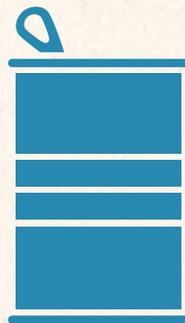
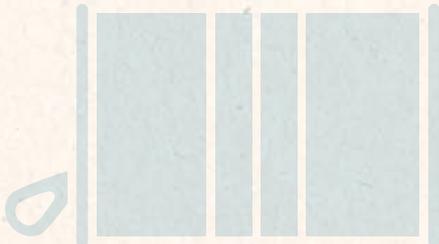
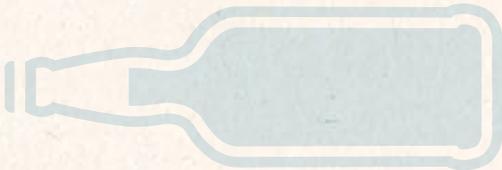


Introductory Guide



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Purpose of the Design Smart Material Guides

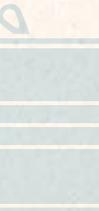
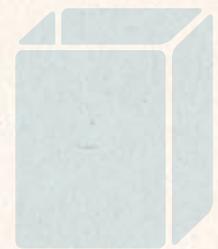
The Australian Packaging Covenant (APC) requires brand-owner signatories to assess existing packaging ranges and develop systems to ensure that new packaging is assessed at the point of design or procurement.

This is the first in a series of ten Design Smart Material Guides published by the APC.

The purpose of the Guides is to help those involved in the design, specification and procurement of packaging to improve the environmental performance of packaging systems, while avoiding significant compromise on cost or functionality. They provide a strong starting point for anyone looking to undertake packaging assessments that are consistent with the APC's Sustainable Packaging Guidelines (SPG). To undertake packaging assessments you need to have sound background information relating to the key environmental issues that should be considered at the point of design or procurement. The Guides provide a 'checklist' of sustainability considerations to keep in mind during the assessment process.

The Guides cover common packaging materials and components. The purpose of this first Guide is to:

- Highlight some of the benefits of life cycle based thinking and design
- Introduce the principles that underpin design for sustainability
- Provide a quick comparison of the different packaging materials
- Provide high-level guidance on the use of environmental claims and labelling



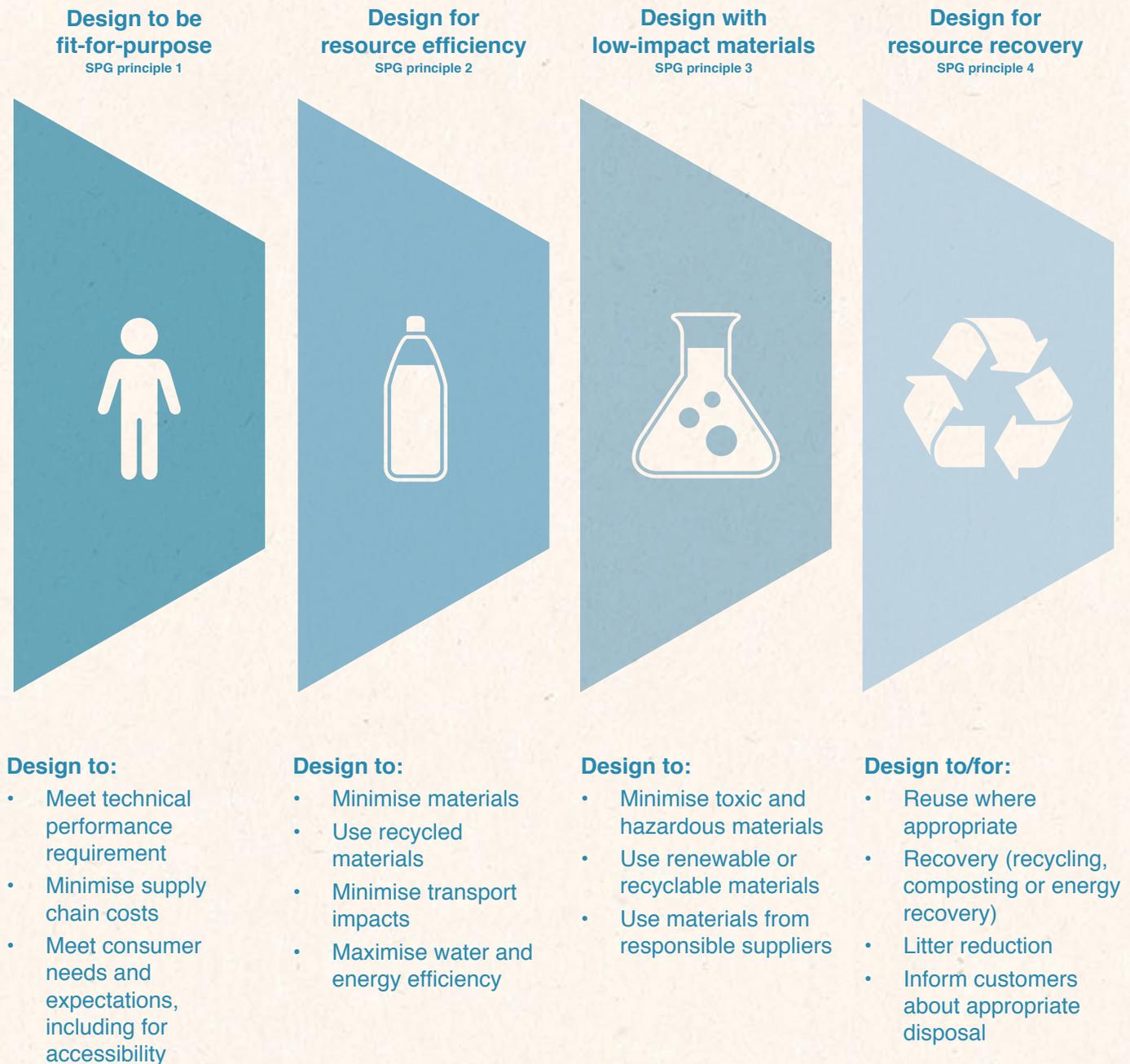
Design Smart Material Guides

1. **Introductory guide**
2. **Fibre based packaging**
3. **Rigid plastic packaging**
4. **Flexible plastic packaging**
5. **Aluminium packaging**
6. **Steel packaging**
7. **Glass packaging**
8. **Compostable plastic packaging**
9. **Composite packaging**
10. **Packaging components**

Purpose of the Design Smart Material Guides

Figure 1

Principles and strategies from the sustainable packaging guidelines



If you or your organisation have any questions regarding these guides, would like to make any comments on them, or want to better understand sustainable packaging assessments in general, please contact the APC at: apc@packagingcovenant.org.au

The APC will endeavour to review the content of these guides on a regular basis to ensure currency and alignment to industry developments.

Disclaimer

The Design Smart Material Guides are provided as general guidance only. Aspects relating to material extraction, material processing, transport systems and consumption patterns will impact the environmental, financial and functional performance of packaging systems. Appropriately detailed analyses of specific packaging systems are necessary to confirm the benefits of any of the design considerations outlined in the Design Smart Material Guides.

Benefits of More Sustainable Packaging

Providing consumers with products in more sustainable packaging solutions can help to differentiate your brand, without significantly compromising cost and functionality requirements. Of course, there are also other benefits to the environment and to your business if it's done well.

It can help you to achieve your environmental goals

- Reduce product and packaging waste in the supply chain and at end-of-life
- Make your packaging more recyclable
- Reduce product waste in the supply chain
- Contribute to a lower carbon footprint for your product
- Save energy and reduce greenhouse gas emissions in manufacturing and transport

It can save you and your customers money

- Reduce material costs
- Reduce manufacturing costs
- Reduce transport costs
- Reduce the cost of damage in the supply chain
- Reduce your exposure to carbon pricing
- Reduce or avoid the cost of future regulatory interventions

It can help to maintain or build your market share

- Meet consumer and customer expectations for more sustainable packaging
- Attract new customers by making your packaging easier to open and use
- Build brand loyalty among environmentally motivated consumers
- Use packaging innovation to differentiate your product
- Promote reductions in packaging and other sustainability improvements to consumers
- Use third party certification to add credibility to your claims

It can have other less tangible benefits

- Enhance your corporate reputation
- Find new opportunities to engage with your customers
- Increase staff engagement and participation in your sustainability programs
- Improve understanding and relationships with your supply chain partners

Design Principles

Each Design Smart Material Guide focuses on particular types of packaging materials. This is because the life cycle impacts and design considerations for each material group are often quite different. There are however three inter-related design principles that should always underpin life cycle based packaging assessments:

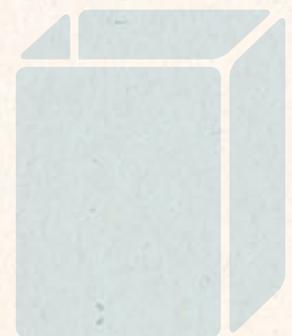
- 1. Consider impacts and benefits over the entire packaging life cycle, not just at end-of-life**
- 2. Optimise the packaging system as a whole by considering the interaction between primary, secondary and tertiary packaging (also known as retail, distribution and transport packaging)**
- 3. Look for opportunities to minimise product losses in the supply chain**

Consider the whole packaging life cycle

The information contained in this Guide is based on 'life cycle thinking', which considers environmental impacts and the performance of packaging throughout its supply chain, during use, and at end-of-life (Figure 2). Designing for sustainability often involves trade-offs, and actions to optimise outcomes at one point in the life cycle may increase impacts at another part of the life cycle. This could occur, for example, if a more energy intensive material is chosen because of its recyclability. Packaging sustainability must therefore be considered from a life cycle perspective.

Many of the first Life Cycle Assessments (LCAs), dating back to the early 1970s, were on packaging. A considerable amount of research on packaging life cycles has been completed since then. These Design Smart Material Guides distil that knowledge into 'rules-of-thumb' that you should keep in mind when designing a new packaging format or redesigning an existing one. They identify a number of actions that can be taken at the packaging system design or specification stage to minimise environmental impacts and optimise performance at different stages of the life cycle.

To assist APC signatories, the Guides are explicitly linked to the four principles of the SPG. Some of the links between the SPG principles and the packaging life cycle are shown in Table 1.



Design Principles

Figure 2

Life cycle diagram for packaging

Adapted from diagrams developed by GreenBlue (2011)



Design Principles

Table 1

Design considerations and the life cycle stage they will influence

| | Packaging Material Manufacture | Packaging Conversion | Filling | Distribution | Retail | Use | End of Life |
|---|--------------------------------|--|---|-------------------------------------|---|--|--|
| Sustainable Packaging Guidelines | Fit-for-Purpose | | Ensure manufacturability | | Maximise product protection Optimise the trade-offs between primary, secondary and tertiary packaging | Design for accessibility Design to reduce product waste | |
| | Resource Efficiency | Maximise water, energy and materials efficiency | Investigate down-gauging Maximise product to packaging ratios Minimise unnecessary components | Maximise production line efficiency | Optimise cube utilisation Minimise distribution packaging Investigate reusable distribution packaging | Design to reduce product waste | |
| | Low-Impact Materials | Source sustainable materials Recycled materials Minimise the use of problematic chemicals Explore third party certification | Use responsible suppliers Minimise the use of problematic chemicals | | | Evaluate risks of constituents migrating into food | |
| | Resource Recovery | | | | | Provide clear recycling or disposal instructions | Design for disassembly and recovery Design to minimise down-cycling |

Design Principles

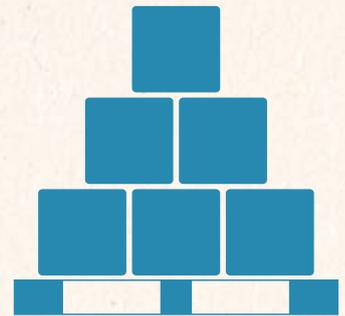
Optimise the whole packaging system

As this Guide is based on life cycle thinking, it considers the impacts of the whole packaging system, including primary, secondary and tertiary packaging, as well as its performance in delivering the product to the consumer:

Primary packaging is the retail or consumer packaging that contains the sales unit (e.g. steel can containing baked beans).

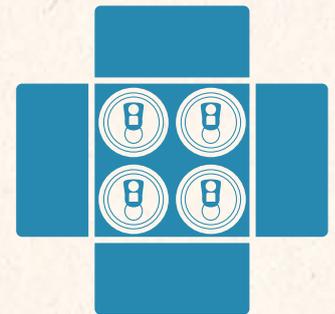
Secondary packaging is the distribution or traded packaging that contains a number of sales units (e.g. a cardboard box of twelve cans).

Tertiary packaging is the freight/transport related packaging (e.g. a pallet with stretch wrap and cardboard slip sheet).



Minimise product losses

Product related environmental impacts are usually much greater than the impacts associated with the packaging itself. As a rule of thumb, around 10% of the energy used in delivering a packaged food product, through to consumption, is directly due to the packaging system (Figure 3). This means that incremental reductions in the environmental impacts of the packaging can be easily wiped out by a small increase in product losses. Care needs to be taken to ensure that any design change intended to improve sustainability, for example by light-weighting containers or eliminating components, does not increase product waste at any point in the supply chain.

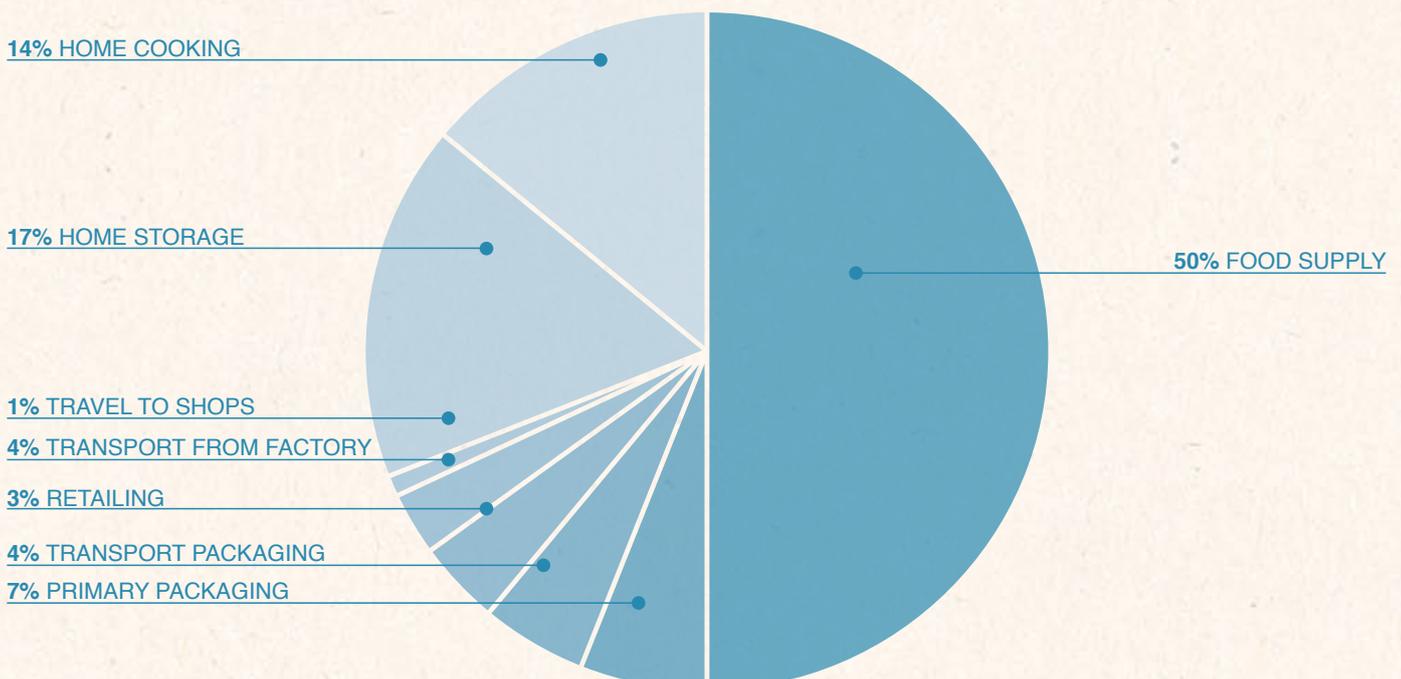


A primary objective of any packaging assessment should therefore be to eliminate or minimise product waste in the supply chain and in use.

Figure 3

Energy inputs for one person's weekly consumption of food

(Total 340 MJ/person.week)



Source: INCPEN (2009) Table for One (available from www.incpen.org/docs/TableForOne.pdf)

Comparative Environmental Impacts

The following table provides some indicative life cycle data on the most common materials prior to their conversion to packaging.

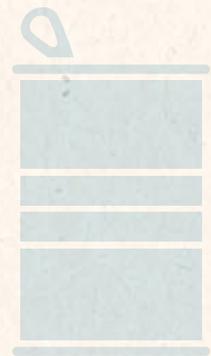
Note: The environmental impacts of an item of packaging or packaging system over its total life cycle will depend on:

- Where the material is sourced, manufactured, used and recovered
- The design of the packaging system, including the amount of material used
- The product the packaging is designed to contain

The data in Table 2 is from the point of raw material extraction (virgin) or the recovery of packaging from the kerbside (recycled), to the point of production of the packaging material ('cradle-to-gate'). It does not cover the full packaging life cycle.

Where it is likely that packaging decision makers will be able to specify a proportion of recycled content in packaging, we have provided data for both virgin and recycled content materials.

Please note that this information is generic in nature, and does not include consideration of the different end-of-life recycling rates for each packaging material in Australia at the current time.



Comparative Environmental Impacts

Table 2

Environmental indicators for common packaging materials

| Packaging Material Type | Raw Materials | Renewable Sources | Embodied Energy (MJ/kg material) | Water Use (L/kg material) | Greenhouse Gas Emissions (kg CO ₂ e/kg material) |
|---|---|-------------------|----------------------------------|---------------------------|---|
| Polyethylene Terephthalate (PET) – Virgin | Crude oil | No | 70 | 9.3 | 2.5 |
| PET – Recycled | Recycled PET | No | 20 | 29.7 | 1.6 |
| High Density Polyethylene (HDPE) – Virgin | Crude oil or natural gas | No | 67 | 1.4 | 2.1 |
| HDPE – Recycled | Recycled HDPE | No | 16 | 4.7 | 1.3 |
| Polyvinyl Chloride (PVC) – Unplasticised – Virgin | Crude oil or natural gas, and chloride (from salt) | No | 45 | 70.7 | 1.9 |
| Low Density Polyethylene (LDPE) – Virgin | Crude oil or natural gas | No | 83 | 6.9 | 1.5 |
| Polypropylene (PP) – Virgin | Crude oil | No | 72 | 1.5 | 1.3 |
| Polystyrene (PS) – Virgin | Crude oil or coking coal | No | 92 | 5 | 2.8 |
| Polylactic Acid (PLA) | Lactic acid (from corn) | Yes | 57 | 16 | 1.5 |
| Biopolymers (Starch Based) | Starch from corn, often blended with biodegradable polyesters | Mixed | 25 | 13 | 1.5 |
| Biopolymers (Cellulose Based) | Wood pulp | Yes | 81 | 16 | 1.5 |
| Glass – 35% Recycled Content | Silica sand, soda ash, lime, feldspar, recycled glass | No | 8 | 1.5 | 0.1 |
| Steel – 35% Recycled Content | Iron ore, coking coal, recycled steel | No | 23 | 3 | 2 |
| Aluminium – Virgin | Bauxite ore, lime, caustic soda | No | 198 | 183 | 12 |
| Aluminium – Recycled | Recycled aluminium | No | 11 | 1 | 0.5 |
| Cartonboard – Virgin Fibre | Wood pulp (hardwood and softwood) | Yes | 43 | 60 | 2.8 |
| Cartonboard – Recycled Fibre | Recycled fibre | Yes | 28 | 7 | 2.1 |

Primary sources: (DECCW, 2010; SPC, 2009a; SPC, 2009b; SPC, 2009c; SPA, 2004)

Note: In the table above the environmental indicators are only provided for virgin/recycled content packaging materials that are more likely to be available in the Australian market.

Environmental Claims and Labels

Environmental claims and labels can be an effective way to:

- Promote the benefits of your packaging to consumers
- Encourage and assist consumers to dispose of your packaging correctly at end-of-life

To do this effectively there are a few principles that you need to keep in mind:

1. Packaging claims should be consistent with your marketing and communication strategy
2. Avoid false or misleading claims
3. Use symbols that consumers recognise and understand

Be strategic in your choice of claims and labels

The decision on whether or not you should include an environmental claim or label to your packaging will depend on a range of factors, including:

- Your company's sustainability goals
- Your marketing and communication strategies for the product
- The role of your packaging label (compared to other media) in communicating environmental benefits

These factors need to be evaluated on a case-by-case basis.



Avoid false or misleading claims

The Australian Competition and Consumer Commission (ACCC) has published [Guidelines on Green Marketing](#) to assist companies to comply with the Australian Consumer Law. They advise that a claim should:

- Be honest and truthful
- Detail the specific part of the product or process it refers to
- Use language which the average member of the public can understand
- Explain the significance of the benefit
- Be able to be substantiated

Vague and unsubstantiated claims such as 'green', 'environmentally friendly' or 'sustainable' should be avoided.

Environmental Claims and Labels

Use symbols that consumers recognise and understand

Consumer surveys indicate that many people are confused about the meaning of many environmental symbols. It is important that you choose the most appropriate symbol to convey your desired message, and use that symbol correctly.

Recyclability and recycling symbols

A recycling claim or symbol should only be used on packaging that is genuinely 'recyclable'. Australian Standard **AS/NZS ISO 14021 (Environmental labels and declarations)** defines this as packaging that can be diverted from the waste stream through available processes and programs, and can be collected, processed and returned to use in the form of raw materials or products.

According to the Standard, if collection or drop-off services for the packaging are not 'conveniently available to a reasonable proportion of purchasers, potential purchasers and users of the product in the area where the product is sold', then a qualified claim¹ of recyclability should be made. Furthermore, the ACCC requires that manufacturers verify that their product or packaging can actually be recycled before they make any claims to that effect.

If your packaging is recyclable, you could provide additional encouragement to consumers by adding words such as 'Please recycle' to your label, along with a recycling symbol. AS/NZS 14021 recommends use of the Mobius loop, which is widely used in Australia and recognised by many consumers.

Recycled content

Consumers do not necessarily understand the difference between 'recyclable' and 'recycled content'. Recycled content is the proportion, by mass, of recycled material in a product or packaging. This could include material generated during a manufacturing process (pre-consumer waste) and/or material generated by households or organisations (post-consumer waste) that would otherwise have been disposed to landfill.

If your packaging item is only partially made of recycled material then it is important to be clear and specific about the recycled content, for example a claim on a carton might say 'contains 50% recycled fibre, including 30% post-consumer fibre'. All claims need to be substantiated.

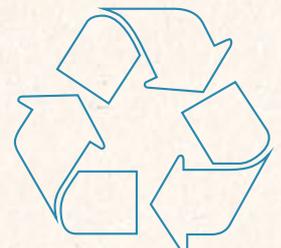
The use of a symbol to indicate recycled content is not essential. AS/NZS 14021 recommends that if a symbol is to be used to indicate recycled content, then the Mobius Loop should be accompanied by the percentage of recycled content (some examples are provided below).

If your packaging is not also recyclable (see above) the use of the Mobius Loop may not be appropriate. This is because it has potential to mislead consumers.

¹A qualified claim means making it clear on the label that the recycling systems required to recycle your packaging have limited availability, and potentially even identifying the percentage of consumers or communities that have access to a service that can recycle the packaging. See AS/NZS 14041 for more information on making qualified claims, both on recyclability and other environmental claims (e.g. compostability and recycled content).



(Examples Only)



(Examples Only)

Environmental Claims and Labels

Plastics identification code

The plastics identification code (PIC) is a voluntary, industry-managed code to identify the type of plastic polymer used to make the packaging. Within Australia it is governed by the Plastics and Chemicals Industries Association (PACIA), who have published an explanatory [Code of Practice](#) on its proper use.

Market research suggests that a high proportion of Australians believe (incorrectly) that the PIC indicates recyclability. The code was originally introduced to support recycling programs by helping consumers and recyclers to identify plastic packaging, both recyclable and unrecyclable, by resin type. In the absence of any other labelling scheme, it has been widely used in consumer education on recyclability, e.g. by local councils, which is contributing to the confusion over its meaning.

To avoid the potential to mislead consumers, the PIC should not be used in a prominent location on containers. PACIA recommends its use on the bottom of the container, or as close to the bottom as technically possible.

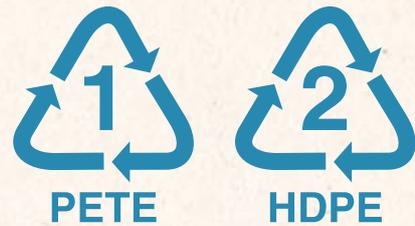
The PACIA guidelines allow the use of the PIC on flexible packaging, but its high visibility on a range of consumer packaging (e.g., bags, tubes and film) has the potential to mislead consumers by implying widespread recyclability. Consider only using the PIC on rigid plastic packaging.

This advice may change when recovery programs for soft plastics (e.g. film and bags) are more widely available to consumers.

Litter symbol

The 'Tidyman' symbol is used in various forms around the world to encourage consumers to dispose of their packaging in a public place rubbish bin, rather than littering. The symbol is in the public domain (not licensed) and its use is entirely voluntary.

The symbol is recommended for use on non-recyclable packaging that is likely to be disposed of in a public place, for example snack food packaging. You may choose to provide additional advice, such as 'please dispose of thoughtfully' or 'please dispose of empty packaging in a rubbish bin'. If your package is recyclable, then the use of the Mobius Loop and a recycling message (see above) may be more appropriate.



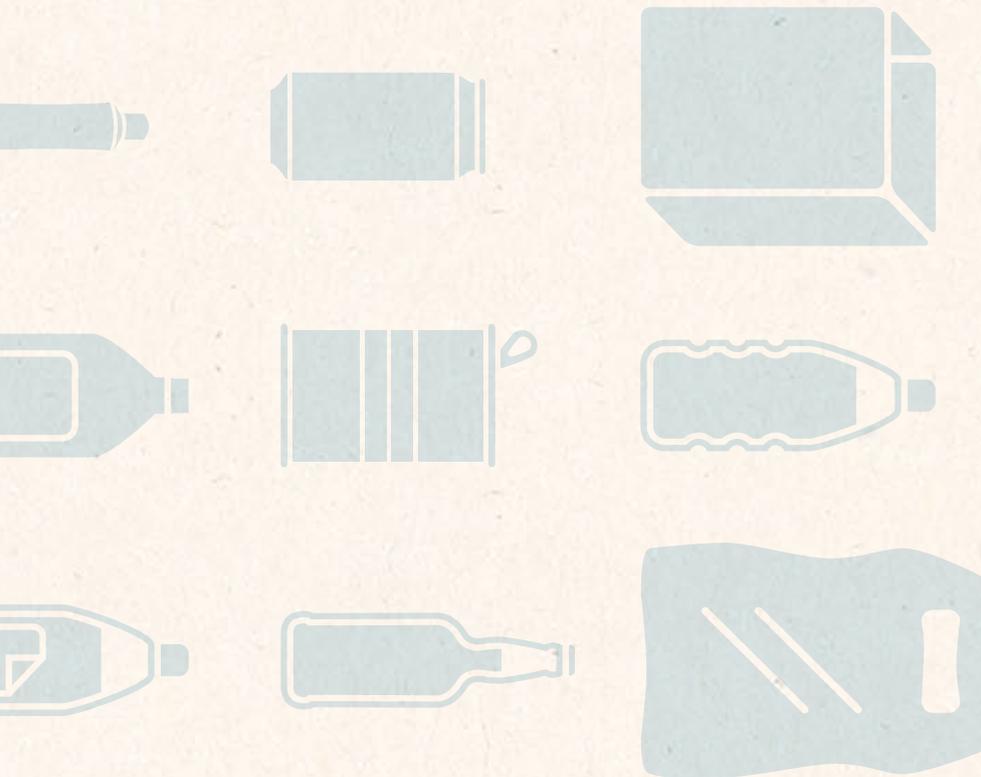
Assessing Your Packaging

The purpose of assessing your packaging for its environmental performance is to identify potential opportunities to improve existing packaging and key issues to consider when designing or procuring new packaging. It is important that organisations approach the assessment of packaging in a strategic manner. A sound approach is to focus on those products with the most significant impacts or highest selling volume first, and then to systematically implement the identified environmental improvements for existing and future packaging designs.

It is important that assessments and supporting information are documented appropriately and available as evidence of your organisation's activities, particularly in the event you are selected to be audited as part of the APC's annual reporting process. Make sure your organisation is 'audit ready'.

For more information regarding the APC, packaging assessments, the Sustainable Packaging Guidelines, or the audit process, please visit the Resources section on the APC website or contact the APC at: apc@packagingcovenant.org.au

The APC recommends setting up internal teams to review packaging, and also working with others in the supply chain, particularly your packaging suppliers, to improve the assessment process. The information contained within these Guides provides you with much of the base-level knowledge required to initiate those discussions.



Useful Further Reading

Reference

Australian Competition and Consumer Commission (ACCC), 2011. Green marketing and the Australian Consumer Law. 29 pages.

APC, 2010. Sustainable Packaging Guidelines, Australian Packaging Covenant. 30 pages.

Arthritis Australia, 2012. Food packaging design accessibility guidelines. 31 pages.

Boylston, Scott (2009), Designing Sustainable Packaging. 188 pages.

Department of Environment, Climate Change and Water NSW (DECCW), 2010. Environmental benefits of recycling. 30 pages.

What is it?

The Australian Consumer Law prohibits misleading and deceptive conduct, which has implications for environmental claims and labels on packaging. This document provides plain language guidance on particular claims. Free download from: www.accc.gov.au/publications/green-marketing-and-the-australian-consumer-law

The SPG is the key document for APC signatories and others to use in framing APC compliant packaging reviews. The objectives of these reviews are to optimise resources and reduce environmental impact, without compromising product quality and safety. Free download from: www.packagingcovenant.org.au/

This document provides more detailed guidance on accessibility principles and strategies to improve accessibility of food packaging; prepared in conjunction with NSW Health. For a complimentary copy of the Food Packaging Accessibility Guidelines and several other packaging design reports contact Arthritis Australia at: design@arthritisaustralia.com.au

A book full of inspiring case studies and interviews with designers and brand managers. Order from: www.laurenceking.com/en/designing-sustainable-packaging www.laurenceking.com/en/designing-sustainable-packaging/

This comprehensive report, along with the supporting appendices, provides the latest Australian LCA data on the recycling benefits and impacts of 21 materials, including most types of packaging. Free download from: <http://www.environment.nsw.gov.au/warr/BenefitRecycling.htm>

Useful Further Reading

Jedlicka, W. 2009. Packaging Sustainability: Tools, Systems and Strategies for Innovative Packaging Design. 332 pages.

Detailed information and analysis of sustainability, consumer attitudes and behaviour, marketing, the regulatory environment and different packaging materials and processes. Order from: au.wiley.com/WileyCDA/WileyTitle/productCd-0470246693.html

Plastics and Chemicals Industries Association, 2003. Plastics identification code, 14 pages.

Guidelines on appropriate use of the plastics identification code, including how it should be applied, where it shouldn't be used, mould modifications and 'do's and don'ts'. Order from: www.pacia.org.au/learningcentre/pic

SPA. 2004. Packaging Material Selector. Sustainable Packaging Alliance, 2004. 2 pages.

A useful comparative summary of the key characteristics of the main packaging material types, and also provides a summary of selected physical and life cycle parameters on each packaging material. Soon to be updated. Order from: www.sustainablepack.org/resources/page.aspx?id=29

SPC. 2009a. Environmental Technical Briefs of Common Packaging Materials: Fibre-Based Materials. Green Blue Institute. 19 pages.

Life cycle based information and data intended to assist packaging designers with understanding the environmental and human health impacts of using corrugated containerboard and boxboard in packaging. The document focusses on the life cycle phases of raw material extraction to packaging material manufacture. Lots of great information. Order from: www.sustainablepackaging.org

SPC. 2009b. Environmental Technical Briefs of Common Packaging Materials: Metals and Glass in Packaging. Green Blue Institute. 32 pages.

Life cycle based information and data intended to assist packaging designers with understanding the environmental and human health impacts of using steel, aluminium and glass in packaging. The document focusses on the life cycle phases of raw material extraction to packaging material manufacture. Lots of great information. Order from: www.sustainablepackaging.org

Useful Further Reading

SPC. 2009c.
Environmental
Technical Briefs of
Common Packaging
Materials: Polymers.
Green Blue Institute.
60 pages.

Life cycle based information and data intended to assist packaging designers with understanding the environmental and human health impacts of using the main plastic polymers in packaging. The document focusses on the life cycle phases of raw material extraction to packaging material manufacture. Lots of great information. Order from:
www.sustainablepackaging.org

Standards Australia,
2000, AS/NZS
ISO 14021:2000
Environmental labels
and declarations—
Self-declared
environmental claims
(Type II environmental
labelling). 20 pages.

This is the only labelling standard in Australia. It defines key terms such as recyclable, recycled content and compostable, and recommends use of the Mobius Loop for recycling claims. Order from:
infostore.saiglobal.com/store/

Verghese, K., Lewis,
H. & Fitzpatrick, L.,
2012. Packaging for
Sustainability. 1st ed.
Boston: Springer.
384 pages.

This life cycle thinking based reference book provides extensive detail on just about every aspect of sustainable packaging design. Beyond design, it also contains detailed information on marketing, regulatory and labelling aspects. Order from:
www.springer.com/engineering/production+engineering/book/978-0-85729-987-1

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