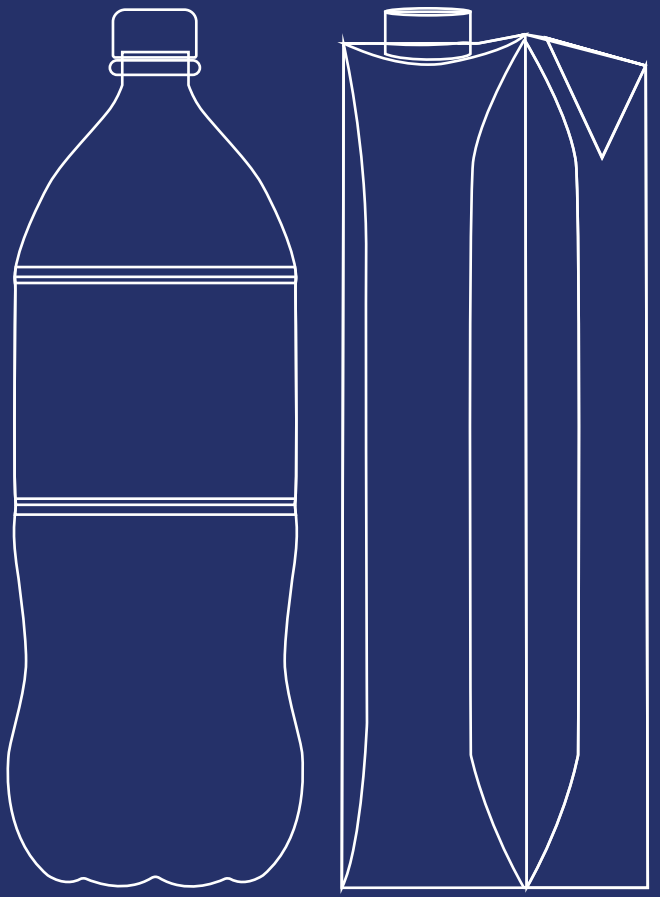
Packaging Design Guidelines

The essential how-to guide for all those involved in the development, design, marketing, and procurement of packaging on how to design PET plastic packaging, and Liquid Board Packaging (LBP) that works for your product and for our planet.

This document will be continually reviewed and updated to align with international best practice.



petco
Leading Producer Responsibility

Foreword

We live in a world where take, make, dispose-of is a way of life. But it is not sustainable. It is therefore critical to incorporate circular economy principles into our way of life to ensure that waste is reduced to a minimum and that resources are kept in use for as long as possible, and at their highest value.

This is often referred to as 'closing the loop' and it implies that products traditionally seen as waste are rather seen as resources which can be brought back into the supply chain after they've completed their original purpose. In this model, well-designed packaging would never become waste; rather, it re-enters the economy as a valuable technical or biological nutrient.

The recycling of packaging does not begin with its collection, but rather with its design. Therefore, to maximise the recycling of plastic packaging, it is essential that retailers, brand owners, packaging manufacturers and designers embed recyclability principles into their pack design processes so that, at the end of its life, the packaging material can be successfully recycled and used again in new products and packaging.

Bearing circular economy principles in mind when designing packaging is about product stewardship, about forward-thinking initiatives, about innovation and breaking new ground to at times realise never-before-seen solutions.

The future of recycling within a circular economy begins with you.

Introduction

Climate change and sustainable development are two of the biggest issues facing today's society. It is therefore increasingly important for companies to reduce the environmental impacts of their products and services throughout their entire lifecycle; companies that fail to address environmental performance in product design and development will find it increasingly difficult to compete in a global market that is fast transitioning towards a circular economy. Packaging needs to be designed to satisfy more than just aesthetics – it needs to fulfil technical, consumer and customer needs in a manner that minimises environmental impact. This means that it needs to be designed and produced with the minimum amount of resources for purpose and, once it has completed its job, the scope for recovery maximised.

Around the world product stewardship and Extended Producer Responsibility (EPR) have become requirements for producers in some countries. In short, this means that the producer (which Petco believes is the brand owner, retailer or importer) takes joint responsibility to deal with the product and all the waste it creates after its commercial life (i.e. cradle to cradle). In South Africa, Section 18 of The National Environmental Management: Waste Act (Act 59 of 2008) (hereafter referred to as The Waste Act) makes this a legal requirement for all.

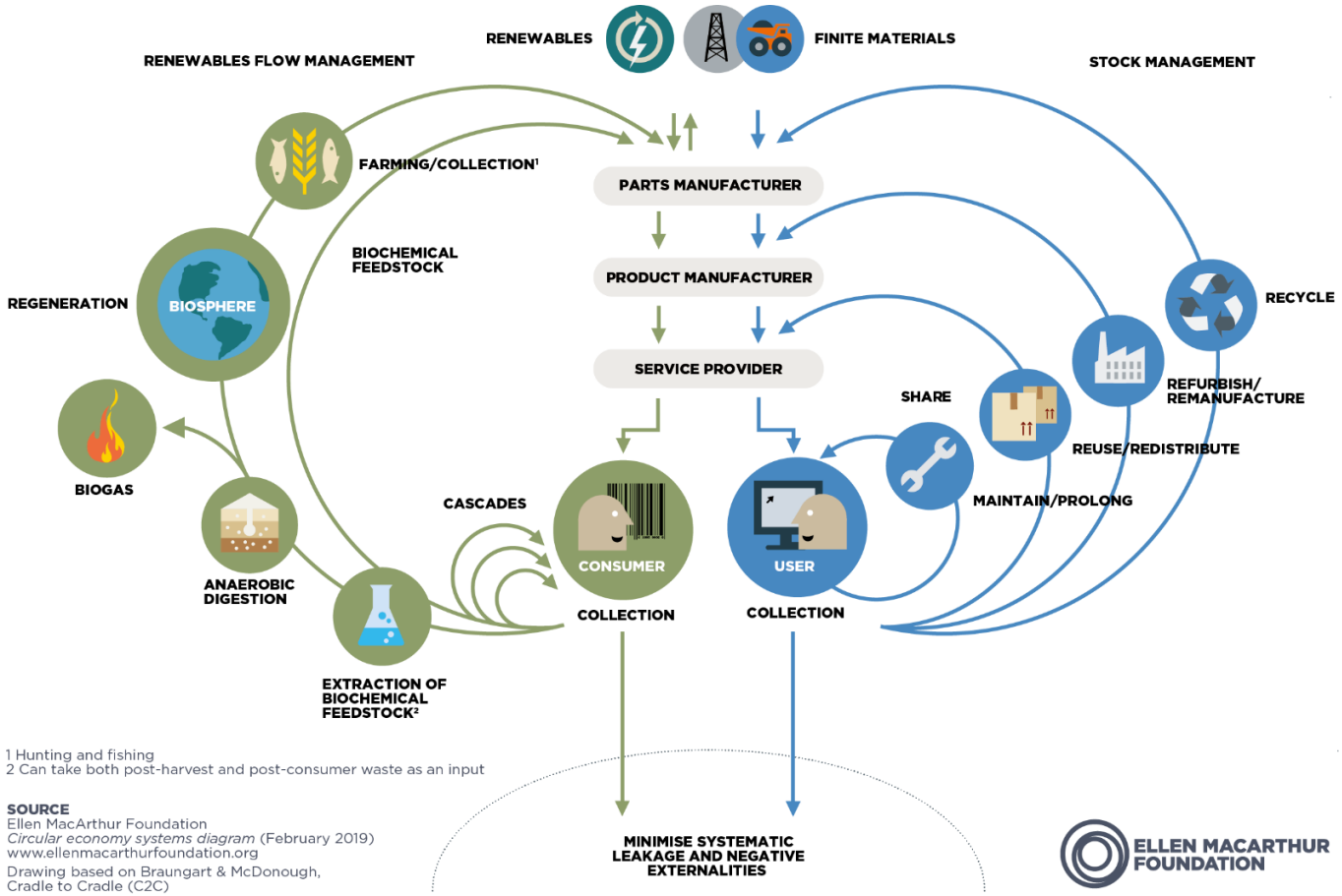
The Minister has the power to declare any waste which may be problematic as a priority waste. In this instance, the Minister will decide what to do with it e.g. through the placement of a material ban or a deposit on the container, etc.

In South Africa, the approach to waste management is rooted in the principles of the waste hierarchy and the circular economy (NWMS, 2020). The waste hierarchy comprises several levels, each representing an approach to waste management, arranged in descending order of priority.

The Waste Hierarchy

"The circular economy system diagram, known as the butterfly diagram, illustrates the continuous flow of materials in a circular economy. There are two main cycles – the technical cycle and the biological cycle. In the technical cycle, products and materials are kept in circulation through processes such as reuse, repair, remanufacture and recycling. In the biological cycle, the nutrients from biodegradable materials are returned to the Earth to regenerate nature".

- Ellen MacArthur Foundation, (2023)



See Appendix 1 for more information on the evolution of waste management in South Africa.

Document Scope

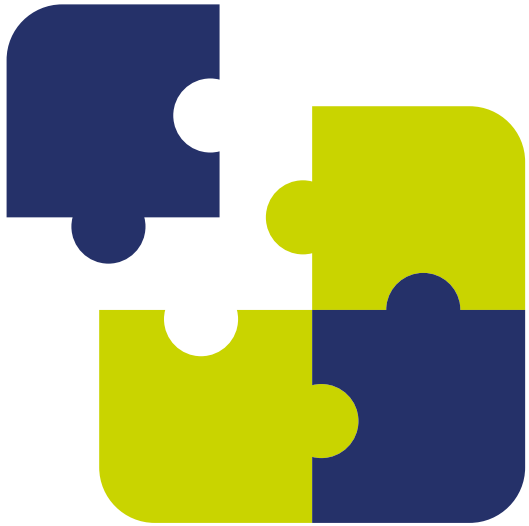
These guidelines focus on the design of PET plastic packaging and Liquid Board Packaging (LBP) to facilitate recycling. This represents a small yet important guide for the journey to sustainable production and consumption in South Africa. Furthermore, these guidelines are driven by the requirements of the mechanical recycling process in South Africa specifically.

The guidelines contained in this document have been created to help producers and brand owners realise and appreciate that used PET and Liquid Board Packaging material is far too valuable to be considered as trash, and to encourage the recycling of these materials.

While this document does not provide a full strategic overview of all the known issues in PET and LBP recycling, we acknowledge that guidance on designing for recyclability is one component of a large sustainability challenge, and we aim to share as much knowledge as possible.

There are wider issues of relevance, both in considering the overall environmental impact of differentiated PET and LBP packaging systems, and in developing efficient operational solutions to recycling and recovery of used PET plastic and LBP packaging.

It is noted that designing for recyclability is not something that can happen overnight, and that on-going work will be required by new and existing parties, including designers, manufacturers, waste and resource management professionals, and governments to address these developing issues. It is also important to note that since the packaging market is characterised first and foremost by "fit-for-purpose", then affordability, there will be specific circumstances where the relationship between packaging production and recycling will continue to develop.



"PET and Liquid Board Packaging material is far too valuable to be considered as trash"

Aims & Objectives

The aims of this document.

1 **Encourage packaging designers, retaileras, packaging manufacturers, as well as brand owners and marketing teams, to consider the recycling possibilities of the products they're designing.**

2 **Offer guidelines for those wishing to make their PET and LBP packaging more compatible with the existing recycling infrastructure in South Africa and therefore recyclable.**

3 **Provide adequate information to prevent PET and LBP packaging from:**

- **Inadvertently interfering with existing recycling streams**
- **Interfering with existing recycling infrastructure**
- **Being landfilled due to bad design**

Pursuit of these aims must be proportionate; the guiding principle for any packaging design should be 'fit for purpose'. The goal of improving recyclability of packaging cannot compromise product safety or interfere with product functionality. Furthermore, packs must be strong enough to protect the contents as best as possible throughout the supply chain. Lastly, improving recyclability should positively contribute to an overall reduction in the environmental impact of the total product offering.

However, brand owners should be wary of allowing functionality to excuse poor design, especially with new government legislation in mind. Packaging must be both functional and designed for end-of-life solutions like recycling.

It is also recognised that recyclability is only one measure of sustainability. While recycling is important as it can extend the life of valuable materials, reduce energy use, waste and litter, and cut greenhouse gas emissions, it is the full life cycle of the product – all environmental, social and economic benefits as well as negative impacts throughout the life of the product – which must be considered.

Following these guidelines will assist in matching societal expectations and company practices and increase market share by promoting the environmental features of a product to an environmentally conscious consumer.

Following these guidelines will also help companies demonstrate compliance linked to current legislation and, more generally, will demonstrate due diligence.

What is Petco asking of you?

We are asking you to follow the guidelines we have put in place to help ensure that PET and LBP packaging does not cause recycling issues and has value far beyond its original intended purpose.

Existing packaging companies, manufacturers of packaging and brand owners are asked to review their current portfolio of PET and LBP packaging against these design guidelines, highlight any aspects where designs could potentially be improved and then implement the changes as soon as the opportunity presents itself.

New packaging companies, manufacturers of packaging and brand owners are asked to integrate these guidelines into the design process at the very beginning to minimise cost and maximise the opportunity for compliance.

PLEASE

- Do not use materials and/or components that are known to impede the recycling process or reduce the quality of recyclate.
- Ensure that packaging components allow for ease of separation and efficiency of recycling.
- Include recycled PET packaging into your strategic planning.
- Support end-use markets for recycled content applications.
- Design components, such as closures and labels, so that they can easily, safely, cost-effectively and rapidly be separated, and then eliminated from the recycled PET/LBP.
- Understand that the goal of improving the recyclability of packaging cannot compromise product safety.

Not all packaging is created equal.

What to look out for.

PET Packaging
Guidelines

PET forms the basis for synthetic fibres like polyester and is also recognised in the packaging industry as the rigid plastic commonly used as beverage bottles for carbonated soft drinks, bottled water, milk, juice, sports and energy drinks, jars, punnets, tubs and trays for food items, bottles for household, personal care and pharmaceutical products, and sheet and film for general packaging.

The following sources were used for the recyclability guidelines for PET packaging:

- Government Gazette 48845, Notice No. 3604 - National Environmental Management: Waste Act No.59 of 2008: Packaging guideline: Recyclability by Design for packaging and paper in South Africa.
- The European PET Bottle Platform's Guidelines for Recycling.

PET is identified by its polymer code '1', which is usually stamped on the underside of the packaging.

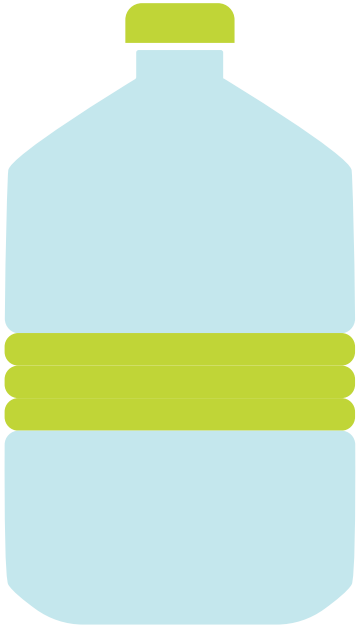
Here are the specifics of what to look out for when designing PET packaging:

PACKAGING FORM

Start empty.

Good packaging design can encourage reduced content waste. It should be possible to empty a pack responsibly so that only very little of the residual contents are left in the pack. This simplifies processing and recycling of the plastic packaging.

For PET bottles, wide necks allow the bottle to be placed upside down to drain all of the contents without any residue being left behind. This applies more to sauce and food bottles/jars and similar segments of the market.



MATERIAL TYPE

Choose wisely.

Not all packaging materials can be recycled in South Africa. Understanding which different polymers can be recycled in South Africa can drastically improve the design for recyclability. The aim is to minimise the number of different plastics used and to specify plastics that can be recycled together or easily separated in the recycling process.

Do not use combinations of different types of plastics with the same density ranges; PET is heavier than water and will sink during one stage of the recycling process.

During the PET washing process, caps or labels manufactured from polyolefins (polypropylene (PP), high-density polyethylene (HDPE), or Low-density polyethylene (LDPE)) will float and can easily be separated and then removed.

MATERIAL TYPE (CONTINUED)

Choose wisely.

- Do not use PVC as its similar appearance and overlapping range of densities with PET make the two polymers difficult to separate, often resulting in PVC contamination. This contamination (even at levels as low as ca50-200ppm) can render large amounts of PET useless for most recycling applications. For this reason, the use of PVC components of any kind with PET containers should be scrupulously avoided. These components generally include, but are not limited to closure liners, labels, sleeves, and tamper-evident seals.
- Do not use PETG[1] (PET with glycol added) for similar challenges to PVC and especially given its lower melting temperature to PET, which renders it a contaminant.
- Other types of polymers that are sometimes substituted for PET include PLA (Polylactic Acid), polycarbonate (PC) and rigid polystyrene (PS). Even the lowest levels of PLA in PET leads to haze and a deterioration of physical properties within recycled PET.

See Appendix 2 for more information on bioplastics and biodegradable plastics, and their recyclability.

MATERIAL IDENTIFICATION

Know your sign.

To facilitate the ease of visual identification of plastic types during manual separation, major plastic components should carry a material identifier, otherwise known as a product identification code (PIC).

- The PIC symbol should be clear, legible and moulded into the container as well as on the label so as to be easily identifiable.
- In the case of films, the PIC symbol should be lightly and repeatedly printed onto the material.
- Multilayer polymer composites should be marked with PIC '7'.
- Do not use the PIC 1 for PETG, PET/PE laminate, or PET with biodegradable laminates (refer to bullet point directly above).
- In exceptions, the PIC symbol can be located close to the base or printed on the label.

COMPOSITE MATERIALS / BARRIER LAYERS

Effective protection.

- Other external coatings (e.g., O^2 or CO_2 barriers) can cause recycling issues. External coatings such as those that are applied to extend the shelf-life of products may sometimes cause recycling problems. If absolutely necessary to use a barrier, it needs to flake off the PET, be efficiently removed during granulation and needs to be validated by Petco and its recycling partners. Designers and converters need to select the correct combinations.
- Where performance-enhancing barrier layers are used that could interfere with current recycling (e.g. PET wine bottles), it is important to ensure that the container is easily distinguishable and sorted from conventional PET bottles and marked with a PIC '7'.

1 The State of California revised the state's definition of PET in 2017 to exclude PETG, meaning products made from the glycol-modified plastic are barred from using resin code No. 1. PETG which has a much lower melting point than PET, creating problems during the recycling process. AB 906 redefines PET by its melting point and material composition (Assembly Bill No. 906 https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB906).

ADDITIVES

Are you adding for the right reason?

The inclusion of nucleating and hazing agents, colours, and, oxygen scavengers and other additives for technical effects should be examined on a case-by-case basis for their impact on the overall plastic recycling stream. Such additives, which often (but not always) cause PET to discolour and/ or haze, should be avoided unless means are readily and economically available to negate their effect.[2]

COLOUR OF PLASTIC

Is bright right?

- Clear bottles have the highest commercial value for recycling. Very light blue bottles are also acceptable as they can be blended in small amounts with clear bottles.
- Green and brown bottles are also recycled but have a much lower value than clear bottles. Designers are encouraged to consider alternatives (e.g. floatable polyolefin shrink sleeves) if colour is absolutely necessary.
- Do not print directly onto the bottle as it contaminates the PET and therefore deems the bottle unrecyclable. Note that minimal printing, for e.g., batch numbers, is acceptable but should be avoided if possible.

CLOSURES / CLOSURE LINERS / CAP SLEEVES / SEALS

Know how to close.

- All closures, closure liners, puffers, inserts, caps, sleeves, and tamper-evident seals should be recyclable themselves.
- Use Polyolefins (PP/PE-HD/PE-LD or PE-LLD) for closures on PET bottles.
- Do not use metal caps on bottles as they are difficult and costly to remove, which results in good bottles being rejected in sorting systems. Additionally, any residual metal not removed can damage machinery.
- Do not use coated paper lids, as these make separation very difficult.
- Consider tethering your cap to the bottle.

2 Check with Petco as additive companies have sometimes run tests in other jurisdictions. However, compatibility else where does not necessarily denote compatibility with local recycling streams.

LABELS AND ADHESIVES

Stick to the basics.

- For bottles, sleeves and tamper-evident seals should be designed to completely detach from the container during the washing phase of recycling.
- Do not use PET sleeves and labels with PET bottles.
- Do not use PVC sleeves and labels with PET bottles.
- Polyolefin sleeves and labels with PET bottles are the better option, as these can be separated from the PET bottle during the washing process.
- Do not use paper labels on PET bottles; they cause significant problems in conventional recycling.
- Polyethylene and polypropylene labels are preferred.
- Where adhesives are absolutely necessary, use those that are soluble or alkali-soluble at 60-80˚C.
- For self-adhesive labels, use glue that is designed to separate from the PET flakes, and stay on the label during the washing process.
- Do not use foil tamper-evident seals that leave remnants of foil and adhesive.
- Metallised/foil labels on film are costly to remove, increase contamination and have the potential to devalue the collected material.
  They also increase the rejection rate in the sorting line and reduce the yield.

INKS

Think before you ink.

- Do not print directly onto the bottle as it contaminates the PET and therefore deems the bottle unrecyclable.
- For printing of batch or date information on the bottle, use lasers, in preference to ink jet or other printing, which uses no ink.
- Do not use metallic inks.

OTHER COMPONENTS

For effect or effectiveness?

- The use of other components of a different material (e.g., pour spouts, handles, etc.) is discouraged as they often increase the separation costs and reduce resin yield.
- Do not use metal springs / components, as found in trigger mechanisms.
- Do not use silicon seals.
- The use of Radio Frequency Identification (RFID) on bottles, labels, or closures is discouraged.
- Do not consider thermoformed In-Mould Labelling (t-IML) as the inclusion of these labels renders the PET unrecyclable.

CLOSING THE LOOP

The full circle starts with you.

Designers, manufacturers of packaging, and brand owners should always consider the possibility of including increasing percentages of recycled PET plastic in their packaging. The specification of recycled materials in the design of new products supports the recovery of plastics by providing a market for reprocessed materials and reduces reliance on virgin materials. Advantages include a potential cost-saving, marketing benefits, and reduced environmental impact.

GUIDELINE TABLE FOR PET BOTTLES

		Yes Compatible with recycling for most applications.	**Conditional** Limited compatibility.	**No** Low compatibility i.e. not suited for recycling.
PACKAGING		PET.		PLA / PVC / PS / PETG / Polycarbonate (PC) / Polybutylene Terephthalate (PBT).
BODY	**Colour**	Transparent clear/ Transparent light blue.		Other transparent colours / opaque / metallic / fluorescent colours / carbon black.
	Barrier/Coatings	SiOx plasma-coating.		EVOH or PA monolayer blends. Dual layer combination of different polymers. Multilayer.
	Additives			O2 scavengers; UV stabilisers; Acetaldehyde blockers. Nanocomposites. Oxo-biodegradable additives.
CLOSURE	**Caps**	Materials with densities less than 1g/cm3 like PP/PE-HD/ PE-LD.		Materials with densities more than 1g/cm3 e.g., PVC and PET; Metals.
	Seals	Materials with densities less than 1g/cm3 like PE, PP, BOPP.		Materials with densities more than 1g/cm3 e.g., PVC, Al, Silicone, PS.
DECORATION	**Direct printing**	Laser printing of production or expiry date.		Direct printing onto bottle or jar.
	Labels	Materials with densities less than 1g/cm^3 like PE, PP, BOPP.	Self-adhesive labels where glues are designed to stay on the label when detached from the bottle.	Materials with densities more than 1g/cm3 like PVC, PS, PET. Self-adhesive with improper glue i.e. glue does not stay on the label. Metalised labels. Paper labels.
	Sleeves (including tamper resistance)	Materials with densities less than 1g/cm^3 like PE, PP, BOPP.		Materials with densities more than 1g/cm3 like PVC, PS, PET, PETG. Heavily inked shrink sleeves. Metalised materials.
	Adhesive	Water or alkali soluble in 60-80°C, designed to remain on the label.		Not removable or soluble in water.
	Ink	Laser printing of batch or date information on the bottle.		Metallic inks. Inks that bleed in the recycling process.
OTHER	**Trigger sprays**	PE-HD/PE-LD PE / PP - HD / PE - LD / PP / uncoloured PET.		Glass components. Metal springs / ball bearings Coloured PET.

* Aligned with the European PET Bottle Platform, which is a voluntary industry initiative that provides PET bottle design guidelines for recycling, evaluates PET bottle packaging solutions and technologies, and facilitates understanding of the effects of new PET bottle innovations on recycling processes. www.epbp.org.

WHAT DO WE WANT YOU TO DO?

- Design PET containers with the environment, the recycling process, and the available recycling infrastructure in South Africa in mind. Sustainable recycling starts with a product that is designed to be compatible with the available collection and recycling infrastructure in South Africa and aligned with the end-use markets prevalent in our region.
- Include recycled content (rPET) in your packaging.
- Be transparent about your usage of rPET.
- Be transparent about the recyclability of your PET packaging.

GOLD STANDARD

Here is a quick visual guide to help you improve the recyclability of PET bottles and jars.

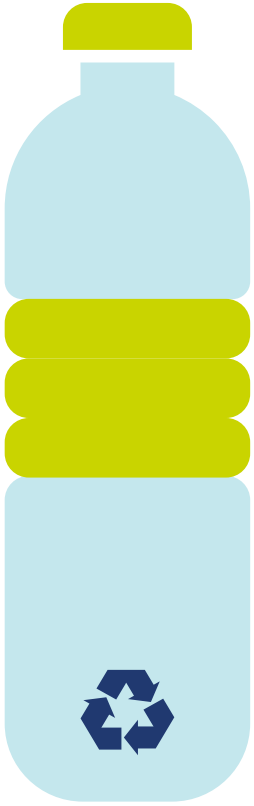
HOW TO IMPROVE THE RECYCLABILITY OF PET BOTTLES:

COLOUR
DO: Transparent / clear.
DON'T: Other/strong colours, opaque colours.

MATERIAL
DON'T: Use plastics with the same density range as PET e.g. PVC or PET with biodegradable additives.

BARRIERS & COATINGS
DON'T: Use use any barriers and coatings.

MATERIAL IDENTIFICATION
DO: Show PIC clearly and legibly.



CAP, CLOSURES & CAP LINERS
DO: Use materials with densities less than 1g/cm3: PP, PE, BOPP, EPS.
DON'T: Use metal closures or PVC liners.

ADHESIVES
DO: Where absolutely necessary use water-soluble at 60-80°C adhesives.
DO: For self-adhesive labels, use glues that are designed to stay on the label.

LABELS & SLEEVES
DO: Use materials with densities less than 1g/cm^3 like PP.
DON'T: Use metal or paper for labels.

INKS & DIRECT PRINTING
DON'T: Print directly on the bottle.

GUIDELINES FOR PET TRAYS AND BLISTER PACKS

Although PET is extensively used for bottles and jars, it is also used in other packaging formats, e.g. thermoformed sheet for trays and blisterpacks.

PET trays and blister packs (alongside all plastic trays) are not widely collected and recycled in South Africa. This is gradually being addressed. However, packaging designers should still incorporate all the aspects to render PET trays recyclable. For PET trays, moulds with specific PICs logos should not be used for other materials; for example, a mould with a No 1 PET insert cannot be used for No 5 PP, etc.

Here are the specifics of what to look out for when designing PET trays and blister packs.

1. COLOUR OF PLASTIC

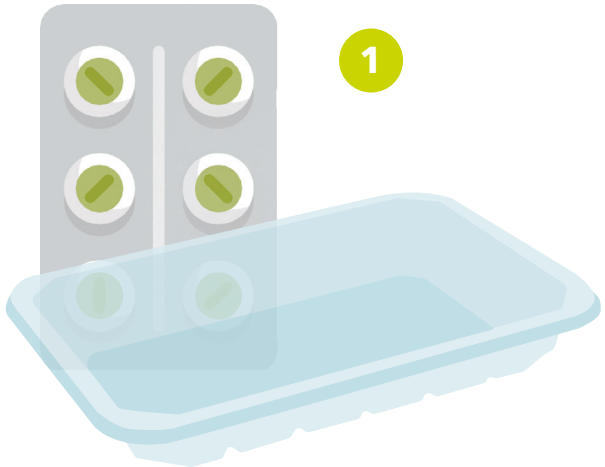
Trays and blister packs should be clear without the addition of any colourants.

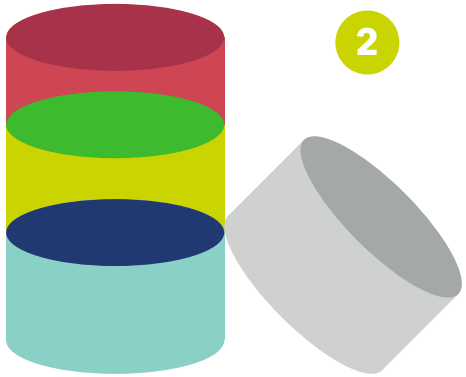
2. CLOSURES / CLOSURE LINERS / CAP SLEEVES / SEAL

The plastic lid must be an integral part of the tray or at least the same plastic as the main body. Coated paper lids make separation very difficult.

3. LABELS AND ADHESIVES

- Labels have a negative effect on recycling especially if they cannot be removed easily in water. Even if the labels can be separated, adhesive residue on the tray that is difficult to remove significantly impairs the quality of the recyclate.
- Combinations of different plastics with a similar specific density, such as the combinations of PET and PVC, and combinations of plastics with other substrates render the packaging unrecyclable.





GUIDELINE TABLE FOR PET TRAYS AND BLISTER PACKS

* Aligned with the Design for Recycling Guidelines for PET trays, developed by the PET Thermoforms Working Group under Petcore Europe. https://www.petcore-europe.org/images/evaluation-platform-test-procedures/dfrguidelines_final_version.pdf

		Yes Compatible with recycling or most applications.	**Conditional** Limited compatability.	**No** Low compatability i.e. not suited for recycling.
PACKAGING		PET.	Delaminating PET / PE / PET-GAG structure.	PLA / PVC / PS / PETG / C-PET. Any PET-based multi-layer material apart from delaminating PET / PE and PET-GAG. Expanded PET. Other opaque and colour material.
BODY	**Colour**	Transparent clear; Transparent light-blue.		Other transparent colours / opaque / metallic / fluorescent colours / carbon black.
	Barrier / Coatings	None.	Inner or outer layer coating.	EVOH or PA / any other barrier / any other oxygen scavenger.
	Additives	Silicone surface coating (on coating area); Antiblocking masterbatch (max 3%). No additives should affect clarity .	Minimal silicone surface coating (de-nest).	O^2 scavengers; UV stabilisers. Acetaldehyde blockers. Nanocomposites. Oxo/Bio-biodegradable additives.
CLOSURE	**Lid**	Integral with container. PET; floating combination of plastics with density less than 1 g/ cm^3 (floating to be proven with sink/float test); in any case with no glue residuals (to be proven with glue removal test and oven test).	Peel-off lids if adhesive layer remains with lid. Made of materials with densities less than 1g/ cm^3 including PP / PE-HD / PE-LD.	Paper labels containing BPA – non-floating paper labels. Peel-off lids where adhesive remains on container Made of PVC, PLA or any material with density greater than 1g/cm^3.
DECORATION	**Direct Printing**	Do not print on tray unless production or expiry date, in which case use laser printing (minimally).		Direct printing on tray.
	Labels	Adhesives with 100% removing ratio and no adhesive residuals on flakes at 70°C testing temperature. Materials with densities less than 1g/cm^3 like PE, PP, BOPP.	Self-adhesive labels where glues are designed to stay on the label when detached from the tub or the tray 85°C testing temperature. BPA-Free Paper label not losing fibres (pulping).	Materials with densities more than 1g/cm^3 like PVC, PS, PET. Self-adhesive with improper glue i.e., glue does not stay on the label. Metalised labels. Paper labels losing fibres (pulping) or paper containing BPA.
	Adhesive	No adhesives on body.	Water soluble adhesives. Hot melt alkali adhesives.	Any other adhesive.
	Ink	Good manufacturing practice – excluding heavy metal-containing inks Laser printing.		Direct printing on tray.
OTHER	**Inserts**		PE / PE-HD / PE-LD/ PP/ uncoloured PET. Paper - all inserts should be completely removable and leave no traces.	PVC/ PLA/ PS/ EPS/ PU/ PC/ PMMA/ Nylon. Thermoset plastics / metals.

GOLD STANDARD

Here is a quick visual guide to help you improve the recyclability of PET trays.

HOW TO IMPROVE THE RECYCLABILITY OF PET TRAYS:

LIDS
DO: Ensure the plastic lid is an integral part of the tray.

COLOUR
DO: Transparent / clear.
DON'T: Other / strong colours, opaque colours.

ADHESIVE
DON'T: Use adhesives on body.

LABELS
DON'T: Use materials with densities greater than 1g/cm^3 like PVC, PET, PS.
DON'T: Use metals or paper.
DON'T: Use self-adhesive labels that don't detach.

INKS & DIRECT PRINTING
DON'T: Print directly on tray.

MATERIAL IDENTIFICATION
DO: Show PIC clearly and legibly.

Bioplastics
Guidelines

THE FACTS: BIOPLASTICS, BIODEGRADABLE PLASTICS & THEIR RECYCLABILITY

The way plastic is designed to behave alongside what material it's made from, affects what it can be used for as well as how it can be recycled and disposed of at the end of its life.

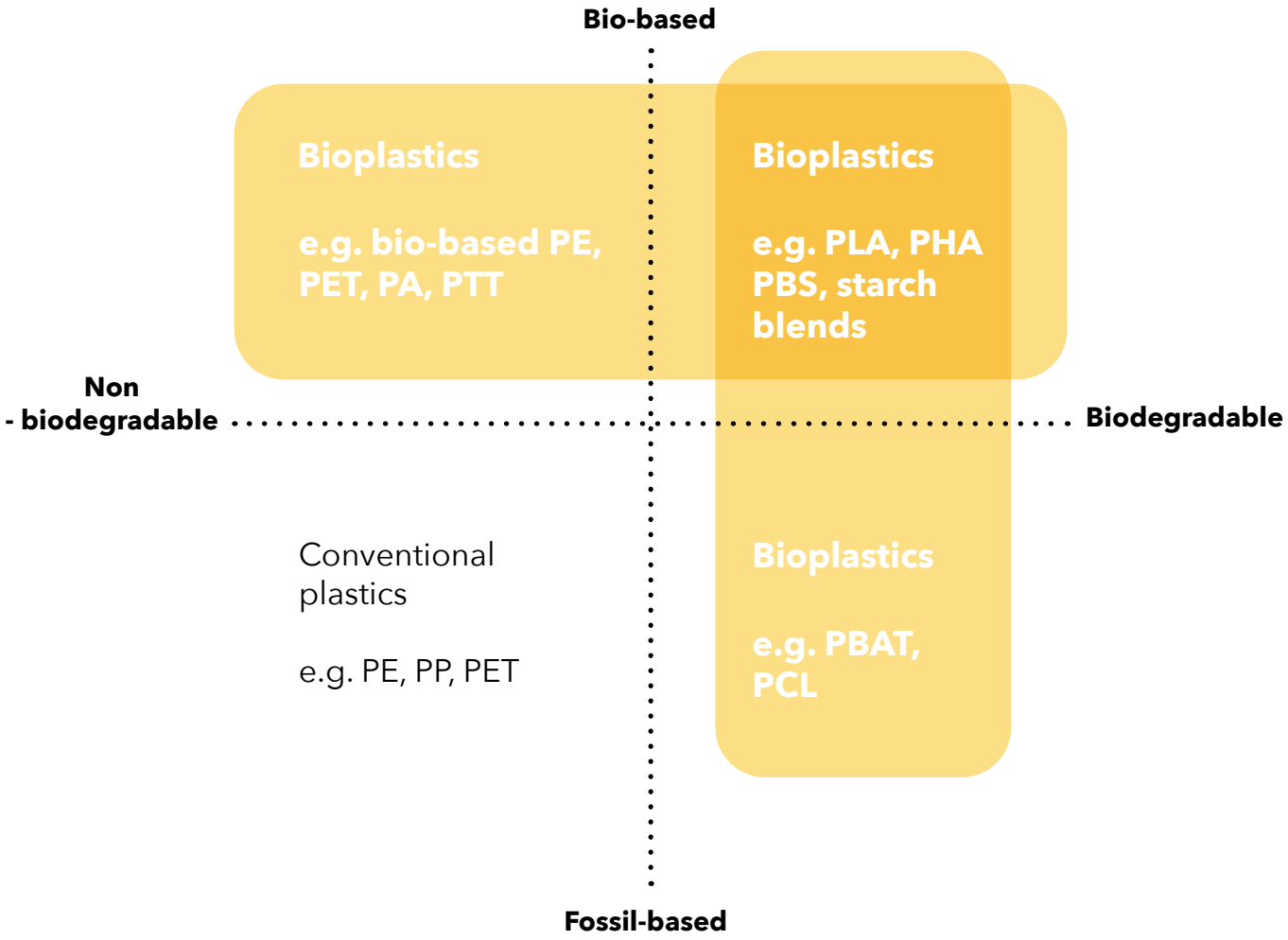
Plastic can be made from fossil-based or bio-based materials. Both can be used to make highly durable, non-biodegradable plastics, or plastics which either biodegrade or compost. The nature of the material used to make a plastic or the term used to describe it does not necessarily dictate the way it will behave at the end of its life e.g. a bio-based plastic or bioplastic does not automatically mean it will biodegrade.

This diagram demonstrates the complexity of the term bioplastics; which refers to a diverse family of materials with differing properties – there are three main groups:

1. Bio-based or partially bio-based non-biodegradable plastics such as bio-based PE or PP;
2. Plastics that are both bio-based and biodegradable, such as biodegradable PLA and PHA or PBS;
3. Plastics that are fossil-based and biodegradable, such as PBAT.

See glossary for acronyms.

Bioplastics diagram is based on the European Bioplastics version https://www.europeanbioplastics.org/bioplastics/materials/



Extracted and used with permission from WRAP (2018) Understanding plastic packaging http://www.wrap.org.uk/sites/ files/wrap/Understanding%20plastic%20packaging%20FINAL.pdf

MATERIAL TYPE

Fossil-based plastic.
Made from a wide range of polymers derived from petrochemicals. Fossil-based plastic packaging is generally long lived, non-biodegradable and durable. These are referred to as conventional plastics. However, fossil-based plastic can also be designed to biodegrade.

Bio-based plastic.
Made using polymers derived from plant-based sources e.g. starch, cellulose, oils, lignin etc.

Bio-based plastic is the term used for any plastic made from bio-based polymers and refers to the source from which the plastic is made, not how the material will function.

Bio-based polymers can be used to make plastic packaging that behaves like conventional plastic and is long-lived, durable and non-biodegradable. It can also be used to make biodegradable and compostable plastics. Both types are referred to as bioplastics.

BEHAVIOUR AND FEATURES

All plastics, regardless of whether they are fossil-based or bio-based, can be designed to behave in three ways:

1. Non-biodegradable.
Is durable and lasts for years.

It has high strength and can be used in low weight applications.

2. Biodegradable.
Breaks down in a defined period of time.

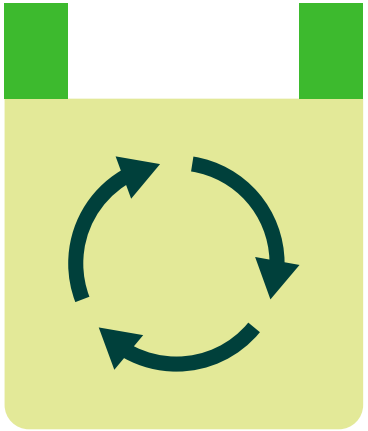
It can now be made with similar strength, plasticity and elasticity properties of non-biodegradable plastics, and made into products using the same technologies (e.g. film processing or moulding).

The fact that a plastic is described as biodegradable does not mean that it should be freely released into the environment in an uncontrolled manner.
The speed, method and nature of biodegradation differs between materials and users should question the behaviour of biodegradable materials before using them in any application.

3. Compostable.
Can meet EN13432 or a comparable standard for compostable packaging so that the material decomposes and biodegrades in industrial composting conditions. Materials that meet an appropriate home composting standard can be composted in home composting systems.

It can have similar strength, plasticity and elasticity properties to non-biodegradable plastics and can be made into products using the same technologies (e.g. film processing or moulding).

Importantly, not all biodegradable plastic is compostable, but all compostable plastic is biodegradable.



SUITABILITY FOR RECYCLING

The way a plastic is designed to behave dictates its suitability for recycling – not whether it is fossil-based or bio-based.

1.Non-biodegradable.
Packaging plastics can be recycled, if collected and sorted into separate material reprocessing streams.

The route for recycling or disposal must not compromise other recycling routes. Biodegradable plastics entering the recycling stream will contaminate the recyclate.

2. Biodegradable.
Currently, biodegradable plastics cannot be recycled in the same way as non-biodegradable plastic.

It must be separated from non-biodegradable plastic streams and dealt with separately. If not, it causes problems during the recycling process.

Biodegradable packaging needs to be clearly labelled and easy for citizens to identify, separate and correctly dispose of. The route for treatment and disposal must not compromise existing recycling routes. Biodegradable packaging can only be composted when it meets the appropriate composting standard. South Africa does not currently have commercial facilities that can handle biodegradable packaging.

3. Compostable.
Compostable plastics can be composted at industrial scale composting facilities or, in some cases, may be suitable for home composting. It is vital that only compostable plastics are sent to these routes as non-compostable plastics can contaminate the final compost produced.

Compostable plastic packaging needs to be clearly labelled and easy for citizens to identify, separate and correctly dispose of in an appropriate collection and recycling scheme for compostable plastics. The route for recycling compostable packaging must not compromise non-biodegradable recycling routes. Non- biodegradable plastics entering the composting processes can end up contaminating the final product.

ENVIRONMENTAL IMPACT

Any plastic that evades appropriate collection and treatment that escapes into the environment has the potential to have a long-lasting impact on the environment.

1. Non-biodegradable plastic packaging.
Conventional plastic debris has been shown to accumulate in inland waters and marine environments. The impact of this is now being widely discussed.

There is very limited information on the impact of conventional plastic in soil-based environments, though it is clear that plastic fragments will persist for long periods of time.

2. Biodegradable and compostable plastic packaging.
There is a lack of clarity concerning standards that define the biodegradability of biodegradable or compostable plastics in any environment. There is a particular lack of evidence on the behaviour of these materials in water and there is a need to understand biodegradation at lower temperatures. Therefore, it is very difficult to accurately assess environmental impact of the biodegradable and compostable plastic packaging.

Composting is only taking place at temperatures exceeding 60 °C.

CARBON FOOTPRINT OVER LIFE CYCLE

Life Cycle Assessment is a complex technique to quantify the environmental impact of a single product over its entire life cycle.

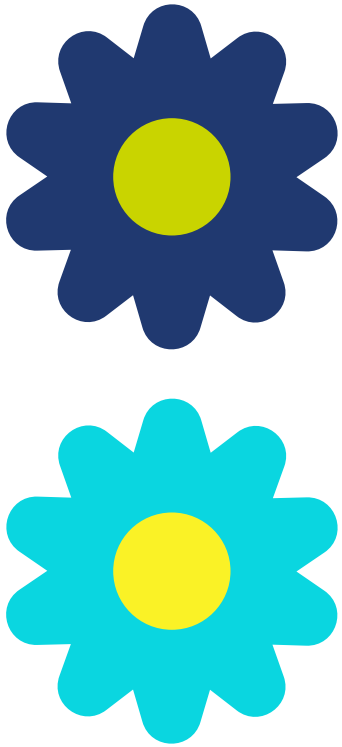
For greenhouse gas emissions from all types of plastic, studies show that raw material extraction, production, and waste disposal, contribute most to emissions. Bio-based plastics usually have a lower carbon impact in their extraction and production phase.

Where conventional plastics enter 'energy to waste' facilities, they emit greenhouse gases, which can be higher than combusting coal or natural gas to generate the same amount of energy. Within landfills they are considered inert.

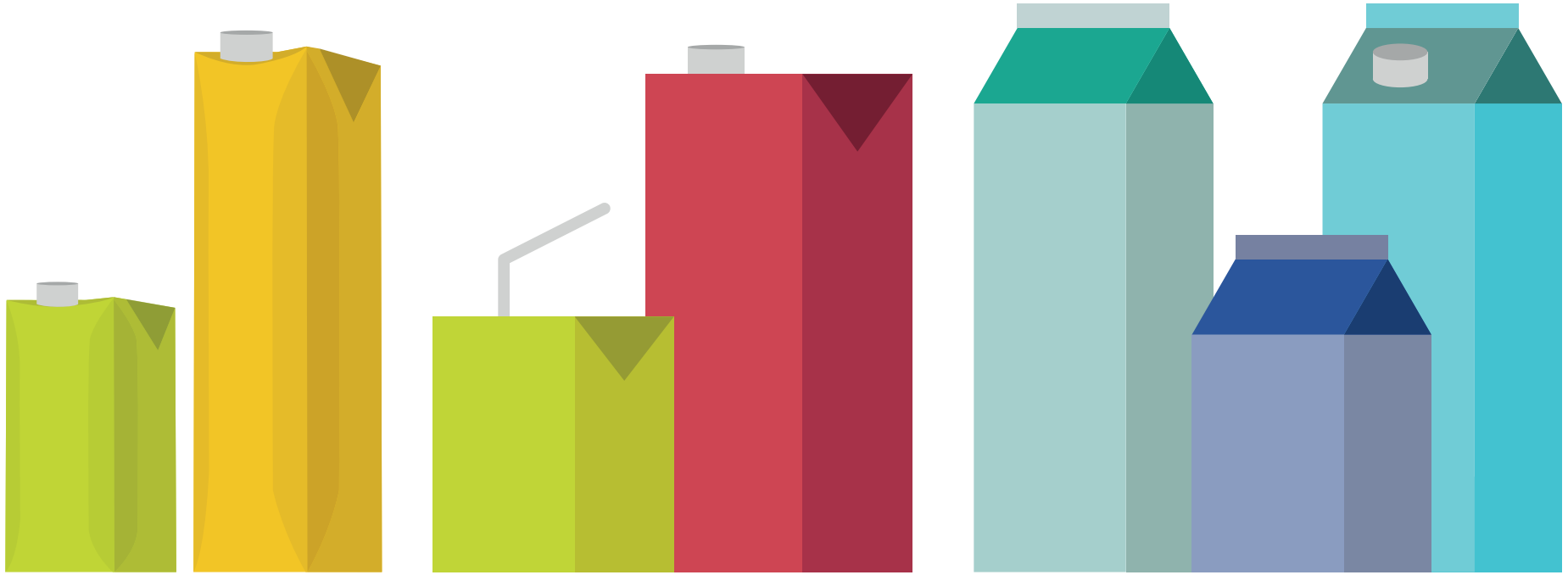
The opposite is true for biodegradable plastics, which has the potential to give rise to methane under landfill conditions, but in energy recovery are considered carbon neutral (short cycle emissions).

Compostable plastics contribute to compost structure but contain no nutrients Nitrogen, Phosphorous, and Potassium (NPK).

For all plastics, recycling generates the lowest emissions at end of life (WRAP).



Liquid Board Packaging
Guidelines



Here are the specifics of what to look out for when designing Liquid Board Packaging:

According to the Alliance for Beverage Cartons and the Environment "Although the evaluation and evidence bear out that beverage cartons are inherently recyclable, it has been demonstrated that there are still characteristics of carton structures and designs which may influence the recyclability of individual beverage cartons as measured by recyclability criteria". [3]

The following sources were consulted for the recyclability guidelines for liquid board packaging:

- Government Gazette 48845, Notice No. 3604 - National Environmental Management: Waste Act No.59 of 2008: Packaging guideline: Recyclability by Design for packaging and paper in South Africa.
- The Alliance for Beverage Cartons and the Environment's Beverage Cartons Design for Recyclability Guidelines (October, 2022).

USED BEVERAGE CARTONS / LIQUID BOARD PACKAGING

Know your components.

Milk, juice and certain food cartons are made up of a combination of paper board, polyethylene and aluminium (PolyAl). In most cases paper board is the dominant component comprising at least 75% of the laminated board packaging. The packaging is recycled through a hydropulping process where the fibre is separated from the PolyAl.
The fibre is then used to manufacture recycled paper board for various end uses. The PolyAl, is processed further into various plastic products.
The closures are separated and processed into various plastic products.

PRINTING INKS AND PRINTING TECHNIQUES

Think before you ink.

Two acceptable alternatives exist for printing LBP. The printing is either applied directly onto the board prior to the attachment of the outer PE layer, or the ink is applied on the outer PE layer.
Offset printing (with vegetable oil-based ink), Flexo-SB, Flexo-Wb, Gravure-SB, Gravure-Wb printing is all fully compatible with recycling processes. Offset printing (with mineral-oil based ink) despite being fully recyclable, limits the use of recovered fibre to non-food applications. Mineral-oil based inks can also cause occupational health and safety issues for people working in PolyAl recycling facilities. When heated during the extrusion process, mineral-oil based inks can emit volatile organic compounds (VOC).

Despite the fact that paper recyclers are able to de-ink printing, it is still recommended that excessive ink coverage be avoided. Heavily inked papers can interrupt production. In addition, heavily inked paper is recycled into lower grade paper. Refer to the *European Paper Recycling Council Assessment of Printed Product Recyclability De-inkability Score* to determine whether your product is de-inkable according to the thresholds set by the scorecard.

Ink applied to the PE liner is removed with the liner and forms part of the PolyAl stream.

[3] The Alliance for Beverage Cartons and the Environment, Beverage Cartons Design for Recyclability Guidelines (October, 2022)

ADHESIVES

Stick to the rules.

Adhesives may be used for attaching drinking straws to beverage cartons and attaching caps/closures to cartons.

Water soluble and hot melt adhesives (with softening temperatures ≥68°C) are fully compatible with recycling processes.

Water insoluble, re-dispersing adhesives, Latex, and hotmelt adhesives (≤68°C) have the potential to cause "stickies". This happens when adhesives stick to the cylinders on the paper machines and cause holes in the paper being produced thereby reducing quality.

Refer to the *European Paper Recycling Council Assessment of Printed Product Recyclability Scorecard for the Removability of Adhesive* Applications to determine whether your adhesives are removable according to the thresholds set by the scorecard.

WET-STRENGTH ADDITIVES

Stronger is not always better.

Certain papers contain additives to prevent the paper breaking up in moist conditions. This additive is referred to as a wet-strength additive, and causes paper fibres to cling together in the hydropulper. Paper with less wet-strength requires less pulping time, lower pulping temperatures, reduced chemical usage etc. The amount and type of wet-strength additive can therefore impact the efficiency of the paper recycling process.

Papers with high wet-strength levels are avoided by South African paper mills.

POLYMERS USED FOR LAMINATION, BARRIER FILMS, AND VAPOUR DEPOSITION BARRIERS

Product freshness vs recyclability.

Liquid board packaging is typically made from board, polyethylene and/or aluminium. Alternative/additional materials can be used in the structure of the pack. Liners are applied separately from the board production. The Alliance for Beverage Cartons and the Environment stipulates the following regarding liner alternatives:

- Beverage cartons containing more than 90% polyethylene in the polymer component of the structure are fully compatible with PolyAl recycling processes. At 80-90%, the material has limited compatibility, and at less than 80% it is not compatible.
- For PolyAl recycling processes producing recycled PE pellets, beverage cartons containing less than 10% polypropylene in the polymer component of the structure is likely to be fully compatible with the recycling processes. At 10-20%, the material has limited compatibility, and at more than 20% it is not compatible.
- Other liners such as ethylene vinyl alcohol copolymer (EVOH), polyamide (PA), PET, Aluminium Oxide, Silicon Oxide, and metallisation are only fully / conditionally compatible at specific % thresholds.
- Biodegradable polymers are not compatible with recycling processes.

COATINGS

Are coated boards recyclable?

Liquid Board Packaging may be coated with clay or pigment. “There are lightly coated and fully coated boards in the market. Fully coated boards provide improved printability (for beverage cartons where the ink is applied directly to the board) and are required to meet the design needs for some brand owners. Both lightly and fully coated boards are recyclable.” (The Alliance for Beverage Cartons and the Environment, 2022 p.30). Soluble/insoluble coatings can be removed during the fibre preparation stage and are disposed of.

However, it is still encouraged that the quantity of clay coating required is reduced as far as possible (within the limitations of meeting the printability requirements). This is because residual clay coating may decrease the quality of recycled fibre. Its presence could lead to optical inhomogeneities in the recycled product.

POLYMERS USED FOR CAPS & CLOSURES

Put on your thinking cap.

The caps and closures are separated out after the pulping process and recycled separately as a mixed polyolefin stream.

Biodegradable or compostable polymers are not compatible with the polyolefin recycling process. Biodegradable polymers negatively impact the quality and properties of recyclate.

STRAWS AND PROTECTIVE WRAPPERS

Go for paper.

Paper straws are fully compatible with the recycling process, as they can be pulped.

		Yes Compatible with recycling. (Fibre recovery & Polyal recycling process)	**Conditionally compatible** With some used beverage carton recycling processes. *Less favourable for either the enhanced fibre recovery process or some promoted PolyAl recycling processes, as they make the process more difficult or reduce the quality of the output material. Specific testing can demonstrate that these constituents do not negatively impact recycling.*	**Not compatible** With used beverage carton recycling processes unless testing proves otherwise.
FIBRES		Sulphate Kraft, bleached. Sulphate Kraft, unbleached. Chemi-thermomechanical pulp.		
ADDITIVES	**Wet strength resins**	Glyoxylated polyacrylamide (GPAM).	Polyamide-epichlorohydrin (PAE) Urea/Formaldehyde	
	Sizing, Wet end	Alkylketene dimers (AKD). Alkenylsuccinic anhydride (ASA). Rosin.		
BARRIERS		Clay/pigment coatings.		
	Polymers used for lamination and barrier films; vapor deposition barriers	**Lamination and barrier films** >90% Polyethylene (PE) – fossil based and bio-based. <10% polypropylene (PP) – fossil based and bio-based. <5% EVOH. Up to 20% polyamide 6 (PA 6) or co-polyamide 6/6.6 as coextruded layer, with at least one surrounding layer containing maleic anhydride-grafted PE as a tie layer specified for PA/PE coextrusion in a ratio of ≥ 0.5 g per g PA. **Vapour deposition barriers** AlOx at <5% share by weight. SiOx at <5% share by weight. Metallisation at <5% share by weight.	**Lamination and barrier films** 80-90% Polyethylene (PE) – fossil based and bio-based. 10 – 20% polypropylene (PP) – fossil based and bio-based. <5% PET. **Vapour deposition barriers** AlOx at >5% share by weight. SiOx at >5% share by weight. Metallisation at >5% share by weight.	**Lamination and barrier films** >20% propylene (PP) – fossil based and bio-based. >5% EVOH (not compatible with recycling process unless testing proves otherwise). >5% PET Biodegradable polymers.
CAPS & CLOSURES		>90% polyolefin.	80 – 90% polyolefin (At 80-90%, the material has limited compatibility, and at less than 80% it is not compatible).	<80% polyolefin Biodegradable polymers.
ADHESIVES	**Adhesives for attachments**	Water soluble adhesives Hot melt adhesives (with softening temperatures ≥ 68°C)	Water insoluble or re-dispersing adhesives	
INKS	**Printing inks and printing techniques**	Offset print – oil-based ink (vegetable). Flexo – SB. Flexo – Wb. Gravure – SB. Gravure – Wb.	Offset print – oil-based ink (mineral) (Fully recyclable, but limits the use of recovered fibre to non-food applications).	
STRAWS & PROTECTIVE WRAPPERS	**Straws**	Paper straws are engineered to withstand water vapour/moisture and therefore repulpability of paper drinking straws in the context of mills which recover fibre from beverage cartons should be ascertained.		
	Wrappers	PE (fossil based and bio-based) protective wrappers. PP (fossil based and bio-based) protective wrappers. Paper protective wrappers.		

Adapted from The Alliance for Beverage Cartons and the Environment's Beverage Cartons Design for Recyclability Guidelines (October, 2022).

WHAT DO WE WANT YOU TO DO?

- Design Liquid Board Packaging with the environment, the recycling process, and the available recycling infrastructure in South Africa in mind. Sustainable recycling starts with a product that is designed to be compatible with the available collection and recycling infrastructure in South Africa and aligned with the end-use markets prevalent in our region.
- Be transparent about the recyclability of your Liquid Board Packaging.

GOLD STANDARD

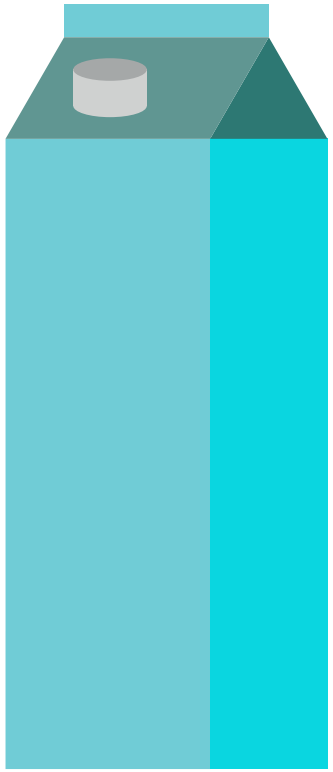
Here is a quick visual guide to help you improve the recyclability of Liquid Board Packaging.

HOW TO IMPROVE THE RECYCLABILITY OF LIQUID BOARD PACKAGING:

INKS
DO: Avoid excessive ink coverage.
DON'T: Mineral-oil based ink.

CAPS
DO: Polyethylene caps
DON'T: Biodegradable or compostable polymers are not compatible with the polyolefin recycling process.

STRAWS & PROTECTIVE WRAPPERS
DO: Paper straws and paper protective wrappers are fully compatible as they can be pulped.



COATINGS
DO: Clay or pigment coating is compatible with the recycling process.

BARRIER FILMS
DO: polyethylene > 90% in the polymer component of the structure.
DON'T:: Biodegradable polymers are not compatible with the recycling process.

ADHESIVES
DO: Water soluble and hot melt adhesives (with softening temperatures ≥68°C)

WET-STRENGTH ADDITIVES
DO: Avoid excessive use of wet strength

ACKNOWLEDGEMENTS

ABOUT PETCO

Petco Producer Responsibility Organisation NPC is a Producer Responsibility Organisation (PRO), incorporated in 2004, that administers Extended Producer Responsibility (EPR) schemes on behalf of its members for various identified products in the packaging sector. Petco serves as a national organisation responsible for driving recycling activities, unlocking the collection and recycling value chain, guiding product design, stimulating end-use markets for recycled material, carrying out education and awareness initiatives and building the required local recycling infrastructure and capacity.

Petco's strategic approach involves empowering its members to assume EPR and take accountability for their products throughout their entire life cycle, as mandated by Section 18 of the National Environmental Management: Waste Act. Petco is committed to driving change towards a circular economy in South Africa's packaging industry in partnership with its members.

petco

Leading Producer Responsibility

The guidelines for PET packaging in this document were adapted with permission from the RECOUP Recyclability by Design 2017 guideline document (www.recoup.org).

RECOUP
RECycling Of Used Plastics Limited

Thanks also to WRAP for their permission to use content from the publication WRAP (2018) Understanding Plastic Packaging:

wrap

The guidelines for liquid board packaging in this document were adapted with permission from The Alliance for Beverage Cartons and the Environment's Beverage Cartons Design for Recyclability Guidelines (October 2022).

Note that other sources and stakeholders were consulted in order to ensure the guidelines are tailored to the South African context, as such the content of the guidelines shall not be attributed to The Alliance For Beverage Cartons and the Environment.

THE ALLIANCE FOR
BEVERAGE CARTONS
AND THE ENVIRONMENT

WHAT WE DO

Petco works with the plastics industry, community members, municipalities, NGO's and entrepreneurs to build a sustainable value chain.

HOW WE WORK TO BUILD A SUSTAINABLE VALUE CHAIN:

OUR WORK

- **Commercial-scale recycling projects:**
  We enter into contractual agreements with our recycling partners to ensure that packaging is sustainably recycled into viable end-use products.
- **Collector support and training:**
  Petco offers support to individuals and enterprises that are contributing to the volumes of valuable packaging being collected for recycling in South Africa. We provide support in the form of equipment and training to help them, and their businesses thrive.
- **Communications and awareness:**
  Interested consumers – individuals, schools, organisations – can access Petco's wide range of resources to find out how to identify recyclable packaging, and how to collect, sort and recycle it effectively. With great buying power comes great responsibility!
- **Facilitating a circular economy:**
  We are motivated by the drive to see that every piece of packaging put onto the market by our members is designed for recycling, and then collected and recycled – ensuring that valuable packaging doesn't end up at landfill and instead goes back into the economy.

GLOSSARY

Barrier layers
Protection layer from deterioration or admittance of moisture or other elements (such as oxygen and other gases) through the package material. Barriers can consist of an additive to the resin or a coating on the interior or exterior of the bottle.

Bio-based
Materials or fuels derived from biomass (living matter such as trees and plants, chitosan from shellfish, etc). The Alliance for Beverage Cartons and the Environment (2022)

Colour consideration
Light blue bottles (using base colour ALTO BLUE-DB52 at maximum 0.056%) are acceptable as they can be blended in small amounts with clear bottles.

Composite materials
A composite material is a material made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components.

Compostable
Compostable materials are materials that break down in composting conditions. Industrial composting conditions require elevated temperature (Approx.55-60°C) combined with a high relative humidity and the presence of oxygen, and they are in fact the most optimal compared to other everyday biodegradation conditions: in soil, surface water and marine water. Compliance with EN 13432 is considered a good measure for industrial compostability of packaging materials.

Degradable
A compound/material that is capable of being chemically degraded.

De-ink
Deinking (also de-inking) is any process, in addition to slushing and incidental washing, intended to remove most of the ink particles from pulp made from recovered printed paper or board (ISO 4046-2, 2016). The Alliance for Beverage Cartons and the Environment (2022)

Deposition techniques
The act of applying a thin film to a surface is called thin-film deposition – any technique for depositing a thin film of material onto a substrate or onto previously deposited layers. "Thin" is a relative term, but most deposition techniques control layer thickness within a few tens of nanometres. Molecular beam epitaxy, Langmuir-Blodgett method and atomic layer deposition allow a single layer of atoms or molecules to be deposited at a time. Deposition techniques fall into two broad categories, depending on whether the process is primarily chemical or physical.

EVOH (Ethylene vinyl alcohol)
A formal copolymer of ethylene and vinyl alcohol. The plastic resin is commonly used as an oxygen barrier in food packaging. It is better than other plastics at keeping air out and flavours in, is highly transparent, weather resistant, oil and solvent resistant, flexible, mouldable, recyclable, and printable. Its drawback is that it is difficult to make and therefore more expensive than other food packaging. Instead of making an entire package out of EVOH, manufacturers keep costs down by coextruding or laminating it as a thin layer between cardboard, foil, or other plastics. It is also used as a hydrocarbon barrier in plastic fuel tanks and pipes.

Fluorescers
A fluorescent substance used for whitening.

Hazing agents
Promotes the degree of cloudiness in a plastics material.

Home composting
Home composting creates conditions with much lower and less stable temperatures than industrial composting. There is no CEN standard for plastics that are suitable for home composting, but several countries have developed and applied national standards for testing and certifying of home compostable materials.

Liquid Board Packaging
Cartons used to package liquids. The cartons are composed of a mix of materials, primarily paperboard, along with thin layers of polyethylene plastic, and/or aluminium, which protect the carton's contents from light, oxygen and moisture.

NIRS (Near-infrared spectroscopy)
This is a spectroscopic method that uses the near-infrared region of the electromagnetic spectrum (from 780 nm to 2500 nm). It is based on molecular overtone and combination vibrations. Such transitions are forbidden by the selection rules of quantum mechanics.

Nucleating agents
Promotes the crystallization of semi-crystalline polymers. Some special nucleating agents produce spherulites so small that they do not scatter visible light, providing transparent polypropylene.

PE-HD (High Density Polyethylene)
Any of various partially crystalline lightweight thermoplastics that are resistant to chemicals and moisture, have good insulating properties, and are used especially in packaging and insulation.

PA (polyamides)
Polyamides (nylon) comprise the largest family of engineering plastics with a very wide range of applications. Polyamides are one of the major engineering and high-performance plastics because of their good balance of properties. Polyamides are very resistant to wear and abrasion, have good mechanical properties even at elevated temperatures, have low permeability to gases and have good chemical resistance, good dimensional stability, good toughness, high strength, high impact resistance, good flow.

PBAT and PBS (Polybutylene adipate terephthalate and Polybutylene succinate)
Two biodegradable polyesters (Muthuraj et al 2014).

PET (Polyethylene terephthalate)
A type of resin and a form of polyester; it is commonly labelled with the code on or near the bottom of bottles and other containers. PET has some important characteristics such as it's strength, thermo-stability, gas barrier properties and transparency. It is also lightweight, shatter-resistant and recyclable.

PHA (Polyhydroxyalkanoate)
A naturally occurring family of biodegradable polyesters (NNFCC 2018).

PLA (Polylactic acid)
A biodegradable polyester produced from lactic acid, used in wide range of serviceware products and as filament for 3D printing (NNFCC 2018). Industry example: PG Tips is using PLA for their tea bags (NNFCC 2018).

Plc (polycaprolactone)
A biodegradable polymer that is suitable for applications requiring years of stability. In recent years it is becoming of increased interest to manufacturers of medical devices and drug delivery particles (polysciences.com 2018).

Polyalu
The mixed polymer and aluminium stream remaining after the LBP recycling fibre recovery process. The Alliance for Beverage Cartons and the Environment (2022)

Post-used materials
Materials that have completed their initial purpose and can now be recycled.

Polymer
A substance, which has a molecular structure built up chiefly or completely from many similar units bonded together (plastic).

Polymer densities
A measurement of how dense a specific polymer is. In general, all polymers are very light in weight.

PP (Polypropylene)
A synthetic recyclable polyolefin commonly used for margarine tubs, microwaveable meal trays, also produced as fibres and filaments for carpets, wall coverings and vehicle upholstery.

Product Identification Code (PIC)
A form of label that allows an individual to determine the composition of the product. Ideally it should be located on or near to the base of the product.

PTT (Polytrimethylene terephthalate)
A type of polyester that differs from PET as it contains one more methylene group in the aliphatic chain that links the terephthalic moiety (European Commission Joint Research Centre 2013).

Pulping
The act of processing wood (or other plant-based sources) to obtain the primary raw material for making paper, usually cellulose fibre. Wood is the most widely used source of fibre for the paper making process. The fibres are separated from one another into a mass of individual fibres. The separation can be undertaken by a mechanical process, where the fibres are teased apart, or by chemical means, where the lignin binding the fibres together is dissolved away by cooking the woodchips in suitable chemicals. After separation, the fibres are washed and screened to remove any remaining fibre bundles. The Alliance for Beverage Cartons and the Environment (2022)

PVC (Polyvinyl Chloride)
A polymer of vinyl chloride used especially for electrical insulation, films, and pipes.

Recyclable
In PETCO's view, claims for recyclability should be supported by evidence of collection and re-processing at a meaningfully substantial rate.

Recycling
Material recycling is defined in European standard EN 13430 and EN 16848 (adapted from ISO 18604) as the reprocessing of a used product material into a new product. Plastic, which after use can be collected, sorted and reprocessed into new products is called mechanical recycling. Another option is chemical recycling where materials are broken down to monomers, which can be used again for the production of polymer.

RFID (Radio Frequency Identification)
A form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person.

Scavengers
Scavenger compounds absorb oxygen from head space of closed bottles and additionally prevent oxygen ingress into the bottle.

Starch blends
Most bio-based plastics are currently manufactured using starch as a feedstock (c.a. 80% of current bio-based plastics). The current major sources of this starch are maize, potatoes and cassava. Other potential sources include arrowroot, barley, some varieties of liana, millet, oats, rice, sago, sorghum, sweet potato, taro and wheat (BPF 2018).

APPENDICES

A SUMMARY OF THE EVOLUTION OF WASTE MANAGEMENT IN SOUTH AFRICA

Waste Policy and Regulation in South Africa started with the Environmental Conservation Act (Act 73 of 1989) as amended, which set out the requirements for the management of waste and provided the first legal definition of waste. Limited waste policy and regulation emerged between 1989 and 2007.

With the publishing of the first National Waste Management Strategy (NWMS) and the White Paper on Integrated Pollution and Waste Management (IP&WM), the stage was set for what was to follow. The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008, NEMWA) then came into effect on 1 July 2009, after which the Minister of Environmental Affairs then established the National Waste Management Strategy (NWMS) in terms of Section 6(1) for achieving the objects of the Act.

NEMWA establishes a system of waste management plans, licencing requirements for waste activities, and the establishment of the Waste Management Bureau to coordinate and regulate waste-related matters at both national and provincial levels. The Act encourages the implementation of EPR programmes to hold producers accountable for the waste generated from their products. Overall, NEMWA seeks to achieve sustainable waste management practices and promote a circular economy in South Africa.

Extended Producer Responsibility (EPR) is a waste management strategy for the sustainable organisation and financing of specific waste streams. In South Africa, EPR used to be voluntary, but since the Section 18 regulations of the NEMWA came into effect in 2021, it has become mandatory. Producers are required to take full responsibility for the products they place onto the market, including their post-consumer collection, sorting and recycling.

Essentially, EPR schemes tie producers into financing and organising management systems for packaging waste. Implementing an EPR system enhances the interactions between stakeholders, assigning new responsibilities to each. The Section 18 regulations provide the framework for the development, implementation, monitoring and evaluation of EPR schemes by producers. The system allows companies to engage with the issue of waste on a level playing field, because it is based on shared responsibility. Companies that decide to play an active role in the system from the outset can influence how the system operates and contribute to the goal of EPR, which is to achieve a circular economy and address waste management issues.

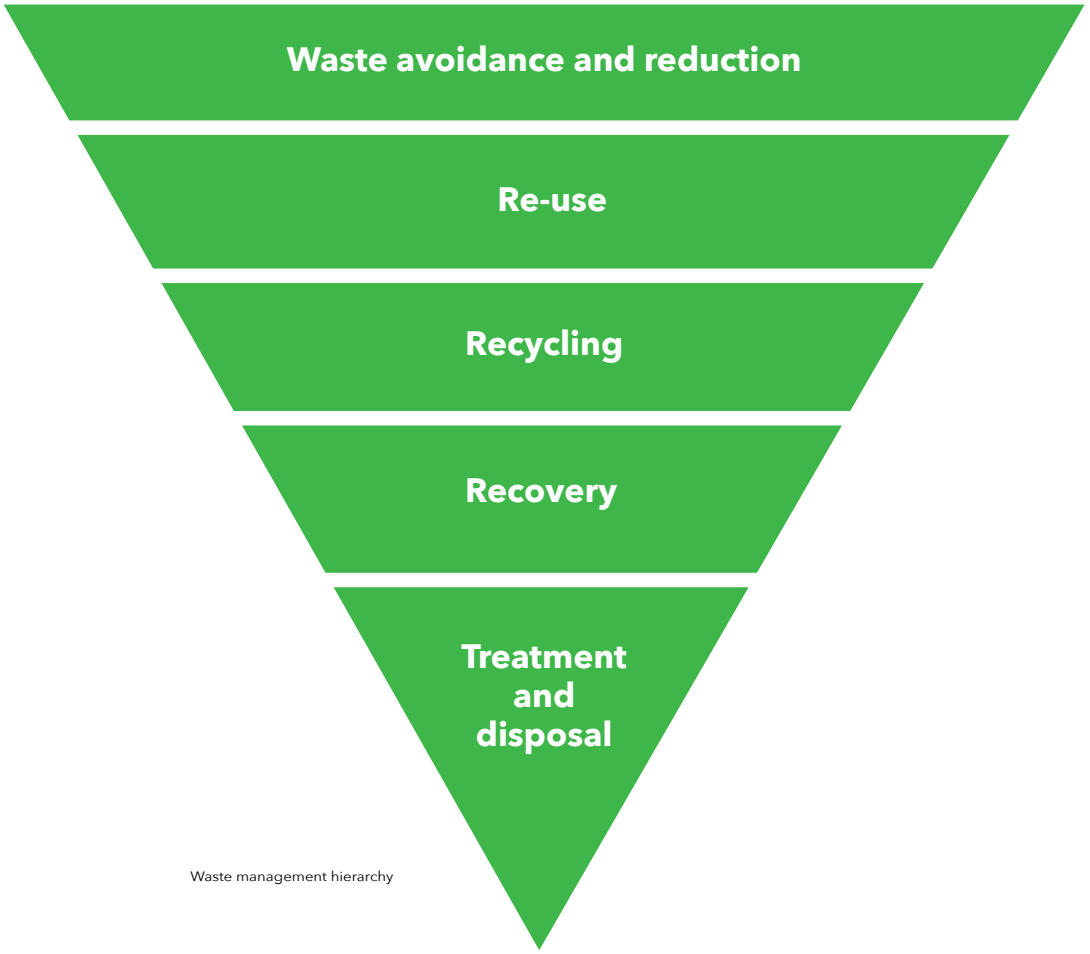
The Section 18 regulations provide the framework for the development, implementation, monitoring and evaluation of EPR schemes by producers.

The NWMS, a legislative requirement of NEMWA, provides a strategic policy intervention and a framework for the implementation of the NEMWA.

The NWMS "outlines government's policy and strategic approach to waste management within the South African government's context and agenda of socio- economic development that is 'equitable, inclusive, sustainable and environmentally sound. The premise of the latest iteration of the NWMS (2020) is for "local government needs to shift the focus of waste collection services to enable and promote diversion of waste from landfills through reuse, recycling and recovery".

The management of waste in South Africa has been based on the principles of the Waste Management Hierarchy from early waste policy and entrenched in recent waste legislation. The adoption of the hierarchy has been in the policy since 2009, but the management of waste has not necessarily followed the hierarchal approach. It is only as a result of the promulgation of the NEMWA and finalisation of the NWMS that the implementation of the hierarchy approach was prioritised.

A SUMMARY OF THE EVOLUTION OF WASTE MANAGEMENT IN SOUTH AFRICA



Waste management hierarchy

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6. https://www.environment.gov.za/sites/default/files/docs/series12_environmental_managementplans.pdf

SELF-DECLARED ENVIRONMENTAL CLAIMS

The International Organisation for Standardisation (ISO) is the world's largest developer and publisher of International Standards. *The 'ISO 14021:2016 Environmental Labels and Declarations: Self-declared Environmental Claims'* Standard specifies requirements for self-declared environmental claims, including statements, symbols and graphics, regarding products.

The proliferation of environmental claims has created a need for environmental labelling standards that require consideration be given to all relevant aspects of the life cycle of the product when such claims are developed. Self-declared environmental claims may be made by manufacturers, importers, distributors, retailers or anyone else likely to benefit from such claims.

Environmental claims made regarding products may take the form of statements, symbols or graphics on product or package labels, or in product literature, technical bulletins, advertising, publicity, telemarketing, as well as digital or electronic media, such as the internet.

In self-declared environmental claims, the assurance of reliability is essential. It is important that verification is properly conducted to avoid negative market effects such as trade barriers or unfair competition, which can arise from unreliable and deceptive environmental claims.

The evaluation methodology used by those who make environmental claims should be clear, transparent, scientifically sound and documented so that those who purchase or may potentially purchase products can be assured of the validity of the claims.

Seventeen selected claims are addressed in this standard:

- Compostable
- Degradable
- Designed for assembly
- Extended life product
- Recovered energy
- Recyclable
- Recycled content
- Pre-consumer material
- Post-consumer material
- Recycled material
- Recovered [reclaimed] material
- Reduced energy consumption
- Reduced resource use
- Reduced water consumption
- Reusable
- Refillable
- Waste reduction

See ISO's website for more information (www.iso.org).

FREQUENTLY ASKED QUESTIONS

PACKAGING RELATED FAQS

What role does packaging play? Why do we need it?

Packaging allows us to consume products in ways that would be difficult – if not impossible – without it. Specifically, packaging:

- protects vulnerable products from damage while in transit and from contamination or damage by moisture, humidity, gases, micro-organisms, insects and light;
- allows the product to be transported over great distances, used, and stored by consumers;
- saves space through stacking objects, making transport more efficient;
- maintains quality and food safety by preventing tampering or spoiling;
- displays important product information, such as nutritional content, allergy advice and manufacturer details.

The product contained within the packaging often has a higher carbon footprint than the package itself, and thus it is vitally important to protect the contents to prevent waste of resources and reduce CO_2 emissions.

Without packaging, we would not be able to purchase liquids, gels, powders or out-of-season fruit. We would have significant problems with food safety and hygiene. Food wastage would increase, with negative environmental impacts.

Increased urbanisation, improved living standards, lifestyle changes and increased mobility all place greater requirements on our food and product systems to be durable and affordable.

Why do we need plastic packaging?

Plastic packaging is an important enabler of the modern economy. The range of plastic packaging has extremely useful properties which make them well suited to their purpose.

Calls to ban plastic packaging are often made in response to the environmental problems associated with poorly managed waste streams, but do not consider the many environmental benefits that plastic packaging has.

Some of these benefits include:

- **Lightweight:** Plastic packaging is lightweight, which means lighter loads for planes and trucks, which saves energy and carbon emissions associated with transporting products.
- **Resource efficient:** Plastic packaging saves packaging mass, energy and CO_2 emissions. Without it, we would use two to three times more resources.
- **Reduced material use:** The amount of plastic needed for packaging decreases as manufacturers continually innovate to reduce the material needed for manufactured packaging.
- **Safe and hygienic:** Plastics are hygienic, shatterproof, and safe – even for rough handling. Plastics keep products free from contamination (particularly useful for medical packaging e.g. sterile syringes). Plastic can be sealed shut or moulded into a safety mechanism e.g. child-proof locks on medication.
- **Versatile:** Plastics can be transformed in many ways – blown, injected or thermomoulded – which means it can be used to package sauces and pastes.
- **Recyclable:** There are subsets of plastic packaging that can be recycled many times to create new products.

In addition to this, there are some products that are more convenient to use in plastic packaging whether that be for pouring, handling, or storing.

Packaging, and plastic packaging, offer so many benefits that it will not be practical to do without it.

What about single-use packaging?

Single-use packaging has an important role to play in modern life, especially where safety and hygiene are concerned.

Single-use packaging is much thinner and lighter than re-usable packaging. This reduces the amount of material needed for the package, making it more affordable for consumers and saving in transport costs.

It also has another benefit in that it doesn't require the packaging to be returned to the point of purchase and then onto the point of manufacture, for it to be re-used. This reverse logistics chain incurs a large financial and environmental cost. Of course, this needs to be considered given the economic and environmental costs of single-use waste streams, but the assumption is that a reusable packaging will automatically be returned at greater rates than the what recycling rates of single-use packaging can achieve.

The challenge with single-use plastics is not inherently that they are single-use, but that there is poor management when they enter the waste stream, and thus they end up in the environment with large associated environmental costs.

Shifting from single-use to reusable plastics will not automatically mean that poor management of waste streams will improve.

Some waste streams, such as PET bottles, are managed well and improving year-on-year.

Petco is a proud member of the SA Plastics Pact who is working to eradicate single-use packaging items. Learn more here.

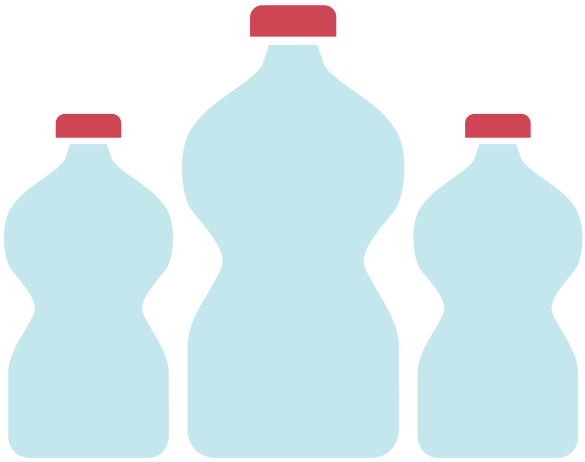
In addition to this, there are some products that are more convenient to use in plastic packaging whether that be for pouring, handling, or storing. Packaging and plastic packaging offer so many benefits that life as we know it would not be practical without it.

How can we improve recycling rates?

Improving recycling rates needs to be done on multiple fronts. From a consumer and citizenry perspective, actions include:

- Demanding packaging containing recycled content from brand owners and retailers. Demand for recycled material is the enabling mechanism for recycling to occur in the first place and ultimately increase.
- Purchasing products that are recyclable, and pressuring brand owners and retailers to indicate on the product whether packaging is recyclable.
- Lobbying for separation-at-source schemes to be implemented and part-taking in and encouraging others to take part when these are in place. Success of these schemes depends largely on household participation.
- Educating fellow citizens and raising awareness on recycling, separation-at-source, and recyclability of packaging materials.

Showing your support for organisations and companies who are making recycling happen will further encourage others do to the same.



Why is it important for brand owners to transition to well-designed packaging?

In terms of EPR regulations brand owners and producers are obliged to take accountability for the collection and recycling of products they place on the market. The obligations center around collection and diversion from landfill of these products, an important factor of which is recyclable and circular packaging design. It must be noted however, that further to the responsibility of ensuring materials placed on the market are designed for recyclability, is the responsibility of ensuring there are viable end-use markets for the recycled product.

Global industry players no longer consider packaging recyclable only based on whether it is collected or made from a particular plastic resin.

The Ellen MacArthur Foundation, for example, defines recyclability as "The ease with which a material can be recycled in practice and at scale". Similarly, How2Recycle defines recyclable packaging as packaging that can be "collected, sorted, reprocessed, and ultimately reused in manufacturing or making another item". The Ellen MacArthur Foundation plans to take this a step further by introducing a minimum collected and recycled percentage standard of product placed on the market before claims of recyclability for the specific product can be made. Hence, efforts to develop end-use markets for technically recyclable materials are critical for achieving material recyclability.

To demonstrate the brand owner's responsibility to design their packaging for recycling / circularity and not for landfill, the EPR regulations make provision for the introduction of eco-modulated EPR fees.

Eco-modulation is the concept of penalising brand owners for the use of materials that are perceived to be environmentally harmful i.e., difficult to recycle / non-recyclable by means of charging them an increased EPR fee. The increased EPR fee will then be spent to cover the true cost of collection, sorting, recycling/landfilling a particular material. The intention is for eco-modulation to encourage good product design & discourage use of problematic materials or material combinations.

PET and LBP related FAQs

To learn more about the packaging types previously discussed in the document, please head to our website: petco.co.za/producers/resources/

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Sign up to our newsletter if you wish to receive periodic emails regarding Petco news, events, collection and recycling information: www.petco.co.za

UNSURE ABOUT ANYTHING?
DON'T HESITATE TO GET IN TOUCH.

We strive to stay up to date and to share locally relevant case studies as far as design for recycling is concerned. If you have any stories in this respect, please email them to kara.levy@petco.co.za.

Supporter of **Plastics** | SA
Supporter of **Packaging** | SA

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Leading Producer Responsibility