BRÜCKNER GROUP

PACKAGING
A FACT CHECK

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FOREWORD

Dear Readers,

In the first booklet of our YES, **WE CARE** initiative in 2018, we tried to answer twelve frequently-asked questions about **plastics and the environment**. At that time, the discussion was still quite new and we were aware that this could only be a first step. That is why we have compiled further facts and background information on the topics of packaging, waste avoidance, recycling and the circular economy in booklets two and three.

What you now hold in your hands is an attempt to summarise the current state of the discussion on a **sustainable approach to packaging** and to highlight the latest solutions. This is not only about obvious problems such as pollution of the oceans or growing mountains of waste. **Climate change** with the question of what contribution the right packaging can make in this context is also an issue we address.

In this booklet we would like to show that there is **no universal answer** to the question of the best and most sustainable packaging solution. For a correct assessment, the complete picture, i.e. the entire development and life cycle, must be considered. This includes raw materials and resources, transport and logistics, product and packaging, use and disposal and finally return and recycling.

But one thing is clear: all of us - from manufacturers to consumers - are in the same boat and bear **responsibility** for ensuring that packaging can fulfil its important function of protecting products of all kinds without having a negative impact on the environment and climate.

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RAW MATERIALS **& RESOURCES**

By the time a product lands on the supermarket shelf or in the kitchen cupboard at home, it has already gone through numerous stages - as has its packaging. The process begins with the extraction of the respective raw materials that are needed for the materials. Emissions, energy expenditure, social and environmental impacts and the finite nature of resources all play a role here.

Packaging is made from many different materials: plastic, paper, glass and aluminium are the most common. There are **different resources** for some materials. Plastic, for example, can be made from petroleum, natural gas, corn, sugar cane, waste or recycled plastics, among other things. Paper can also be made from wood, other plant materials or waste paper. In addition to the main raw materials, additives are needed. The extraction and processing of raw materials are determined by different issues.

Emissions

How many and what emissions (especially CO_2 and other greenhouse gases) do extraction and production cause?

Example: Recycling can save a significant amount of CO_2 emissions compared to the extraction of new raw materials, in the case of plastic up to 40 % depending on the type, and in the case of glass almost 50 %.

Energy

How much energy is needed for extraction and processing? And from which sources is this obtained?

Example: Aluminium production is extremely energy-intensive, which is why aluminium smelters are often located near power plants. Recycling significantly reduces the energy requirement.

Resources

Is the resource finite or renewable? Under what social and ecological conditions are raw materials extracted? What routes are taken for processing?

Example: Oil is a finite resource. Therefore, it is important on the one hand to keep the recyclable material plastic in the cycle through recycling and on the other hand to promote the development of plastics from alternative raw materials - if applicable obtained locally.

No raw material for packaging can be extracted and processed entirely without impact - without energy, without CO_2 emissions, without water consumption.

Recycling materials that have already been produced is an important instrument for conserving resources - especially finite ones - and reducing emissions. Packaging is an important recyclable material and should therefore not be incinerated but kept in circulation. This also applies to bio-based materials, because their extraction also produces emissions and uses soil and water. Here, too, resources need to be conserved and systems must not be thrown out of balance.

If plastic is obtained from **alternative raw materials**, production can be decoupled from the fossil raw materials oil or natural gas. There are various bio-based plastics, most so far made from starch (corn, wheat, tapioca, etc.), cellulose (from plant material) or polylactic acid (polylactide/PLA, obtained from sugar and starch). However, numerous other raw materials are also used, including lignin, chitin, gelatine or vegetable oils.

The market share of bio-based raw materials was 6 % in 2021, and the trend is rising. The following questions are important here: does the extraction of alternative raw materials compete with food production? And are these plastics suitable for recycling? If they end up in the incinerator instead, recyclable materials are lost here as well.

Basic formulations of the materials

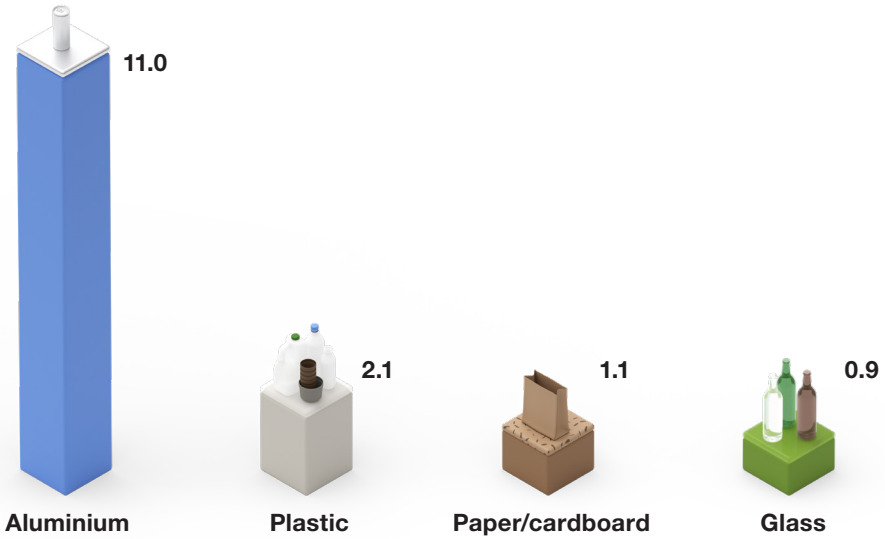
Aluminium	Aluminium oxide Cryolite Energy	Melting temperature 2,054° C
Plastic	Crude oil Water vapour Pressure Energy	Process temperature ca. 600° C
Paper/cardboard	Wood fibre Water Energy	Drying temperature 105 - 130° C
Glass	Quartz sand Soda Lime Potash Energy	Melting temperature 1,450 – 1,650° C

New chance: PHA

The **p**oly**h**ydroxy**a**lkanoates are naturally occurring biopolyesters. The **biopolymers** developed from them include a large group of plastics that can be used in a variety of ways. They are obtained, for example, from wastewater streams, methane gas or even CO_2. They are also biodegradable and recyclable.

The research and development department of **Brückner Maschinenbau** is already conducting trials with promising film samples made of PHA.

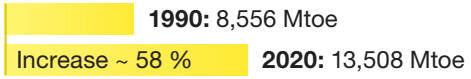
CO_2 emissions of material production
(in CO_2 equivalents per kg)



Energy as a resource

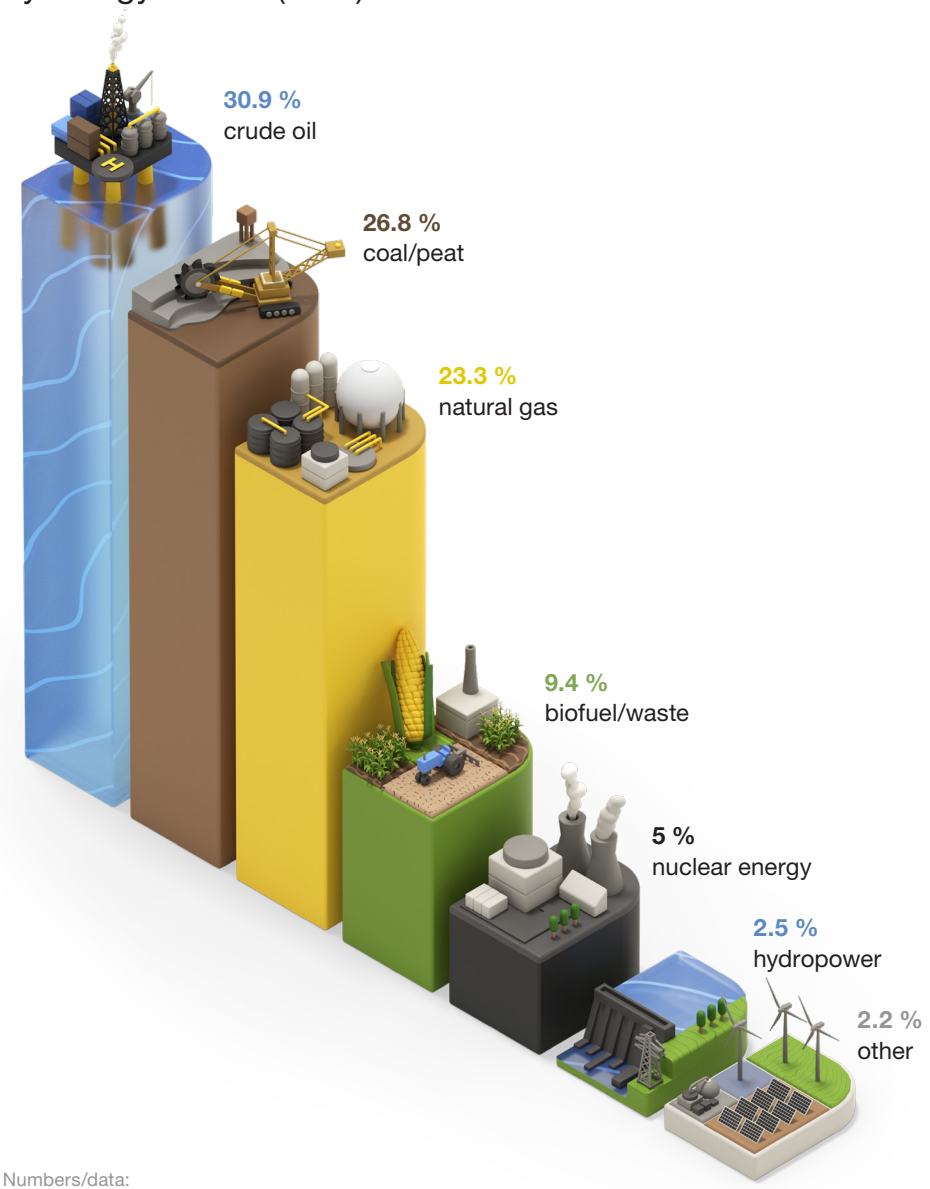
Energy plays an important role in the entire packaging cycle, from raw material extraction to production and transport to recycling - because it is needed everywhere. Too much of it is still produced worldwide from fossil raw materials, especially oil and coal. **Renewable energy production** is important, also because global energy demand is rising at the same time: from the electric car to advancing digitalisation and the extraction of alternative resources, all of this is associated with additional energy demand. The **economical use** of energy must be the primary goal. The companies of the **Brückner Group** therefore develop all machines and lines to be as energy-efficient as possible.

Global energy consumption



(equivalent in Mtoe = million tonnes of oil equivalent)

Energy production worldwide
by energy source (2019)

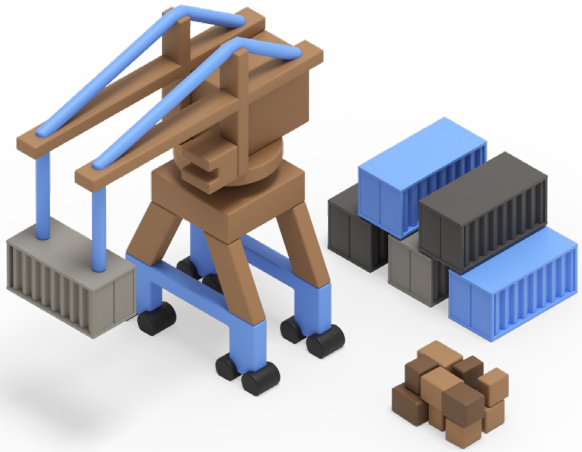


Numbers/data:
Enerdata; Statista; WDR/Quarks according to Hillman et al. 2015; IfBB Hanover

TRANSPORT
& LOGISTICS

Here, it's all about kilometres and weight and the right ratios. In a globally functioning economy, goods - as raw materials, components, finished products, empty or filled packaging and also as waste - travel long distances. As long as transport on the road, on water or in the air is still primarily powered by fossil fuels, this means above all CO_2 emissions. Even with alternative drive sources - e.g. electric vehicles - you have to look at primary resources.

Decisive factors in transport include:
- Means of transport: ship, truck, plane, train
- Type of fuel
- Transport weight and volume



Transport distances are incurred for **many stages** of product and packaging: raw materials are transported to the producer and processed there. Sometimes different constituents are brought together at another location and processed further. This is followed by routes to wholesalers and retailers and finally to the customers' homes. And afterwards? At least the packaging then has further routes ahead of it: to the waste disposal company, to thermal utilisation, to recycling - to be transported back into the cycle as a recycled raw material, if applicable.

Ships, trucks and planes have a poor **carbon footprint** because of their fuels, namely heavy oil, diesel and kerosene. Electric drives (train, electric trucks, etc.) do better - as long as the electricity is generated from renewable energies. Trucks serve land routes and benefit from flexible **logistics**. Ships emit harmful sulphur oxide as well as CO_2, but transport large quantities over long distances. Per tonne of transported weight, their emissions are therefore proportionally lower than those of trucks or planes. So a direct comparison is not easy.

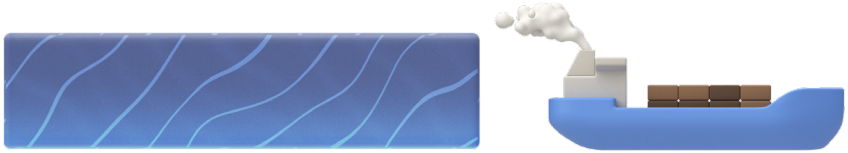
It remains to be said that the possible freight volume and thus **weight and volume** are crucial for the relationship between environmentally harmful emissions and product. Plastic packaging also scores well in terms of weight: it is comparatively light and thin and therefore causes relatively low CO_2 emissions during transport in relation to the product.

In order to minimise transport emissions, many consumers also make sure to buy as regionally as possible.

But how close is close enough? A climate-friendly radius is unrealistically small for many goods in our daily lives. And even **indications of origin** do not always cover all distances - especially not those of packaging.

Buying regionally or in a climate-friendly manner = radius of max. 150 km for production of raw materials, processing and distribution

Transport share of freight transport
(based on tonne-kilometres)



70 % ships

9 % truck

1 % plane

20 % other (e.g. pipelines)

CO_2 emissions of transport

29.4 %
road freight

45.1 %
road passenger transport

11.6 %
air transport
(81 % passengers,
19 % freight)

10.6 %
shipping

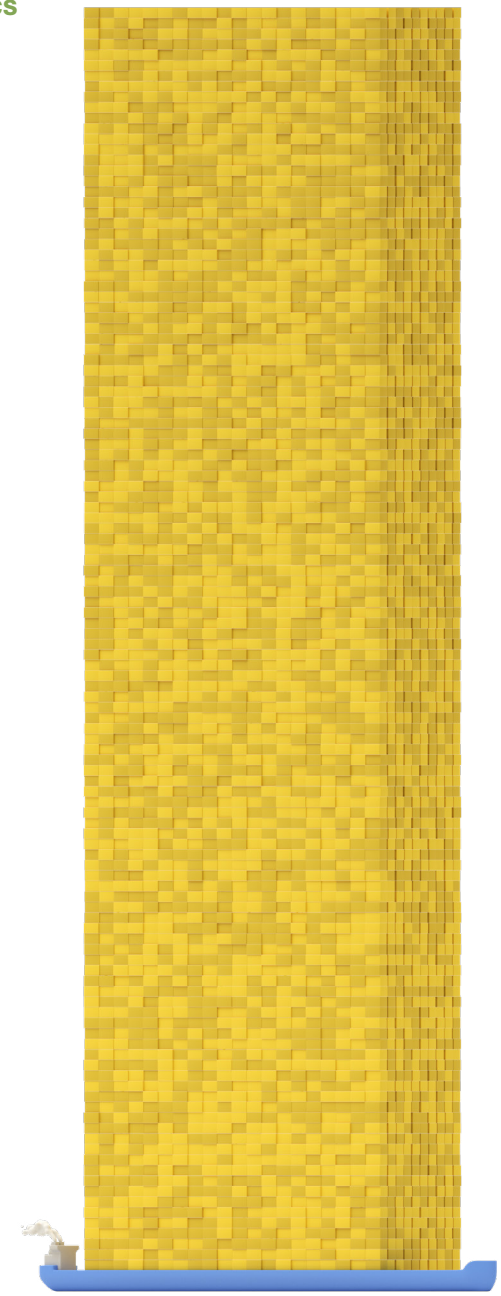
1 %
train

2.2 %
other

Total CO_2 emissions worldwide
= 8 billion tonnes per year
Total transport share = 24 %

Cargo loading in TEU
(**T**wenty-foot **E**quivalent **U**nit (container))

Emission reduction through speed reduction:
20 % less speed =
40 % lower emissions



Truck
1 TEU

Semi-trailer
2 TEU

Container ship
Up to 24,000 TEU

Packaging share (weight) during transport:
Example of yoghurt

Plastic pot
3.5 % packaging
96.5 % yoghurt

Glass
36.2 % packaging
63.8 % yoghurt

Lightweight plastic packaging

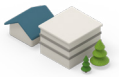
- **50% of all goods** in Europe are packaged in plastic
- **17 % of the total weight** of packaging is made of plastic

Regional presence and remote instead of travel

Thanks to remote systems and a strong expansion of staff in the countries on site, we carry out many installations and services with significantly reduced or even no travel emissions.

Brückner Maschinenbau
> 20 % of commissioning services are carried out remotely

Brückner Servtec
> 80 % of service is remote or regionally performed



Kiefel
> 25 % commissioning through regional staff

PackSys Global
> 15 remote installations since 2020

Numbers/data:
DerStandard/International Transport Forum (as of 2015); OurWorldinData.org (as of 2018); VDMA; PlasticsEurope

PRODUCT
& PACKAGING

A central task of packaging is product protection - during transport, for shelf life and hygiene. The exact requirements depend on the product in question. Packaging also serves marketing purposes and consumer information - from ingredients to shelf life. At the same time, it should be as environmentally friendly as possible, lightweight and compostable, reusable or recyclable. And of course not too expensive. Product and packaging design must provide the right solution for this.

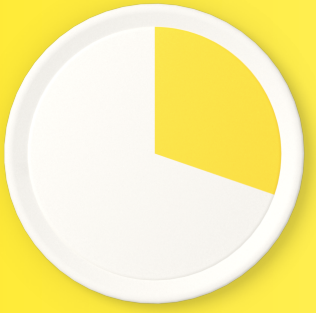
There is little that can be done without packaging in the global trade of goods. A banana, for example, naturally comes with the best packaging: its skin. But even bananas still need at least some form of **transport packaging** such as cardboard boxes for their long journeys. High-value electronic devices must be safely protected when on the move. Liquids are only transportable to a very limited extent without packaging. Food is given a longer shelf life through packaging.

This is important because **food loss** - at harvest, during transport, at the shop, at the consumer - is high and causes 4.4 billion tonnes of CO_2 equivalent per year. By way of comparison, China produces a total of 10.7 billion tonnes of CO_2 per year and the USA 5.7 billion tonnes. Food loss should always be avoided, as it outweighs the environmental impact of packaging - as long as it can be properly disposed of and recycled.

Nevertheless, questions have to be asked: does the product really need packaging? And what exactly does this packaging need to achieve? Or can the product itself be rethought so that less packaging is needed (e.g. solid instead of liquid shampoo)? Packaging should always be as **efficient** as possible: Do you really need the outer packaging? Is less possible? What is the composition of the material? **Material combinations** or composite materials save raw materials and make packaging lightweight, but are also less recyclable if the materials cannot be separated.

Mono-material packaging is the better choice for recycling. What exactly does that mean? The term can be understood quite literally: only one material, i.e. only paper or only glass or only aluminium. With plastic, you have to be more precise: only one type of plastic, e.g. only PET (polyethylene terephthalate) or only PP (polypropylene). This also applies to coatings. A paper cup is not a mono-material packaging if it has a plastic coating. Kiefel is therefore researching and testing alternative coatings for natural fibre packaging that withstand liquids and at the same time do not impair the recyclability of the paper.

Food loss annually worldwide:
1.3 billion tonnes



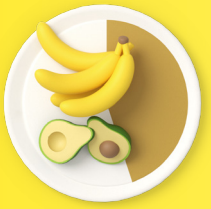
33 %
of total production

20 %
of all meat products

20 %
of all dairy products

22 %
of all oil and
legume crops

35 %
of all fish and
seafood



45 %
of the fruit and
vegetable harvest

30 %
of all cereal products

90 % of a product‘s ecological footprint is created before it reaches the consumer

Mono-material packaging made of plastic usually requires somewhat more material than multi-material packaging. However, since plastic packaging has been optimised and thus reduced over the years - by 25% on average - even mono-material packaging still remains very light and thin. It is not the packaging as such that is responsible for the worldwide increase in the production of plastic packaging, but rather the growing consumption.

The use of **bio-based alternatives** partly requires innovative solutions for the different requirements. Cups for hot drinks, for example, must be heat-stable - but biobased PLA can only withstand temperatures up to max. 55° C. However, **Kiefel** has co-developed a patented process with which a drinking cup that is heat-resistant up to 100° C can now also be produced from PLA.

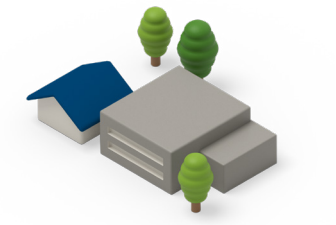
Among other things, **PackSys Global** is currently working on the possibilities of producing laminate tubes from materials other than (crude oil- or bio-based) plastic. The current focus is mainly on paper, but materials such as hemp or chalk could also play a role soon.

Brückner Maschinenbau is working with alternatives, too: Stone Paper (based on calcium carbonate) can serve as a substitute for traditional pulp paper and can already be produced on the lines.

Circular packaging design

- Good labelling = good sortability
- No unnecessary material mix: mono-materials
- Take into account additives such as adhesives and colours

Numbers/data:
Berndt+Partner Consultants, 2018; Food and Agriculture Organization of the United Nations (FAO), 2015



Brückner Maschinenbau

Improved energy efficiency of film production lines
- Reduction of the total energy consumption of a plant by around 30 % in the last 20 years
- Example of stretching oven 1: intelligent oven air supply and the recirculation of waste heat results in energy savings of 1,600 MWh/year, which corresponds to a reduction in CO_2 emissions of several hundred tonnes
- Example of stretching oven 2: seasonal use of ambient air for process cooling

No plastic waste during film production
Almost 100 % inline recycling of production waste

Long lifespan
Construction, execution, spare parts and maintenance service from **Brückner Maschinenbau** and **Brückner Servtec** focus on line longevity. Many have been in operation for decades. Currently, the oldest line has been running in France since 1976.

Brückner Servtec

Drive technology along the line
Direct drives reduce energy consumption by up to 20 % compared to conventional drives, while at the same time increasing film quality and availability

Heat recovery system
As a heat exchanger, converts waste heat into usable energy = heating power savings of up to 40 % with a simultaneous increase in product quality

Direct fluff feeding
Enables direct processing and extrusion of the production waste and edge trimmings without prior regranulation = reduction of the waste content towards zero

Conversion for hybrid operation
Enables production of conventional as well as bio-based plastics - e.g. PLA - on one and the same line

Extrusion with twin screw
Enables a higher proportion of plastic recyclates and energy savings of up to 25 % compared to conventional single-screw extruders

Kiefel

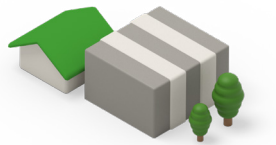
Reduction of energy consumption
10 % energy savings on KMD and KTR machines from 1st to 2nd generation through insulated heating station or heating tower

Reduction in material consumption
Savings of 10 tonnes of steel in SHARPFORMER refrigerator systems through optimisation of the basic design and machine components

Economical water cycle
Condensation, cooling and production water of the machine series for plastic and fibre thermoforming are not consumed but always reused in a closed circuit.

Energy consumption of Kiefel Fibre Thermoforming
Around 1/3 more economical than the competition‘s machines

The companies of the **Brückner Group** are continuously working on optimisations such as energy and material savings or the longevity of their machines and lines.



PackSys Global

smartcube
The smartcube platform is a perfect tool to improve the line performances and to reduce wastages (lower raw material consumption) by analysing and visualising the root causes.

New procedure NEOseam
Reduction of tubes from 500 to 300 µm wall thickness; NEOSeam can now also be applied to thinner laminate structures, saving plastics for the same package.

Tubes with compression shoulder
Method for reducing the tube shoulder by up to 35 % with lower energy consumption (compared to injection moulded tube shoulders) at the same time

HDPE-PBL tubes
Mono-material tubes made of plastic barrier laminate (PBL) = recyclable alternative to aluminum barrier laminate (ABL) tubes compatible to the blown bottle recycle stream

KREA LAB
Technology Centre for Innovation: Driving for sustainable products by process development, material science, education of employees, customers and visitors

USE
& DISPOSAL

How sustainable a product or packaging is is primarily determined by factors that lie outside consumers‘ sphere of influence. Nevertheless, what everyone does is important. It is the sum of actions and decisions in the everyday life of each and every individual that has a big impact in the end. This section therefore deals with the issues that affect use and disposal and ultimately consumption habits.

In front of the supermarket shelf, **feelings** are often decisive - including when it comes to sustainability. Noodles in paper packaging seem to many people to be more environmentally friendly than noodles in film bags. However, if the paper packaging - whether cardboard box or bag - has a plastic viewing window or a coating, it is usually less recyclable as a mixture of materials than the pure film bag.

Clear **labelling** can help to ensure that more packaging is recycled, as can uniform **design and disposal guidelines.** Currently, there are still far too many differences. That is why it pays to remain critical of promises made on packaging. Just a few examples:

- **“100% recyclable”** means that the packaging is in principle recyclable. Whether it is actually recycled depends on the disposal system.
- **“Bioplastic”** is not synonymous with “biodegradable”.
- **“Climate-neutral”** often only means that the manufacturing companies have made CO_2 offsetting payments, but not that the type and manufacture of the product or packaging has become more environmentally friendly.
- **“Made from ocean plastic”**: the term ocean plastic is not protected and the plastic used is therefore often not fished out of the ocean, but collected in coastal regions or similar.

Important questions consumers should ask themselves are: What is your own **consumption behaviour** like? And how high is the demand for **convenience**, i.e. how fast or convenient does it have to be? Ultimately, all contributions within the cycle are important for the necessary **system change**. And then it is crucial what consumers do with the product and packaging after use. Because even in the best system, only what is disposed of correctly can be recycled. Where there is no appropriate **disposal system**, even recyclable packaging is - for the time being - just as harmful to the environment as any non-recyclable packaging. The development and establishment of waste management systems must therefore be promoted worldwide.

Lack of waste collection
About 3 billion people are without access to controlled waste disposal.

Packaging waste by weight (EU)

Packaging
3 % of total waste

41 % paper and cardboard

19 % plastic

19 % glass

16 % wood

5 % metal

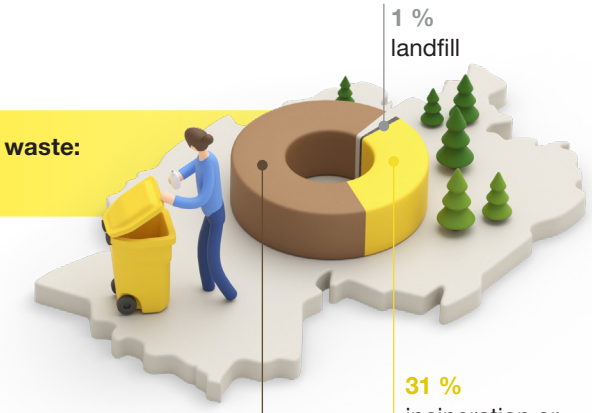
Proper disposal - a few tips:

- Separate all materials - even if they end up in the same rubbish bag.
- Do not stack different materials inside each other.
- Only what is disposed of correctly is recycled: comply with the specifications of the responsible waste disposal company.
- Bioplastics do not belong in organic waste.
- Dispose of packaging only when empty. But: rinsing is not necessary.
- Soiled, soggy, coated packaging boxes or papers do not belong in the waste paper.

Waste generation - a comparison*

Germany

Total household waste:
627 kg/person**



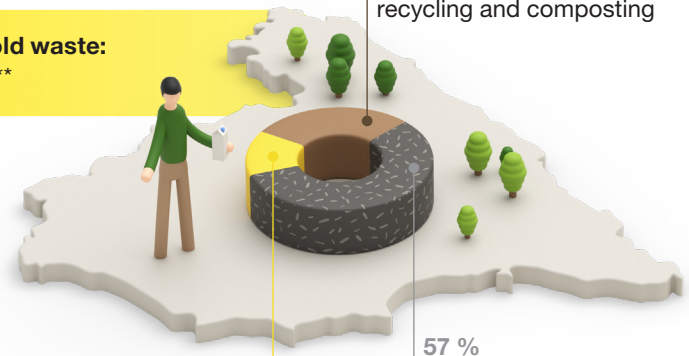
1 % landfill

31 % incineration or thermal recovery

66 % recycling and composting

Spain

Total household waste:
443 kg/person**



30 % recycling and composting

57 % landfill

14 % incineration or thermal recovery

Numbers/data:
Study by the Gesellschaft für Verpackungsmarktforschung on behalf of the Industrievereinigung Kunststoffverpackungen e.V. (2021); ISWA - The International Solid Waste Association (2010); European Parliamentary Research Service (EU-28 2016)

RETURN
& RECYCLING

The linear economy of producing, using and throwing away has caused great damage, especially in recent decades. The order of the day is therefore to establish closed cycles, to think holistically in terms of systems and to ask during the development phase what happens to the product or packaging after use.

Reusable and recycling systems are central building blocks for the necessary system change. The EU's "Green Deal 2020" states: "Single-use products will be phased out where possible and replaced with long-lasting reusable products." And: "Measures will be taken to avoid and reduce waste, to increase the proportion of recycled material [...]. An EU model for the separate collection and labelling of products is being launched."

Recycling avoids final waste and conserves resources because the materials already produced are retained. Of course, recycling does not work without the renewed use of energy, pollutants may be emitted again or auxiliary materials may be used. Also, in almost all recycling processes - from paper to glass to plastics - the addition of new **raw material** is still necessary. Nevertheless, recycling significantly reduces all environmental impacts. And especially with finite resources such as crude oil, it is important that the materials - once extracted - remain in the cycle. Optimising recyclability is therefore crucial. This also includes establishing and optimising recycling systems throughout the world. There are still considerable differences from country to country. The **Brückner Group** therefore supports, among others, the **ASASE Foundation**, which is setting up a recycling system in Accra, Ghana.

The challenge in recycling is the clean **separation** of materials, especially with different types of plastic. Different plastics have different **qualities**. This makes the (mixed) processing of the resulting recyclates more difficult than that of new material.

A lot is being done to improve the quality and processing possibilities of recycled materials: technological developments optimise recycling. Sorting machines are able to read material composition **codes** inserted into the packaging - the **HolyGrail 2.0** and **R-Cycle** projects, for example, are driving this development forward.
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Mono-material packaging is also on the rise. Some product cycles - such as that of PET bottles - are already largely closed because PET bottles are also easily recyclable. Deposit and reusable systems support single-variety collection.

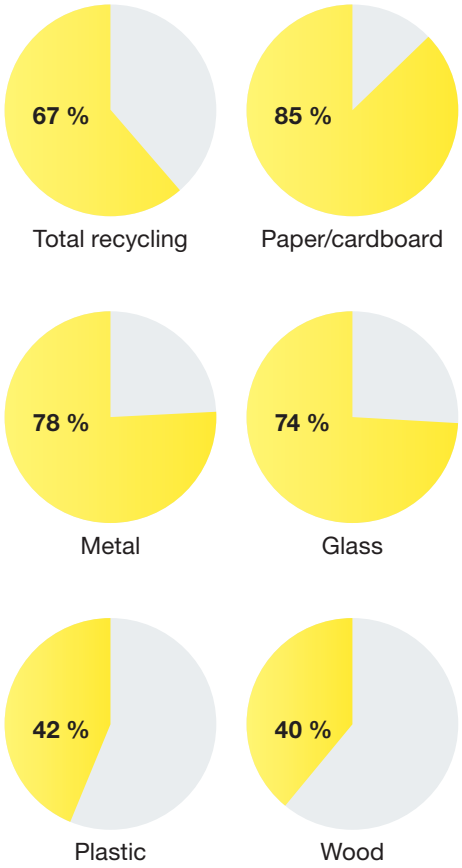
In **Switzerland** the current **recycling rate** for PET is over **80%**. A new directive is to additionally increase the quotas for the collection and recycling of plastic beverage bottles throughout the EU.

In addition to mechanical recycling, there is also **chemical recycling**. In this process, the plastics are reconverted - by means of solvolysis, thermolysis or pyrolysis - to oils or synthesis gases. However, high temperatures are needed for this. In **solvent-based recycling**, on the other hand, plastic waste is shredded and cleaned as in mechanical recycling, but the polymers are selectively separated in a solvent bath so that they can be processed into single-variety granulates.

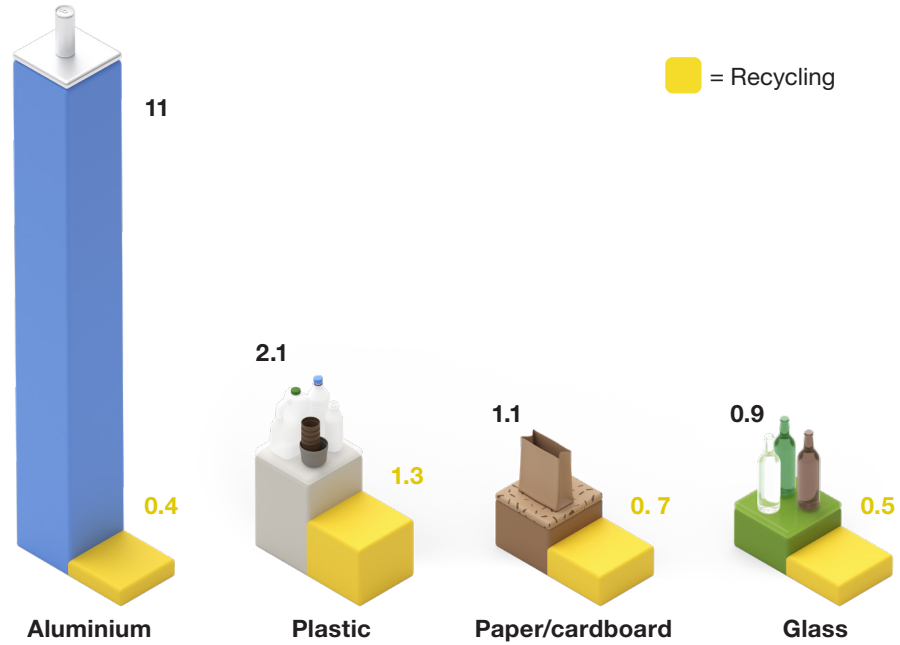
Details are also important in recycling. Even the printing ink or a label made of a different material than the packaging itself can affect recyclability. The companies of the **Brückner Group** are actively involved with the **PrintCYC** initiative, among others. The caps of disposable beverage bottles are also in focus: according to the EU directive, they are to remain tethered to the bottle by July 2024 so that they can be recycled in a targeted manner.

PackSys Global is already working on various technologies to implement these tethered caps. Recycling and reusable systems also start with materials, design and production.

Packaging recycling
in the EU



Fewer CO_2 emissions through recycling
(in CO_2 equivalents per kg)



Recyclability in comparison
Packaging for 500 g of noodles

Paper bag with window
(9.0 g weight)

Plastic film bag
(4.9 g weight)

Recycling-facts

Recycling pioneer PET
Recycling PET bottles saves 42 million litres of crude oil annually in Switzerland alone.

Savings of old paper packaging
(compared to virgin fibre board)
- around 20 % CO_2
- around 60 % energy
- around 60 % water

No black
Very often, the sorting machines cannot capture black plastic products - they are therefore hardly ever recycled.

EU directive for plastic beverage bottles:
- at least 77% collected and recycled by 2025
- at least 90% collected and recycled by 2029

Aluminium recycling
75% of the aluminium produced since 1888 is still in use.

Energy comparison of glass in recycling for every 10 % of old glass used
3 % less energy required
7 % fewer CO_2 emissions

Numbers/data:
WDR/Quarks according to Hillman et al. 2015; Vetropack; Gesamtverband der Aluminiumindustrie e.V.; Wirtschaftsverband Papierverarbeitung e.V.; European Parliamentary Research Service (Data EU-28 2016)

AFTERWORD

The search for the best and most sustainable packaging incorporates several aspects. The interrelationships are **complex** and the decisions depend on many factors as well as countries, markets, people and companies. Often one has to weigh up and decide which **priorities** to set. Is resource conservation more important, or rather the reduction of CO_2 emissions? Where is packaging dispensed with, and where does product protection take precedence? And what role do social aspects play in the supply chain? Many comparisons are not meaningful when done on 1:1 basis. Transport, for example, is not only about CO_2, but also about other pollutants and effects that burden the climate, the ozone layer, nature, animal habitats and the health of us humans. Some data, on the other hand, cannot be measured objectively. So one must not stop **questioning**.

There are many starting points for **improvements** and **changes**. A system change is urgently needed - and with it a rethinking in many areas. As long as everything is supposed to be available at all times and in abundance, and as long as it is about artificially creating a new demand just to be able to sell something, change is difficult. The challenge is that there are many different **responsibilities** and **decisions** throughout the chain. This also means that no one can change the systems alone: everyone has to be willing to do their part. Many instruments already exist. The necessary goals for climate protection, environmental protection and the preservation of ecological systems are clear. Now, we have to keep working to reach them. The findings must be followed by action.

PROJECTS
& INITIATIVES

Current details can be found on our companies‘ websites.

The research and development departments of the **Brückner Group** companies are actively working on sustainable system change in various initiatives and associations. Among other things, they are participating in the development and testing of new materials, including new or alternative plastics, natural fibres, etc. The collaborations are being created with business partners as well as various stakeholders in the value chain.

PrintCYC
The PrintCYC initiative deals with the recyclability of printed films. The members along the entire value chain - including the companies of the **Brückner Group** - have already gained important insights into recycling and further processing of the corresponding recyclates. The central goals are cost-effective solutions for a functioning circular economy, the extraction of high-quality recyclates (comparable to virgin material) for various packaging applications and a significant improvement in recycling. By changing the formulation of the printing inks (using a PU-based ink system), significant successes have already been achieved. The recyclates were used to produce bags, trays, yoghurt pots and tubes with excellent properties.

HolyGrail 2.0
This European project is about the traceability of packaging for optimised recycling. Well-known brand owners have launched HolyGrail to improve the sorting and thus the recyclability of plastic. Largely invisible (printed or imprinted) codes serve as digital watermarks for the scanners in the sorting facilities to identify the materials and optimise recycling opportunities. **Kiefel**‘s thermoforming machines are already capable of integrating the embossing of this code into the production process.

R-Cycle
R-Cycle is also active along the entire packaging value chain. The goal here is also the implementation of a practicable solution for an open and worldwide standard for the traceability of plastic packaging. Complete documentation of all recycling-relevant properties should make packaging identifiable in the recycling process. R-Cycle is based on globally valid identification numbers, field-tested marking technologies and the tracing technology familiar from packaged meat products. This is to ensure that the recyclate can be reprocessed into high-quality plastic products. **Brückner Maschinenbau** is actively involved in R-Cycle.

CEFLEX
The European consortium of associations and companies - including **Brückner Maschinenbau** - has set itself the goal of integrating flexible packaging more fixedly into the circular economy. By 2025, the infrastructure for the collection, sorting and reprocessing of flexible packaging for consumers should be established throughout Europe in order to reduce the need for new material, among other things. The aim is to optimise the entire system design in terms of ecological and economic sustainability by developing and implementing concrete solutions.

In our **technology centres**, we develop and test new materials and packaging types with various partners from material manufacturers to packaging producers.

Plastic Squeeze Tube Recycling Project
The objective of the project is to develop design guidelines for Europe (and subsequently North America) based on specific knowledge of the recycling stream of HDPE (High Density Polyethylene) and PP, specifically addressing the requirements of tubes as a packaging format. But the project, of which **PackSys Global** is a founding member, also looks beyond design to the recyclability of tubes and their role in the recycling stream. The aim is to actively promote tube recycling in theory and practice.

Tube Circle
The international consortium launched by **PackSys Global** brings together stakeholders along the tube value chain. The aim is to close the tube circuit. To achieve this, the first focus is on material reduction. Secondly, the development of monomaterial tubes (tube body incl. closure) is being driven forward for better recyclability. Currently, many tubes are still made of polyethylene (PE), while the closures are made of polypropylene (PP). For the best option, the advantages and disadvantages of PE-only or PP-only tubes must be reviewed and weighed. It is also about the use of bio-based materials.

Blue Competence
The initiative of the German Engineering Federation (VDMA) pools resources and expertise for technologies and processes to drive sustainability in the industry. Among other things, it seeks to achieve minimum energy consumption with maximum productivity, resource conservation, emission reduction and the improvement of social conditions. These criteria are formulated in twelve sustainability principles, to which the participating companies (including **Brückner Maschinenbau, Brückner Servtec** and **Kiefel**) are committed.

Further stimuli
The companies of the **Brückner Group** are also working in various cooperations and projects on further improvements in the direction of **circular economy**. This is not only about optimising what already exists, but also about opening up completely new paths. We are also researching the possibilities that arise from the use of paper. **Kiefel** has already launched a corresponding new machine series on the market with the NATUREFORMER series. **PackSys Global**, meanwhile, is researching the potential uses of paper in tube production (e.g. POP paper laminate tube, Pure Paper Tube)

What's more
With financial support, the companies of the **Brückner Group** are also actively involved with the following projects: The **ASASE Foundation** is working to build a recycling system in Accra, Ghana. ASASE uses its own recycling plants to promote the collection and reprocessing of plastic waste and at the same time creates valuable jobs in the region. The **Buy Food with Plastic** association organises events in Nicaragua, India and Ghana where locals can exchange ten plastic bottles for a hot meal. The plastic collected in this way is processed into new products.

BRÜCKNER GROUP

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