable and ranked as outlined in Table 37.

Table 37: Possible results from RECOUP assessment of recyclability

ASSESSMENT	DEFINITION
Compatible	Compatible for recycling for most applications
May be suitable	May be suitable for recycling for some applications
Not suitable	Not suitable for recycling

Source: RECOUP 2023a.

Each section provides an overview of recent trends. The guide includes an overview of various hot topics (e.g., why oxo-degradable plastics are an issue, alternatives to PVDC for use by the fresh meat industry, an overview of plastic packaging [including label removal and washing, separation by floatation and drying], de-labellers to manage sleeves and end product case studies). There are also appendices, including one that identifies polymer densities and how they behave in water (i.e., what floats, what is variable and what sinks).

2.14.2 Recyclability by Design Summary by British Plastics Federation and RECOUP

The British Plastics Federation is a plastics trade association. It has more than 450 member companies that represent over 80% of the UK plastics industry and span the entire plastics supply chain, including plastics recyclers, polymer suppliers and distributors, additive suppliers, service providers, plastics processors, packaging manufacturers, equipment suppliers and more.

This guide provides a summary of Recyclability by Design (RECOUP 2023a). The summary provides detailed guidance for a variety of polymers (PET, HDPE, PP, PS), with tables summarising best practice for the main component of the packaging, as well as other components such as lids and labels. a snapshot of design considerations for PET, HDPE, PP and PS. The

assessment for each is identical to the RECOUP Design Guide and, as a result, has not been outlined here (see Table 38). The guide concludes with an overview and graphic of the density ranges of plastics commonly used to make plastic packaging.

2.14.3 RecyClassUK: RecyClass Recyclability Certification

As of 2021, RECOUP is the accredited United Kingdom (UK) provider of the RecyClass Recyclability Certifications for rigid plastic packaging, including Design for Recycling Assessment and Recyclability Rate Assessment (see Section 2.13) (RECOUP n.d. and RecyClass n.d.b). In the UK, this certification system is referred to as RecyClassUK (RECOUP 2023b).

RECOUP's certification system includes two types of review:

1. RecyClass online assessment, which assesses and rates packaging as follows:
 - Class A: The package does not pose any recyclability issues and it has the potential to feed a closed-loop system for use in the same application.
 - Class B: The package has some minor recyclability issues and has the potential to feed a closed-loop system.
 - Class C: The package has some recyclability issues that affect the quality of its final recycle.
 - Class D: The package has some significant design issues that highly affect its recyclability.
 - Class E: The package has major design issues that put its recyclability in jeopardy.
 - Class F: The package is not recyclable either because of fundamental design issues or because there is a lack of the type of packaging in the EU waste stream (which hinders its collection) (RECOUP n.d.).
2. MRF testing, which includes:
 - confirmation of the recyclability result obtained with the RecyClass online tool
 - a report and approved certificate confirming the classification.

Table 38: RECOUP assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in the UK (i.e., in a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free. More resources available on members-only platform (e.g., networking opportunities, projects, research, industry information and news).
Level of technical detail		Includes significant data or testing protocols.
Other strengths - Provides specific advice on components that could interfere with recycling, including the testing protocols that substantiate the assessment (RecyClassUK). - Provides case studies and information on hot topics and trends to assist the user's understanding. - Discusses the impact of RFIDs on recyclability. Other gaps or limitations - Encourages the use of old-form ASTM International codes (with the Mobius loop) in the materials identification section. - RECOUP is clear that this advice applies to the UK only.		

2.15 Walmart

AT A GLANCE	
TITLE	Walmart Recycling Playbook and Walmart Sustainability Playbook
PUBLISHED BY	Walmart
DATE PUBLISHED	2019
TOOL TYPES	Design guide, including decision tree
SOURCES	Walmart Recycling Playbook (Walmart 2022 – last updated 2024) Other Walmart Sustainable Packaging Playbook (Walmart n.d.)
OVERVIEW	
Target audiences	Suppliers of packaged products and packaging to Walmart
Target materials	Packaging
Target plastics	All
Geographic scope	North America
Sector coverage	Suppliers to Walmart
Update frequency	Unknown

Walmart Inc. is an American multi-national retail corporation that operates a chain of stores in the United States, Canada and internationally. Walmart operates approximately 10,500 stores and clubs under 48 banners in 24 countries as well as e-commerce websites (Walmart 2021a).

2.15.1 Walmart Recycling Playbook

The Recycling Playbook helps producers to better understand how to design their packaging to be more recyclable, including by:

- optimizing the recyclability of existing packaging by removing problematic components (e.g., colour or labels)
- identifying packaging that is not recyclable and encouraging a change to different packaging formats
- investing and engaging in the development of diversion options for packaging that could be recyclable if system barriers were removed (i.e., new recycling solutions, reuse, take-back and composting).

An overview of the advice provided to designers is outlined in Table 39.

Table 39: Possible results from Walmart assessment of recyclability

ASSESSMENT	DEFINITION	COLOUR CODE
Optimize	Recyclable packages: Small issues can be detrimental or make a package not compatible with recycling (e.g., colour or labels). Use the playbook to help design out elements not recyclable and detrimental to recycling.	Green
Change	Packages that are not recyclable: These may contaminate high-value recycling streams or have feasible replacements. Switch to a recyclable package; see playbook for ideas.	Red
Advance	Packages that are not recyclable: Barriers in recycling at this time. Invest and engage in the development of recycling, reuse, take-back, or composting solution.	Yellow

Source: Walmart 2022.

Each type of package (e.g., bag, film or pouch) is listed under one of the three colours. Options identified to improve recyclability include changing container format; testing for recyclability through APR testing protocols (see Section 2.1); avoiding specific resin colours, additives, attachments and glues; swapping out labels and testing full body sleeves; or swapping materials. A decision tree format is used to help suppliers better understand the steps of making decisions to optimize, change or advance solutions.

2.15.2 Walmart Sustainability Playbook

While not a recyclability guide per se, the Sustainability Playbook is a complementary guide to the Recycling Playbook. It identifies three pillars to sustainable design: sourcing materials (recycled content, sustainable sources), optimizing design (reducing materials while protecting the product) and supporting recycling (by design for recycling). The guide provides best practices and tips for achieving better design and provides a real-life example for each tip. It also points to sources of information that the reader can access to learn more (e.g., Consumer Goods Forum, Federal Trade Commission (FTC) Green Guides, Material IQ, Association of Plastic Recyclers).

Walmart encourages the use of the How2Recycle label (see Section 4.1.1).

Table 40: Walmart assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Drafted for use in North America.
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided.
Other strengths • Refers to the APR Design® Guide for Plastics and provides specific advice on different types of common packaging. • Encourages suppliers to look for the How2Recycle guidance. • Was reviewed by APR and the Sustainable Packaging Coalition. Other gaps or limitations • Guides do not provide technical detail, such as the costs of testing, or how to determine if a material is collected at scale (e.g., household survey).		

2.16 WRAP

AT A GLANCE	
TITLE	1. Rigid Plastic Packaging: Design tips for recycling 2. Defining what's recyclable and best-in-class polymer choice for packaging
PUBLISHED BY	WRAP
DATE PUBLISHED	• Rigid Plastic Packaging: Design tips for recycling (2018) • Defining what's recyclable and best-in-class polymer choices for packaging (2019)
TOOL TYPES	• Design guide • Reports
SOURCES	• Rigid Plastic Packaging: Design tips for recycling (WRAP 2018a) • Defining what's recyclable and best-in-class polymer choices for packaging (WRAP 2019a) <u>Other</u> • Phase 1: Development of NIR detectable black plastic packaging (WRAP 2011) • Phase 2: Masking strength of NIR detectable black colourants (WRAP 2013a) • Phase 3: End markets for recycled detectable black PET plastics (WRAP 2013b) • Technical Bulletin for Operators at Plastic Sorting Facilities: Sorting detectable black trays (Mitchell and Kosior n.d.) • In-market trial to prove closed-loop process for black CPET trays (WRAP 2016) • Roadmap 2025: Creating a circular economy for flexible plastic packaging (WRAP 2018b) • Eliminating problem plastics (report) (WRAP 2019b) • Eliminating problem plastics (video) (WRAP 2019c) • Understanding plastic packaging and the language we use to describe it (WRAP 2020)
OVERVIEW	
Target audiences	UK suppliers, packaging sector
Target materials	Packaging
Target plastics	• Rigid plastic packaging (e.g., bottles and pots, tubs and trays) • Guidance for film and flexible plastic packaging to be added
Geographic scope	United Kingdom
Sector coverage	Works across the value chain in the UK
Update frequency	Unknown, commitment to update as information becomes available

WRAP is a United Kingdom charity that promotes and encourages sustainable resource use through product design, waste minimization, and the re-use, recycling and reprocessing of waste materials. It works across six continents with governments, businesses and citizens (WRAP 2021).

Two WRAP design guides summarize the technical advice of RECOUP B and aim to translate the information into a digestible format for the layperson.

2.16.1 Rigid Plastic Packaging: Design Tips for Recycling

The first half of the guide highlights rigid plastic packaging designs to avoid: i.e., black plastic; aluminum closures on plastic; compostable, biodegradable and oxy-degradable plastics; sleeves with more than 60% surface coverage; multi-layer laminates and PE sealing layers; non-removable lids; PVC sleeves and components; and silicone valves with PET bottles (WRAP 2020). For each of the designs to avoid, the guide provides an explanation as to why the design is a problem and it also sets out alternatives. The guide provides high-level information.

The latter half of the guide provides material guidelines that outline specific material attributes that render specific rigid plastics not recyclable. The material guidelines cover PET bottles; PET pots, tubs and trays; HDPE bottles; and PP Bottles, pots, tubs and trays (WRAP 2020). The guide addresses the recyclability of specific design features or components of plastic packaging outlined in Table 41.

Table 41: Packaging components addressed by WRAP

PACKAGING COMPONENTS
BODY
Colour
Barrier and coatings
CLOSURE
Caps
Seals
DECORATION
Direct printing on pack
Labels
Sleeves

Source: WRAP 2020.

Each of these attributes are then assessed as either not suitable for plastics recycling or preferred alternatives for plastics recycling (e.g., carbon black is not suitable for recycling).

2.16.2 Defining What's Recyclable and Best-in-Class Polymer Choices for Packaging

The first half of the guide explains the concept of recyclability and refers to the Ellen MacArthur Foundation definition of “recyclable.”² It also explains that since “plastic packaging is predominantly sorted using near-infrared (NIR) technology in the UK, ‘sortable’ is defined as plastic packaging that can be detected by NIR” (WRAP 2019a). The guide then lists (in a table) which plastic polymers are currently recyclable by colour in the UK: e.g., clear or natural, NIR-detectable colour and non-NIR-detectable colour. For PET it distinguishes between aPET/rPET and cPET (WRAP 2019a). The acronym aPET stands for “amorphous PET,” which is the most common type of PET. The acronym cPET stands for “crystallized PET,” which is common for microwave food trays. The cPET is listed as only recyclable with NIR-detectable colour.

² “A packaging or a packaging component is recyclable if post-consumer collection, sorting, and recycling is proven to work in practise and at scale... A package can be considered recyclable if its main packaging components, together representing more than 95% of the entire packaging weight, are recyclable according to the above definition, and if the remaining minor components are compatible with the recycling process and do not hinder the recyclability of the main components.” (WRAP 2019a).

The second half of the guide provides specific best practice guidance on polymers for various types of rigid plastics, e.g., milk bottles; bottles (food and drink); bottles (non-food and drink); pots, tubs, and trays (food and drink); and pots, tubs and trays (non-food and drink) (WRAP 2019). The following is an example of the advice for food or drink pots, tubs and trays (PTTs):

- best-in-class material choice for the tray, pot, tub or lid (i.e., rPET, PET and PP [and rPP when available], cPET [typically used for ready meals] and lid same as pot or tub)
- best-in-class colour choice for the tray, pot, tub or lid (i.e., clear PET; it is not possible for cPET to be clear, but natural ranges are available)
- best-in-class material choice for the label (i.e., HDPE or PP label covering less than 40% of the pot or tub or if a full-body label is necessary use the same polymer as the pot or tub) (WRAP 2019a).

WRAP states that its guidance is aligned with the OPRL: On-Pack Recycling Label (see Section 4.1 Labelling Systems).

Table 42: WRAP assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in United Kingdom (i.e., for a different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided.
Other strengths • Guides are designed as an introduction for the layperson. • Guides refer readers who want to learn more to the experts (e.g., RECOUP, CEFLEX). Other gaps or limitations • No technical details are provided to support the advice.		

3 RECYCLABILITY REPORTS

This section provides a summary of additional reports that are not recyclability guidelines but that do provide or summarize recent research on recyclability.

3.1 CSA Group

AT A GLANCE	
TITLE	A Roadmap to Support the Circularity and Recycling of Plastics in Canada – Technical Standards, Regulations and Research
PUBLISHED BY	CSA Group
DATE PUBLISHED	2020
TOOL TYPES	• Report
SOURCES	• A Roadmap to Support the Circularity and Recycling of Plastics in Canada – Technical Standards, Regulations and Research (CSA Group and Tetra Tech Canada Inc. 2020)
OVERVIEW	
Target audiences	Any
Target materials	Any
Target plastics	All
Geographic scope	Canada
Sector coverage	Not applicable (not a member-based organization)
Update frequency	n/a (first publication)

CSA Group describes itself as a global leader in standards development, testing, inspection and certification, including in Canada, the United States, Europe and Asia (CSA Group 2021).

3.1.1 *A Roadmap to Support the Circularity and Recycling of Plastics in Canada*

This report is not a recyclability guideline but does provide information on design for recyclability. It provides an overview and advice on plastics recycling and recyclability in Canada, including opportunities and gaps. The report:

- provides an overview of the plastics recycling system and the current flow of plastics in that system
- identifies key actors in the plastics recycling system
- discusses key issues with recycled resin, including resin quality
- discusses key issues with designing products for recyclability
- provides an overview of existing standards and labelling systems (e.g., How2Recycle, Triman Logo, On-Pack Recycling Label).

Table 43: CSA Group assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in Canada.
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided.
Other strengths - Provides a good overview of issues relating to plastics recyclability. Other gaps or limitations - It is not intended as a recycling guideline. It identifies the need for a recycling guideline.		

3.2 Mepex Consult

AT A GLANCE	
TITLE	Basic Facts Report on Design for Plastic Packaging Recyclability (Version 2)
PUBLISHED BY	Grønt Punkt Norge
DATE PUBLISHED	2017
TOOL TYPES	• Report
SOURCES	• Basic Facts Report on Design for Plastic Packaging Recyclability (Version 2) (Mepex Consult AS 2017)
OVERVIEW	
Target audiences	Policymakers, designers, producer responsibility organizations
Target materials	Packaging
Target plastics	All
Geographic scope	Europe: Norway and Sweden specifically
Sector coverage	Not applicable, not a member-based organization
Update frequency	n/a (first publication)

Mepex Consult is a Norwegian consulting company specializing in waste management and recycling (Mepex Consult n.d.).

3.2.1 *Basic Facts Report on Design for Plastic Packaging Recyclability*

This report is not a recyclability guideline but does provide information on design for recyclability. It was developed and reviewed by industry experts for the two major producer responsibility organizations (PROs) in Norway and Sweden, Grønt Punkt Norge and FTI AB, and it includes a literature review of factors that affect the recyclability of plastics.

Section 4 of the Mepex report provides general guidelines for specific attributes that affect plastic recycling including additives, barrier materials, colours, carbon black, aluminum, paper, PVC, adhesives, inks and printing, sleeves and labels, residues, and bio-based, oxo-degradable and biodegradable plastic. For each section, there is a summary that provides an overview of the attribute and an explanation for why the attribute is (or can be) an issue. For some attributes the report also provides a table that lists what is acceptable, conditionally acceptable or not acceptable. For example, for the inks and printing attribute: laser-marked HDPE is a yes, minimal printing is a yes, and any other direct printing is a no (Mepex Consult AS 2017).

Table 44: Mepex Consult assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Advice is based on data and methods vetted by experts.
Relevance		Designed for use in Europe (i.e., for different infrastructure context than Canada).
Clarity		Clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		Includes significant data or testing protocols.
Other strengths - Provides a deeper explanation than most guides as to why specific attributes are acceptable or not acceptable. Other gaps or limitations - The language is highly academic and lacks clarity.		

3.3 Pet Sustainability Coalition

AT A GLANCE	
TITLE	Sustainable Packaging Toolkit
PUBLISHED BY	Pet Sustainability Coalition
DATE PUBLISHED	2019
TOOL TYPES	• Checklist (aimed at packaging suppliers) • Reports • Lifecycle assessment tool
SOURCES	• Packaging supplier checklist (Pet Sustainability Coalition 2019a) <u>Other</u> • Eco-Impact Packaging Lifecycle Assessment (New): Compass (Comparative Packaging Assessment) (Pet Sustainability Coalition n.d.a) • PSC Accelerator (Pet Sustainability Coalition n.d.b) • Examination of Alternatives to Multilaminate Pouches (Pet Sustainability Coalition 2019b) • Lifecycle Assessment of Packaging Alternatives (Pet Sustainability Coalition 2020)
OVERVIEW	
Target audiences	Pet food manufacturers / pet sustainability coalition members
Target materials	Pet food packaging
Target plastics	All
Geographic scope	North America
Sector coverage	Over 200 members, pet (i.e., animal) industry
Update frequency	Unknown (all tools published in 2019)

The Pet Sustainability Coalition is a non-profit, North American coalition that shares tools and resources to encourage the adoption of sustainable business practices in the pet industry (Pet Sustainability Coalition n.d.c).

3.3.1 The Packaging Supplier Checklist

This checklist is advertised as a quick way for manufacturers to assess and compare the packaging sustainability options offered by different suppliers. Packaging that meets the requirements of the checklist includes packaging that (Pet Sustainability Coalition 2019a):

- is beneficial, safe and healthy for individuals and communities throughout its lifecycle
- meets market criteria for performance
- is sourced, manufactured, transported and recycled using renewable energy
- optimizes the use of renewable or recycled source materials
- is manufactured using clean production technologies and best practices
- is made from materials that are healthy throughout their lifecycle
- is physically designed to optimize materials and energy
- is effectively recovered and utilized in biological or industrial closed-loop cycles.

The checklist asks the supplier to confirm its sustainability goals, whether it holds any certifications or labels (i.e., ISO, LEED, WELL, BRC Global Standard, Global Food Safety Initiative, How2Recycle, How2Compost), the packaging offerings (including whether it contains recycled content, is made from bioplastic, contains specific materials of concern (e.g., lead), and whether there it has conducted an LCA on its packaging.

3.3.2 Other Tools

- A report that offers insight into the challenges of multi-laminate packaging and also the relative environmental impacts of reusable or refillable, recycle-ready, petroleum-based, biobased and compostable packaging.
- A lifecycle assessment tool called COMPASS (see Section 4.2.3) that helps manufacturers compare the environmental impact based on the fossil fuel use, greenhouse gas emissions and water use of different packaging options (SPC n.d.a).

Table 45: Pet Sustainability Coalition assessment

ASSESSMENT	RATING	RATIONALE
Reliability		Unclear. While advice is based on data and methods vetted by experts, issues include: ○ The LCA report seems to contradict the multilaminate pouches report. ○ The discussion of chemical recycling is limited to pyrolysis.
Relevance		Designed for use in North America.
Clarity		Checklist provides no clear link between the packaging attribute and its effect on recyclability.
Accessibility		Free.
Level of technical detail		No data or testing protocols are provided, though LCA is encouraged.
Other strengths • Advice is built on lifecycle assessment. • It refers the reader to existing certifications and labelling systems. Other gaps or limitations • Target is the pet food industry only. • Does not provide data, information or advice for manufacturers or suppliers on where to begin to improve packaging recyclability. • Some information in the document appears to be outdated.		

3.4 Zentrale Stelle Verpackungs Register

AT A GLANCE	
TITLE	Guidance on the assessment of the recyclability of packaging subject to mandatory scheme participation—Aligned with the German Federal Environment Agency
PUBLISHED BY	Zentrale Stelle Verpackungs Register (ZSVR)
DATE PUBLISHED	2018
TOOL TYPES	Report
SOURCES	Guidance on the assessment of the recyclability of packaging subject to mandatory scheme participation—Aligned with the German Federal Environment Agency (ZSVR 2018) Minimum standard for determining the recyclability of packaging subject to system participation pursuant to section 21 (3) VerpackG (ZSVR 2020)
OVERVIEW	
Target audiences	Packaging producers selling to the German market
Target materials	Plastic packaging
Target plastics	All
Geographic scope	Germany
Sector coverage	German packaging industry
Update frequency	n/a (first publication)

Zentrale Stelle Verpackungs Register (ZSVR, English translation: Central Agency Packaging Register) is a German organization that acts as a central registry for obligated producers within Germany’s packaging producer responsibility system. ZSVR makes their identity public and fosters transparency and legal certainty through activities such as data reporting (ZSVR n.d.).

3.4.1 *Guidance on the assessment of the recyclability of packaging subject to mandatory scheme participation*

This report is not a recyclability guideline but does provide information on design for recyclability. It was drafted in response to changes in Germany’s *Packaging Act* (VerpackG), which took effect in 2019. The report provides advice to producers on how to assess recyclability for compliance with the new Act.

In the report, ZSVR (2018, p. 2–3) states:

When calculating the recyclability, at least the proportion of recycling-ready materials in the individual packaging must be taken into account. When determining the recycling-ready material content, at least the following three criteria must be taken into account:

- 1) the existence of sorting and recovery infrastructure for high-quality mechanical recycling of this packaging
- 2) the “sortability” of the packaging and the separability of its possible components
- 3) incompatibilities of packaging components or substances contained which, according to recovery practice, may prevent successful recovery.

The report also includes advice on how to assess recyclability to be in compliance with the Act. Key components of the assessment include:

- existence of sorting and recovery infrastructure
- sortability and separability
- recycling incompatibilities
- available content of recycled materials.

The appendices provide details on:

- how to check material conformity with recycling by material types, material fractions and recycling pathways (including disqualifying materials)
- packaging characteristics requiring the verification of identifiability in sensor-based sorting
- an overview of packaging recyclables and material-specific recycling incompatibilities
- a procedure model for the assessment of recyclability (i.e., none, low-grade recyclable, medium-degree recyclable and highly recyclable).

The definition of recyclable used in the report is: “the basic and gradual suitability of a packaging, after passing through industrially available recovery processes, to substitute virgin material in material-typical applications” (ZSVR 2018).

3.4.2 Minimum standard for determining the recyclability of packaging subject to system participation pursuant to section 21 (3) VerpackG

This report is not a recyclability guideline but does provide information calculating the recyclability of packaging designs. It updates, clarifies and expands on information provided in the 2018 guidance report (above) and the 2019 version of the minimum standard (in a document entitled with the same name). Its purpose is to ensure proper reporting against legal requirements.

Part 1 of the document provides an overview of German law as it relates to determining recyclability. Highlights include (ZSVR 2020):

- Germany’s extended producer responsibility law (i.e., Verpackungsgesetz or Packaging Act – VerpackG) requires that packaging system operators set monetary incentives that take general recyclability into account when calculating producers’ system participation fees.
- The purpose of this requirement is to provide producers with an incentive to take the environmental impact of their packaging into account during its design and manufacture, especially the impacts of its end-of-life management.
- The Packaging Act requires the ZSVR, in consultation with the German Environment Agency, to set a uniform framework for system operators to determine recyclability by publishing annual minimum standards by September 1 of each year.
- This document contains those minimum standards.

Part 2 of the document outlines the minimum standards (criteria) for determining recyclability as follows (ZSVR 2020):

- 1) There is sorting and recycling infrastructure that allows for high-quality mechanical recycling.

- 2) The packaging design enables the recyclable portion to be sorted from the non-recyclable portion, i.e., packaging components must be separable to the extent needed to enable high-quality mechanical recycling.
- 3) Packaging components and additives must not be incompatible with recycling.

ZSVR directs that if a package fully meets these three requirements, then the package is considered recyclable and the amount of available recyclable content per whole package determines its maximum recyclability. If the criteria 1 or 3 are not met, the packaging is deemed not recyclable. If criteria 1 and 3 are met, then criterion 2 affects the quantitative determination of recyclable content (i.e., calculation of the portion of recyclable content that can be sorted).

Part 3 of the document clarifies that recyclability must be determined for the package as a whole, including all components, such as labels, sealing films, lids, closures and adhesive applications.

Part 4 outlines the processes for determining whether a package meets the minimum criteria for recyclability and for calculating the available recyclable content as follows (ZSVR 2020):

- 1) The process for determining whether there is sorting and recycling infrastructure that allows for high-quality mechanical recycling is as follows:
 - Do the materials in the package meet ZSVR's good material description listed in Appendix 1?
 - If so, then system operators can assume there is adequate infrastructure in place to recycle that material.
 - If not, then the package is considered not recyclable according to current practice.
- 2) The process for determining whether a plastic package (excluding films) is sortable and separable involves testing whether sensor-based sorting equipment can effectively sort the materials. Testing is only required if the package meets one or more of the exclusion criteria listed in Appendix 2 (see Table 46). In addition, the density of the shredded plastic (which changes as a result of additives and other factors) must also enable it to flow and be sorted properly by the recycling system.

Table 46: ZSVR exclusion criteria for plastic packaging that require testing

PLASTIC PACKAGING EXCLUSION CRITERIA THAT REQUIRE TESTING
Large labels (taking up > 50% of the surface) made from foreign material
Full-sleeve label
Multi-layer structure (excluding PE/PP EVOH)
Metallization (excluding on the inside or in the middle layer)
Dark colours using soot-carbon-based pigments (also when used for internal layers)
Different types of plastic used on front and back sides
Metal pigments applied on a large scale (taking up > 50% of the surface) (lacquering, coating or embossing)

Source: ZSVR 2020.

- 3) In addition, a package cannot be deemed recyclable if it contains any combinations of materials or substances that can impede successful recycling (these are listed in Appendix 3).

- 4) To calculate the available recyclable content, calculate the proportion of recyclable materials in the packaging as a whole that can make feasibly make it through a recycling process. Once that is determined, the ZSVR requirement is that “recyclability must be ranked on a metric or ordinal scale (the latter with more than three scale degrees). The scale value and, if not self-explanatory, the scale units are required for the documentation of the determination result by the systems” (ZSVR 2020 p. 5).

Part 5 of the document directs readers to Appendix 4, which provides a flowchart that outlines the process for determining recyclability and recyclable content (i.e., the steps listed in Part 4 above).

Part 6 of the document lists definitions used in the minimum standard.

Table 47: ZSVR assessment

ASSESSMENT	RATING	RATIONALE
Reliability		The data, sources and methods that underlie the advice are published.
Relevance		Written specifically for compliance with German law. However, the assessment process could be adapted for use in Canada.
Clarity		The guidance uses industry-specific or Germany-specific language that would not be accessible to the layperson and may not be accessible to Canadian producers (e.g., Fraction No. 510, PPK packaging and composites based on PPK).
Accessibility		Free.
Level of technical detail		The main reports are not technical. However, the appendices are technical and require industry-specific information in order to be understood.
Other strengths - Provides a framework for the assessment of recyclability that could be adapted for use in Canada. Other gaps or limitations - Report specifically drafted for measurement or recyclability in compliance with German law.		

4 OTHER SUPPORTING TOOLS

This section provides a number of additional resources that are not recyclability guidelines or reports but are likely to be helpful resources for policymakers, procurers of goods, and packaging designers interested in learning more about design for recyclability. This includes recyclability labelling systems and software tools that provide more information on design for recyclability.

As these other tools were not a focus of this work, an extensive search was not undertaken to ensure that the list of those other tools included is comprehensive. Instead, the tools included were those found during the research that complete this compendium of recyclability guidelines. These resources have not been assessed or compared as they were not the focus of the report.

In addition, readers might be interested in reviewing the following documents, which outline governmental, quasi-governmental and International Organization for Standardization (ISO) guidance on recyclability claims and labelling relevant to North America:

- Environmental Claims and Greenwashing (Competition Bureau Canada, 2021)
- A Canada-Wide Strategy for Sustainable Packaging (Canadian Council of Ministers of the Environment 2009)
- Green Guides (FTC 2012a)
- Environmental Claims: Summary of the Green Guides (FTC 2012b)
- ISO 14024:2018 Environmental labels and declarations – Type I environmental labelling – Principles and procedures (International Organization for Standardization 2018)
- ISO 14021:2016 Environmental labels and declarations – Type II Self-declared claims (International Organization for Standardization 2016)
- ISO 14025:2006 Environmental labels and declarations – Type III Environmental declarations – Principles and procedures (International Organization for Standardization 2006).

4.1 Labelling Systems

The following is a brief summary of the on-package labelling systems that Canadians are most likely to see on their packaging, including in the foreign food aisles. One predominant labelling system operates in North America: How2Recycle (see Section 4.1.1). There are also widely adopted labelling systems in the UK (see On-Pack Recycling Label in Section 4.1.2) and Australia (see Australasian Recycling Label Program in Section 4.1.3). A handful of other labelling systems operate globally.

For a recent and thorough overview and assessment of environmental labelling systems used globally, see the United Nations Environment Programme (UNEP) and Consumers International report entitled *Can I Recycle This* (United Nations Environment Programme and Consumers International 2020), which identifies and rates the existing programs.

4.1.1 How2Recycle

AT A GLANCE	
TITLE	The How2Recycle Guide to Recyclability
PUBLISHED BY	How2Recycle
DATE PUBLISHED	2020
SOURCES	• The How2Recycle Guide to Recyclability (How2Recycle n.d.) • The How2Recycle Guide to Future Recyclability (How2Recycle 2024) Other • How2Recycle Recyclability Insights (How2Recycle 2020b) • The Future of Store Drop-Off Recyclability (How2Recycle 2020c) • Access to Residential Recycling of Paper Packaging and Packaging Materials in Canada (CM Consulting 2014) • 2020-2021 Centralized Study on the Availability of Recycling (SPC 2021)
OVERVIEW	
Target audiences	Designers
Target materials	Packaging
Target plastics	All
Geographic scope	United States and Canada; free, more behind members-only portal
Sector coverage	225 brand and retail members
Update frequency	Frequent

How2Recycle is a part of the environmental non-profit GreenBlue, which is dedicated to the sustainable use of materials in society (How2Recycle 2021). The How2Recycle recyclability labelling system establishes rules for how companies can properly label their products. There are over 6,000 possible labels in the system.

Labels include the following:

- directions for preparing materials for recycling (e.g., rinse, insert lid), how to recycle (e.g., store drop-off)
- type of recyclable material (e.g., metal, plastic), and list of recyclable parts (e.g., bottle, tray, insert, box)
- in some cases, multi-component labels for multi-material packages (e.g., box, wrap, tray).

For members, there is a process to obtain the right to display How2Recycle's logo, including an assessment of collection, sortation, reprocessing and end markets. How2Recycle uses the Association of Plastic Recyclers tests for plastics recyclability. How2Recycle references the United States' FTC Guidelines and Canada's Competition Bureau as the bodies in each country that govern labelling claims.

An example of the labelling system is provided in Figure 1.

It's a smarter label system.

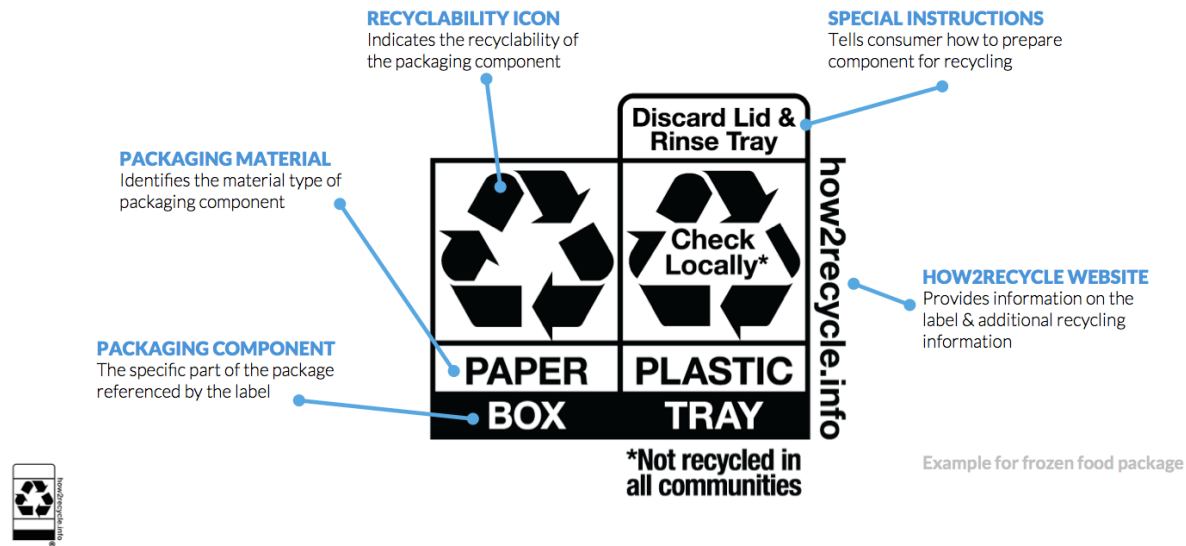


Figure 1: How2Recycle recyclability label

Source: How2Recycle 2021, reproduced with permission (copyright How2Recycle).

The How2Recycle Guide to Recyclability

The Guide to Recyclability provides an overview of the way How2Recycle defines and assesses recyclability, both in general and on a package-by-package basis for label eligibility. This includes an assessment of:

- applicable law (i.e., Federal Trade Commission in the United States and the Competition Bureau in Canada)
- collection or access to recycling
 - In the United States, How2Recycle refers to the Sustainable Packaging Coalition's Centralized Availability of Recycling Study (2016).
 - In Canada, How2Recycle refers to several studies including the Paper & Paperboard Packaging Environmental Council's Access to Residential Recycling of Paper Packaging and Packaging Materials in Canada (CM Consulting 2014).
- sortation or MRF packaging flow (i.e., how successfully materials are sorted in an MRF based on size, shape and other physical attributes)
- reprocessing or technical recyclability (i.e., how successfully materials are reprocessed by entities such as reclaimers and paper mills)
- end markets (i.e., whether the resulting recyclate has a market).

The How2Recycle Future Guide

The Future Guide provides advice for their member companies about how to build a case for their packaging to be considered recyclable and be eligible for a How2Recycle label. Key advice includes:

- an explanation of “core” versus “recyclability-challenged” packaging
 - Core packaging can be defined by How2Recycle as recyclable and is eligible for a How2Recycle label.
 - Recyclability-challenged packaging is not recyclable, challenging to recycle, or recyclable but lacking sufficient data to support a claim of recyclability in order to be eligible for the How2Recycle label.
- assessment criteria to achieve future recyclability
- considerations for far future recyclability
- considerations for substantiation data
- recommendations for strategizing future recyclability
- steps for How2Recycle members to achieve future recyclability.

4.1.2 On-Pack Recycling Label (OPRL)

AT A GLANCE	
TITLE	On-Pack Recycling Label (OPRL)
PUBLISHED BY	On-Pack Recycling Label Ltd.
DATE PUBLISHED	2020
SOURCES	• OPRL: On-Pack Recycling Label (On-Pack Recycling Label Ltd. n.d.a)
OVERVIEW	
Target audiences	Designers
Target materials	Packaging
Target plastics	All
Geographic scope	United Kingdom
Sector coverage	600 members; manufacturers and producers, charities, retailers and leisure organizations
Update frequency	Frequent, at least annual over the last several years

The On-Pack Recycling Label Ltd. is a not-for-profit company that operates the On-Pack Recycling Label (OPRL), which is the recyclability labelling scheme recognized by the UK government (OPRL n.d.b). It relies on third-party verification of recyclability, using data collected and assessed by PREP UK. Examples of the recycling labels are provided in Figure 2 and Figure 3.



Figure 2: OPRL recyclable label

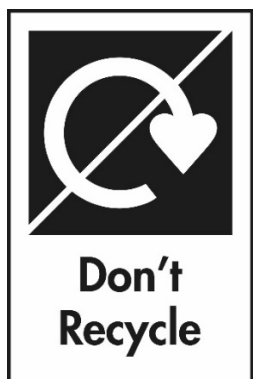


Figure 3: OPRL not recyclable label

OPRL has released a new program through which it provides third-party recyclability certification. An example of OPRL certification label is provided in Figure 4.



Figure 4: OPRL recyclability certification label

Source for figures 2, 3 and 4: OPRL (2021), reproduced with permission (copyright OPRL).

4.1.3 Australasian Recycling Label Program

AT A GLANCE	
TITLE	Australasian Recycling Label Program
PUBLISHED BY	Planet Ark and Australian Packaging Covenant Organisation
DATE PUBLISHED	2020
SOURCES	• Australasian Recycling Label Program (Planet Ark 2020) • APCO website (APCO 2021a) • PREP Design (PREP Design n.d.)
OVERVIEW	
Target audiences	Designers
Target materials	Packaging
Target plastics	All
Geographic scope	Australia and New Zealand
Sector coverage	400 businesses
Update frequency	Frequent

Planet Ark is an Australian not-for-profit organization that helps individuals, communities, governments and businesses reduce their impact on the environment (Planet Ark 2021). Planet Ark owns the trademark for the Australasian Recycling Label, while the Australian Packaging Covenant Organisation (APCO) has an exclusive license to deliver the Australasian Recycling Label Program (referred to here as the program). For more information on APCO, see Section 2.2.

The program is an evidence-based, on-pack recyclability label that helps consumers in Australia and New Zealand correctly recycle their packaging. The program was developed by APCO in partnership with Planet Ark and PREP Design (for more information on PREP Design see Section 4.2.6).

An example of the recycling label is provided in Figure 5.

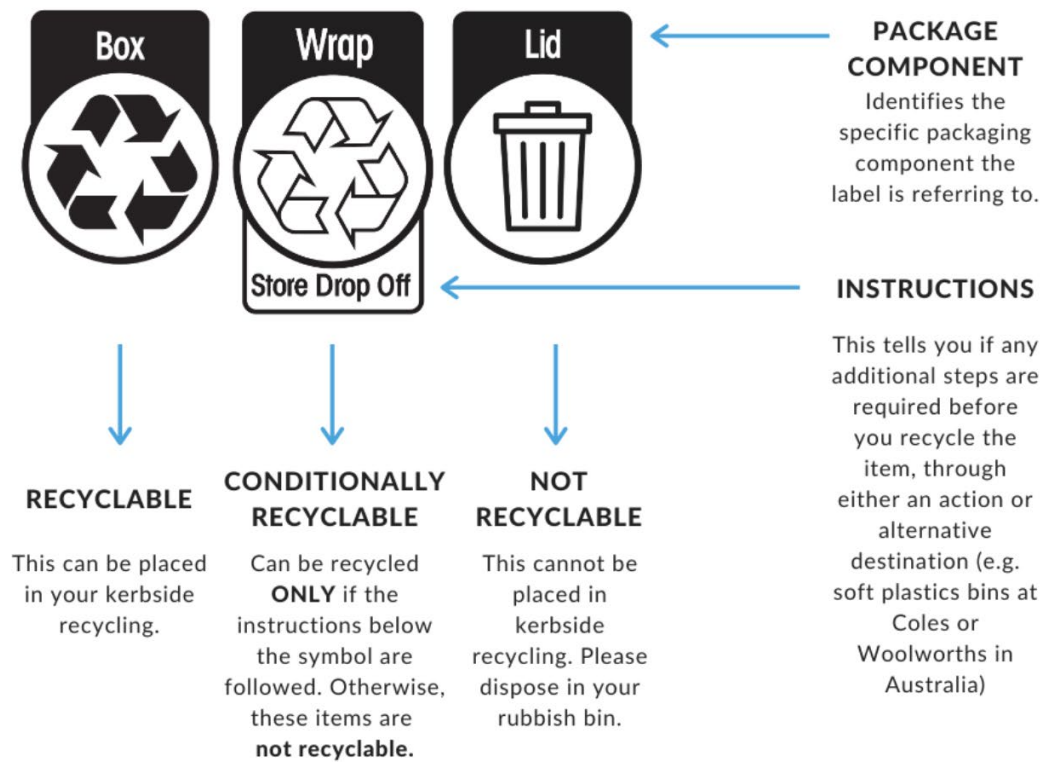


Figure 5: Australasian Recycling Label

Source: Australian Packaging Covenant Organisation (APCO) (2021), reproduced with permission (copyright APCO).

4.2 Software and Decision-Making Tools for Recyclability Assessment

This section provides a brief summary of the software tools that are being used to help producers and designers assess the recyclability of their products and packaging.

4.2.1 PIP 360°

AT A GLANCE	
TITLE	PIP 360°
PUBLISHED BY	PAC Packaging Consortium
DATE PUBLISHED	2021
TOOL TYPE(S)	Circularity assessment software, including a database to enable benchmarking
SOURCE(S)	• PIP 360° (PAC Packaging Consortium n.d.)
OVERVIEW	
Target Audience(s)	Packaging value chain: retailers, quick-service restaurants, brand owners, manufacturers, recycling facilities and municipalities
Target Material(s)	Packaging (reusable, recyclable and certified compostable)
Target Plastic(s)	All
Geographic Scope	North America, unknown global reach
Sector Coverage	Unknown
Update Frequency	Unknown

The online benchmarking tool and database is designed to assist the packaging value chain in comparing, contrasting and rating types of packaging against circular environmental impact categories (i.e., number of reuses, reduction, use of recycled and renewable content, recycling and composting rates) (PAC Packaging Consortium n.d.). The tool provides users with a baseline package circularity score (from 0 to 360, where 360 is the highest degree of circularity) and a decision-making tool that identifies opportunities to continually improve that score (PAC Packaging Consortium n.d.).

4.2.2 Ecodesign Studio

AT A GLANCE	
TITLE	Ecodesign studio
PUBLISHED BY	Altermaker
DATE PUBLISHED	n/a
TOOL TYPES	Recyclability assessment software
SOURCES	• Ecodesign Studio, le logiciel pour l'éco-conception (Altermaker 2021)
OVERVIEW	
Target audiences	Producers, designers
Target materials	Packaging
Target plastics	All
Geographic scope	France
Sector coverage	Unknown
Update frequency	Unknown

The software tool aims to help producers reduce the environmental impact of end-of-life products using lifecycle analysis.

4.2.3 COMPASS® / EcoImpact

AT A GLANCE	
TITLE	COMPASS® / EcoImpact
PUBLISHED BY	Trayak
DATE PUBLISHED	• First published in 2006 by SPC as COMPASS® • Now owned and operated by Trayak as EcoImpact
TOOL TYPES	Design assessment software
SOURCES	• COMPASS (SPC 2021) • COMPASS LCA Training (Trayak 2020a) • EcoImpact (Trayak 2020b)
OVERVIEW	
Target audiences	producers, designers
Target materials	packaging
Target plastics	All
Geographic scope	global, designed in North America
Sector coverage	Used in nine regions around the world
Update frequency	Unknown

COMPASS is a cloud-based lifecycle assessment (LCA) tool that enables evaluations of the environmental effects of packaging design alternatives. It was launched by SPC in 2006 and is now owned and operated by Trayak (a product and packaging sustainability consulting firm) on an online platform called EcoImpact (Trayak 2020b). COMPASS’s underlying methodology was vetted by a team of experts including brand manufacturers, packaging suppliers, retailers and LCA professionals (SPC 2021). EcoImpact updates COMPASS by enabling enhanced use of the tool on an online platform, including the ability for designers to incorporate “proprietary materials, tracking of custom metrics, and the ability to fully embed automated environmental assessment within (the) design process” (Trayak 2020b).

The COMPASS assessment is based on “industry average data sets for materials and converting processes for packaging (that allows for) reliable apples-to-apples comparisons” across alternative packaging designs (SPC 2021). The output of the assessment provides the user with an assessment of lifecycle and other sustainability impacts and an understanding of the end-fate profile of a specific packaging design (SPC 2021). In addition, the output provides the user with the ability to:

- test what-if scenarios when considering changes to packaging design
- compare alternative packaging designs
- benchmark packaging designs against others
- track changes in design against sustainability goals
- better communicate outcomes (SPC 2021).

The criteria included in the COMPASS assessment are outlined in Table 48.

Table 48: COMPASS® assessment criteria

ASSEMENT CRITERIA
CONSUMPTION METRICS
Fossil fuel use
Water use
Mineral use
Greenhouse gas
Human impacts
Freshwater ecotoxicity
Eutrophication
EMISSION METRICS
Greenhouse gas
Human impacts
Aquatic toxicity
Eutrophication
PACKAGING ATTRIBUTES
Recycled versus virgin content
Source certified material
Damage rates
Shelf life
Cube efficiency
Recyclability
Material circularity index
LIFECYCLE PHASES
Material manufacture
Conversion
Distribution
End of life

Source: SPC 2021.

The EcoImpact platform updates the COMPASS assessment by providing the user with the flexibility to customize their assessment, including:

- choosing LCA indicators that matter most to their organization
- incorporating primary and secondary lifecycle inventory data
- incorporating supplier-specific data
- tracking a broader set of sustainability metrics than typical LCA indicators
- supporting commonly used industry scorecard assessments
- integrating and automating analysis into the design process (Trayak 2020c).

4.2.4 EasyD4R – Evaluation Tool

AT A GLANCE	
TITLE	EasyD4R – Evaluation Tool
PUBLISHED BY	Henkel Design
DATE PUBLISHED	n/a
TOOL TYPES	Recyclability assessment software
SOURCES	• Henkel Design (Henkel n.d.)
OVERVIEW	
Target audiences	Producers, designers
Target materials	Packaging
Target plastics	All
Geographic scope	Europe
Sector coverage	Unknown
Update frequency	Unknown

EasyD4R is a software tool based on criteria from Plastics Recyclers Europe that tests the composition and the individual weight proportions of the respective packaging components: basic materials, closures, labels and colours. It provides an A to G grade for the recyclability of packaging.

4.2.5 Ecolizer 2.0

AT A GLANCE	
TITLE	Ecolizer 2.0
PUBLISHED BY	OVAM
DATE PUBLISHED	n/a
TOOL TYPES	Recyclability assessment software
SOURCES	• Ecolizer 2.0 (OVAM n.d.)
OVERVIEW	
Target audiences	Producers, designers
Target materials	Products and packaging
Target plastics	All
Geographic scope	Belgium
Sector coverage	Unknown
Update frequency	Unknown

Ecolizer 2.0 is a software tool designed to help companies reduce the environmental impacts of their products and packaging. It enables a company to calculate the total environmental impact as well as the impact per phase in the lifecycle of a product.

4.2.6 PREP / PREP UK

AT A GLANCE	
TITLE	PREP and PREP UK
PUBLISHED BY	Prep Design
DATE PUBLISHED	n/a (constantly updated)
TOOL TYPES	Recyclability assessment software
SOURCES	• PREP Design (PREP Design n.d.) • PREP UK (PREP UK n.d.) • L4R (Singapore) (Label for Recycling 2021)
OVERVIEW	
Target audiences	Producers, designers
Target materials	Packaging
Target plastics	All
Geographic scope	UK, Australasia, Singapore
Sector coverage	Unknown
Update frequency	Constant

PREP Design has developed a software tool called the Packaging Recyclability Evaluation Portal (PREP) that underpins the Australasian, UK and Singapore recyclability labels. PREP’s goal is to make it easy for producers and packaging designers to classify the recyclability of their packaging (PREP Design n.d.). PREP advises producers as to why an item is not recyclable so it can be modified prior to release.

PREP assesses packaging items by material, shape, weight, size, inks, adhesives used and other variables. PREP simulates the behaviour of packaging in the recycling system from collection through sorting at an MRF and through processing facilities by using a series of algorithms. In each country, the recyclability assessment is underpinned by local data that is assessed and reviewed by independent third parties. PREP’s definition of “recyclable” is based on ISO 14021: 2016.

An example of the PREP Design Fact Sheet is provided in Figure 6.

Packaging Recyclability Evaluation Portal

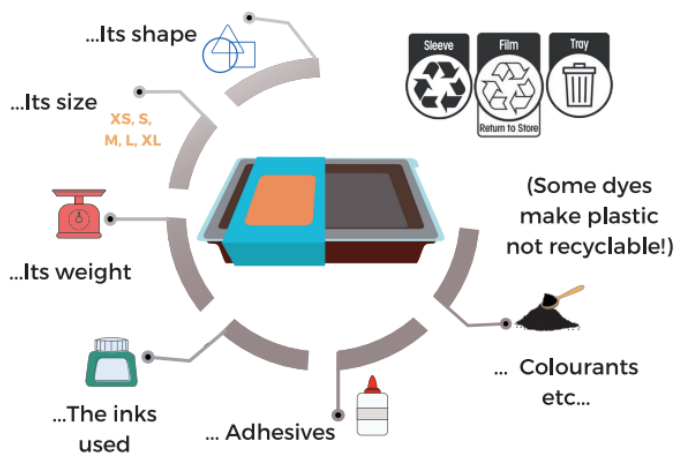
PREP provides the evidence behind packaging disposal claims.

What is it?

The Packaging Recyclability Evaluation Portal (PREP) is a unique online tool that packaging designers can use to assess the recyclability of a package.

How does it work?

Packaging designers must enter all the specifications of the package to assess its technical recyclability:



Recyclability Classification

Recyclable

Widely collected and end markets exist.

Recyclable with lost value

As above, but the item's design will decrease the material quality for recyclers.

Not Recyclable

Not widely accepted or an item that causes excessive issues for recyclers.

It then assesses if that item or material will be collected and processed through councils' kerbside collection services. Kerbside access levels are determined from Planet Ark's website: recyclingnearyou.com.au.

The PREP assessment underpins claims using the Australasian Recycling Label. The label can only be used if there is a PREP report that backs up its disposal claims.

To keep the PREP up to date, APCO formed a Technical Advisory Committee, including packaging and waste management experts, who meet regularly to discuss the status..

Figure 6: PREP Design fact sheet

Source: Australian Packaging Covenant Organisation (APCO) (2021), reproduced with permission (copyright APCO).

4.2.7 TREE

AT A GLANCE	
TITLE	TREE: Test de la recyclabilité des emballages
PUBLISHED BY	Citeo and Adelphe
DATE PUBLISHED	2021
TOOL TYPES	Recyclability assessment software
SOURCES	TREE: Test de la Recyclabilité des Emballages (Citeo and Adelphe n.d.a)
OVERVIEW	
Target audiences	Producers, designers
Target materials	Packaging and paper
Target plastics	All
Geographic scope	France
Sector coverage	Unknown
Update frequency	New version 2021

A summary of this tool is provided in Section 2.5.1.

4.2.8 Understanding Packaging (UP) Scorecard

AT A GLANCE	
TITLE	UP Scorecard
PUBLISHED BY	Food Packaging Forum, Single-Use Material Decelerator, Fondation Didier et Martine Primat and the Lexicon
DATE PUBLISHED	2021
TOOL TYPES	Online assessment of overall environmental sustainability
SOURCES	UP Scorecard (SUM'D <i>et al.</i> 2021) The Understanding Packaging (UP) Scorecard Methodology. (SUM'D and Meisterling 2022)
OVERVIEW	
Target audiences	Food service businesses
Target materials	Packaging
Target plastics	All
Geographic scope	Unknown: uses source data from North America and Europe
Sector coverage	Food ware and food packaging
Update frequency	Unknown

The UP Scorecard is a free online tool aimed at providing businesses with information to help them select more sustainable food ware and food packaging. Scoring is based on lifecycle assessment (LCA) calculations that measure impacts from production to disposal. The LCA score is based on six impact areas: recoverability (indicator is a scale from worst to best), plastic pollution (indicator is grams of plastic leakage to the environment), chemicals of concern (indicator is a scale of best to worst chemicals of concern and material inertness), climate impact (indicator is grams of carbon dioxide equivalents), water used (indicator is litres of water consumed) and sustainable sourcing (indicator is a scale from worst to best) (SUM'D *et al.* 2021). The recoverability ranking provides a score that indicates the circularity potential of the products.

4.2.9 Pathway to Circularity: The Recyclability Framework

AT A GLANCE	
TITLE	The Recyclability Framework
PUBLISHED BY	The Recycling Partnership
DATE PUBLISHED	2021
TOOL TYPES	Decision framework (question-based)
SOURCES	• The Recyclability Framework (the Recycling Partnership 2021a)
OVERVIEW	
Target audiences	Brands, designers, materials manufacturers, non-governmental organizations, retailers and other stakeholders
Target materials	Packaging
Target plastics	All
Geographic scope	United States
Sector coverage	Unknown
Update frequency	Unknown

The Pathway to Circularity is an initiative that aims to develop solutions for packaging circularity challenges. The first element of the Pathway that has been developed is the Recyclability Framework (the Framework), which was released for public comment August 2021. The Framework aims to help companies determine whether their packaging can navigate the recycling system and ensure the material is actually recyclable. It includes five elements that are required for a package to be considered recyclable: design for circularity, recyclability prevalence, access and adoption, capture journey and packaging fate (The Recycling Partnership 2021a). Each element has mandatory criteria (e.g., Does the package follow the respective industry guide? The Association of Plastic Recyclers Design Guide is the reference guide for plastics) and optional criteria (e.g., Does the package contain post-consumer recycled materials?) (The Recycling Partnership 2021b). The Framework was developed in collaboration with Pathway to Circularity Industry Council and in consultation with members across the packaging value chain.

5 CONCLUSIONS

This compendium provides an overview of existing guidelines on the recyclability of plastic products. Preparing this compendium and speaking to experts brought a number of observations to light.

The Association of Plastic Recyclers (APR) is recognized by Canadian stakeholders as the trusted North American expert in recyclability assessment and is considered an international leader by other leading experts (e.g., RECOUP).

However, producers and designers in North America do not have the same access to the breadth of tools to inform recyclability that are available to companies in Europe and Australia. Some tools that exist abroad to help companies make better decisions to improve the recyclability of their plastic products and packaging may be useful for Canada to consider. Examples include:

- A survey of collection, sorting and processing infrastructure in Canada. RECOUP does this work in the UK to inform whether a plastic product or package can be collected at scale (i.e., at 60% or more municipalities across the country), properly sorted at the majority of material recovery facilities and ultimately sent for processing. Without credible information about whether a plastic product can be collected, information on the technical possibility of processing is moot.
- Online, free software tools (like Citeo's and Adelphe's TREE, BEE tools) that provide designers with ready access to a method to test their designs before a product or package is produced or marketed.
- A labelling program that would be recognized or endorsed by governments Canada-wide (e.g., the On-Pack Recycling Label is recognized by the UK government,) and that is underpinned by assessment software that is overseen by a credible and unbiased third party (e.g., PREP for UK, Australasia and Singapore, or TREE for France). For a labelling system to be trusted, it should be informed by credible data and a trusted source.

Recyclers would also benefit by having a harmonized list of materials collected and recycled across Canada. This would enable more consistent communications to consumers about how to recycle. It would also increase the feedstock reaching recyclers and make it more economical for them to recycle some low-volume streams.

Countries such as France that have a common list of materials that can be collected and recycled are able to provide clear and consistent communications to their residents and local companies. The Cotrep design guide is a good example of the kinds of informative communications that are possible at a country-wide level when the entire country is seeking to collect and manage a common list of materials.

As more Canadian jurisdictions adopt extended producer responsibility (EPR) systems, this activity could help to harmonize the list of materials collected and recycled within each province and territory. However, additional cross-jurisdiction harmonization efforts would be required in order to achieve a consistent list of materials across Canada, such as the adoption of clear, harmonized and inclusive definitions (i.e., definitions that are not easily made obsolete with changes in product or packaging design or new technologies).

Globally, both packaging formats and recyclability guidelines are evolving quickly. Commitments by companies to reduce plastic pollution, such as under plastics pacts, are contributing to new investment in research, updates to design advice and advances in technologies, infrastructure and collection systems. As a result, users of this compendium should check for updates of the materials it references and recognize that new guidance may become available.

6 REFERENCES

- Altermaker. 2021. Ecodesign Studio, le logiciel pour l'éco-conception. Altermaker, France. <https://altermaker.fr/ecodesign-studio/>
- APCO (Australian Packaging Covenant Organisation). 2019a. Sustainable Packaging Checklist. APCO, Australia. <http://documents.packagingcovenant.org.au/public-documents/Sustainable%20Packaging%20Checklist>
- APCO. 2019b. Quickstart Guide: Labelling for Recovery. APCO, Australia. <https://documents.packagingcovenant.org.au/public-documents/Quickstart%20Guide%20-%20Labelling%20for%20Recovery>
- APCO. 2019c. Quickstart Guide: Designing for Recyclability—Glass Packaging. APCO, Australia. <https://documents.packagingcovenant.org.au/public-documents/Quickstart%20Guide%20-%20Designing%20for%20Recyclability;%20Glass%20Packaging>
- APCO. 2020a. Sustainable Packaging Guidelines SPGs. APCO, Australia. [https://documents.packagingcovenant.org.au/public-documents/Sustainable%20Packaging%20Guidelines%20\(SPGs\)](https://documents.packagingcovenant.org.au/public-documents/Sustainable%20Packaging%20Guidelines%20(SPGs))
- APCO. 2020b. Quickstart Guide: Designing for Recyclability—Rigid HDPE Packaging. APCO, Australia. <https://documents.packagingcovenant.org.au/public-documents/Quickstart%20Guide%20-%20Designing%20for%20Recyclability;%20HDPE%20Packaging>
- APCO. 2020c. Quickstart Guide: Designing for Recyclability—Rigid PP Packaging. APCO, Australia. <https://documents.packagingcovenant.org.au/public-documents/Quickstart%20Guide%20-%20Designing%20for%20Recyclability;%20PP%20Packaging>
- APCO. 2020d. Quickstart Guide: Designing for Recyclability—Household Consumer Soft Plastics. APCO, Australia. <https://documents.packagingcovenant.org.au/public-documents/Quickstart%20Guide%20-%20Designing%20for%20Recyclability;%20Consumer%20Soft%20Plastic%20Packaging>
- APCO. 2021a. Australian Packaging Covenant Association website. About APCO. APCO, Australia. <https://apco.org.au/about-apco>
- APCO. 2021b. Australian Packaging Covenant Association website. About Membership. APCO, Australia. <https://apco.org.au/apco-members>
- APCO. 2021c. Australian Packaging Covenant Association website. Withdrawn Signatories. APCO, Australia. <https://apco.org.au/withdrawn-signatories>
- APCO. 2021d. Quickstart Guide: Design for Recovery—Reuse, Recycling, or Composting. APCO, Australia. <https://documents.packagingcovenant.org.au/public-documents/Quickstart%20Guide%20-%20Design%20for%20Recovery;%20Reuse.%20Recycling%20or%20Composting>
- APCO. 2021e. Quickstart Guide: Designing for Recyclability—PET Packaging. APCO, Australia. <https://documents.packagingcovenant.org.au/public-documents/Quickstart%20Guide%20-%20Designing%20for%20Recyclability;%20PET%20Packaging>
- APR (The Association of Plastic Recyclers). n.d.a. Biopolymer Use in Bottles: Critical mass levels still needed for system-wide reclamation. APR, Washington. <https://plasticsrecycling.org/wp-content/uploads/2024/09/APR-Position-Biopolymer-Use-Bottles.pdf>
- APR. n.d.b. Degradable Additives Use in Bottles, Forms, and Films: The degradation of otherwise-recycled plastics means lost opportunities for the repeated use of molecules through recycling. APR, Washington. <https://plasticsrecycling.org/images/library/APR-White-Paper-Degradable-Additives.pdf>
- APR. 2018. Plastics Recycling Glossary. APR, Washington. <https://plasticsrecycling.org/images/library/Plastics-Recycling-Glossary.pdf>
- APR. 2018–2021. APR Design® Guide for Plastics Recyclability. APR, Washington. <https://plasticsrecycling.org/apr-design-guide>

- APR. 2021a. Crash Course: APR Design® Guide for Plastics Recyclability. Online webinar (recorded May 19, 2021). APR, Washington. <https://plasticsrecycling.org/web-seminars/the-apr-design-guide-for-plastics-recyclability-crash-course>
- APR. 2021b. About APR: The Voice of Plastics Recycling. APR, Washington. <https://plasticsrecycling.org/about>
- APR and the Foodservice Packaging Institute. n.d. Design Guide for Foodservice Plastics Recyclability. APR, Washington. https://fpi.org/wp-content/uploads/2021/03/APR_FPI_Design_Guide_for_Foodservice_Packaging.pdf
- BEE (Bilan Environmental des Emballages), Citeo, and Adelphe. 2019. Methodological Guide BEE (Bilan Environmental des Emballages) – Environmental Assessment of Packaging. BEE, virtual. Citeo, Paris. https://bee.citeo.com/pdfdoc/guide_methodologique_en.pdf
- BPF (British Plastics Federation) and RECOUP. 2019. Recyclability by Design. BPF, London. <https://www.bpf.co.uk/design/recyclability-by-design.aspx>
- CCME (Canadian Council of Ministers of the Environment). 2009. A Canada-Wide Strategy for Sustainable Packaging. CCME, Winnipeg. https://ccme.ca/en/res/sustainable_pkg_strategy_e.pdf
- CCME. 2018. Strategy on Zero Plastic Waste. CCME, Winnipeg, Manitoba. <https://ccme.ca/en/res/strategyonzeroplasticwaste.pdf>
- CCME. 2019. Canada-wide Action Plan on Zero Plastic Waste: Phase 1. CCME, Winnipeg, Manitoba. https://ccme.ca/en/res/1589_ccmecanada-wideactionplanonzeroplasticwaste_en-secured.pdf
- CCME. 2020. Canada-wide Action Plan on Zero Plastic Waste: Phase 2. CCME, Winnipeg, Manitoba. https://ccme.ca/en/res/ccmephase2actionplan_en-external-secured.pdf
- CEFLEX (A Circular Economy for Flexible Packaging). 2020a. Designing for a Circular Economy Guidelines summary. CEFLEX, EU. <https://guidelines.ceflex.eu/resources/>
- CEFLEX. 2020b. Designing for a Circular Economy Recyclability of polyolefin-based flexible packaging executive summary. CEFLEX, EU. <https://guidelines.ceflex.eu/resources/>
- CEFLEX. 2020c. Designing for a Circular Economy Recyclability of polyolefin-based flexible packaging technical report. CEFLEX, EU. <https://guidelines.ceflex.eu/resources/>
- CEFLEX. 2020d. Designing for a Circular Economy An introduction. CEFLEX, EU. https://guidelines.ceflex.eu/assets/public_docs/D4ACE_guidelines_An_Introduction.pdf
- CEFLEX. 2020e. Flexible packaging design requirements. CEFLEX, EU. https://guidelines.ceflex.eu/assets/public_docs/01_CEFLEX_Figure_Flexible-packaging-design-requirements_b.jpg
- CEFLEX. 2020f. 5 Steps to Build a Circular Economy for Flexible Packaging. CEFLEX, EU. https://guidelines.ceflex.eu/assets/public_docs/02_CEFLEX_Figure_5-STEPS-to-Build-a-Circular-Economy-for-Flexible-Packaging_b.jpg
- CEFLEX. 2020g. CELFEX: Who We Are. CEFLEX, EU. <https://ceflex.eu/who-we-are/>
- Citeo. n.d. Notre Organisation. Citeo, Paris. <https://www.citeo.com/notre-organisation>
- Citeo. 2018. [Webinar] Comment mesurer les bénéfices environnementaux de vos actions d'éco-conception? Module 7. Citeo, Paris. <https://www.youtube.com/watch?v=EAjJA5GDfEk>
- Citeo. 2019. Recyclabilité des emballages en plastique: Innovations et pistes de travail issues des projets de R&D 2015–2018. Citeo, Paris. https://bo.citeo.com/sites/default/files/2020-02/20191203_Citeo_AAP_RECyclABILITE_2019_V2.pdf
- Citeo and Adelphe. n.d.a. TREE: Test de la Recyclabilité des Emballages. Citeo, Paris. <https://tree.citeo.com/en-GB/Home/Index>
- Citeo and Adelphe. n.d.b. Discover the eco-design tool for your packaging. Citeo, Paris. <https://bee.citeo.com/en-GB/Home/Index>

- CM Consulting. 2014. Access to Residential Recycling of Paper Packaging Materials in Canada. Paper & Paperboard Packaging Environmental Council, Canada. <http://ppecc-paper.com/wp-content/uploads/2014/ProtectedDocs/AccessPPECOct21members.pdf>
- Consumer Goods Forum. 2021a. Golden design rules for optimal plastic design, production and recycling. <https://www.theconsumergoodsforum.com/wp-content/uploads/2021/07/2021-Plastics-All-Golden-Design-Rules-One-Pager.pdf>
- Consumer Goods Forum. 2021b. Plastic Waste Coalition of Action. <https://www.theconsumergoodsforum.com/environmental-sustainability/plastic-waste/>
- Consumer Goods Forum. 2021c. Reducing the Complexity of the Recycling Process & Increasing Recycling Rates. <https://www.theconsumergoodsforum.com/environmental-sustainability/plastic-waste/key-projects/packaging-design/>
- Consumer Goods Forum. 2021d. Commitments & Achievements: Creating a Blueprint for Success. <https://www.theconsumergoodsforum.com/environmental-sustainability/plastic-waste/about/our-achievements/>
- Consumer Goods Forum. 2021e. Who We Are. <https://www.theconsumergoodsforum.com/who-we-are/overview/>
- Cotrep (Comité Technique pour le Recyclage des Emballages Plastiques). n.d.a. Our Guidelines for Your Packaging. <https://www.cotrep.fr/en/>
- Cotrep. n.d.b. About Cotrep: Eco-Design for Better Recycling. <https://www.cotrep.fr/en/about-cotrep/>
- Cotrep. 2010. Test procedure to determine the influence of a new packaging or new materials for packaging on the production of fibers from R-PET. Cotrep, France. <https://www.cotrep.fr/content/uploads/sites/3/2019/02/pet-p1-fiber11-2010.pdf>
- Cotrep. 2014–2020. Technical studies. <https://www.cotrep.fr/en/technical-study/#studies>
- Cotrep. 2016a. Fiche Recyclabilité PE Souple: Les Recommandations. Cotrep, France. <https://www.cotrep.fr/content/uploads/sites/3/2019/02/recommandations-films-souples-complexes-pebd.pdf>
- Cotrep. 2018. Recyclability of Plastic Pots and Trays. Cotrep, France. <https://www.cotrep.fr/content/uploads/sites/3/2019/04/cotrep-trays-recyclability-dec-2018-vf-en.pdf>
- Cotrep. 2019. Cotrep Optical Sorting Test Procedure: Assessing Dark Packaging Detectability in Optical Sorting Processes. Cotrep, France <https://www.cotrep.fr/content/uploads/sites/3/2019/02/sorting-p1-dark-packaging-v01-2019.pdf>
- Cotrep. 2022. Recyclability of Plastic Packaging: Improving Recycling through Eco-design. Cotrep, France. <https://www.cotrep.fr/content/uploads/sites/3/2019/02/cotrep-recyclability-guide-en.pdf>
- Competition Bureau Canada. 2021. Environmental Claims and Greenwashing. <https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/04607.html>
- CPMA (Canadian Produce Marketing Association). 2019a. Plastics Research 2019. CPMA, Ottawa. <https://community.cpma.ca/login?ReturnUrl=https%3a%2f%2fcommunity.cpma.ca%2fviewdocument%2fc-pma-plastics-research-2019-by-abac%3fCommunityKey%3da0528646-3138-4194-8424-7908b8396d70%26tab%3dlibrarydocuments> (member login required)
- CPMA. 2019b. CPMA Plastics Packaging Roadmap. CPMA, Ottawa. [https://www.cpma.ca/docs/default-source/corporate/2019/CPMA_Plastics_Packaging_Roadmap_\(Complete_Roadmap\).pdf](https://www.cpma.ca/docs/default-source/corporate/2019/CPMA_Plastics_Packaging_Roadmap_(Complete_Roadmap).pdf)
- CPMA. 2020a. Preferred Plastics Guide. CPMA, Ottawa. https://www.cpma.ca/docs/default-source/industry/2020/CPMA_Prefered_Plastics_Guide_English.pdf
- CPMA. 2020b. Produce Packaging Executive Framework. CPMA, Ottawa [https://www.cpma.ca/docs/default-source/corporate/2019/CPMA_Produce_Packaging_Executive_Framework_\(Roadmap_Overview\).pdf](https://www.cpma.ca/docs/default-source/corporate/2019/CPMA_Produce_Packaging_Executive_Framework_(Roadmap_Overview).pdf)
- CPMA. 2021. About Us: About CPMA and Our History. CPMA, Ottawa. <https://www.cpma.ca/about-us>
- CSA Group. 2021. About Us. CSA, Canada. <https://www.csagroup.org/about-csa-group/>

CSA Group and Tetra Tech Canada Inc. 2020. A Roadmap to Support the Circularity and Recycling of Plastics in Canada – Technical Standards, Regulations and Research. The Current Landscape and the Need for Change. CSA, Canada <https://www.csagroup.org/wp-content/uploads/CSA-Group-Research-Roadmap-to-Support-Circularity-and-Recycling.pdf>

Eco-Emballages. 2017. Eco-Emballages et Ecofolio Deviennent Citeo. Eco-Emballages, France.

Eco Design (Eco Design of Plastic Packaging Roundtable). n.d.a. Instruction – Design for Optimised Resource Use. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/02-Strategielement-01a-Df-Optimierte-Ressourcennutzung-Factsheet-final-EN.pdf>

Eco Design. n.d.b. Instruction – Design for Sustainable Sourcing. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/02-Strategielement-02a-Df-Nachhaltige-Beschaffung-Factsheet-final-EN.pdf>

Eco Design. n.d.c. Instruction – Design for Recycling. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/02-Strategielement-04a-Df-Recycling-Factsheet-final-EN.pdf>

Eco Design. n.d.d. Instruction – Design for Environmentally Sound Use. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/02-Strategielement-03a-Df-Umweltvertraeglich-Nutzung-Factsheet-final-EN.pdf>

Eco Design. n.d.e. Instruction – Environmental Targets for Eco Design Projects. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/01c-Mgmt-Prozess-Umweltziele-in-Eco-Design-Projekten-Factsheet-final-EN.pdf>

Eco Design. n.d.f. Checklist – Design for Optimised Resource Use. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/02-Strategielement-01b-Df-Optimierte-Ressourcennutzung-Checkliste-final-en.pdf>

Eco Design. n.d.g. Checklist – Design for Recycling. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/02-Strategielement-04b-Df-Recycling-Checkliste-final-en.pdf>

Eco Design. n.d.h. Checklist – Design for Environmentally Sound Use. Eco Design, Germany. <https://ecodesign-packaging.org/wp-content/uploads/2019/09/02-Strategielement-03b-Df-Umweltvertraeglich-Nutzung-Checkliste-final-en.pdf>

Eco Design. n.d.i. Eco-design of Plastic Packaging. Eco Design, Germany. <https://ecodesign-packaging.org/en/>

Eco Design. 2019. Eco Design of Plastic Packaging Round Table Management Guidelines: Core Guidelines. Eco Design, Germany. https://ecodesign-packaging.org/wp-content/uploads/2020/05/ecodesign_core_guidelines_online_EN.pdf

Eco Design. 2021. Round Table Experts' Initiative. Eco Design, Germany. <https://ecodesign-packaging.org/en/the-round-table/>

ÉEQ. (Éco Entreprises Québec). 2018. Materials Guide. ÉEQ, Montréal. https://www.eeq.ca/wp-content/uploads/guide_materieres_2018_EN_VF.pdf

ÉEQ. 2021. About: ÉEQ's mission and values. ÉEQ, Montréal. <https://www.eeq.ca/en/eeq-profile/>

EPBP (European PET Bottle Platform). n.d. Design Guidelines. EPBP, Belgium. <https://www.epbp.org/design-guidelines/products>

EPBP. 2011. The European PET Bottle Platform (EPBP) – 2 years of progress. EPBP, Belgium. <https://www.epbp.org/download/217/epbp-the-first-2-years>

EPBP. 2021. How to keep a sustainable PET recycling industry in Europe. EPBP, Belgium. <https://www.epbp.org/>

FTC (Federal Trade Commission). 2012a. Guides for the Use of Environmental Marketing Claims. FTC, USA. <https://www.ftc.gov/sites/default/files/attachments/press-releases/ftc-issues-revised-green-guides/greenguides.pdf>

- FTC. 2012b. Environmental Claims: Summary of the Green Guides. FTC, USA. [https://www.ftc.gov/system/files/documents/public_events/975753/ftc -
environmental claims summary of the green guides.pdf](https://www.ftc.gov/system/files/documents/public_events/975753/ftc_-_environmental_claims_summary_of_the_green_guides.pdf)
- Henkel. n.d. Easy D4R – Evaluation Tool. Henkel, Germany. <https://www.henkel.com/sustainability/sustainable-packaging/easyd4r>
- How2Recycle. n.d. The How2Recycle Guide to Recyclability. How2Recycle. <https://how2recycle.info/about-the-how2recycle-label/>
- How2Recycle. 2024. The How2Recycle Guide to Future Recyclability. How2Recycle. <https://greenblue.org/2024/01/04/the-how2recycle-guide-to-future-recyclability/>
- How2Recycle. 2020b. The How2Recycle Recyclability Insights. How2Recycle. <https://how2recycle.info/insights>
- How2Recycle. 2020c. The Future of Store Drop-Off Recyclability. How2Recycle. <https://how2recycle.info/news/2020/report-the-future-of-store-drop-off-recyclability>
- How2Recycle. 2021. About: Our Mission. How2Recycle. <https://how2recycle.info/about>
- HPRC (Healthcare Plastics Recycling Council). 2015. Environmental Impacts of Recycling Compared to Other Waste Disposal Methods. HPRC, Minnesota. https://40864656-dd71-4c8a-a82d-dffa36a152a5.filesusr.com/ugd/49d7a0_6bb3ebb481ec49ceafe92f0b0ba010d.pdf
- HPRC. 2016. Design Guidelines for Optimal Hospital Plastics Recycling. HPRC, Minnesota. https://40864656-dd71-4c8a-a82d-dffa36a152a5.filesusr.com/ugd/49d7a0_16dc3540ea004c21bf72a7ae19f6f7f0.pdf
- HPRC. 2020a. Design Guidance: Best Practices for Recyclable Products and Packaging. HPRC, Minnesota. <https://www.hprc.org/design-guidance>
- HPRC. 2020b. About HPRC: Inspiring and Enabling Plastic Recycling Solutions in Healthcare. HPRC, Minnesota. <https://www.hprc.org/about-hprc>
- ISO (International Organization for Standardization). 2016. ISO 14021:2016 Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling). ISO, Switzerland. <https://www.iso.org/standard/66652.html>
- ISO. 2006. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures. ISO, Switzerland. <https://www.iso.org/standard/38131.html>
- ISO. 2018. ISO 14024:2018 Environmental labels and declarations – Type I environmental labelling – Principles and procedures. ISO, Switzerland. <https://www.iso.org/standard/72458.html>
- Label for Recycling. 2021. “Can I recycle this?” L4R, Singapore. <https://www.label4recycling.asia>
- Mepex Consult AS. n.d. About Mepex. Mepex Consult AS, Norway. <https://mepex.no/about-mepex/?lang=en>
- Mepex Consult AS. 2017. Basic Facts Report on Design for Plastic Packaging Recyclability. Mepex Consult AS, Norway. <https://www.grontpunkt.no/media/vx3oriyp/report-gpn-design-for-recycling-0704174.pdf>
- Mitchell, J., and Kosior, E. n.d. Technical bulletin for operators at plastic sorting facilities. WRAP, UK. [https://preprod.wrap.org.uk/sites/default/files/2020-09/WRAP-
Technical bulletin for operators at plastic sorting facilities.pdf](https://preprod.wrap.org.uk/sites/default/files/2020-09/WRAP-Technical_bulletin_for_operators_at_plastic_sorting_facilities.pdf)
- Mott, A., Musgrave, A., and Hermel-Davidock, T. 2014. Helping out Health Care Film Recycling. PRU, Portland. https://docs.wixstatic.com/ugd/49d7a0_0ee6b01223fb4dcbb02c7e05e30db378.pdf
- OPRL (On-Pack Recycling Label). n.d.a. OPRL: On-Pack Recycling Label. OPRL, UK. <https://www.oprl.org.uk>
- OPRL. n.d.b. About OPRL. OPRL, UK. <https://www.oprl.org.uk/about-oprl/>
- OVAM. n.d. OVAM Ecolizer. OVAM, Netherlands. <https://ecodesign.vlaanderen-circulair.be/en/tools/ecolizer>
- PAC Packaging Consortium. n.d. PIP360 – Packaging Innovation Pathway to Circularity. PAC, Markham. <https://www.pacpip360.com/>

Pet Sustainability Coalition. n.d.a. Eco-Impact Packaging Lifecycle Assessment: COMPASS (Comparative Packaging Assessment). PSC. <https://petsustainability.org/packaging/>

Pet Sustainability Coalition. n.d.b. PSC Accelerator. Pet Sustainability Coalition. <https://petsustainability.org/toolkit-accelerator/>

Pet Sustainability Coalition. n.d.c. About PSC: Why PSC? PSC. <https://petsustainability.org/about-psc-2/>

Pet Sustainability Coalition. 2019a. Packaging Supplier Checklist. Pet Sustainability Coalition. <https://petsustainability.org/portfolio/packaging-supplier-checklist/>

Pet Sustainability Coalition. 2019b. Examination of Multilaminate Pouches. Pet Sustainability Coalition. <https://petsustainability.org/portfolio/alternatives-to-multilaminate-pouches/>

Pet Sustainability Coalition. 2020. Lifecycle Assessment Earth Animal Packaging. Pet Sustainability Coalition. <https://petsustainability.org/portfolio/life-cycle-assessment-earth-animal-packaging/>

Petcore Europe. 2017. Test procedure – Adhesive/labels on PET trays. PETCORE Europe, Belgium. https://www.petcore-europe.org/images/PetcoreEurope_Adhesive-labels_Wash-off_Testing_Protocol.pdf

Petcore Europe. 2019. Petcore Europe Board of Directors. Petcore Europe, Brussels. <https://www.petcore-europe.org/news-events/223-bod.html>

Petcore Europe. 2020a. Design for Recycling Guidelines for PET Thermoformed Trays. Petcore Europe, Brussels. https://www.petcore-europe.org/images/pet/Design_for_Recycling_Guidelines_PET_Trays_Clear_Transparent_Jan_2020.pdf

Petcore Europe. 2020b. Recyclability Evaluation Protocol for Pet Trays. Petcore Europe, Brussels. https://www.petcore-europe.org/images/pet/PETTraysRecyclingProtocol_Jan2020.pdf

Petcore Europe. 2021. About Petcore Europe. Petcore Europe, Brussels. <https://www.petcore-europe.org/about.html>

Planet Ark. 2020. Australasian Recycling Label. Planet Ark, Australia. [https://recyclingnearyou.com.au/arl/#:~:text=The%20Australasian%20Recycling%20Label%20\(ARL,reduces%20waste%20going%20to%20landfill](https://recyclingnearyou.com.au/arl/#:~:text=The%20Australasian%20Recycling%20Label%20(ARL,reduces%20waste%20going%20to%20landfill)

Planet Ark. 2021. About Us. Planet Ark, Australia. <https://planetark.org/about>

PREP Design (Packaging Recyclability Evaluation Portal). n.d. Remove Confusion from Recycling. Planet Ark, Australia. <https://www.prep.org.au/main/content/home>

PREP Design. 2020. The Circular Economy Relies Firstly on Design of Recyclable Packaging. PREP Design, Australia. <https://prep.design>

PREP UK. n.d. PREP Walkthrough from Prep Design. OPRL, UK. <https://oprl.prep.design/main/content/home>

RECOUP. n.d. RecyClass Pack Certification. RECOUP, UK. <https://www.recoup.org/p/356/recyclclass-pack-certification>

RECOUP. 2018. Deposit Return Schemes. RECOUP, UK. <https://www.recoup.org/wp-content/uploads/2023/09/recoup-deposit-return-schemes-consumer-insight-research-1544085848-1.pdf>

RECOUP. 2020a. Rigid Plastic Packaging – Design tips for recycling. RECOUP, UK. <https://www.recoup.org/wp-content/uploads/2023/09/WRAP-rigid-plastic-packaging-design-tips-for-recycling-v2-Nov-2020-1.pdf>

RECOUP. 2020b. Recycling of Coloured PET. RECOUP, UK. <https://www.recoup.org/research-and-reports/recycling-of-coloured-pet-oct-2020/>

RECOUP. 2020c. Recyclability by Design – Beauty & Personal Care Case Studies 2020. RECOUP, UK. <https://www.recoup.org/wp-content/uploads/2023/09/case-study-booklet-beauty-and-personal-care-case-studies-updated-29oct2020-1604917787.pdf>

RECOUP. 2021a. Recyclability by Design – On-the-Go Case Studies. RECOUP, UK. <https://www.recoup.org/wp-content/uploads/2023/09/recyclability-by-design-on-the-go-case-studies-2021-final-booklet-format-23feb-1614071210.pdf>

- RECOUP. 2021b. RECOUP: Our Work. RECOUP, UK. <https://www.recoup.org/>
- RECOUP. 2021c. Recyclability by Design: DIY Case Studies 2021. RECOUP, UK. [recyclability-by-design-diy-case-studies-2021-final-290421-1619701213.pdf](https://www.recoup.org/wp-content/uploads/2021/12/recoup-by-design-diy-case-studies-2021-final-290421-1619701213.pdf)
- RECOUP. 2021d. Recyclability by Design: UK Consumer Health Care Case Studies 2021. RECOUP, UK. <https://www.recoup.org/p/173/recoup-reports>
- RECOUP. 2022a. UK Household Plastics Collection Survey 2022. RECOUP, UK. <https://www.recoup.org/research-and-reports/uk-household-plastic-packaging-collection-survey-2022/>
- RECOUP. 2022b. UK Plastic Packaging Sorting and Reprocessing Infrastructure. RECOUP, UK. <https://www.recoup.org/research-and-reports/uk-plastic-packaging-sorting-reprocessing-infrastructure-report-2022/>
- RECOUP. 2022c. Recycled Content Verification Systems. RECOUP, UK. <https://www.recoup.org/wp-content/uploads/2023/09/recoup-and-bpf-recycled-content-verification-systems-december-2022-1671192520-1.pdf>
- RECOUP. 2023a. Recyclability by Design. RECOUP, <https://www.recoup.org/wp-content/uploads/2023/09/rbd-2022-1687261042.pdf>
- RECOUP. 2023b. UK Household Plastic Packaging Collection Survey 2023 Data Summary. RECOUP, UK. <https://www.recoup.org/wp-content/uploads/2023/12/2023-UK-Household-Plastic-Packaging-Collection-Survey-Data-Summary.pdf>
- RecyClass. n.d.a. RecyClass online tool. RecyClass, Belgium. <https://recyclclass.eu/recyclability/online-tool/>
- RecyClass. n.d.b. Recyclability. RecyClass, Belgium. <https://recyclclass.eu/get-certified/recyclability/#1>
- RecyClass. n.d.c About RecyClass. RecyClass, Belgium. <https://recyclclass.eu/recyclclass/>
- RecyClass. 2017–2024. Design for Recycling Guidelines. RecyClass, Belgium. <https://recyclclass.eu/recyclclass/design-for-recycling-guidelines/>
- RecyClass. 2020a. RecyClass Recyclability Methodology. RecyClass, Belgium. https://recyclclass.eu/wp-content/uploads/2021/10/RecyClass-Recyclability-Methodology_v1.1.pdf
- RecyClass. 2022a. Recyclability Evaluation Protocol for HDPE Containers – Standard Laboratory Practice. RecyClass, Belgium. <https://recyclclass.eu/wp-content/uploads/2022/02/RecyClass-Recyclability-Evaluation-Protocol-for-HDPE-containers-v.3.0-FINAL.pdf>
- RecyClass. 2022b. Recyclability Evaluation Protocol for PE Films – Standard Laboratory Practice. RecyClass, Belgium. <https://recyclclass.eu/wp-content/uploads/2022/02/RecyClass-Recyclability-Evaluation-Protocol-for-PE-Films-v.3.0-FINAL.pdf>
- RecyClass. 2022c. Recyclability Evaluation Protocol for PP Containers – Standard Laboratory Practice. RecyClass, Belgium. <https://recyclclass.eu/wp-content/uploads/2022/02/RecyClass-Recyclability-Evaluation-Protocol-for-PP-containers-v.3.0-FINAL.pdf>
- RecyClass. 2022d. Recyclability Evaluation Protocol for PP Films – Standard Laboratory Practice. RecyClass, Belgium. https://recyclclass.eu/wp-content/uploads/2022/02/RecyClass-Recyclability-Evaluation-Protocol-for-PP-films_v2.0-FINAL.pdf
- SPC (Sustainable Packaging Coalition). 2006. Design guidelines for sustainable packaging, version 1.0. Michigan United States. https://s3.amazonaws.com/gb.assets/SPC+DG_1-8-07_FINAL.pdf
- SPC. 2016. 2015-6 Centralized Availability of Recycling Study. Michigan United States. <http://www.sustainablepackaging.org/content/?type=5&id=centralized-study-on-availability-of-recycling>
- SPC. 2021. 2020–21 Centralized Study on Availability of Recycling. Sustainable Packaging Coalition, Michigan United States. <https://sustainablepackaging.org/wp-content/uploads/2022/03/UPDATED-2020-21-Centralized-Study-on-Availability-of-Recycling-SPC-3-2022.pdf>

- SPC. 2021. COMPASS: What is COMPASS? SPC, Michigan United States. <https://sustainablepackaging.org/projects/compass/>
- SUM'D (Single-Use Material Decelerator), Food Packaging Forum Foundation, Fondation Didier et Martine Primat and The Lexicon 2021. The Understanding Packaging (UP) Scorecard. Food Packaging Forum Foundation, Switzerland. <https://upscorecard.org/about>
- SUM'D and K. Meisterling. 2022. The Understanding Packaging (UP) Scorecard Methodology. Food Packaging Forum Foundation, Switzerland. <https://docs.google.com/document/d/1mSUtzjjLXpPbi3jzhexCWKiY8fEMgUiVskDyPt5nDSU/edit>
- The Recycling Partnership. 2021a. The Recyclability Framework. The Recycling Partnership, Virginia, United States. <https://recyclingpartnership.org/framework/>
- The Recycling Partnership. 2021b. Pathway to Circularity. The Recycling Partnership, Virginia, United States. <https://recyclingpartnership.org/circulareconomy/>
- Trayak. 2020a. COMPASS. Trayak, Ohio, United States. <https://trayak.com/category/compass>
- Trayak. 2020b. The Evolution of COMPASS. Trayak, Ohio, United States. <https://trayak.com/the-evolution-of-compass/>
- Trayak. 2020c. Trayak is excited to announce the launch of its next generation platform EcoImpact. Trayak, Ohio, United States. <https://trayak.com/ecoimpact-launch-lca>
- United Nations Environment Programme (UNEP) and Consumers International. 2020. Can I Recycle This? A Global Mapping and Assessment of Standards, Labels and Claims on Plastic Packaging. UNEP, Kenya. https://www.oneplanetnetwork.org/sites/default/files/unep_ci_2020_can_i_recycle_this.pdf
- Value Chain Management International Inc. 2019. A Landscape Review of Plastics in the Canadian Fresh Produce Sector Technical Report. Canadian Produce Marketing Association, Ottawa. <https://community.cpma.ca/login?ReturnUrl=https%3a%2f%2fcommunity.cpma.ca%2fvie%2fdocument%2fc%2fpma-technical-report-a-landscape%3fCommunityKey%3da0528646-3138-4194-8424-7908b8396d70%26tab%3dlibrarydocuments> (login required).
- Walmart. n.d. Sustainable Packaging Playbook: A guidebook for suppliers to improve packaging sustainability. Walmart, United States. <https://cdn.corporate.walmart.com/c0/02/c8b62e684567bb16e0877d6614de/new-wm-packagingplaybook.pdf>
- Walmart. 2021a. Our Business. Walmart, United States. <https://corporate.walmart.com/our-story/our-business>.
- Walmart. 2022. The Recycling Playbook: Optimize, Change, Advance. Walmart, United States. <https://www.walmartsustainabilityhub.com/content/dam/walmart-sustainability-hub/documents/project-gigaton/packaging/walmart-recycling-playbook.pdf>
- WRAP (The Waste and Resources Action Programme). 2011. Development of NIR Detectable Black Plastic Packaging. WRAP, UK. <https://wrap.org.uk/sites/default/files/2020-09/WRAP-Recyclability%20of%20black%20plastic%20packaging.pdf>
- WRAP. 2013a. Masking strength of NIR detectable black colourants. WRAP, UK. <https://wrap.org.uk/sites/default/files/2020-09/WRAP-Masking%20Strength%20of%20DBP%20report.pdf>
- WRAP. 2013b. End Markets for recycled detectable black PET plastics. WRAP, UK. <https://wrap.org.uk/sites/default/files/2020-09/WRAP-End%20Markets%20for%20black%20rPET%20report.pdf>
- WRAP. 2016. In-market trial black CPET trays. WRAP, UK. <https://wrap.org.uk/resources/case-study/market-trial-black-cpet-trays>
- WRAP. 2018a. Rigid Plastic Packaging: Design Tips for Recycling. WRAP, UK. <https://wrap.org.uk/sites/default/files/2020-10/WRAP-Design%20tips%20for%20making%20rigid%20plastic%20packaging%20more%20recyclable.pdf>

- WRAP. 2018b. Roadmap 2025: Creating a circular economy for flexible plastic packaging. WRAP, UK. https://wrap.org.uk/sites/default/files/2020-10/Creating_a_circular_economy_for_flexible_plastic_packaging_roadmap_2025_0.pdf
- WRAP. 2019a. Defining what's recyclable and best in class polymer choices for packaging. WRAP, UK. <https://preprod.wrap.org.uk/sites/default/files/2020-09/WRAP-Polymer-Choice-and-Recyclability-Guidance.pdf>
- WRAP. 2019b. Eliminating problem plastics. WRAP, UK. <https://wrap.org.uk/sites/default/files/2020-08/WRAP-eliminating-problem-plastics-v2.pdf>
- WRAP. 2019c. [Video] Eight Problem Plastics to Be Eliminated Before the End of 2020. WRAP, UK. <https://www.youtube.com/watch?v=tdgCUSPj1y8>
- WRAP. 2020. Understanding plastic packaging and the language we use to describe it. WRAP, UK. <https://wrap.org.uk/sites/default/files/2020-09/WRAP-Understanding-plastic-packaging-FINAL.pdf>
- WRAP. 2021. What we do. WRAP, UK. <https://wrap.org.uk/what-we-do>
- ZSVR (Zentrale Stelle Verpackungs Register). n.d. Welcome to the ZSVR. ZSVR, Germany. <https://www.verpackungsregister.org/en?r=1>
- ZSVR. 2018. Guidance on the assessment of the recyclability of packaging subject to mandatory scheme participation. ZSVR, Germany. http://www.bellandvision.de/xist4c/download/web/Guidance%20Bon%20the%20Bassessment%20Bof%20the%20Brecyclability%20Bof%20Bpackaging_uplId_2717__cold_2113_.pdf
- ZSVR. 2020. Minimum standard for determining the recyclability of packaging subject to system participation pursuant to section 21 (3) VerpackG. ZSVR, Germany. https://www.verpackungsregister.org/fileadmin/files/Mindeststandard/Minimum_standard_Packaging-Act_2020.pdf