SUSTAINABLE PACKAGING?

energy use, lightweighting, recyclable, bioplastics, Dwell to waste, convenience, portion control, marketing, containment, carry, food waste, calories, waste, impacts, incineration, reduce, reuse, recycle, landfill, recoverable materials, PVC, paint, metal, glass, paper, cardboard, plastic,这张图片展示了一种关于可持续包装的视觉表示。图片中展示了诸如“生命周期影响”、“轻量化”、“可回收”、“生物塑料”、“废物处理”、“便利”、“部分控制”、“市场营销”、“包装”等术语，强调了在设计和使用包装时需要考虑的多个方面。

Unilever的标志出现在图片的右下角，表明这是该公司的宣传材料。

这种视觉表示有效地传达了可持续包装的概念，通过将相关术语以流动的方式展示，帮助读者理解可持续包装涉及的多个领域。
What is it?

Packaging is the material we use to contain, protect, handle, deliver and present goods.

There are three broad packaging functions:

**Primary packaging** contains the goods bought by consumers – everything from toothpaste tubes to jam jars.

**Secondary packaging** refers to materials that are not in direct contact with the product, but are sold to the consumer – for example a box round a toothpaste tube.

**Tertiary or transit packaging** is the boxes, wooden pallets, boards and plastic wrapping used to deliver large loads.

**Materials**

Most packaging is made from paper, board, plastic, glass, steel, aluminium or a combination of materials. New bioplastics are beginning to be used but are currently a very small proportion of the total.

Packaging designers consider many factors when choosing which material to use, including flexibility or rigidity, transparency, barrier properties, delivery, recyclability and cost. The choice depends on the product, how it will be stored, how it will be dispensed, whether it will be heated or cooled, how it will be transported, displayed in shops, used by consumers and disposed of.

**Paper and board**

These are made from fibres extracted from crushed wood. It’s important to know that paper and board originates from sustainable sources, where paper is made from smaller trees that are thinned out of managed forests, planted for timber and not from forests with high conservations values. There are a number of programmes to certify responsible forest management, including the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification.

Paper is mainly used for bags, labels and in laminated packs (see Mixed materials packaging). Board, which is thicker and heavier, is used in cartons and packing cases. Corrugated board (made from layers of paper) provides protection when goods are handled and transported.

These materials are light, flexible and can be printed, making them suitable for presenting products. However their use is limited due to lack of strength and poor resistance to water.

**Glass**

Glass is made by heating raw materials such as sand, soda ash and limestone to around 1,500°C. This produces molten glass which is then shaped into jars and bottles.

Glass is ideal for storing food and drinks as the material is impermeable and doesn’t affect the taste. The transparency of glass means the product can be seen but this makes it unsuitable for products that are damaged by light. Glass is heavier than other packaging materials and breaks easily unless toughened.

**Plastics**

There are six major types of plastics used for packaging, which are identified using numbers or their initials (see graphic 1).

The raw materials for plastics (called polymers) are produced by the petrochemicals industry from refined oil, or from ethane, a bi-product of the natural gas purification process. About 4% of the world’s oil consumption is used to make plastic and a fraction of this is used to make packaging plastic. Polymers are converted using heat and pressure to make bottles, tubes, films and other types of packaging. Plastics are relatively strong, lightweight and versatile and can carry print, making them suitable for brand messages and product information.

**Metals**

Steel and aluminium are produced at high temperatures from metal ores. The molten metal is shaped to make containers.

Steel and aluminium are used to make cans and aerosols. Cans are ideal for storing cooked food as the cooking and canning process preserves the contents, avoiding the need for preservatives. Aluminium is also used to make foil containers and laminates.

**Mixed materials packaging**

Some packaging combines several materials, usually paper laminated with polyethylene and aluminium foil, or one type of plastic combined with another. Mixed materials can allow lighter packaging and provide the properties needed for storing liquids, especially food and drink. Plastic windows are also used in paper-based packs so shoppers can see the contents.

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**[1] PLASTICS USED IN PACKAGING**

The resin identification coding system

- **PETE or PET** Polyethylene terephthalate
- **HDPE** High density polyethylene
- **PVC or V** Polychloride
- **LDPE** Low density polyethylene
- **PP** Polypropylene
- **PS** Polystyrene
- **OTHER or O** Plastics other than the six listed above, or more than one resin used in a multi-layer combination.

Source: Society of the Plastics Industry (SPI)
Why we need it

Modern society relies on the ability to transport products from manufacturer to retailer to the consumer. Packaging makes this possible without damaging or spilling the product.

The nature and amount of packaging required depends on each individual product and the logistics of moving it from manufacturer to consumer.

The main functions of packaging are:

**Containment**
Packaging encloses the product. We simply couldn’t store powders and liquids without it.

**Protection**
Packaging keeps products safe and clean, avoiding the risk of contamination. It also helps them stay fresh for longer. It means that goods arrive in shops and homes undamaged, which is important to avoid waste.

**Marketing**
Packaging carries brand messages and makes products stand out on the shelf. The pack design is an important component of product marketing.

**Displaying information**
Packaging is used to display vital information about ingredients, use, transport and disposal of products. This is a legal requirement for some products such as pharmaceuticals, food and chemicals.

**Convenience**
It enables manufacturers to stack, handle and deliver products efficiently. Packaging can also be part of the product use function, for example ready-made packaged food is usually heated or cooked in its packaging.

**Portion control**
Packaging enables the amount of goods sold to be matched to the needs of different consumers. For example, fruit drinks packaged in small bottles can be drunk in one go, giving people one of the five daily portions of fruit or vegetables recommended by nutritionists. In Europe the rise in single person households means there is more demand for smaller portions.
Packaging and sustainability

Many people are naturally concerned about the environmental effects of packaging. The design choices made when specifying packaging determines its environmental impact, which with care can be reduced to a small proportion of the overall product life-cycle impact.

The impact of packaging

Packaging waste is highly visible to consumers – it’s what’s left over when a product has been used – and provokes strong reactions. In a typical developed country like the UK, it makes up around 20% of domestic waste and around 6% of total waste by weight.¹

Unnecessary packaging wastes energy and resources. Well designed packaging brings significant benefits, particularly avoiding waste of the product itself e.g. keeping food fresher for longer.

One of the key sustainability issues with packaging is the conservation of resources, including energy, which is wasted if packaging goes to landfill. Recycling or recovery of the energy through incinerating the waste packaging is one way to resolve this.

Analysis of the greenhouse gas emissions resulting from products and their packaging across their lifecycle shows a wide range in the proportion of the total impact attributable to the packaging (see graphic 4).

For products which require energy to use them (for example shampoo, laundry detergent, heated foods) the use phase of the life-cycle is usually the dominant part of their climate impact. The packaging impact is a small proportion. An exception is in countries where renewable energy (which has almost no impact) makes up a large share of the energy mix.

For products that do not require energy in use (for example food that doesn’t needed to be cooked or stored in the fridge, toilet cleaner) the proportion of climate impact due to packaging is typically greater.

Preventing product waste

It takes around ten times more energy and materials to produce household goods and food than the packaging that surrounds them.¹ This means that packaging has a significant environmental benefit in preventing waste in distribution.

It has been estimated that in the UK, where food is generally well packaged, only 2% is wasted in distribution, compared to 50% in India where transport packaging is generally poor.

Efforts to reduce packaging that make it less effective at protecting food products would be counter-productive in terms of overall impact on climate change.

Better packaging means that the energy used to produce the food isn’t wasted. It also avoids food being sent to landfill sites where it produces methane and contributes further to climate change.

The environmental impact of product waste is wider than its impact on climate. If the product is wasted, then so are the water and other resources used to produce it. Water is a vital resource and there are already shortages in many regions around the world which will be exacerbated by climate change and population growth. It takes 1,000 litres of fresh water to produce 1 litre of milk² and up to 16,000 litres to produce a kilo of beef³. The water footprint of most packaging is relatively small so packaging that prevents product waste saves water.

Reducing transport impacts

Much of the food, clothes and other goods we buy are made far from where they are consumed and as the world becomes more integrated, products tend to be shipped even further. Correctly designed packaging reduces the transport impact of global distribution chains.

Good packaging design can reduce the fuel use per product by allowing more products to be loaded on each pallet and more pallets on each truck, train, boat or plane. This means fewer journeys, less energy use and less climate impact. Using lighter materials also reduces the fuel used in distribution.
Making packaging more sustainable

No packaging is completely sustainable because manufacturing requires energy and creates waste. But designers can make packaging more sustainable by considering environmental impacts during manufacture, use and disposal while ensuring optimum performance in protecting the product.

Sustainable packaging could be considered to be the packaging design with the lowest environmental impact that provides the required functionality. It is important that analysis of the sustainability of packaging takes into account social, environmental and economic considerations across the whole lifecycle of the product that it contains to avoid misleading conclusions.

**Which material is best?**

The environmental impacts of different materials vary significantly (see graphic 4). To improve packaging sustainability, it is vital to consider their impacts at each stage of the lifecycle.

**Reduce, reuse and recycle**

Designers can improve the sustainability of packaging by following the principles of the waste hierarchy: reduce, reuse and recycle. But because environmental impacts must be considered across the whole lifecycle of a product, it is important not to reduce packaging to the extent that it results in damage to the product.

**Reduce**

One way to improve the sustainability of packaging is to use less of it — reducing size, thickness and weight as much as possible. Over the last 30 years the packaging industry has made great strides in reducing the weight of its products. Glass containers and metal cans are around a third lighter than in 1980. Reducing packaging cuts down on the use of materials and it also takes less energy to manufacture and transport lighter and smaller goods. As well as being better for the environment, this cuts costs which provides a strong incentive for companies to minimise packaging.

**The best solution may not be intuitive**

Reducing packaging does not always lead to the most sustainable option. For example, toothpaste tubes often come in a cardboard box. This may seem like unnecessary packaging, but it helps to protect the tube inside on its journey to the store. The box is readily recyclable, and without it, the tube would need to be thickened (making it heavier) and might need more transit packaging.

A 10g laminate shampoo pouch may seem like the more sustainable option compared to a 20g plastic bottle. But if the collection and recycling infrastructure means the pouch cannot be recycled and if half the bottles are recycled, they both generate the same amount of waste.

**Reuse**

A good way to make packaging more sustainable is to reuse it in its original form. For example, some specialist retailers will refill shampoo bottles if customers bring them back to their store. However, it takes energy to transport and water to clean used packaging. Reusable packaging must also be sturdier than for single use. There can be safety and contamination issues associated with reusable packaging. A full lifecycle analysis is required for each product to determine whether reusing packaging is beneficial.

**Recycle**

Using materials with recycled content helps cut down on consumption of virgin resources and can reduce the amount of energy used in manufacturing. It also creates a market for waste materials making recycling more viable. It is technically possible to recycle almost all packaging materials, but to be viable recycling must be economically attractive. Recycling also has environmental impacts requiring energy for transport, cleaning and reprocessing. The environmental balance

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### WHICH MATERIAL IS BEST?

<table>
<thead>
<tr>
<th>Glass</th>
<th>Traditional plastics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pros</strong></td>
<td><strong>cons</strong></td>
</tr>
<tr>
<td>Strong</td>
<td>Suitable for recycling</td>
</tr>
<tr>
<td>Suitable for reuse</td>
<td>Can use high recycled content</td>
</tr>
<tr>
<td>Suitable for recycling</td>
<td>Lightweight and strong</td>
</tr>
<tr>
<td>Recycling facilities in place in developed countries and, to a limited extent, developing countries</td>
<td>Can be burnt to produce energy</td>
</tr>
<tr>
<td>Can use high recycled content</td>
<td>Made from oil, a non-renewable source</td>
</tr>
<tr>
<td><strong>cons</strong></td>
<td><strong>pros</strong></td>
</tr>
<tr>
<td>Cannot be recycled indefinitely</td>
<td>Decomposes back to natural elements</td>
</tr>
<tr>
<td><strong>Paper and board</strong></td>
<td><strong>Lightweight and strong</strong></td>
</tr>
<tr>
<td><strong>pros</strong></td>
<td><strong>cons</strong></td>
</tr>
<tr>
<td>Easy to recycle</td>
<td>Makes poor fertiliser when composted</td>
</tr>
<tr>
<td>Uses naturally occurring, renewable raw materials</td>
<td>Can contaminate recycling</td>
</tr>
<tr>
<td>Lightweight</td>
<td></td>
</tr>
<tr>
<td><strong>cons</strong></td>
<td><strong>pros</strong></td>
</tr>
<tr>
<td></td>
<td>Produces methane if sent to landfill</td>
</tr>
<tr>
<td></td>
<td>Only a third of paper comes from sustainably managed forests</td>
</tr>
<tr>
<td><strong>Metal</strong></td>
<td><strong>Degradable plastics</strong></td>
</tr>
<tr>
<td><strong>pros</strong></td>
<td><strong>cons</strong></td>
</tr>
<tr>
<td>Suitable for recycling</td>
<td>Decomposes back to natural elements</td>
</tr>
<tr>
<td>Uses high recycled content*</td>
<td>Lightweight and strong</td>
</tr>
<tr>
<td>Established recycling infrastructure in developed and developing countries</td>
<td><strong>pros</strong></td>
</tr>
<tr>
<td>High strength to weight ratio</td>
<td>Uses naturally occurring, renewable raw materials</td>
</tr>
<tr>
<td><strong>cons</strong></td>
<td><strong>cons</strong></td>
</tr>
<tr>
<td>Energy intensive to mine raw materials and to manufacture</td>
<td>Could reduce fossil fuel use</td>
</tr>
<tr>
<td><strong>Mixed materials</strong></td>
<td><strong>Biopolymers</strong></td>
</tr>
<tr>
<td><strong>pros</strong></td>
<td><strong>cons</strong></td>
</tr>
<tr>
<td>Lightweight</td>
<td>Can be confused with conventional plastics</td>
</tr>
<tr>
<td>Uses minimal raw materials</td>
<td>Produced from renewable sources which could compete with food for human consumption</td>
</tr>
<tr>
<td>Uses little recycled materials</td>
<td>Requires sorting stream if not compatible</td>
</tr>
<tr>
<td>Collection and recycling</td>
<td>Poor barrier properties compared with traditional plastics</td>
</tr>
<tr>
<td><strong>cons</strong></td>
<td><strong>cons</strong></td>
</tr>
<tr>
<td>Infrastructure not established so often ends up as waste, and in some countries as litter</td>
<td>Large amounts of water needed to grow biomass</td>
</tr>
</tbody>
</table>

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*Source: WRAP*
between virgin and recycled materials is complex to assess and depends on many local factors such as the distance travelled by recycled materials. Waste packaging, mainly plastic, can also be burnt in incinerators to generate energy.

**Everyone does it differently**

Recycling rates and practices differ hugely around the world and depend on the availability and efficiency of recycling facilities and the attitudes of communities.

Many countries have achieved high recycling rates. Belgium recycles close to 95% of its glass, Finland recycles over 70% of its paper and Brazil has one of the highest recycling rates for cans. In many developing countries formal recycling facilities are limited.

Waste is treated differently depending on where it is thrown away. For example, half of Denmark’s energy is from alternative sources as it burns over half its waste to recover energy. In Britain, where communities often oppose incinerators due to fears about health concerns, plastics are recycled or buried in landfill sites. In the developing world, many types of waste are considered valuable and materials are recovered from bins and rubbish dumps. Metals are resold, paper and plastics recycled or burned. However, scavenging is dangerous work and is often carried out by women and children. Open burning of plastics containing chlorine can damage the environment and health.

The variation in waste management makes it important for packaging designers to consider what will happen to different materials in the countries where the product is sold. There is little point in making plastic packaging sold in Denmark more recyclable, since it is likely to end up in an incinerator. Plastics sold in Britain should be made as recyclable as possible. It is difficult to plan for recycling in developing countries as facilities are often limited.

This presents a significant challenge for global companies, who keep costs down through economies of scale by selling the same product in many different countries. One approach is to make packaging more suitable for different waste management systems by simplifying the number and combinations of materials used. In the developing world, where recycling infrastructure can be limited, companies can help to develop collection and recycling programmes.

**Engaging the consumer**

Packaging is an essential part of marketing, helping products stand out on the shelf. But making packaging look more attractive can conflict with sustainability goals. For example, goods such as perfume and cosmetics are often elaborately packaged to increase desirability. As consumers become more environmentally aware, they may begin to reject goods that are perceived to be over-packaged.

Campaigns by environmental groups are encouraging consumers to avoid over-packaged products and even to remove the packaging and give it back to the retailer. Consumer awareness means companies can use the environmental credentials of their packaging to differentiate their brands from competitors.

Packaging can provide information for consumers about how to use a product more sustainably. This is especially important for products that need to be heated or cooled, as this is the point where most energy is used. For example, the label on a coffee jar could encourage consumers to use less energy by boiling only the water they need, rather than always filling the kettle.

**PVC, packaging and health**

PVC (polyvinylchloride) is used in packaging such as food trays, drinks and shampoo bottles and blister packs. Where facilities exist, PVC can be efficiently recycled or safely burnt in high-tech incinerators. However, in the developing world, most PVC packaging is not collected and is often burned on open fires, releasing dioxins which damage the environment and human health.

Environmental groups believe that dioxins are released when PVC is manufactured. Some phthalates, which are used as plasticisers in PVC manufacturing, have been shown to damage health if ingested. These are only used in packaging in very small quantities.

The functional properties of PVC make it difficult to replace for some applications, however many environmental groups have called for a total phase out of PVC in packaging.

**Regulation**

Packaging regulations can help reduce waste and improve recycling. For example some countries have introduced legislation to prevent unnecessary packaging and under-filling.

The European Union and the US have the most advanced packaging regulation, with many other countries following their lead. Around the world, waste management is mainly financed and administered at local level by municipalities.

The 27 countries of the European Union must comply with the Directive on Packaging and Packaging waste (known simply as the Packaging Directive). This specifies minimum design standards for recyclability and requires countries to recover and recycle specified volumes of packaging waste. Member countries have implemented the directive differently. For example, in Britain companies using packaging pay a fee to organisations that invest in recycling facilities. The amount they pay is linked to the amount of packaging they produce or use. In Germany the cost is passed on to the consumer as it is built into the price of products.

In the US, food, cosmetics and pharmaceuticals regulations also contain requirements for packaging.

There is no standardised regulation in Asia and Africa.
The Unilever position

We are working to make our packaging more sustainable by considering impacts across the whole product lifecycle.

Unilever sells around 160 million products every day, all of which are packaged. Packaging protects our products from damage and contamination and communicates important safety and usage information. It is the visible face of our brands and is an important part of marketing. Our goal is to create attractive, well-presented packaging with the least possible environmental impact.

Why packaging sustainability is important to Unilever

Improving the sustainability of our packaging is not just the right thing to do – it also brings business benefits. It helps us to reduce costs, as well as meet the expectations of consumers, governments and campaigning organisations who are increasingly alert to what they see as unnecessary levels of packaging. Leading retailers, including our customers, have committed to reducing the packaging of the products they sell.

Our Sustainable Packaging Steering Team is working to implement this strategy across Unilever.

We have developed metrics to measure the lifecycle environmental impacts of our products (including their packaging):

1. **Water per consumer use in water-stressed countries** = water added to the product + water used by consumers in water-stressed countries (litres)
2. **Waste per brand use** = grammes of packaging + product leftovers per brand use less the reuse, recycling and recovery index
3. **Carbon footprint per brand use** = grammes of CO2 equivalent per brand use across total product lifecycle
4. **Sustainable sourcing** = Proportion of raw and packaging materials being sourced from certified sustainable renewable sources (includ recycled materials where this is considered sustainable practice)

We are developing an environmental scorecard for all our products and are setting reduction targets.

Designing for different waste systems

Our goal is to design products that are suitable for waste management practices within individual countries and we have simplified the number and combinations of materials we use to make our packaging more suitable for different systems.

Sustainable paper sourcing

Together with NGO Rainforest Alliance, we are developing a strategy to ensure that all our paper comes from sustainable sources and not from areas where trees may have been logged illegally. A recent study of paper sourced for our European business showed that 71% was recycled material and 12% was from sustainably managed forests. We are now working on an exercise to assess our suppliers globally and will work together to set action plans and goals in line with our policy.

PVC

Given the concern around the disposal of PVC, we are working to minimise its use in our packaging. Our PVC policy commits us to replace PVC in all our packaging by the end of 2010, where there are viable alternatives.

Biopolymers and degradable plastics

We do not believe that biopolymers and degradable plastics offer more sustainable alternatives to conventional plastics (see graphic 4).

The materials do not currently offer adequate protection for many of our products which have a long shelf life, and in some instances may contaminate recycling streams.

Litter in the developing world

Selling products in sachets makes them more affordable to consumers in emerging markets, but the sachets often end up as litter due to lack of disposal facilities. We are investigating alternative materials to make our sachets more recyclable and to find uses for waste material (such as for use in road surfaces).

Working in partnership

Unilever is a member of the Sustainable Packaging Coalition and the European Organisation for Packaging and the Environment industry groups. We are working with industry partners to define common metrics for sustainable packaging, for launch in mid 2009.

Read more online about our partnerships with retailers and NGOs to improve recycling infrastructures in emerging economies.

Regulation

We are not opposed to reasonable packaging taxes, but feel that the revenue should be invested in waste management infrastructure such as recycling facilities.

Reducing our footprint

Our strategy for improving the sustainability of packaging is based on three principles:

- We consider the whole product, not just packaging in isolation
- We consider the whole lifecycle of the product
- We use leading edge design techniques to minimise packaging materials

Our packaging footprint

![Our Packaging Footprint](Image)

(We are not opposed to reasonable packaging taxes, but feel that the revenue should be invested in waste management infrastructure such as recycling facilities.

SOME UNILEVER PACKAGING ACHIEVEMENTS

57% reduction in packaging needed for our concentrated detergents, such as Persil Small & Mighty.

17% reduction in packaging weight for Suave shampoo saving almost 150 tonnes of plastic each year (enough material for 15 million bottles).

Reduced materials needed for spread containers (across our North American brands) by 2.5 million tonnes each year by employing new production techniques. This is equivalent to eliminating almost 100 million containers annually.

Source: Unilever

Source: Unilever
Relevant link

Read more online about our partnerships with retailers and NGOs to improve recycling infrastructures in emerging economies.


Sources of information:

1. Incpen
2. Incpen
3. Dr J M Kooijman, A Guide to Packaging Eco-Design
4. www.waterfootprint.org
5. Incpen – Packaging – the facts
6. OECD Environmental data 2004

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Design and production

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Printing

Scanplus/Allinsons

(on paper made from responsibly managed forests)

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