

Potential for the Substitution of Plastic Packaging by Packaging Solutions Made of Corrugated Board

Final Report

On behalf of:

RESY Organisation für Wertstoffentsorgung GmbH

Overview: Most Important Results

- > **21 percent** of the currently consumed plastic packaging in Germany, Austria and Switzerland could be substituted by packaging solutions made of corrugated board.
- > This would save **825,057 metric tons of plastic packaging per year.**
- > The substitution potential for **food packaging** is **14 %.**
- > **64 %** plastic packaging of all plastic packaging for **fruits and vegetables** could be substituted by corrugated board. This represents an **eighth of a substitutable plastic packaging.**
- > The substitution potential in the **e-commerce** sector amounts to **75 %.**
- > **The packaging solutions made of corrugated board required for the substitution are either already available on the market or could realistically be developed within the next 3 to 5 years.**

Background

- > The **discussion about plastic packaging waste** is in full swing.
- > Especially the topics **Single Use Plastic Directive** and **Marine Litter** permanently keep this issue in the headlines.
- > **Alternative packaging solutions based on renewable raw materials** are requested again and again by consumers, political decision-makers and last but not least by the packaging industry.
- > The **objective** of this study is to **determine** the potential for the substitution of **plastic packaging by packaging solutions made of corrugated board**.
- > To do this, GVM conducted a detailed **scenario analysis** for the countries of the **DACH-region** (Germany, Austria, Switzerland) and **evaluated the applicability to Europe**.

Basis Quantity of Plastic Packaging

- > The **subject matter** of the substitution scenario is **all plastic packaging**, regardless of the point where they arise - transport packaging and large-scale industrial packaging is explicitly included.
- > The **substitution potential for main and additional packaging** was analyzed in **18 product categories**.
- > The **reference year of the data is 2018**.
- > The **substitution scenario** is based on a **timeframe of 3-5 years**.

Packaging Consumption in the DACH region

> We determined the following packaging consumption for the countries of the DACH region (actual data 2018), in 1,000 metric tons (kt)

Region	Plastic	Corrugated board
Germany	3,249	5,663
Austria	308	562
Switzerland	299	250
DACH Total	3,856	6,475

Source: GVM

Total Substitution Potential

Total consumption of plastics before substitution actual data 2018 - DACH region	3,856 kt
Thereof: plastic packaging not substitutable by corrugated board	3,031 kt
Thereof: plastic packaging substitutable by corrugated board	825 kt

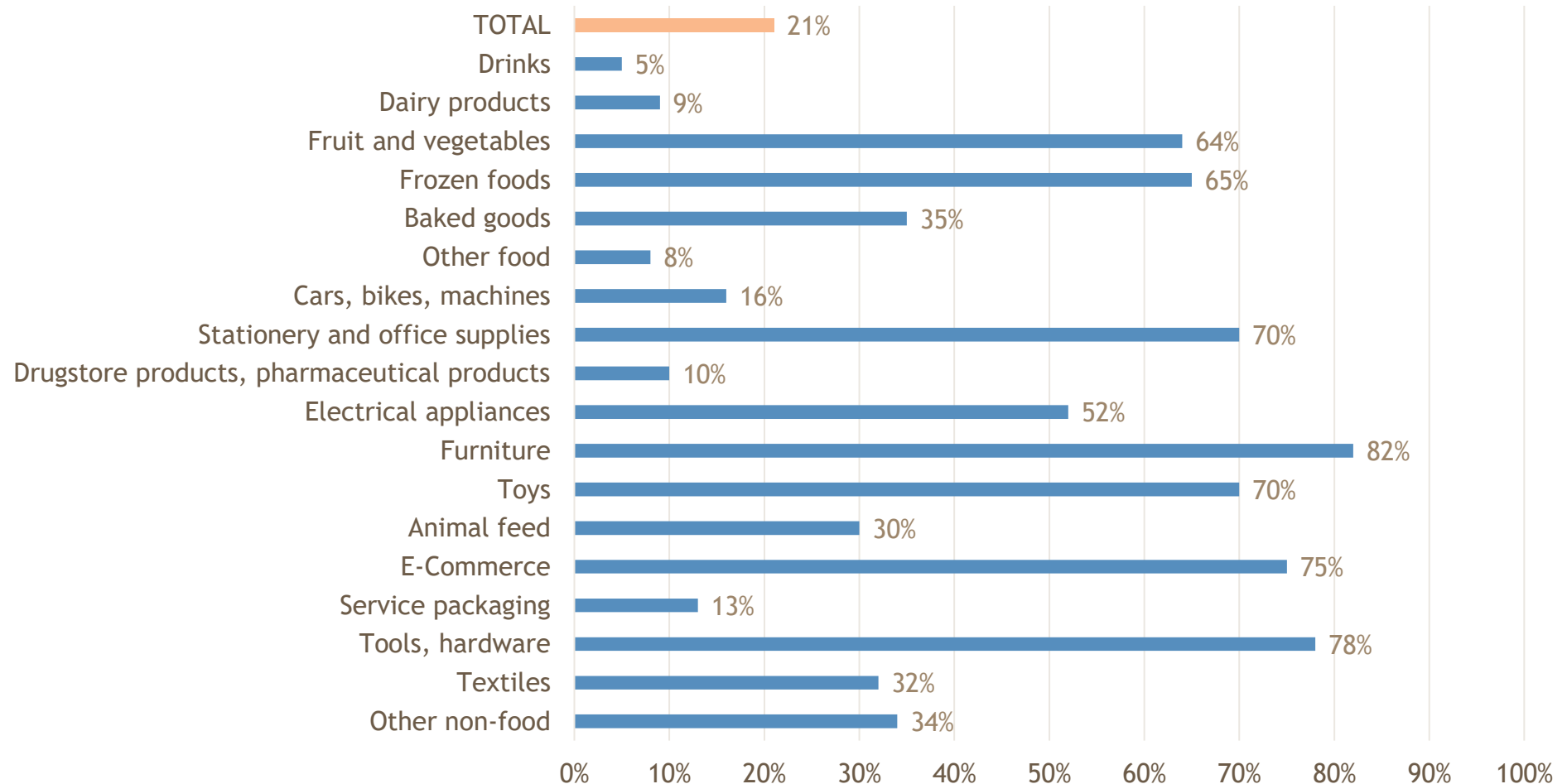
- > **Overall** share of plastic packaging, that can be substituted by packaging solutions made of corrugated board: **21 % - that is 825 kt**
- > Substitution potential for **food packaging: 14 %**.
- > Substitution potential for **non-food packaging: 31 %**.

Total Substitution Potential

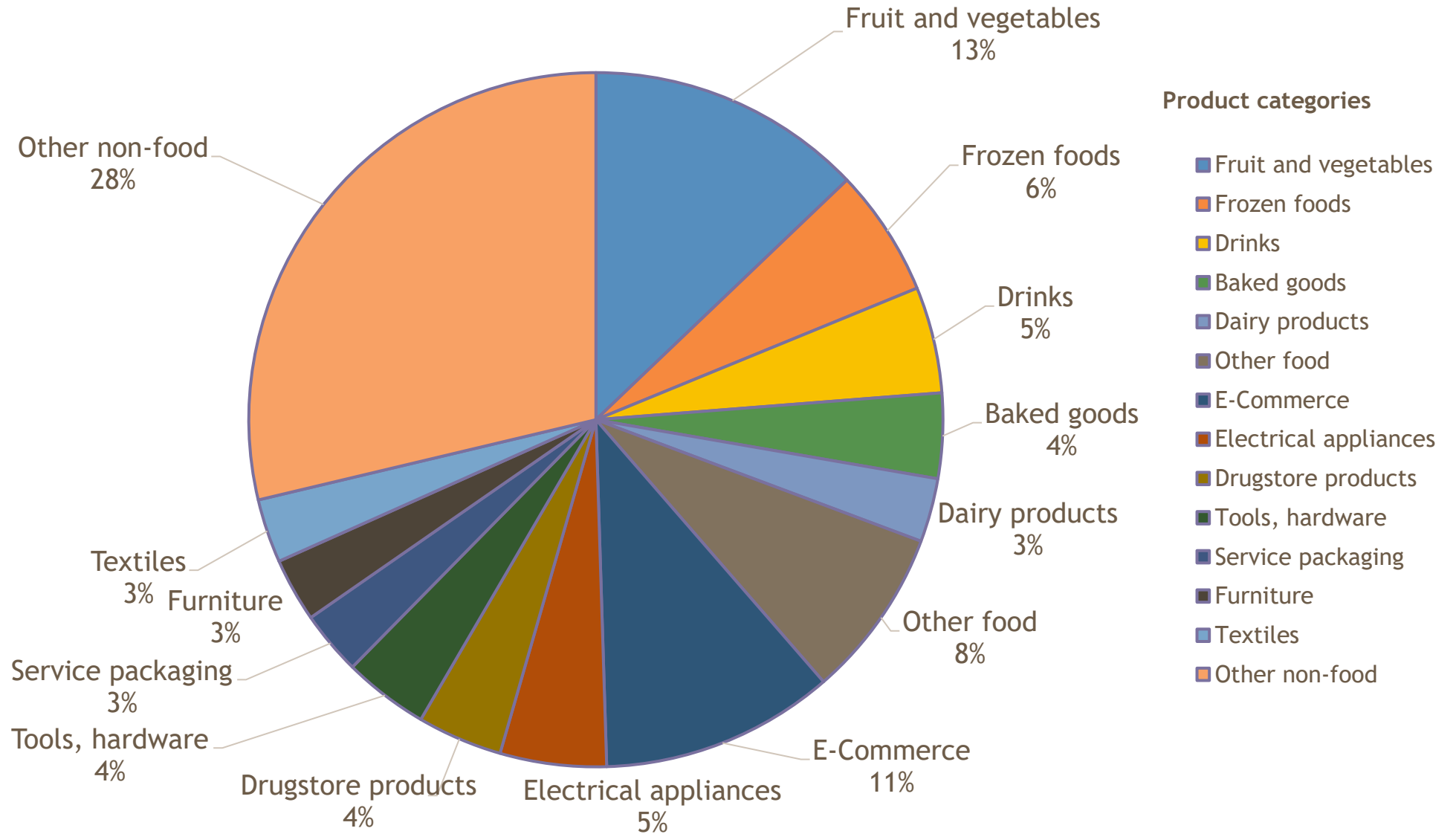
Plastic packaging not substitutable by corrugated board	3.031,3 kt
Additionally needed plastic packaging for corrugated board as substitution packaging	46,2 kt
Total consumption of plastic packaging after substitution - scenario	3.077,5 kt

- > **Partial substitutions** are an important aspect. For **liquid, pasty or fatty filling** goods plastic inliners or internal bags are required in addition to an outer cardboard shell. A typical application are **bag-in-box** packagings.

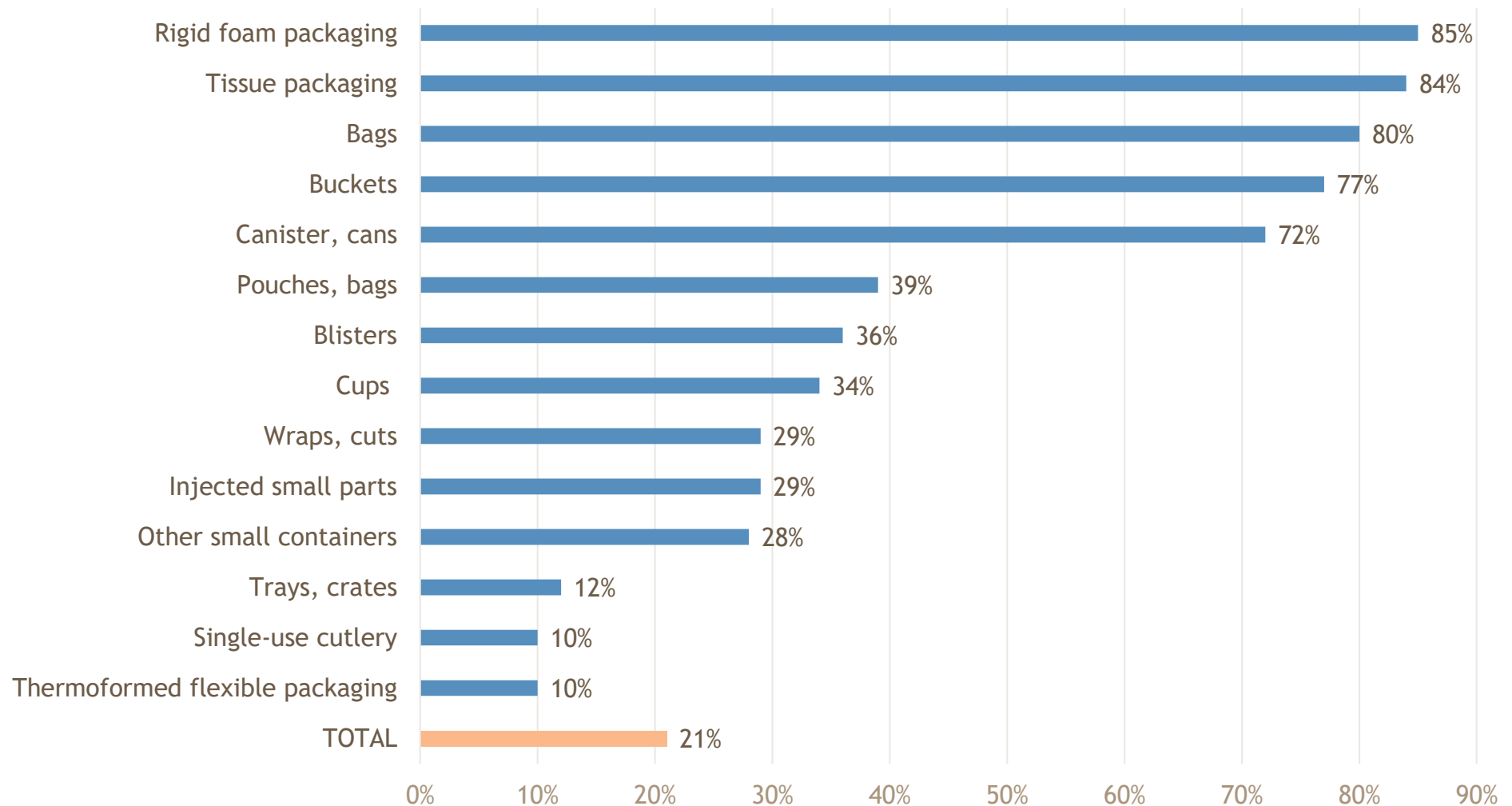
Share of Substitutable Plastic of total Plastic Consumption by Product Categories



Share of Product Categories of Substitutable Plastic



Selected Plastic Packaging Substitutable by Corrugated Board



Listing of not Substitutable Plastic Packaging

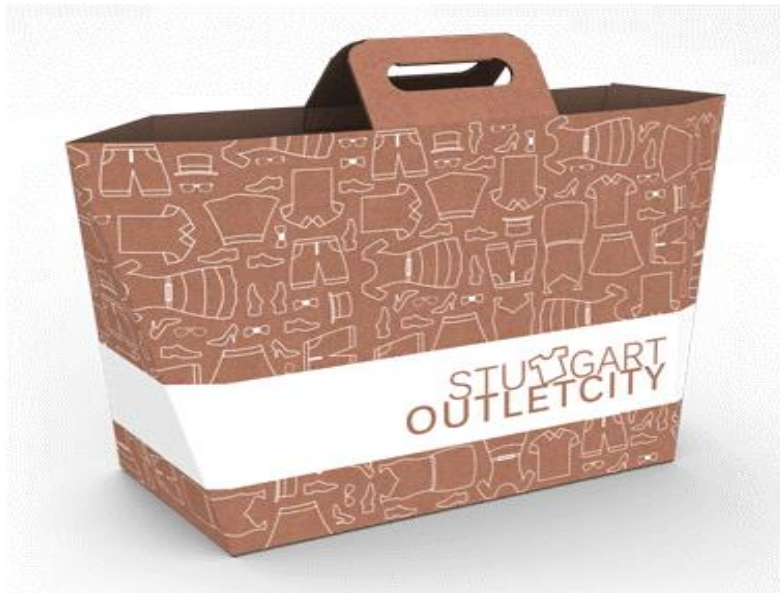
Selected Plastic Packaging not Substitutable by Corrugated Board
Strapping
Tubes
Adhesive tapes
Labels
Injection-moulded closures
Disposable cutlery and accessories
Bottles
Pallets

Exemplary Service Packaging

> Substitutable plastic packaging:

- Containers, small parts
- Pouches, carrier bags, wrappings, other blank cuts
- Foamed packaging

> Corrugated board packaging solution: Bags and boxes for shopping



<https://www.klinge.com/wellpappe/produkte/wellbag-wellbag2go>



<https://www.seyfert.de/reichenbach/produkte/innovationen/fashion-shopper.html>

Exemplary Packaging for Drinks

> Substitutable plastic packaging:

- Buckets
- Canisters, jerrycans
- Barrels

> Corrugated board packaging solution: box for Bag-in-Box systems (BIB) for liquid or semi-liquid food and industrial products

Outer box incl. hollow chamber panels



Source: <http://www.novakarton.com/NOVAcarton/NOVAcarton.html>

BIB for drinks



<https://www.smurfitkappa.com/de/products-and-services/bag-in-box/bag-in-box-bib>

Exemplary Packaging for Drinks

> Substitutable plastic packaging:

- Wrapping
- Bundeling film

> Corrugated board packaging solution: collective package for bottles and cans

Multipacks



<https://www.smurfitkappa.com/de/products-and-services/packaging/multipack-carriers>

Bottle carrier



<https://www.smurfitkappa.com/de/products-and-services/packaging/bottle-carriers>

Exemplary Packaging for Fruits and Vegetables

> Substitutable plastic packaging:

- Small containers
- Crates, boxes
- Wrappings, bundeling film
- Woven packaging

> Corrugated board packaging solution: sales and transport packaging

Fruit bowl



<https://www.klinge.com/wellpappe/produkte/showroom/verpackungen-fuer-obst-und-gemuese/obstschale-aus-wellpappe-schneiders-obsthoef>

Boxes with handle



<https://www.schiettinger.de/food-safe-box/>

Crates, Trays



<https://eikemeier-packaging.de/portfolio/steigen/>

Exemplary Packaging for Frozen Food

> **Substitutable plastic packaging:**

- Small containers
- Pouches
- Wrappings, other blank cuts
- Foamed packaging

> **Corrugated board packaging solution: transport packaging / shipping packaging**



Box of modular corrugated board inlays,
water-repellent polyethylene coating
prevents moisture penetration

<https://www.thimm.de/produkte-dienstleistungen/produkte/produkt-detail/afterhaltige-temperaturgefuehrte-verpackung-fuer-den-onlineversand-647/>

Exemplary Packaging for Baked Goods

> Substitutable plastic packaging:

- Small containers
- Pouches
- Wrappings, other blank cuts

> Corrugated board packaging solution: trays

Trays for chilled and not chilled goods



Painted corrugated board is to a certain extent heat-resistant and impervious to grease and oil

<https://www.thimm.de/produkte-dienstleistungen/produkte/produkt-detail/hitzebestaendige-lebensmittelverpackung-zum-stapeln-932/>

Exemplary Packaging for Other Foods

- > **Substitutable plastic packaging:**
 - Small containers
- > **Corrugated board packaging solution: trays**

Trays for chilled fresh goods (e.g. fresh meat or ready meals)



MAP (Modified Atmosphere Packaging)
gastight, heat-resistant (oven and microwave)
lined with plastic wrap

In this example, the packaging consists of single-layer cardboard, the inside is lined with a gas-tight plastic foil.

This packaging could also be made from corrugated board with an internal plastic film.

Source: Schumacher Packaging

Exemplary Packaging for E-Commerce

> Substitutable plastic packaging:

- Pouches, bags, wrappings, other blank cuts
- Foamed packaging

> Corrugated board packaging solution: shipping packaging

Packaging for products with different requirement profiles

Books, magazines etc.



Shipping packaging with variable filling sizes



<https://www.drei-v.de/de/start.html>

Exemplary Packaging for Electronical Devices

> Substitutable plastic packaging:

- Pouches, bags, wrappings, other blank cuts
- Foamed packaging
- Other small parts

> Corrugated board packaging solution: membrane packaging for sensitive filling goods



Two-piece construction with special foil for fixing



Monomaterial version without foil

<https://www.drei-v.de/de/start.html>

Exemplary Packaging for Cars, Bikes, Machines

> Substitutable plastic packaging:

- Pouches, bags, wrappings, other blank cuts
- Foamed packaging
- Other small parts

> Corrugated board packaging solution: transport packaging for sensitive filling goods



Transport packaging for electric scooters,
also feasible for other vehicle devices

<https://www.thimm.de/produkte-dienstleistungen/produkte/produkt-detail/elektroroller-verpackung-fuer-scrooser-637/>

Exemplary Packaging for Drugstore Products

> Substitutable plastic packaging:

- Buckets, canisters, barrels
- Small containers, small parts
- Pouches, wrappings, other blank cuts

> Corrugated board packaging solution: Bag-in-Box for chemicals, e. g. detergent



<https://www.smurfitkappa.com/de/sectors/chemicals/bag-in-box-bib>



<https://tide.com/en-us/shop/type/liquid/tide-original-eco-box>

Exemplary Packaging for Liquids

- > **Substitutable plastic packaging:**
 - Buckets, canisters, barrels
- > **Corrugated board packaging solution: industry packaging**

Moisture-resistant corrugated board boxes

Product categories:

- Drinking milk
- Water
- Fats



<https://www.kunertwellpappe.de/>

- > The **calculation** of the substitution scenario is **based** on an analysis of **GVM's database „Market Volume Packaging“** that represents the large majority of the German packaging consumption.
- > The database includes detailed packaging data for 1,350 filling good segments. Nearly all of them are relevant for plastic packaging.
- > For the calculation those 1,350 filling good segments were categorized into **18 product categories**. Suitable substitution packaging can only be assigned if the demands of the product for specific packaging functions are taken into account.
- > To determine suitable **substitution packaging** we **distinguished** between different **packaging forms and filling sizes**.

Method for Calculating the Substitution Scenario in Germany

- > **Similar packaging was grouped together**. For example, canisters for liquid foods can be substituted by bag-in-box packaging.






- > For the analysis, substitution cases for hundreds of different data sets were determined and individually considered.

- > For every individual substitution case
 - the **packaging system had to be defined** (e.g. folding box plus interior fittings)
 - the **weight of the substitution packaging** had to be determined
 - the substitution packaging had to be **documented** in a way that made it suitable for data processing.

- > To assess the **technical constraints** for the substitution, GVM conducted **interviews** with experts from the packaging industry.

Method for the Extrapolation to the DACH region

- > The consumption of plastic packaging **in Austria and Switzerland** was researched via different **statistics** by **Eurostat** (e.g. packaging waste by waste management operations and waste flow) for the year 2018.
- > **The consumption of corrugated board packaging** was extrapolated to 2018 by using Data of the European association **FEFCO** for the year 2017 (FEFCO Annual Statistics 2017).

Influencing factor	Applicability to Europe	
Technical limitations	Identical between DACH and Europe overall, unconditionally applicable	
Types of plastic packaging that can be substituted	Identical between DACH and Europe overall, unconditionally applicable	
Suitable substitution packaging	Identical between DACH and Europe overall, unconditionally applicable	
Substitution coefficients	Highly applicable, only small differences within product groups	
Market structure	Differs significantly between DACH and Europe overall	

Conclusion for the applicability of the results to Europe:

- > Only differences in the market structure affect the applicability of the results from DACH to Europe overall in a significant way.
- > We estimate that the result of 21 % substitutable plastic packaging in DACH could deviate as much as 4 % in either direction when applied to Europe.

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