



# Packaging from Recycled Materials

INCPEN PACKAGING FACT SHEET SERIES

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## Packaging from Recycled Materials

Many types of packaging – glass, metal, paper, cardboard, plastics – are widely recycled and there is a long tradition of using recycled materials in the manufacture of new packaging. In recent years, advances in recycling technologies, increased consumer demand for sustainable packaging and government policies are driving the industry towards higher usage of recycled content.

Using recycled materials in packaging can often result in reduced environmental impact and reduced costs compared to using raw materials, for example:

- Producing **glass** from recycled materials needs about 30% less energy than producing it from raw materials because recycled glass (cullet) melts at lower temperatures compared to melting the raw materials used in new glass (largely silica sand, sodium carbonate and limestone).
- Recycling **aluminium** saves up to 95% of the energy used to produce aluminium from its raw material, bauxite ore. This huge saving is because the recycling process involves melting down already formed aluminium metal, which requires much less energy than mining and processing bauxite.
- Producing new **steel** from scrap iron and steel uses about 74% less energy compared to mining and processing iron ore and coal. As well as avoiding the mining impacts, energy savings also come from the efficiency of electric arc furnaces used in recycling.

These energy savings not only reduce costs and the mining of finite earth minerals but also reduces greenhouse gas emissions and the manufacturing process is overall more environmentally sustainable.

The physical properties of glass and metals allow them to be recycled continuously and retain their quality with only small melt losses. For these materials the available sources of recycled material tend to be used to their maximum when available. Making packaging from recycled materials makes sense when this provides *an overall environmental benefit*, however, there are many factors to consider when gauging the environmental impact of various materials and manufacturing processes, it is not a clear-cut issue.

**Waste paper** has always been a significant source of raw material for UK-produced paper and board packaging, especially corrugated board, because it is cheaper than imported pulp. Pulp is usually made from hardwood or softwood timber although can also be other sources such as bamboo or hemp.

Not all recycled materials retain their strength as they are recycled, and this is the case with paper/board as the fibres degrade each time they are recycled as they shorten or break due to the mechanical stress of the recycling process and cleaning. Addition virgin material is added in the process to produce paper/board that achieves the same strength. This may increase the total weight used, potentially offsetting some environmental gains from recycling. Paper

fibres can typically be recycled around 5-7 times before they become too degraded to be used again.

In **closed-loop recycling**, materials are recycled back into the same type of product, maintaining their quality and value. This process usually minimises waste and resource depletion, as the material can often be re-used with less degradation. However, this is not always the case, sometimes closed loop can concentrate any impurities and contaminants present in the materials. For example, additives such as clay coatings build up when paper is repeatedly recycled.

In **open-loop recycling** materials are recycled for multiple purposes, converting materials into different products. In general, open loop recycling tends to produce a lower quality recycled material for some of the following reasons:

1. **Quality control:** In closed-loop recycling, the materials are processed back into the same type of product. This requires stricter quality control measures to ensure the recycled material meets the original product's specifications.
2. **Contamination reduction:** Since the materials are returned to the same production cycle, there is less likelihood of contamination from different types of materials. This helps maintain the purity of the recycled material.
3. **Consistent material stream:** Closed-loop systems often deal with a more consistent and predictable stream of materials. This uniformity makes it easier to manage and clean the recycling process effectively.

Some UK examples of closed loop and open loop recycling:

### **Closed Loop**

1. **Glass:** glass bottles and jars can be recycled indefinitely without losing quality, and the recycled glass is used to make new bottles and jars.
2. **Aluminium:** aluminium drink cans are often recycled back into new cans and this process can be repeated multiple times without degrading the quality of the aluminium.
3. **Plastic bottles:** PET plastic bottles (like those used for soft drinks) and HDPE plastic milk bottles are commonly recycled into new plastic bottles of the same type.

### **Open Loop**

1. **Plastic pipes:** HDPE bottles can be recycled into plastic pipes, which have a long lifespan and keep the recycled material in use for decades.
2. **Plastic 'wood':** plastic bottles, food pots, tubs and trays can be recycled into plastic 'wood' used for garden furniture, park benches and decking.
3. **Carpet Fibers:** plastic bottles are sometimes recycled into fibres used in carpets.

These examples show how different materials can be recycled in ways that either keep them within the same product category (closed loop) or transform them into entirely new products (open loop). Material is 'downgraded' in the open loop examples above as higher quality food grade plastic is no longer suitable for food grade applications.

Above all, prioritising the safety of food packaging should never be compromised in the pursuit of finding outlets for recycled materials. Ensuring human health remains the utmost priority.

## The types of packaging waste available

Packaging waste arises on the premises of packaging manufacturers, packaged goods producers, retailers and other distributors, and at places where citizens use packaged goods including households, workplaces, public buildings and public spaces.

Much of the waste from **packaging companies' operations** is process waste such as 'clean' off-cuts which can easily be recycled back into the same process.

Waste from **packaging plants and retailers** has improved in recent years, with separate collection and baling for paper-based materials and, for plastics, better quality control to reduce contamination. With a high percentage of the material from this source being unprinted or minimally printed, the bales of material have a higher value.

The most challenging packaging waste to recycle is the **material collected from citizens** such as household waste. Each household generates relatively small quantity of a wide variety of materials and the quality of the collected material from citizen sources is often inconsistent and sometimes heavily contaminated with items that should not be in the recycling at all (like nappies, tins of paint or hazardous waste) or items for recycling are contaminated such as plastic food containers or cardboard heavily soiled with food residue or (in mixed recycling), paper and card damaged by getting wet from water or liquids dripping off other containers. These factors all complicate the recycling process.

Changes coming in as part of the **UK Collection and Packaging Reforms** between 2025 - 2027 aim to increase the quality and quantity of packaging material for recycling from households by reducing contamination and increasing the amount of materials captured. One of the reforms, 'Simpler Recycling' (in England), will standardise the packaging materials that are collected for recycling from citizens at home, workplaces and public spaces. Simpler Recycling will also involve separate food waste collections being rolled out to all households and work premises (in England) that don't already have them. (As of 2024, only half of English households have separate food waste collections which is far fewer than the devolved UK nations).

More information on the UK Collection and Packaging Reforms is on the INCPEN Packaging and Legislation Fact Sheet.

## Food contact

About 70% of all primary packaging is used for food and drink. 'Primary packaging' is the container or wrapper that the consumer opens at home, as opposed to the boxes and pallets used to transport the product from the factory to the store.

Recycled materials that are safe to come into direct contact with products we consume are called *food grade*. This term indicates that the materials meet specific safety standards and

regulations for contact with food and beverages. Some pharmaceuticals and toiletries also use this standard in their contact packaging. When using recycled materials in packaging, it is critical there is no contamination that might adversely affect the quality of food contact packaging. Recycled materials have different qualities when it comes to possible contamination from their previous use. This is very important when it comes to food grade packaging:

- Glass and metals are reprocessed at high enough temperatures to ensure that contamination is not a hazard.
- Recycled paper from mixed-origin waste is generally unsuitable for direct contact with food products, toiletries, cosmetics, or pharmaceuticals due to potential contamination.
- Some recycled plastics can be safely used in food contact applications because the advanced recycling processes we have today mean they can be produced to a food safe standard.
- Different types of plastics have different capacities to retain and release contaminants, so certain recycled plastics may not be suitable for contact with specific types of food (eg fats or acids) due to the potential to leach substances.
- Some plastics are not suitable for food safe use at all.
- Newer technological developments such as chemical recycling\* continue to advance and can produce recycled plastics capable of meeting stringent safety standards for direct food contact.

This distinction between food grade and non-food grade materials is crucial for ensuring safety and maintaining the integrity of products that come into direct contact with their packaging. Regulations exist to make sure this happens. The US Food and Drug Administration (FDA) lays down detailed purity requirements for food-contact materials. In Europe, Commission Regulation (EU) No. 282/2008 defines when recycled plastics can be used in the manufacture of packaging for food-contact use. [Packaging & Food Contact Substances \(FCS\) | FDA Regulation - 2022/1616 - EN - EUR-Lex](#)

For certain plastics, such as polyolefins, for food grade standard, 100% sorting efficiency would be necessary and this is unlikely to be achievable outside a controlled product loop. For other materials, such as PET (eg used in drinks bottles), safety can be assured with a lower sorting efficiency. The sorting efficiency of each material must be identified on a case-by-case basis.

### **The implications of mandatory minimum recycled content**

Packaging designers and producers have put a lot of effort into producing packaging materials that are consistent, as thin as possible (to use less material), and of guaranteed high quality. Industry uses recycled materials where it can, producers use it where it is available and economically viable and safe to do so.

The Plastic Packaging Tax (PPT) was introduced in the UK by HMRC from April 2022 (PPT is another in the suite of UK Collection and Packaging Reforms). As of Feb 2025, PPT sets a minimum threshold of 30% recycled content in plastic packaging and producers are taxed if they don't meet it. This tax lever has created more market demand for recycled plastics as

producers work to meet the thresholds and avoid the tax. Unsurprisingly, the value of recycled plastic has increased. However, in some instances and with market fluctuations, the cost of recycled plastic has actually been higher than virgin plastic. This has the unintended consequence of making the use of the recycled content not commercially viable and producers switching back to virgin plastic as a result is the opposite behaviour of that which the PPT was intended to incentivise.

This example shows how the complexities and fluctuations of global markets and economics are fundamental to recycling and well-intentioned state interventions to incentivise closed loop material flows might not always lead to improved environmental outcomes in the short term when it comes to packaging circularity. The concept of a ‘closed loop’, where a product is constantly recycled back into itself for a higher quality output, may, paradoxically, sometimes result in reduced use of recycled materials. Closed-loop recycling may ignore other, possibly better, market outlets for materials.

Introducing a minimum recycled content requirement could face legal challenges under EU law, which prohibits member states from adopting technical specifications that exclude products lawfully manufactured in another EU country. Additionally, even if such legislation were adopted at the European level, it could be challenged under the World Trade Organisation’s General Agreement on Tariffs and Trade (GATT). [Plastic Taxation in Europe: Update 2024](#)

*(\* Mechanical recycling physically processes plastics, whereas chemical recycling converts them down to their original chemical building blocks. This allows recycling of complex plastic waste streams that are usually too difficult to process mechanically. It enables high-quality recycled plastics to be produced).*

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