SCREENFOOD

PPWR & Food Safety: Navigating Compliance and Analysis

Part 1: The Road to 2026: General Requirements and a PFAS Deep Dive

The ScreenFood project

The overall aim of ScreenFood is to develop reference methods and reference materials for providing food and food packaging industries with metrological tools for being compliant to legislation, ensuring safety of products and preventing economic losses

ScreenFood project:

- Reference methods and reference materials
- Standardization of Metrological Practices

Knowledge Dissemination

- Support in the transition to a Circular Economy
- Ensure safe food packaging while following new regulations like the PPWR

PPWR

The consortium

Internal funded partners

External funded partners

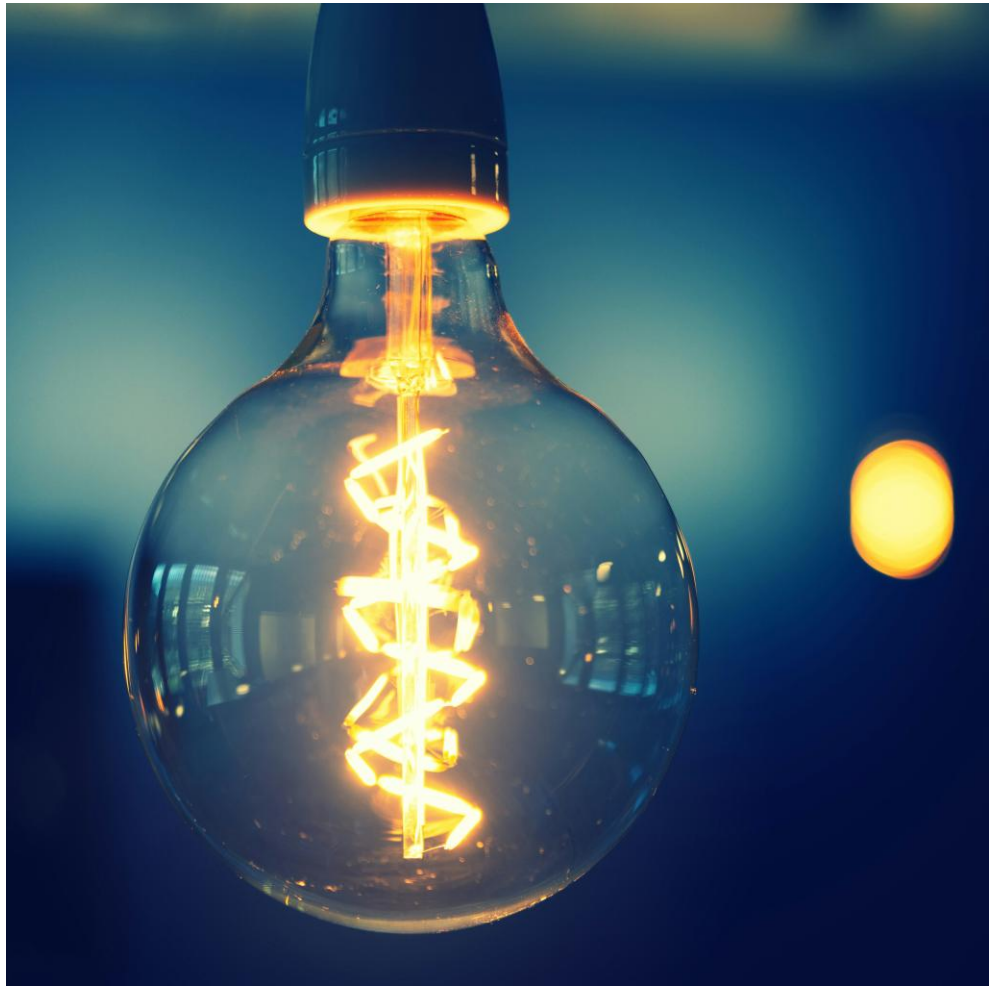
Associated partners

Unfunded partners

PPWR and Food Safety – Webinar Series

Navigating Compliance and Analysis in four Webinars:

- **May 11th, 2026:** The Road to 2026: general requirements and a PFAS deep dive
- **Q3 2026:** General update and deep dive on biobased and compostable packaging materials
- **Q1 2027:** Requirements on recycled content use and its alignment with food safety
- **Q2 2027:** Circular by design: Deep dive into recyclability requirements



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Your experts today

Madleina Sandberg

realcycle

Dr. Christopher McElroy

LGC Group

Dr. Melanie Haupt

realcycle

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Agenda

5 min	**Context: ScreenFood Project**	Dr. Melanie Haupt (realcycle GmbH)
40 min	**Introduction into PPWR**	Dr. Melanie Haupt & Madleina Sandberg (realcycle GmbH)
15 min	**PPWR Article 5: Requirements for substances**	Madleina Sandberg (realcycle GmbH)
30 min	**Deep Dive PFAS**	Dr. Christopher McElroy (LGC Group)
30 min	**Q&A**	all

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Where the PPWR comes from

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Background of PPWR

Background (1994–2020)

- **Directive 94/62/EC (PPWD)** governed packaging for ~30 years
- As a *Directive*, it required national transposition → fragmented rules
- Focused mainly on **waste management & recycling**, less on **product design**

Political shift

- **European Green Deal (2019)** + **Circular Economy Action Plan (2020)**
- Clear mandate to move **up the waste hierarchy**: prevention → reuse → recycling

Why a Regulation (not a Directive)

- Uniform EU market rules (no national divergence)
- Packaging treated as a regulated product with market-access conditions

→ **PPWR marks the shift from waste control to product and market regulation for packaging.**

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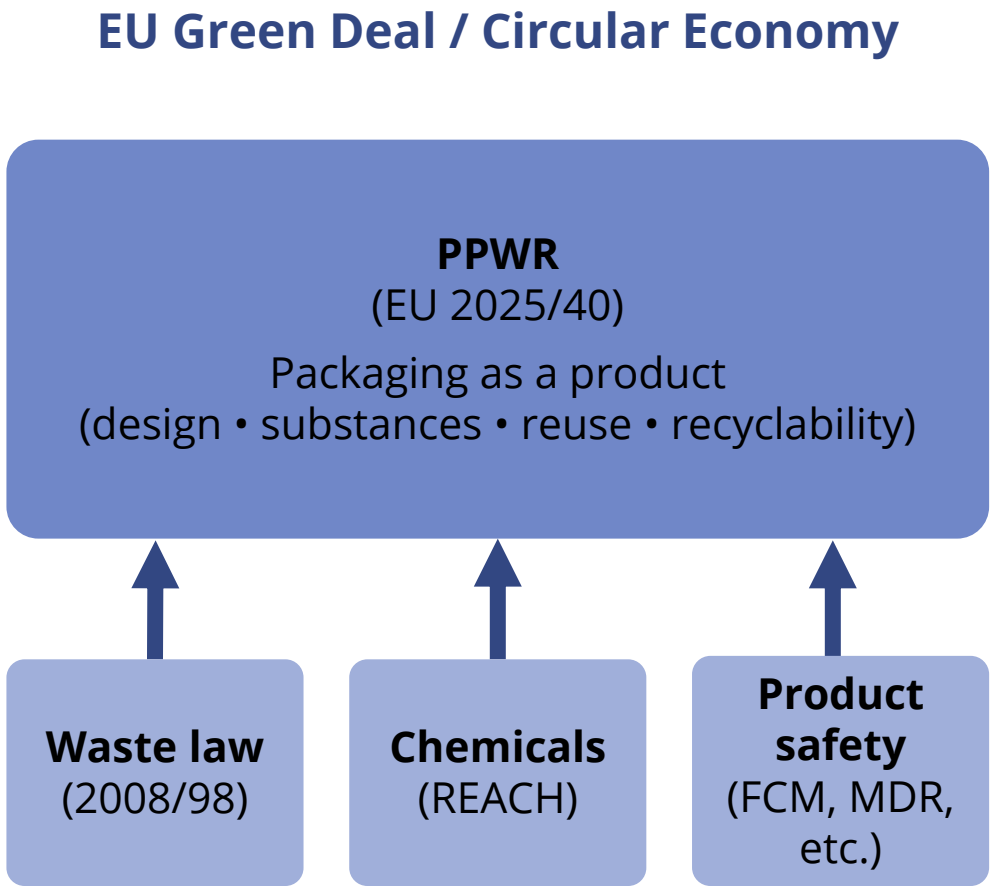
What the PPWR replaces and what stays in force

What the PPWR replaces

- Directive 94/62/EC (Packaging & Packaging Waste Directive)
- Repealed after the PPWR transition period

What continues to apply in parallel

- Waste Framework Directive 2008/98/EC (waste hierarchy)
- Single-Use Plastics Directive (EU) 2019/904 (selected bans & EPR)
- REACH & chemicals legislation
- Food contact law (EC) 1935/2004
- Product-specific regimes (e.g. medical devices, medicines)



Introduction to PPWR

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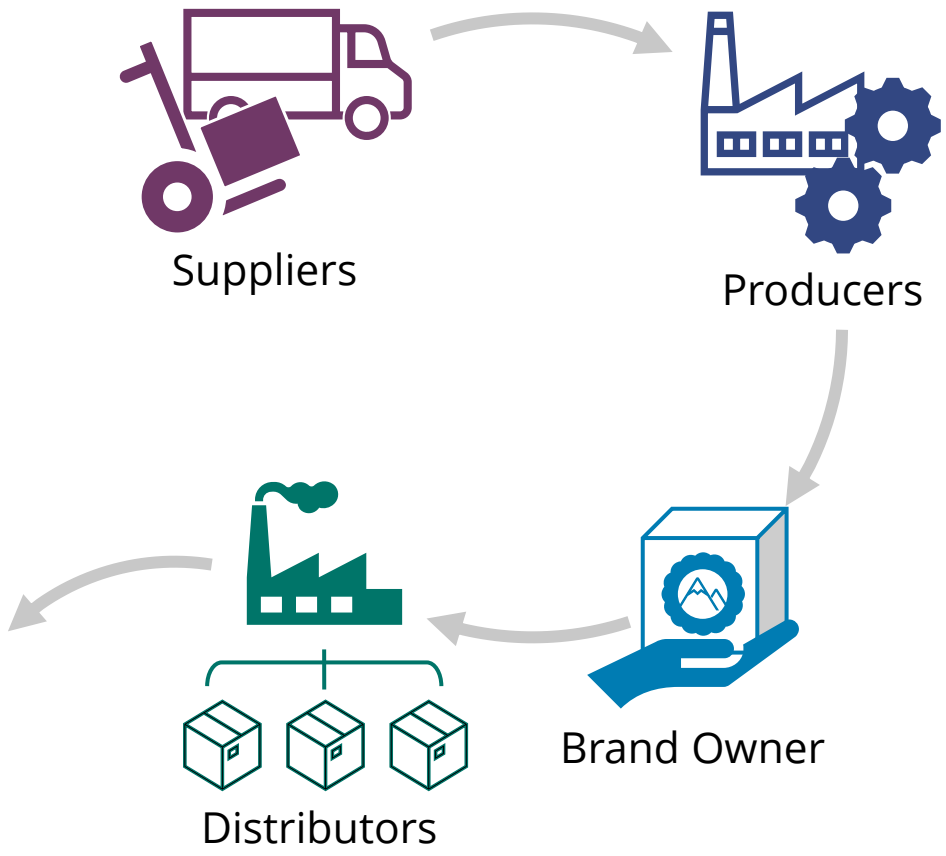
PPWR – in a Nutshell

PPWR is not “another packaging update” — it is the structural backbone of EU packaging policy for the next decades.

Contents:

- General standards for packaging regarding circular economy criteria
- Requirements for Member States, e.g., recycling rates
- Minimization of packaging waste

Broad scope means many companies are affected, whether they are established in the Union or in a third country!



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Scope of Application (Art. 2, para. 1; Art. 3, Annex 1)

The PPWR applies to **all packaging**, regardless of material, throughout the entire value chain.

Special case: Contact materials for veterinary and human medicine and hazardous goods.

Created with ChatGPT

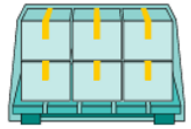
The same basic requirements apply to the **numerous packaging categories.**

Sales packaging

Service packaging

Outer packaging

Transport packaging



Packaging for e-commerce

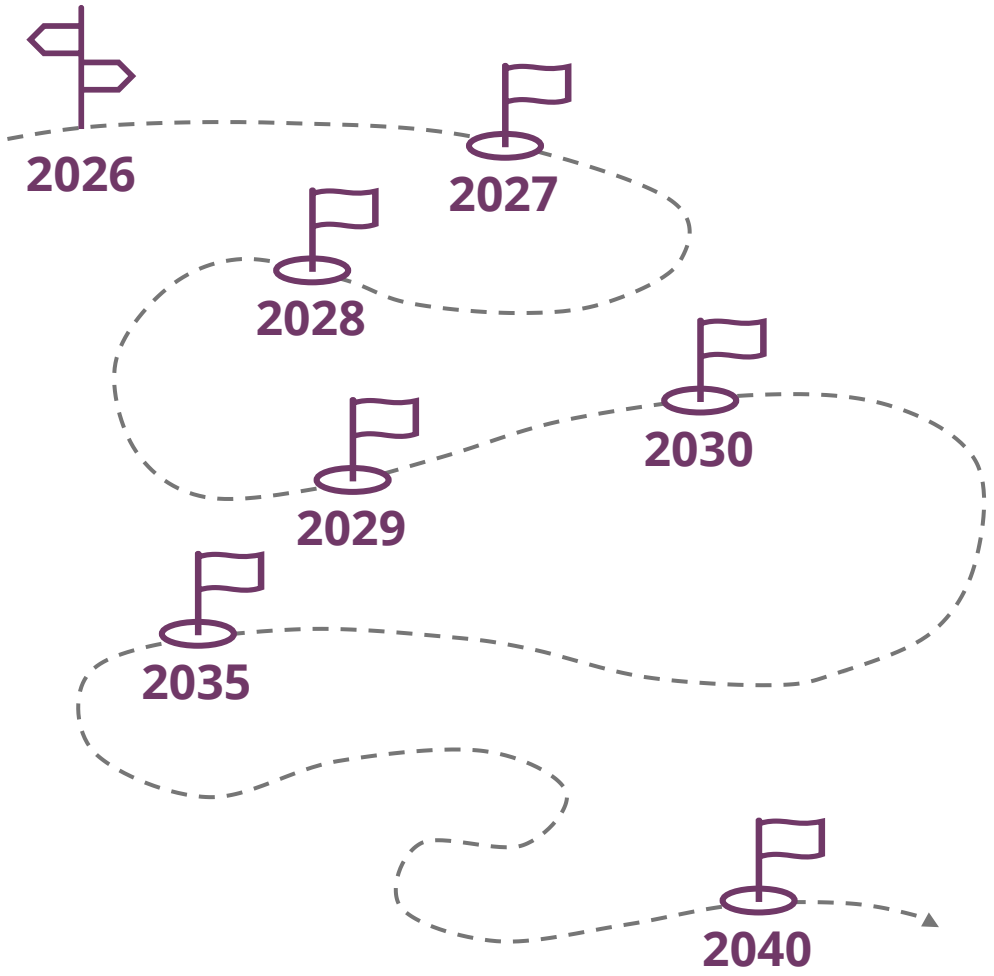
Images adapted from *the Central Packaging Register Foundation*

Timeline

- **February 12, 2025** – PPWR entered into force
- **August 12, 2026** – Only compliant packaging permitted

And it continues from there:

- Publication of accompanying regulations for standardized requirements
- Tightening of compliance rules
- More ambitious targets for member states



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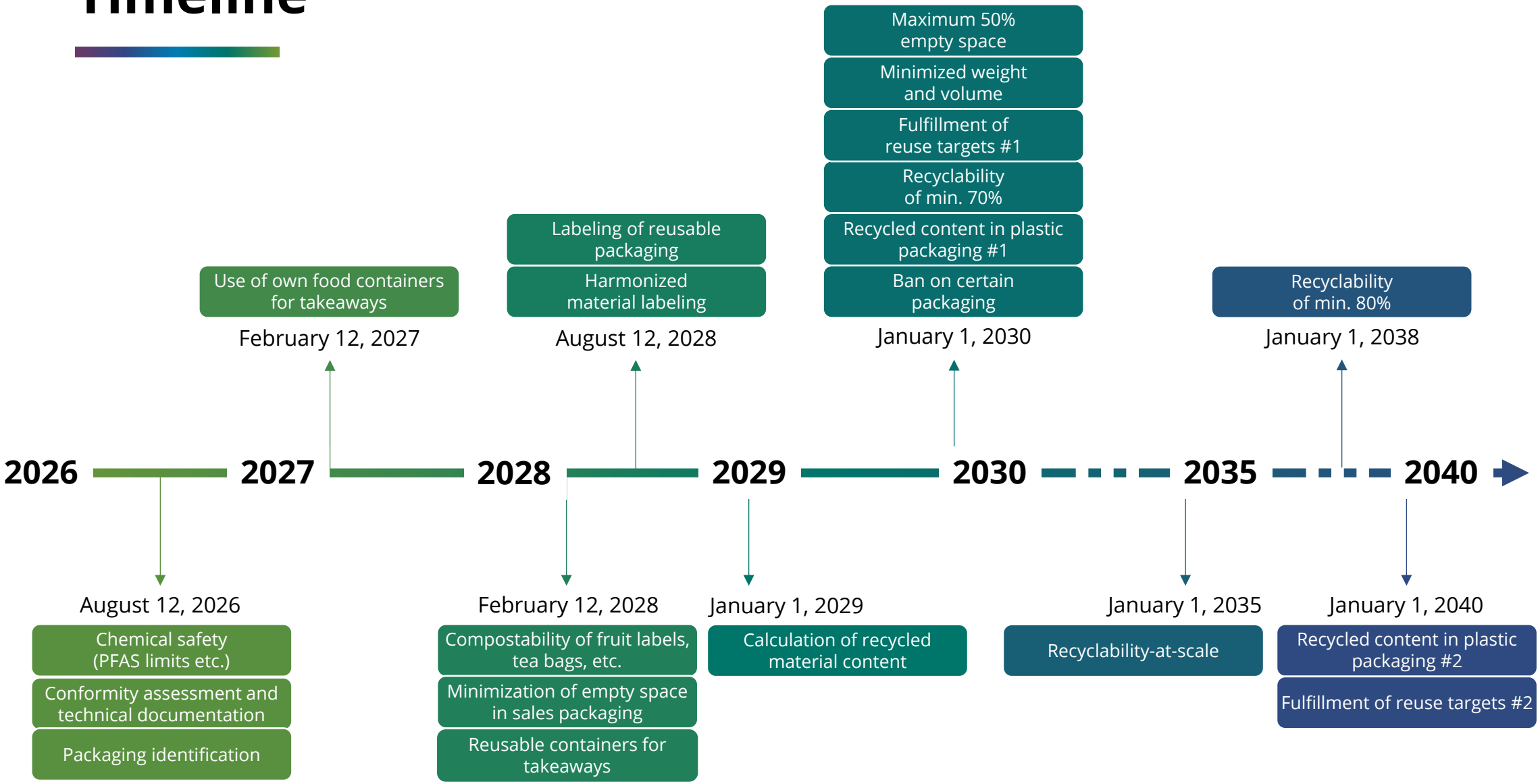
Timeline



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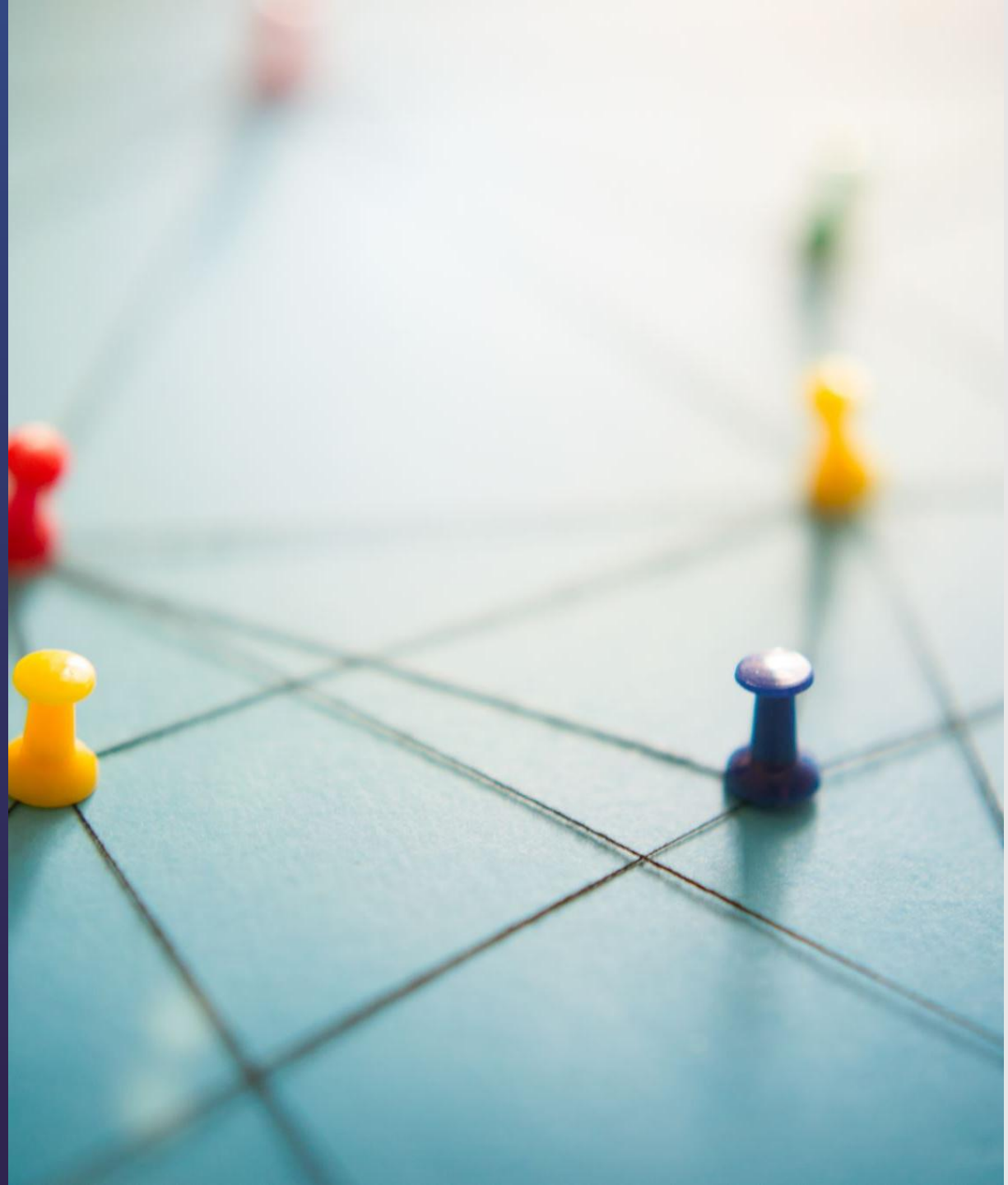
Economic operators under the PPWR

The most important at a glance



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Obligations – brief overview

Packaging compliance

- Packaging meets the requirements for various sustainability and information aspects

Extended producer responsibility

- Responsibility for the entire life cycle
- In particular, waste management and packaging quantities

Each supply chain involving packaging needs one responsible company.

Manufacturer		Producer
Company 1	Case A	Company 2
Company 3	Case B	Company 3

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Economic operators for conformity

Manufacturer (Art. 3, para. 1, no. 13; Art. 15)

- Normally: the **Brand Owner**
- Place products or packaging on the EU market under own name or trademark
- Based in EU or third country

→ **Responsible for packaging conformity**

→ Reporting obligation in case of non-conformity

"Secondary roles"

Supplier: supplies packaging or packaging material (Art. 3, para. 1, no. 16; Art. 16)

→ Ensure conformity of own material

→ Provide data and documentation to the manufacturer

Importer: established within EU, places packaging from third countries on the EU market (Art. 3, para. 1, no. 17; Art. 18)

→ Obligation to verify

→ Reporting obligation in case of non-conformity

Distributor: makes packaging available on the market but is not a manufacturer or importer (Art. 3, para. 1, no. 18; Art. 19)

→ Due diligence obligation

→ Reporting obligation in case of non-conformity

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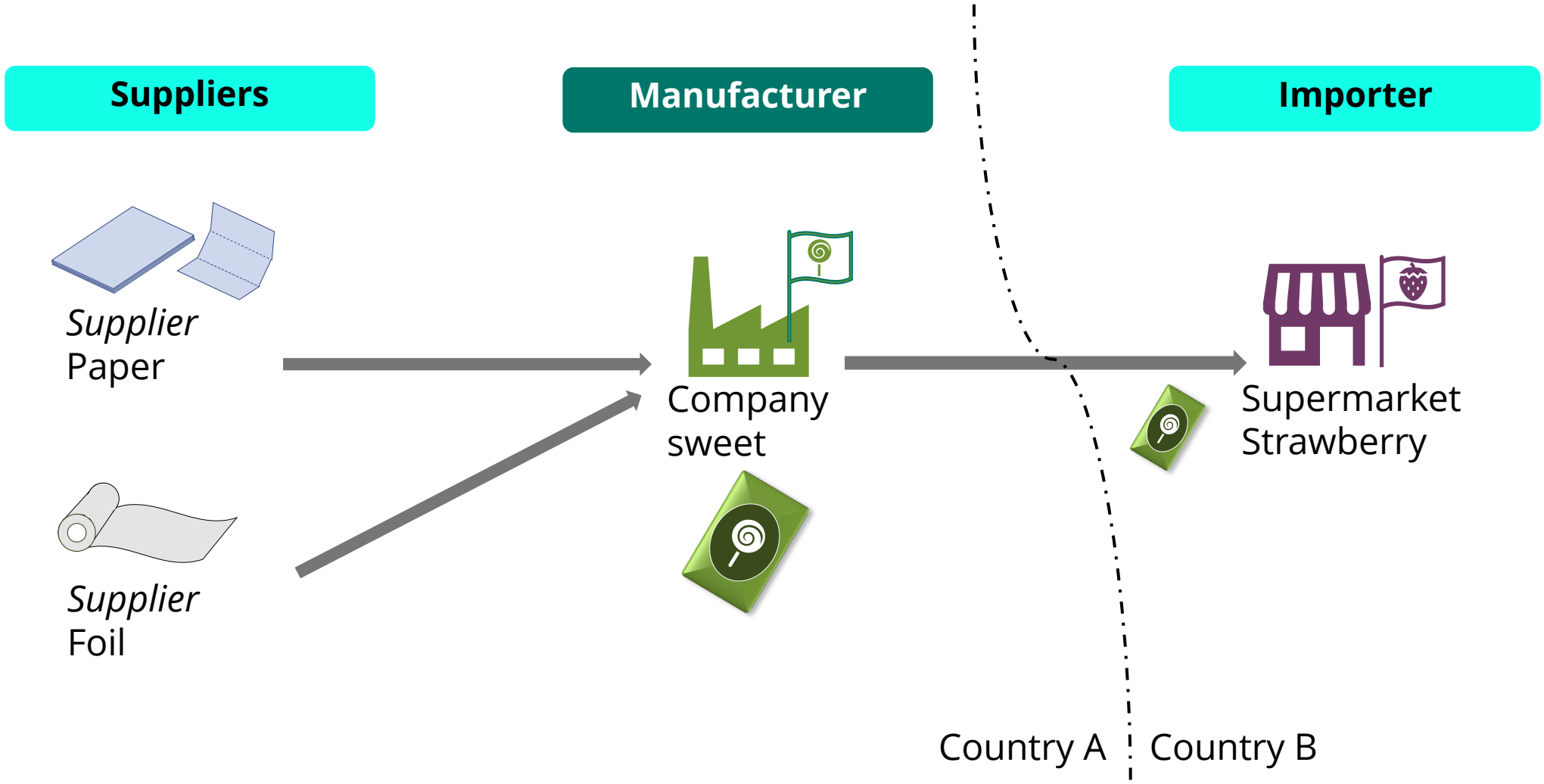
Economic operators for compliance



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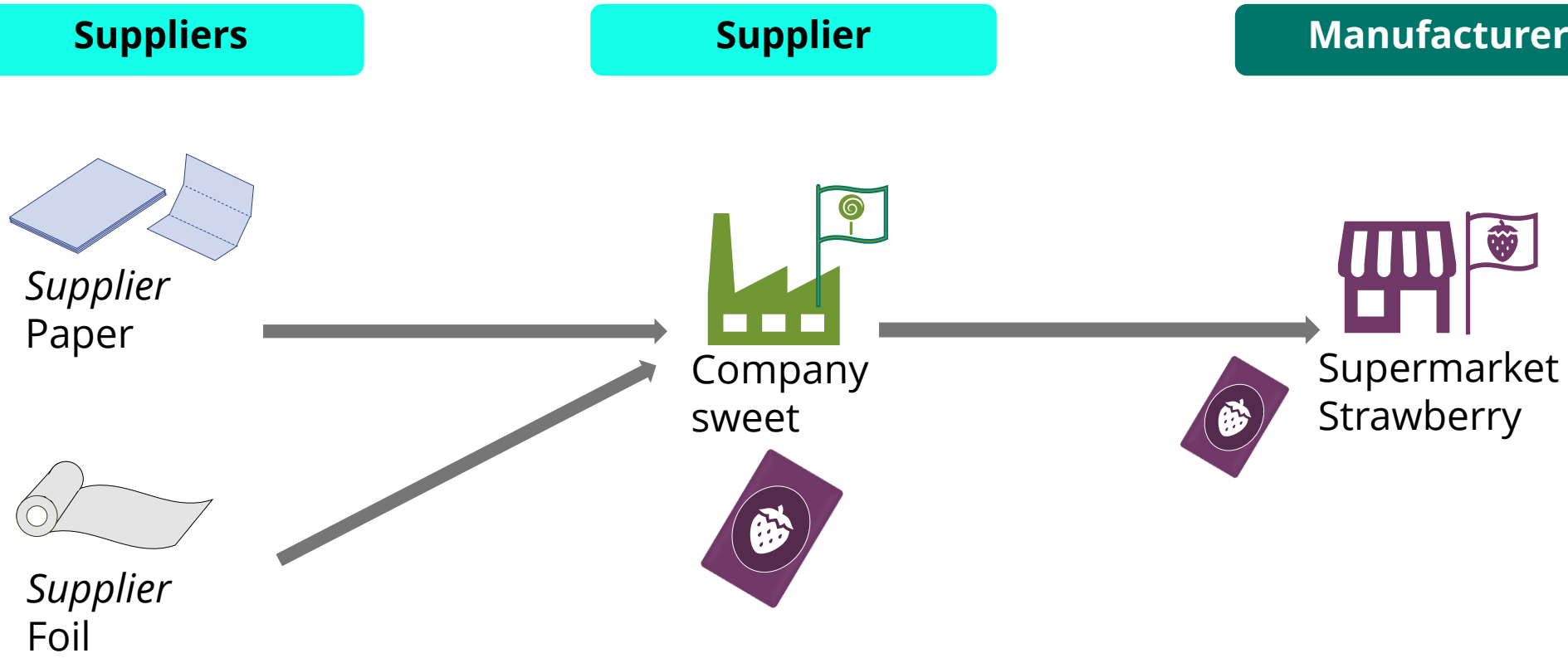
Economic operators for compliance



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Obligations – brief overview

Packaging conformity

- Packaging meets the requirements for various sustainability and information aspects

Extended producer responsibility

- Responsibility for the entire life cycle
- Especially waste management and quantities

Each supply chain involving packaging needs one responsible company.

Manufacturer		Producer
Company 1	Case A	Company 2
Company 3	Case B	Company 3

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Economic operator for EPR

Producer (Art. 3(1)(15); various articles)

- **Manufacturer, importer or distributor**
- Principle: domestic precedence
  = starts the supply chain on the market in the Union

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Extended Producer Responsibility (EPR)

The producer is responsible for the entire life cycle, particularly end-of-life. **This means that the producer must cover the costs of collection, sorting, and recycling.**

Organisation:

- Registration requirement in each affected Member State
- Ensuring producer responsibility through own efforts or by entrusting a responsible organisation
- Mandatory reporting of packaging quantities
- Payment of EPR fees – should include eco-modulation long-term
- Possible appointment of an authorized representative

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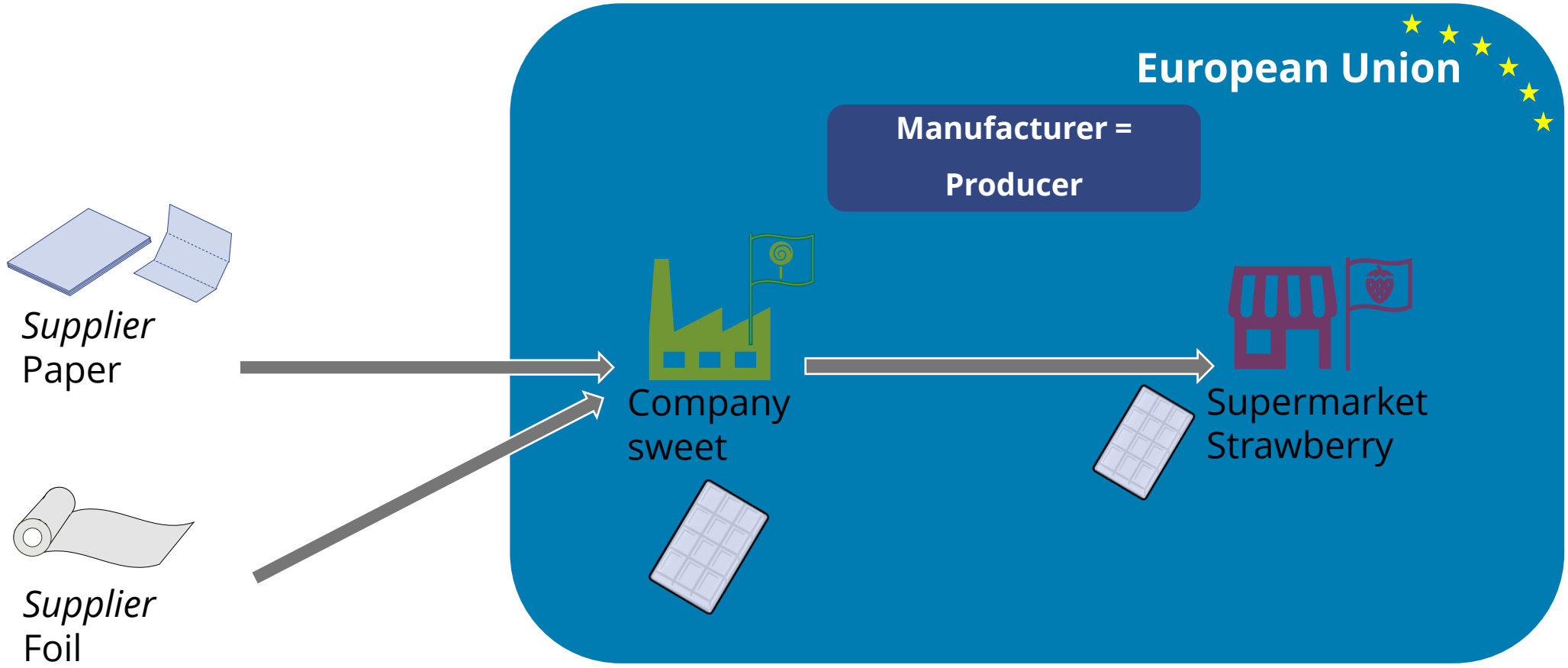
Economic operators for EPR



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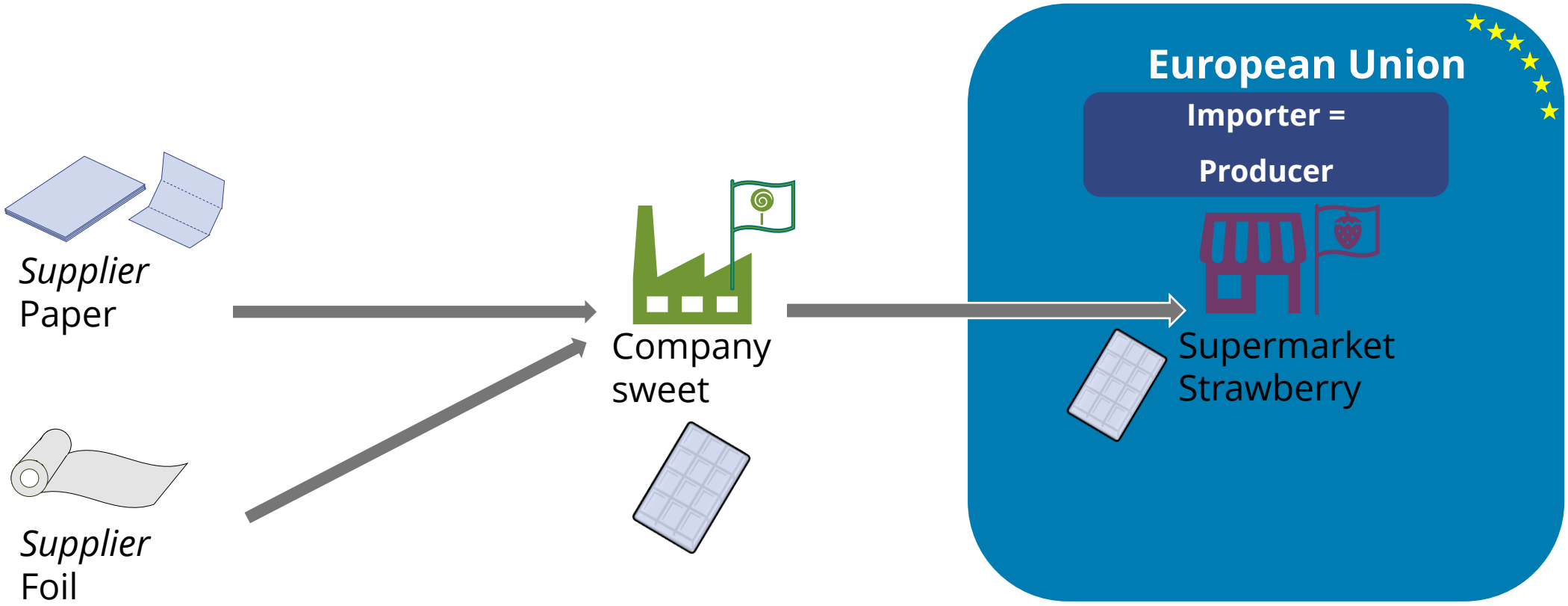
Economic operators for EPR



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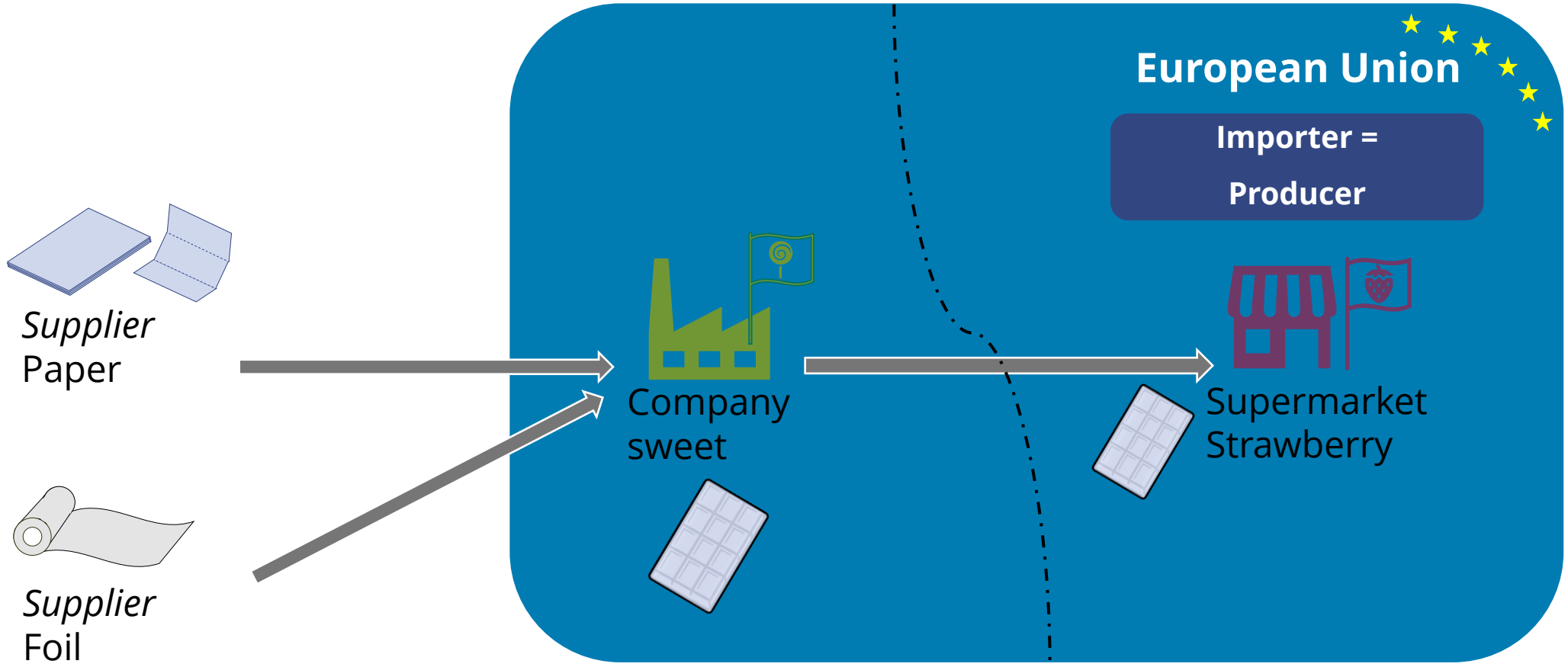
Economic operators for EPR



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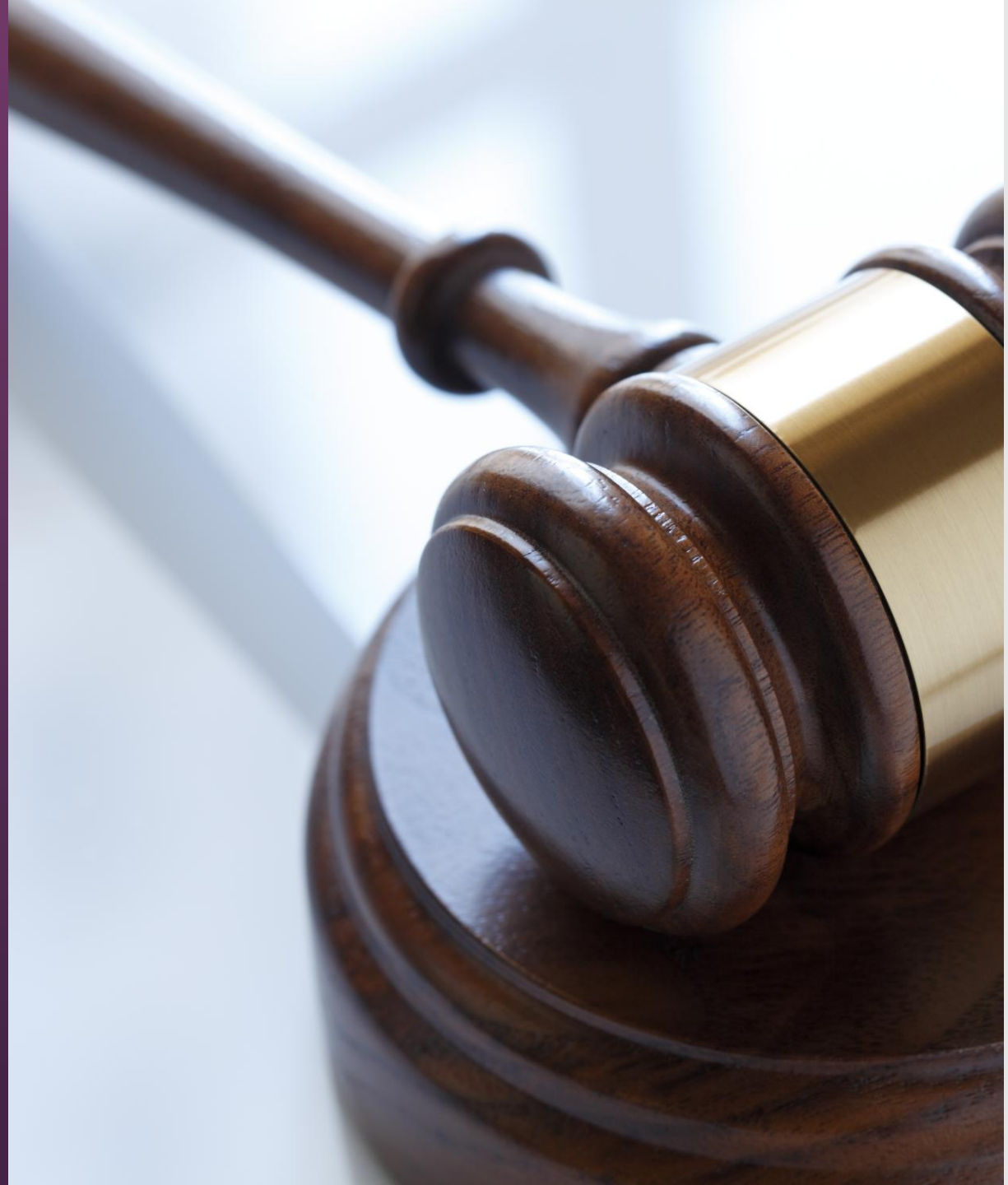
Conformity obligations in detail



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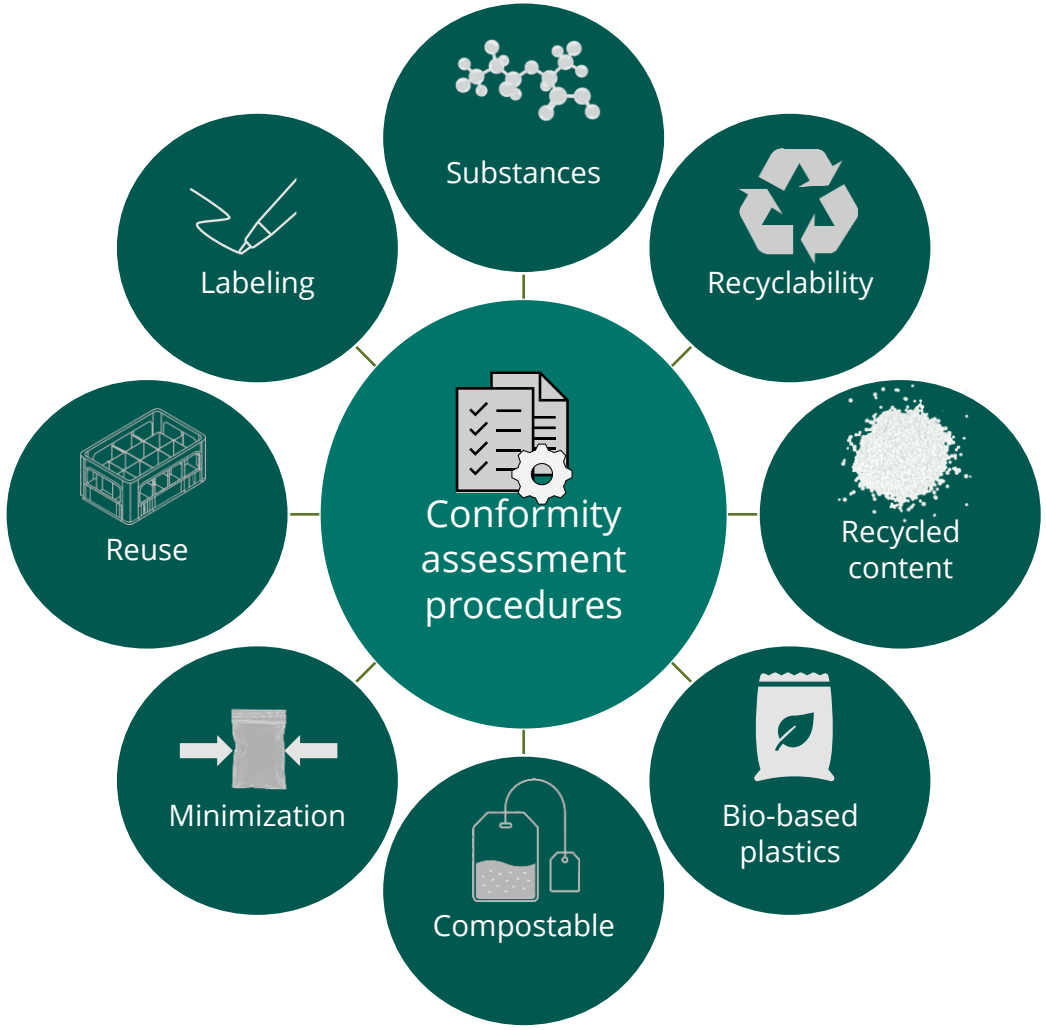
Manufacturer

Conformity obligation

Conformity of the packaging includes

- Conformity assessment
- Declaration of conformity
- Technical documentation



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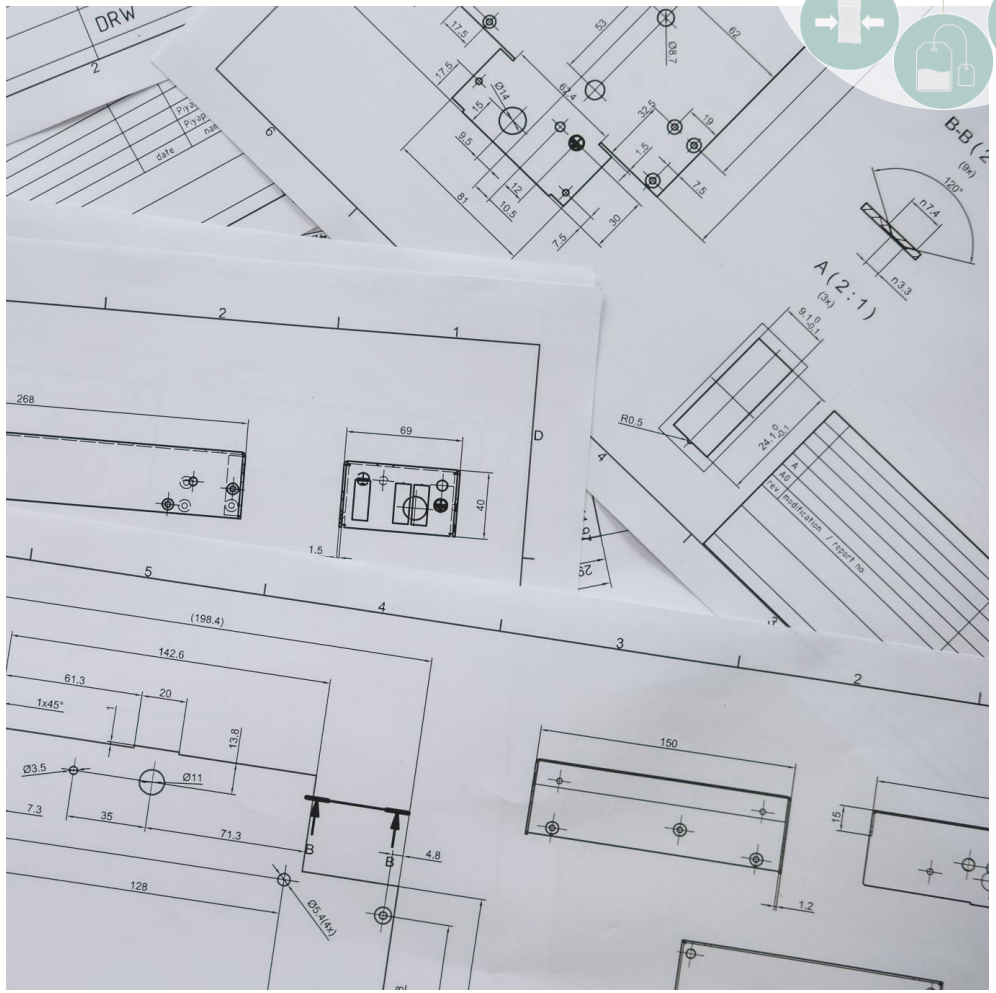
Conformity assessment procedure

Technical documentation

- General description, including manufacturing drawings or conceptual design
- Material information
- List of harmonized standards applied
- Description of the verification of conformity requirements

Declaration of Conformity

- Packaging identification number
- Contact details of the manufacturer/authorized representative
- Specification of standards and specifications
- etc. (see Annex VIII)



Recyclable packaging (Art. 6)

The targets are as follows:

- 2030: 70% recyclability
- 2035: 70% + “large-scale recycling”
- 2038: 80% + “large-scale recycling”

In detail information:

- Recyclability of materials → CEN standard / Technical specifications (coming soon)
- Recyclability assessment of whole packaging → Guidelines are being developed by the JRC

➢ **Delegated act on January 1, 2028**

As of August 12, 2026:

- No new rules via PPWR, but PPWD and EN 13430 remain valid

Special case: innovative materials

- Recyclability requirement under certain conditions only 5 years later

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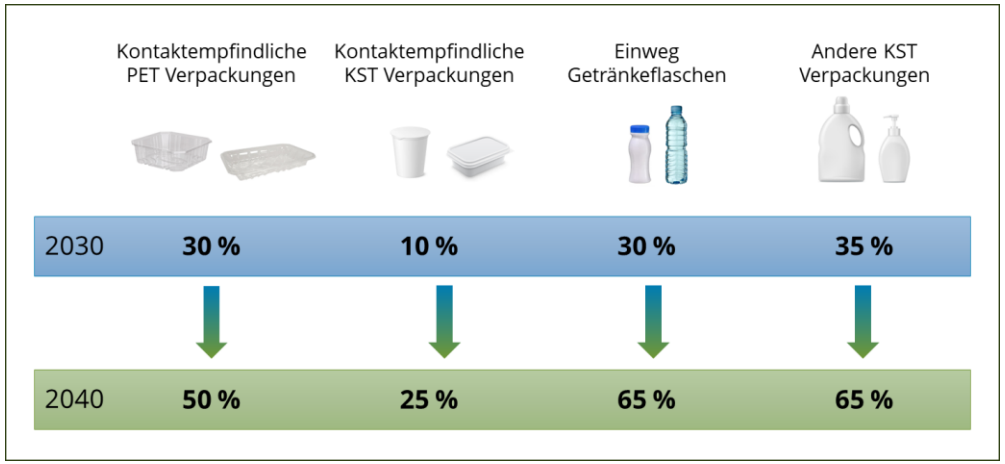
Recycled Materials in Plastic Packaging (Art. 7)

What is known:

- Minimum percentages starting in 2030 & 2040
- Post-consumer recycled material
- Effective January 1, 2029: Assessment required



What will be defined in more detail:

- December 31, 2026: Implementing acts for calculating the recycled content
- December 31, 2026: Delegated acts on what is accepted as recycled content (sustainability criteria for plastic recycling technologies)
- By January 1, 2028: Review of exemptions

Biobased feedstock in plastic packaging (Art. 8)

‘biobased plastics’ means **plastics made from biological resources**, such as biomass feedstock, organic waste or by-products, and irrespective of whether the plastics are biodegradable or non-biodegradable;

- By February 12, 2028, review by the commission on
  - technological development
  - environmental performance

- Legislative proposal where appropriate
  - Sustainability requirements
  - Targets to increase use
  - Possibility to use biobased feedstock instead of recycled content

Bio-based plastic is not automatically “sustainable” – PPWR treats it as a **regulated option with strict sustainability conditions**, not a default solution.

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Compostable packaging (Art. 9)

- Defines when **packaging must or may be compostable** → Focus on **function-driven use**
- Ensures compostability is:
  - technically meaningful
  - aligned with waste management systems
- Compostability is **not a general alternative** to recycling

➢ Commission request to standardisation organisations to

- Prepare or update harmonised standards
- Taking latest scientific and technological development into account
- Verification for biological decomposition shall be required

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Packaging minimisation (Art. 10 & 24)

Minimization requirement:

- Functionality is decisive
- Minimize weight and volume where technically feasible

➢ Harmonized CEN standard to be revised (by February 12, 2027)

Empty space ratio starting in 2030:

- Max. 50% for transport and shipping packaging
- Filling & cushioning material counts as empty space

➢ February 12, 2028: Implementing acts for calculating the empty space ratio

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Reusable packaging (Art. 11, 26-33, 51, VI)

Key objective:

- reduce packaging waste at source
- shift from single-use to system-based solutions

Article 11 defines:

- The requirements for packaging to be considered reusable

➢ Delegated act by February 12, 2027, to supplement PPWR

Further articles define:

- Reuse targets for
  - transport packaging
  - Beverages in sales packaging by final-distributors
- Reporting about reuse
- Handling of reusable packaging
- Rules for re-use systems and refill stations

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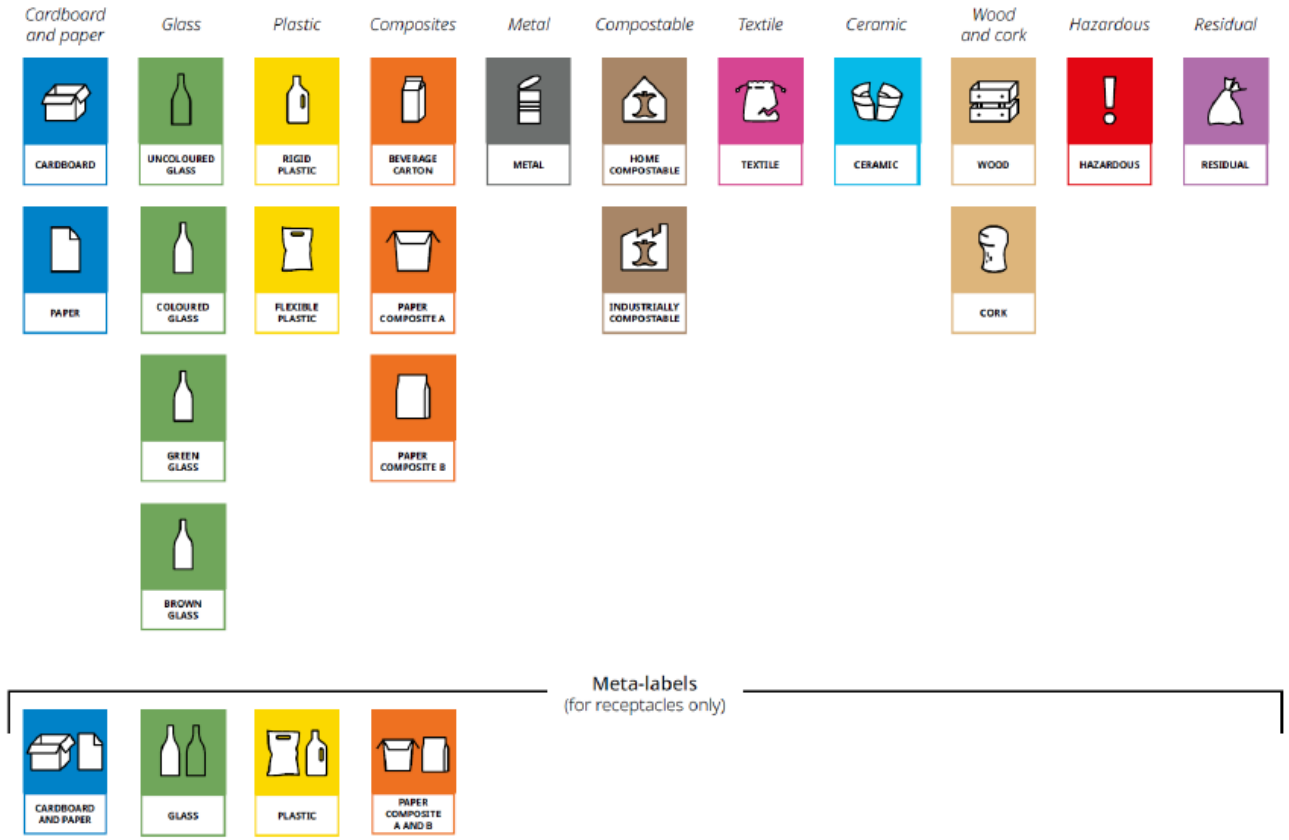
Labelling (Art. 12)

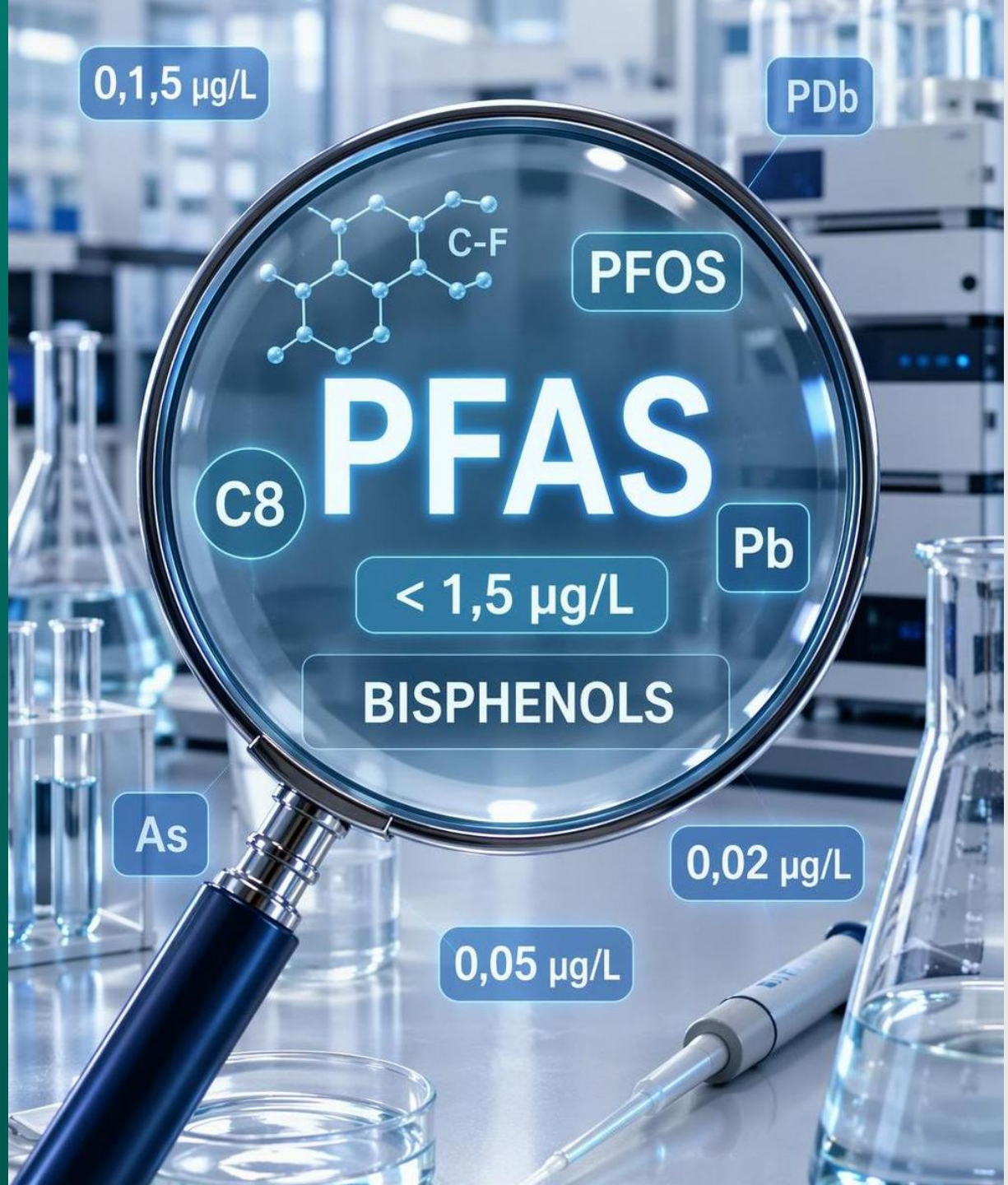
- Ensuring identification (e.g., type, batch, or serial number)
- Provision of trade name/trademark, including contact information, on the packaging
- Material composition as of August 12, 2028:
  - Pictogram: mandatory
  - Detailed information: voluntary
  - Implementing acts by August 12, 2026
  - Exemptions for certain packaging types

Figure ES 1. Final label proposal (colour and text)



Source: JRC technical proposal on EU harmonized waste sorting labels under the Packaging and Packaging Waste Regulation

PPWR Article 5: Requirements for substances



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Substances of concern

1. Packaging placed on the market shall be so manufactured that the presence and concentration of substances of concern as constituents of the packaging material or of any of the packaging components is minimised, including with regard to their presence in emissions and any outcomes of waste management, such as secondary raw materials, ashes or other material for final disposal, and to the adverse impact on the environment due to microplastics.

Objective:

- **Recyclability**: No toxin accumulation in recyclates
- **Transparency**: Disclose packaging composition
- **Health protection**: Prevent pollutant-food contact
- **Environmental protection**: Prevent environmental pollution

Important to note:

- Focus on packaging material, not migration into products
- No clearly defined substances yet (list in progress), but this may include critical plasticizers and bisphenols
- Aligned with other regulations concerning substances (REACH, POP, etc.)

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Heavy metal limit

4. Without prejudice to the restrictions on chemicals set out in Annex XVII to Regulation (EC) No 1907/2006 or, where applicable, to the restrictions and specific measures on food-contact materials and articles in Regulation (EC) No 1935/2004, the sum of the concentrations of lead, cadmium, mercury and hexavalent chromium resulting from substances present in packaging or packaging components shall not exceed 100 mg/kg.

This is no new threshold!

Verification:

- Not specified
- For elevated risk, test results are expected to demonstrate conformity

Existing exemptions (esp. glass and plastic crates with recyclate) are expected to remain in place.

Higher-risk packaging

- Recyclate-based plastic packaging
- Colored or printed packaging
- Glass packaging (esp. colored glass)
- Coated metal packaging
- Paper and cardboard packaging from recycled fibers
- Treated wood packaging

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PFAS limit values

Only for food-contact packaging, but including inks, varnishes, glues, etc.

In relation to other regulations:

- Different from migration limits
- REACH restricts specific substances individually, such as PFOA
- POP Regulation addresses certain persistent organic pollutants.

Background:

- Political goal: elimination of functional PFAS uses in food-contact packaging
- Existing national rules
- Analytical feasibility
- Precautionary principle regarding secondary materials
- Market regulation rather than risk assessment: no toxicological justification / safety threshold

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PFAS limit values

Limit value	Background idea
25 ppb (µg/kg) for any PFAS as measured with targeted PFAS analysis (polymeric PFAS excluded from quantification)	Exclusion of intentionally used PFAS (within the robustly measurable scope of targeted analysis)
250 ppb (µg/kg) for the sum of PFAS measured as the sum of targeted PFAS analysis, where applicable with prior degradation of precursors (polymeric PFAS excluded from quantification);	Prevents functional “splitting” into many individual substances excludes functional uses
50 ppm (mg/kg) for PFASs (including polymeric PFAS) if total fluorine exceeds 50 mg/kg the manufacturer, importer or downstream user shall, upon request, provide to the manufacturer or the importer proof of the quantity of fluorine measured as content of either PFAS or non-PFAS	Pragmatic screening cut-off to distinguish functionally fluorinated materials (typically much higher) from background compatible with recyclates

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PFAS limit values

No difference between

- Intentionally added substances (IAS) for example for grease and moisture resistance
- Non-intentionally added substances (NIAS) for example in recycled material or processing aids

«However – preliminary PFAS laboratory analyses results on a number of selected packaging showed that in practice only packaging where PFAS have been intentionally added would give results above the PFAS limit values.”

But – suppliers declarations will most likely not be considered as enough evidence for conformity

How to assess conformity:

- Guidance document implements a stepwise analyses approach
- Peer-reviewed study developed a risk based approach

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Recommended stepwise enforcement approach

Step 1: Total Fluorine (TF) quantification

TF < 50 mg/kg → sample could be considered compliant*

TF > 50 mg/kg

Step 2: methods such as pyrolysis-GC/MS can be used to confirm whether the fluorine is organic (PFAS) or inorganic

Organic fluorine < 50 mg/kg → the sample could be considered compliant

Step 3: Direct TOP (total oxidizable precursors) analysis is recommended to check compliance with the 25 µg/kg and 250 µg/kg concentration limit

* On the basis of the evidence currently available to the Commission, all samples compliant with test (1) are also compliant with tests (2) and (3).

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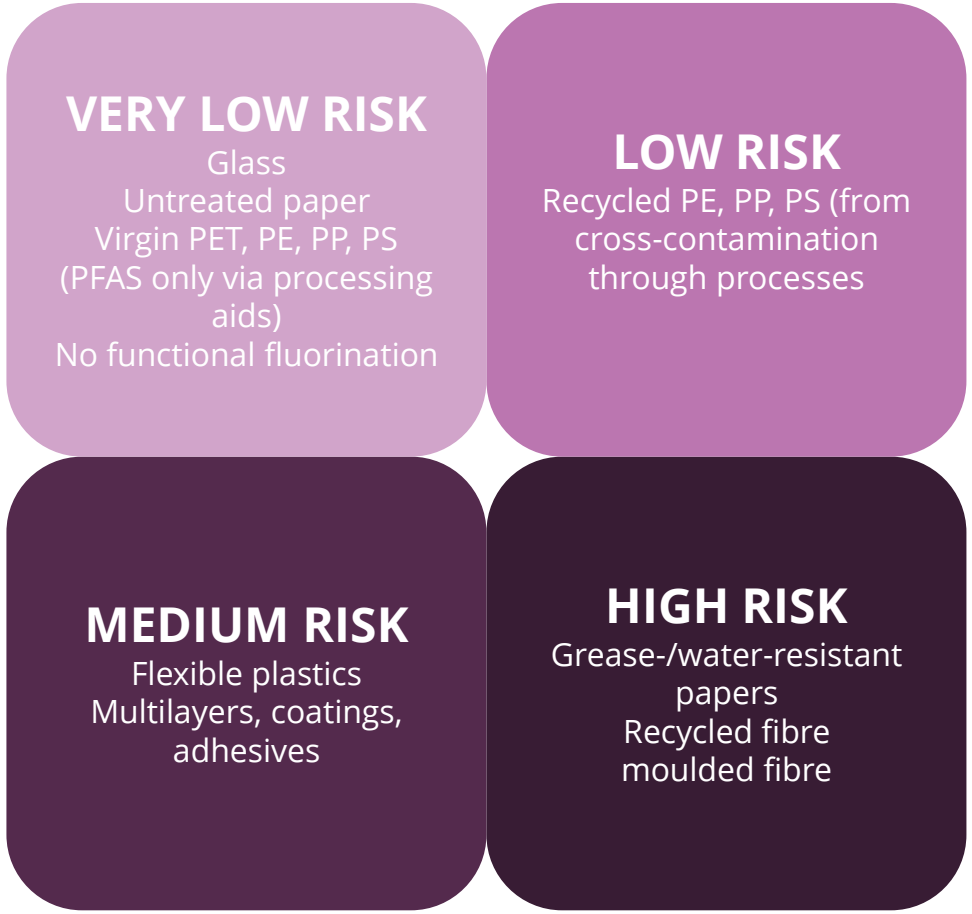
Material-Based PFAS Risk Matrix – Core Idea

Not all packaging materials are equally critical concerning for PFAS compliance

- Likelihood of PFAS relevance, not a toxicological risk assessment
- Based on findings from many studies:
  - Material and processes divided into four qualitative PFAS probability classes



Simplified risk-matrix

Wack, Katja, et al. "Development of a Risk Matrix for Assessing PFAS in Food Packaging." *Foods* 15.7 (2026): 1183.
https://doi.org/10.3390/foods15071183

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SCREENFOOD

The Road to 2026: General requirements and a PFAS deep dive.

Online, May 2026.

Dr Christopher McElroy

Contents

PPWR General Requirements:

- What does the PPWR mean for laboratory testing?
- What are the current limitations for testing?

The PPWR & PFAS compliance testing:

- PFAS-Per & Polyfluoroalkyl substances
- Methods for PFAS analysis
- The ScreenFood project overview
- Progress so far
- Next steps

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2025/40

22.1.2025

REGULATION (EU) 2025/40 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 19 December 2024

on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC

(Text with EEA relevance)

PPWR General Requirements

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 114 thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee (1),

Acting in accordance with the ordinary legislative procedure (2),

What does the PPWR mean for laboratory testing? - PFAS

5. Enforcement of PFAS restrictions in food contact packaging and exhaustion of stocks

Legal provisions:
Article 3(1), point (13), defines 'manufacturer' as 'a natural or legal person' that 'has packaging or a packaged product designed or manufactured under its own name or trademark, regardless of whether any other trademark is visible on the packaging or on the packaged product (…).' Article 3(1), point (10), defines 'placing on the market' 'as the first making available of packaging, whether empty or with a product, on the Union market'. Article 3(1), point (11), defines 'making available on the territory of the Member State' as 'any supply of packaging, whether empty or with a product, for distribution, consumption or use (…) whether in return for payment or free of charge.'

Article 5(5) states: 'From 12 August 2026, food-contact packaging shall not be placed on the market if it contains per- and polyfluorinated alkyl substances (PFAS) in a concentration equal to or above the following limit values to the extent that the placing on the market of packaging containing such a concentration of PFAS is not prohibited pursuant to another Union legal act:

a) 25 ppb for any PFAS as measured with targeted PFAS analysis (polymeric PFAS excluded from quantification);

b) 250 ppb for the sum of PFAS measured as the sum of targeted PFAS analysis, where applicable with prior degradation of precursors (polymeric PFAS excluded from quantification); and

c) 50 ppm for PFASs (including polymeric PFAS); if total fluorine exceeds 50 mg/kg the manufacturer, importer or downstream user as defined respectively in Article 3, points (9), (11) and (13) of Regulation (EC) No 1907/2006 shall, upon request, provide to the manufacturer or the importer as defined respectively in Article 3(1), points (13) and (17), of this Regulation proof of the quantity of fluorine measured as content of either PFAS or non-PFAS in order for them to draw up the technical documentation as referred to in Annex VII to this Regulation.'

What does the PPWR mean for laboratory testing? - PFAS

New limits set for virgin and recycled materials.

a) 25 ppb (ug/kg) for any PFAS as measured with targeted PFAS analysis (polymeric PFAS e.g. PTFE excluded from quantification);

b) 250 ppb for the sum of PFAS measured as the sum of targeted PFAS analysis, where applicable with prior degradation of precursors (polymeric PFAS excluded from quantification); and

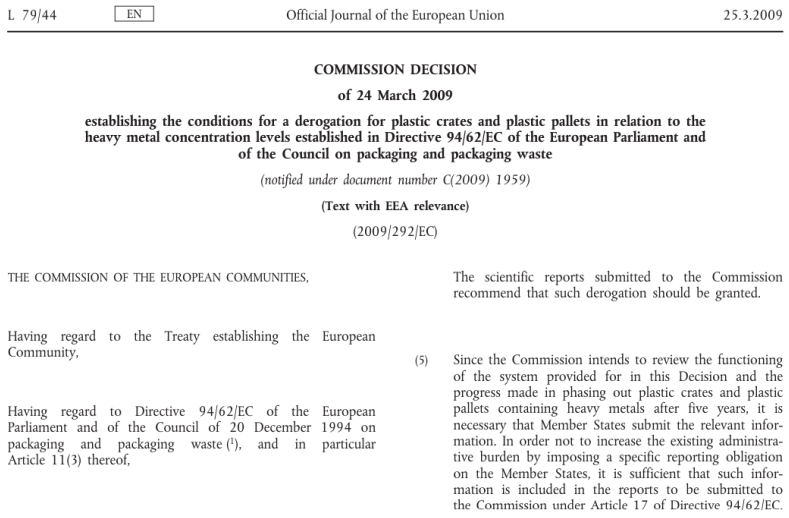
c) 50 ppm for PFASs (including polymeric PFAS); if total fluorine exceeds 50 mg/kg the manufacturer, importer or downstream user as defined respectively in Article 3, points (9), (11) and (13) of Regulation (EC) No 1907/2006 shall, upon request, provide to the manufacturer or the importer as defined respectively in Article 3(1), points (13) and (17), of this Regulation proof of the quantity of fluorine measured as content of either PFAS or non-PFAS in order for them to draw up the technical documentation as referred to in Annex VII to this Regulation.'

What does the PPWR mean for laboratory testing? Elements

Status quo for heavy metals analysis of virgin and recycled materials

“present in packaging or packaging components are established in Commission Decisions 2001/171/EC, 2009/292/EC and, adopted under Directive 94/62/EC, and should be maintained under this Regulation. However, in order to take account of scientific and technical progress, the power to adopt acts in accordance with Article 290 TFEU should be delegated to the Commission in respect of lowering the concentrations for any of those metals laid down in this Regulation or determining the conditions under which the sum of the concentrations of those metals is not to apply to recycled materials or to product loops which are in a closed and controlled chain or to certain packaging types or formats of packaging. On the basis of the Chemicals Strategy for Sustainability, the same concentrations for hazardous substances should, as a principle, apply for virgin and recycled material. However, there may be exceptional circumstances where a derogation from that principle might be necessary. Those exceptional circumstances justifying different concentrations for recycled material compared to primary raw material should be based on a case-by-case analysis. When amending the existing exemptions in respect of the concentrations of lead, cadmium, mercury and hexavalent chromium, the Commission should take that principle into consideration”

100 ppm limit of heavy metals in packaging (94/62/EC)
‘heavy metals’ means lead, cadmium, mercury and hexavalent chromium (2009/292/EC)



L 79/44 EN Official Journal of the European Union 25.3.2009

COMMISSION DECISION

of 24 March 2009

establishing the conditions for a derogation for plastic crates and plastic pallets in relation to the heavy metal concentration levels established in Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste

(notified under document number C(2009) 1959)

(Text with EEA relevance)

(2009/292/EC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Directive 94/62/EC of the European Parliament and of the Council of 20 December 1994 on packaging and packaging waste [1], and in particular Article 11(3) thereof,

The scientific reports submitted to the Commission recommend that such derogation should be granted.

(5) Since the Commission intends to review the functioning of the system provided for in this Decision and the progress made in phasing out plastic crates and plastic pallets containing heavy metals after five years, it is necessary that Member States submit the relevant information. In order not to increase the existing administrative burden by imposing a specific reporting obligation on the Member States, it is sufficient that such information is included in the reports to be submitted to the Commission under Article 17 of Directive 94/62/EC.

What does the PPWR mean for laboratory testing? NIAS

No new content within the PPWR regarding NIAS (non intentionally added substances).

Refer to: The regulation of non-intentionally added substances (NIAS) can be found in the following document 'Commission Regulation (EU) 2025/351 of 21 February 2025 amending Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food.'

"the Authority considers that, where a substance used in the manufacturing of a food contact materials or article has a migration level into food below of 0,00015 mg substance/kg food (0,15 µg/kg), the risk of genotoxicity is unlikely and no toxicity testing of the migrating substance is needed…where it has a migration level of more than 0,15 µg/kg but less than 0,05 mg/kg only data on genotoxicity tests is needed."

What does the PPWR mean for laboratory testing? A lot of questions!

COMMUNICATION TO THE COMMISSION

Approval of the draft Commission Notice on the Guidance document for Regulation (EU) 2025/40 on packaging and packaging waste

Regulation (EU) 2025/40 on packaging and packaging waste ([1]) (hereafter: PPWR) entered into force on 11 February 2025 and will apply from 12 August 2026.

PPWR harmonises the regulatory framework for packaging and packaging waste across the EU and enhances the smooth functioning of the internal market while reducing the environmental and health impacts linked to packaging.

The practical implementation of the new rules has been generating a lot of questions due to their novelty and complexity. The Commission Notice - Guidance document for Regulation (EU) 2025/40 on packaging and packaging waste ('Commission guidance document') addresses those questions, where there is an evident margin of legal discretion. For the other questions received, DG ENV intends to publish a Frequently Asked Questions (FAQ) document, which will be regularly updated.

Member States were consulted on the interpretation of the issues at a dedicated meeting of the Technical Adaptation Committee on Waste on 13 October. A further meeting was organised at the level of deputy permanent representatives on 5 March 2026. Member States' comments and suggestions were duly considered and included into the final draft.

EUROPEAN COMMISSION

Brussels, 30.3.2026
C(2026) 2151 final

ANNEX

ANNEX

to the

Communication to the Commission

Approval of the draft Commission Notice on the Guidance document for Regulation (EU) 2025/40 on packaging and packaging waste

What does the PPWR mean for laboratory testing?

Commission's interpretation:

Food contact packaging is packaging which is intended to be brought into contact with food or is already in contact with food and was intended for that purpose, as per the scope of EU food legislation. The surveillance authorities as referred to in PPWR, based on Regulation (EU) 2019/1020 on market surveillance rules, are competent to verify compliance with the PFAS limits. Several protocols and methodologies to test the presence of PFAS in different matrices exist, but there is no harmonised methodology for PFAS in food contact packaging at EU level. In this context, the following stepwise approach, based on state-of-the-art analytical capacities and a meta-analysis of PFAS testing of the relevant matrices, is recommended to enforce the PFAS limits as of their application date, i.e. 12 August 2026:

1. **Total Fluorine (TF) quantification (step 1): If TF is below 50 mg/kg (ppm), sample could be considered compliant.**

2. **If TF is above 50 mg/kg, methods such as pyrolysis-GC/MS can be used to confirm whether the fluorine is organic (PFAS) or inorganic in step 2. If the organic fluorine is below 50 mg/kg, the sample could be considered compliant.**

3. **Direct TOP (total oxidizable precursors) analysis is recommended to check compliance with the 25 µg/kg (ppb) and 250 µg/kg concentration limit in step 3. On the basis of the evidence currently available to the Commission, all samples compliant with test (1) are also compliant with tests (2) and (3).**

What are the current limitations for testing?

- No reference measurement procedures for analyzing PFAS in Food contact materials.
- Currently laboratories are using reference methods and adapting them to these samples.
- No harmonized approach for this testing-The JRC has published guidelines for the sample preparation so at least there are harmonized migration protocols available and this work is ongoing.
- No food contact material reference materials available for the analysis of PFAS, NIAS, elements. Some availability of QC materials through PT schemes (but these are limited in number, matrix, analyte content and concentrations are based upon agreed equivalency values, rather than being made traceable to the kg).
- Crucially no reference methods for total fluorine (TF) despite this being arguably the most important method recommended by the Annex document.
- Few laboratories have access to all three techniques.
- Pyrolysis GC-MS is intrinsically difficult to perform accurate quantification, must ensure complete pyrolysis!

Official Journal
of the European Union

EN
L series

2025/40

22.1.2025

REGULATION (EU) 2025/40 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 19 December 2024

on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC

(Text with EEA relevance)

The PPWR & PFAS Compliance Testing

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 114 thereof,

Having regard to the proposal from the European Commission,

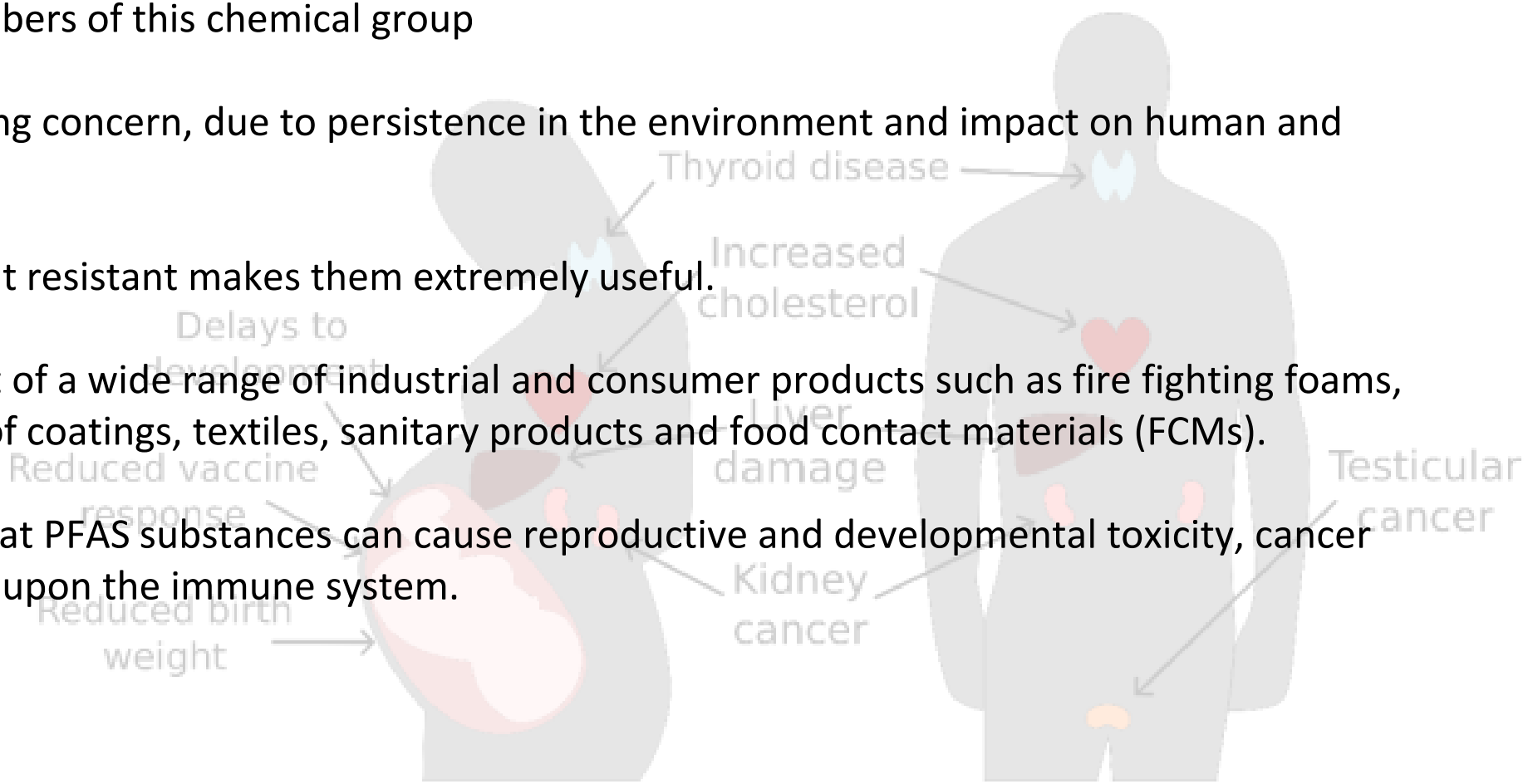
After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee (1),

Acting in accordance with the ordinary legislative procedure (2),

PFAS: Per & Polyfluoroalkyl Substances

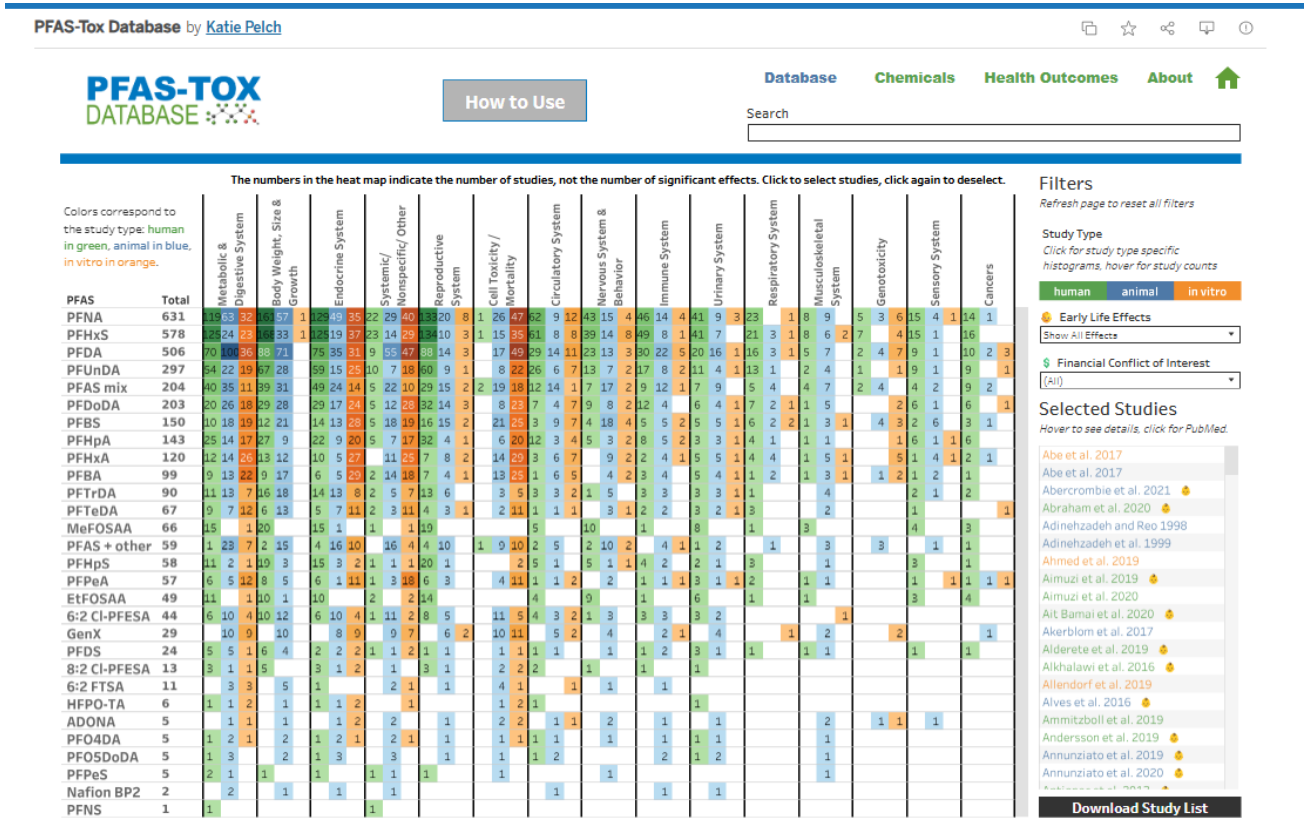
- Estimated >5000 members of this chemical group
- Contaminant of growing concern, due to persistence in the environment and impact on human and animal health
- Water, grease and heat resistant makes them extremely useful.
- PFAS are a component of a wide range of industrial and consumer products such as fire fighting foams, electronics, waterproof coatings, textiles, sanitary products and food contact materials (FCMs).
- Evidence is growing that PFAS substances can cause reproductive and developmental toxicity, cancer and negatively impact upon the immune system.



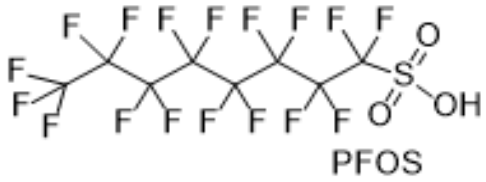
Toolan, Catherine, and Jonathan Wentworth. "Regulation and remediation of ‘forever’chemicals." (2025).

PFAS: Per & Polyfluoroalkyl Substances

- Recent meta-analysis of literature (PFAS tox database), revealed at least 29 additional PFAS (beyond PFOA and PFOS) which have been investigated in toxicology and health studies.



Pelch, Katherine E., et al. "The PFAS-Tox database: a systematic evidence map of health studies on 29 per-and polyfluoroalkyl substances." *Environment international* 167 (2022): 107408.



First discovery
1930s

1940-50s
Commercialization

PFOS designated as a POP* by Stockholm Convention
2009

PFOA designated as a POP
2019

2020
EU DWD sets 0.5 µg/L sum limit (20 specific PFAS) and 0.1 µg/L individual

PFHxS designated as a POP

DWI sets guidance of 0.1 µg/L limit to sum of 48 specific PFAS
2025

2025-enforceable Aug 2026

PPWR sets
25 µg/kg limit (individual non polymeric PFAS).
250 µg/kg for sum of targeted PFAS.
50 mg/kg for total including polymeric.

*POP = persistent organic pollutant, manufacture of/use of/ sale of items containing these are banned except under specific circumstances.

What does the PPWR mean for laboratory testing? - PFAS

a) 25 ppb for any PFAS as measured with targeted PFAS

Targeted PFAS analysis: LC-MS/MS, LC-HRMS, GC-MS/MS (for fluorotelemer alcohols)

b) 250 ppb for the sum of PFAS measured as the sum of targeted PFAS analysis, where applicable with prior degradation of precursors (polymeric PFAS excluded from quantification)

Sum of targeted PFAS: LC-MS/MS, LC-HRMS,

c) 50 ppm for PFASs (including polymeric PFAS)

Total fluorine measurement is required as an initial screen of a material (sample) for potential PFAS content. It would still need to be compliant with NIAS and heavy metals regulatory limits even if <50 ppm.

If a sample contains >50 ppm Total fluorine, pyrolysis GC-MS can be used to differentiate organic (PFAS) vs inorganic fluorine. If the sum of total of organic fluorine is <50 ppm the annex to the PPWR suggests this is compliant.

The 25 and 250 ppb limits for individual and sum PFAS should be analyzed with targeted methods of oxidized and non-oxidized samples (TOP assay)

Linear vs polymeric PFAS

Food Processing	Polymer	Fluoropolymer production materials (such as PTFE) (liners for grills and trays)
	Non-polymers	Possible coatings of food packaging
Plastics and Rubber	Polymer	Fluoropolymers (e.g. PTFE) are used as processing aids, plastic and rubber raw feedstocks, and as an intermediate material. Used in moulded materials for easy release and reduce cast imperfections, polymer processing aids
	Non-polymers	Reduces surface tension for foams, etching of plastics, and production of rubber materials
Paper and Packaging	Polymer	Oil, grease and water repellent coatings of paper, paperboard, moulded pulp products (e.g. food contact materials), and LDPE bags; examples include side-chain fluorinated polymers in which the PFAS- or fluorotelomer-based alcohols or their acrylate or methacrylate esters are attached on side chains
	Non-polymers	Phosphate ester salts (esterification of PFAS or Fluorotelomer alcohols with phosphoric acid).

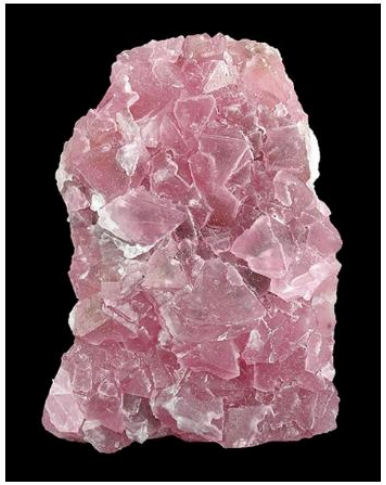
2.5 PFAS Uses and Products – PFAS — Per- and Polyfluoroalkyl Substances

Inorganic vs organic sources of fluorine

Inorganic

Main source of fluorine is within naturally occurring minerals that contain fluoride such as fluorite.

Additional common inorganic sources is fluoride addition to water to prevent tooth decay and as a byproduct of industrial processes such as fertilizer manufacture.



Fluorite
(Fluorspar)

Organic

Natural sources include from bones and plants such as spinach and tea.

PFAS in both its linear and branched isomers are man made sources of organic fluorine.

Fluorine - Wikipedia

Methods for PFAS analysis

LC-MS/MS Targeted PFAS methods

+ High sensitivity (although modern HRMS are comparable)
+ High specificity via MRM (multiple reaction monitoring)
+ Cheaper than HRMS instrumentation
+ More suited to routine analysis with a validated method
- Expensive technique (~£300,000, instrument)
- Targeted analysis only acquires data for the selected targets
- Requires highly skilled technicians to use/maintain
- Low mass accuracy compared with HRMS
- isotopically labelled standards should be used and can be expensive

https://www.waters.com/content/dam/waters/en/Photography/Products/Instruments/mass-spectrometry/tandem-quad/Xevo-TQ-XS-ESIsource-ESIprobe-Angled-Left.jpg.thumb.319.319.png

Methods for PFAS analysis

https://www.agilent.com/about/mygreenlab/en/act-6530-Q-TOF-LC-MS.html

LC-HRMS PFAS methods

+ High mass accuracy, can distinguish between closely matched masses, reducing misidentification
+ High specificity via parent and fragment ions analysis via different fragmentation techniques (CID, HCD)
+ Full scan data which can be interrogated later against new target libraries
+ Can be used for both targeted and untargeted analysis of analytes
- Expensive technique (~£450,000, instrument)
- Requires highly skilled technicians to use/maintain
- isotopically labelled standards should be used and can be expensive

Methods for PFAS analysis

Pyrolysis-GC-MS

+ Can be used for detection of non-volatile PFAS (Fluorotelomer alcohols) and polymeric PFAS like PTFE
+ Requires little to no sample preparation (depends on interface i.e. Pyrola vs JSB)
+ Can be used for untargeted screening and identities can be confirmed against spectral libraries
- Expensive technique (~£200,000, instrument)
- Challenging technique for quantification
- Requires highly skilled technicians to use/maintain
- Thermal decomposition may lead to artifacts
- Without pyrolizer limited to only volatile and semi-volatile PFAS e.g. FTOH

https://www.shimadzu.com.au/industries/environment/microplastics/mixed-polymer/index.html

Methods for PFAS analysis

Combustion ion chromatography

+ Can be used for detection of total fluorine content and organic fluorine
+ Organic fluorine can be determined post combustion in an oxygen rich environment (to enhance combustion)
+ Inorganic fluorine can be determined via direct injection without combustion
- Requires highly skilled technicians to use/maintain
- Expensive technique (~£100,000, instrument)
- Incomplete combustion could lead to artifacts, affecting the organic fluorine determination

SCREENFOOD

Selection and production of reference materials for MOAH/MOSH and PFAS and test materials in food and food packaging

Development and validation of methods for screening and quantification of contaminants

Screening of food packaging materials for the presence of non-polar contaminants and migration studies of specific substances

Interlaboratory comparisons for validating new analytical methods developed for screening and quantification of contaminants

Internal funded partners

External funded partners

Unfunded partners

Associated partners

EURAMET

The role of metrology institutes - Standardisation!

Metrology (what we do)

- Science of measurement
- Key in manufacturing, engineering, science & technology
- Provides a framework to ensure traceability, comparability and reliability of data

Standards (Lead/input/support development)

- Consensus document
- Approved by recognised body
- Provide guidelines for a process or characteristics for a product
- So, it can be repeated or transferred = better consistency

- **Standards and metrology** critical to creating more reliable products, services, and production processes
- Not always considered at early/mid stage of innovation and **lacking in emerging technologies**
- Recognised cross-cutting technology to progress through TRL's faster and facilitate translation

The role of metrology institutes - Standardisation!

Improve reproducibility and support translation

Metrology

Supports **reproducibility** and standardisation of research for improved technology transfer and confidence

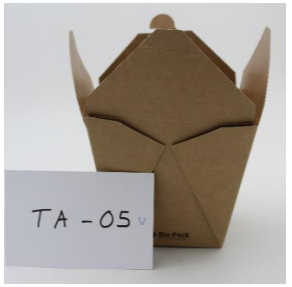
Supports validation, confidence in data, encourages **market expansion**

Technology Readiness Level	1	2	3	4	5	6	7	8	9
	fundamental research		solution exploration		prototype development and testing		demonstration & commercialisation		operation
	invention		concept validation		prototype	pilot demonstration		market intro	market expansion

Available support			
	TRL's 1-4 / Measurement advice and training in Basic research, make innovators aware of metrology	TRL's 5-7 / Measurement solutions and system validation, SMEs/start up De-risk investment and ensure reliability	TRL 8-9 / Reference measurements; reference materials; external assessment to ensure trust in product or processes

Progress so far:
Selection, screening and quantification of contaminants

Consortia laboratories that already have PFAS or untargeted screening methods developed for food contact material (FCM) contaminants have applied these methods to a range of FCMs. Pre screened samples were provided by Sciensano (Belgium) and LGC (UK).



Materials sourced currently for the consortia:

- 650 x 250 g PP cups 100% virgin PP
- 650 x 250 g PS cups 100% virgin PS
- 650 x 180 g PS cups ABA layered structure with B-layer = rPS Approximately 17% rPS overall in cup
- 2.6 kg PET pellets 100% rPET
- 260 x 500 mL PET bottles
- Polyolefin and granules (native PET and rPET flakes)
- Films made of PET and rPET
- Coated paper (wax, PLA, cellulose films etc)
- Virgin and recycled PET
- Commercially available fastfood containers
- Supermarket sourced bottles water

Progress so far: migration studies

Migrations were performed mostly via article fill or liquid emersion assays using food simulant A 10% EtOH and B 3% acetic acid according to JRC guidelines.

Container sub-sampling, weighing, addition of simulant, weighing.

↓

Oven digestion
migration for 2 h at 70 °C

Centrifugation
4500 rpm 10 min

↓

Sub-sampling, concentration, resuspension and analysis

Progress so far

A total of 22 manufacturer materials were selected and distributed to 13 different laboratories.

11 consumer level materials (from supermarkets, canteens, take away restaurants etc) previously screened by Sciensano and 4 by LGC for organic and/or inorganic contaminants were also distributed within the consortia.

Preliminary screening revealed that 4 different samples (all fast-food containers) were found to be contaminated with bisphenol A, which as of the 19th December 2024 was banned in food contact materials with the EU.

Additionally, the migration limits for total phthalate concentrations exceeded the regulatory limits, and indeed in the case of Dibutyl phthalate (DBP), and Bis (2-ethylhexyl)phthalate (DEHP) the individual limits were also breached.

Residual solvents, glycerol, propylene glycol and aldehydes were also identified.

Progress so far

Begasse and paperboard-based materials were also screened for PFAS and trace metals, with ranges obtained between ppt-ppb range. Virgin and post consumer PET flakes were also found to contain PFAS, as did the drinking straw and paper based materials.

		PFHpA	PFHxS	PFOA	PFHpS	PFNA	PFOS	FOUEA	PFDA	PFBS	PFHxA
SAMPLE ID	Extraction method	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
TA-01_2	full immersion[1]			203	6225						
TA-03_1	full immersion			47	1432						
TA-03_2	full immersion			115	1234						
TA-05_1	full immersion			206	25510		366				
TA-05_2	full immersion			223	19059		233				
TA-15_1	full immersion	325		270	10828						
TA-15_2	full immersion	216		218	15544						
TREFCOM-83_1	full immersion	1103		32	64						
TREFCOM-83_2	full immersion	812		32	54	4097					
TREFCOM-95_1	full immersion	12642		47788		4420		7461	8679		
TREFCOM-95_2	full immersion	15518		52964				8776	6839		
TREFCOM-96_1	full immersion	244		190	112						
TREFCOM-96_2	full immersion	256		180	86						
TREFCOM-98_1	full immersion	407		61	276						
TREFCOM-98_2	full immersion	442		64	308						
PET rep 1	full immersion	123	41		<LOQ*	<LOQ					<LOQ
PET rep 2	full immersion	179	42		<LOQ	<LOQ					<LOQ
PCR PET rep 1	full immersion	57	50		168	<LOQ					<LOQ
PCR PET rep 2	full immersion	197	53		122	<LOQ					<LOQ

[1]food simulant A 10% Ethanol in H_2O for 2 h at 70 °C, centrifuged at 4000 rpm for 10 minutes. 10 mL of the extract was dried and re-constituted in 1 mL *LOQ = 5-10 ng/kg

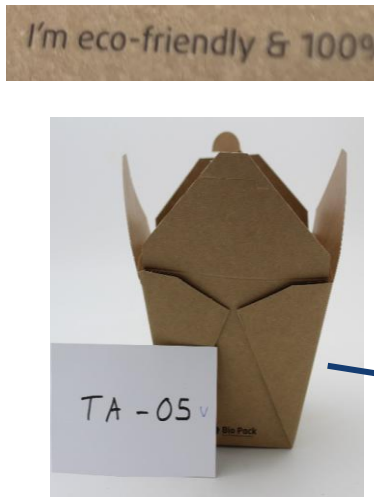
Progress so far

Due to highest PFAS concentrations determined these were used to develop the total organic fluorine method.

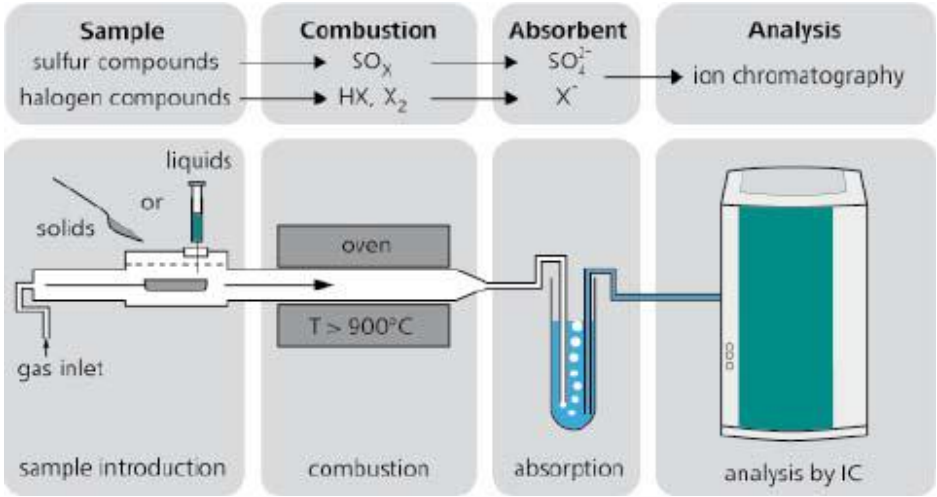
		PFHpA	PFHxS	PFOA	PFHpS	PFNA	PFOS	FOUEA	PFDA	PFBS	PFHxA
SAMPLE ID	Extraction method	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
TA-01_2	full immersion[1]			203	6225						
TA-03_1	full immersion			47	1432						
TA-03_2	full immersion			115	1234						
TA-05_1	full immersion			206	25510		366				
TA-05_2	full immersion			223	19059		233				
TA-15_1	full immersion	325		270	10828						
TA-15_2	full immersion	216		218	15544						
TREFCOM-83_1	full immersion	1103		32	64						
TREFCOM-83_2	full immersion	812		32	54	4097					
TREFCOM-95_1	full immersion	12642		47788		4420		7461	8679		
TREFCOM-95_2	full immersion	15518		52964				8776	6839		
TREFCOM-96_1	full immersion	244		190	112						
TREFCOM-96_2	full immersion	256		180	86						
TREFCOM-98_1	full immersion	407		61	276						
TREFCOM-98_2	full immersion	442		64	308						
PET rep 1	full immersion	123	41		<LOQ*	<LOQ					<LOQ
PET rep 2	full immersion	179	42		<LOQ	<LOQ					<LOQ
PCR PET rep 1	full immersion	57	50		168	<LOQ					<LOQ
PCR PET rep 2	full immersion	197	53		122	<LOQ					<LOQ

[1]food simulant A 10% Ethanol in H_2O for 2 h at 70 °C, centrifuged at 4000 rpm for 10 minutes. 10 mL of the extract was dried and re-constituted in 1 mL *LOQ = 5-10 ng/kg

Progress so far: Preliminary Total Organic Fluorine analysis



Oven digestion
10% ethanol
migration for 2h at 70°C



Sample analysis by combustion ion chromatography against procedural blanks

Initial results indicate between 83-99% of total organic fluorine unaccounted for vs a targeted (18x) PFAS LC-MS/MS method

Progress so far

- Trace metal contaminants were also identified across the same investigated materials.
- Most of the contaminants were at the low ppm levels (mg/kg), with a broad array of different metals identified such as Al, Ba, Pb, Cd, Ca, Cr, Fe, K, Cu, La, Mg, Mn, Na, Ni, Zn, P, B, Sr, Ga, V.
- However, one of the major challenges identified was that no standardized method exists and thus exact analyte quantification suffered from a lack of consensus and appear to be dependent upon the sample sub-sampling.
- To address this, we are developing homogenized materials of pre-analyzed materials from several different pizza boxes or trays so that these can be pooled, shredded and made into reproducible standardized materials for calibration purposes. At least this way more certainty can be attributed to each individual laboratories analysis prior to analysis of new materials.
- Additionally, standardized methods and new guidelines are being produced to help harmonize both organic and inorganic measurements.
- Novel reference materials containing PFAS are being developed in freeze dried tomato and infant food.

Next steps

- To share the PFAS test material for an interlaboratory comparison between 10-15 laboratories, tasked with determining the PFAS content and concentration using targeted and non targeted approaches. We are looking for further participants, so if you know of anyone interested, please email Christopher.McElroy@LGCGroup.com.

- To participate in a tomato and infant matrix candidate reference materials interlaboratory studies.

- To continue screening and quantifying the test materials.

- To develop reference measurement procedures and guidelines for best practice in the analysis of PFAS and other contaminants in food contact materials.

Questions

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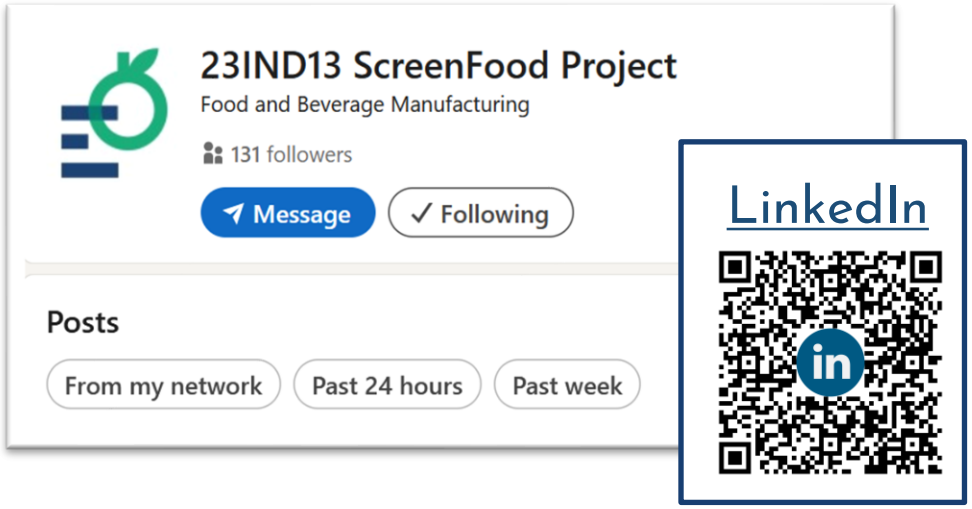
Website & LinkedIn

Website



LinkedIn

Follow us on LinkedIn and check out the website!

Thank you for your attention!

www.screenfood.eu

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or EURAMET. Neither the European Union nor the granting authority can be held responsible for them.

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EUROPEAN PARTNERSHIP

Co-funded by the European Union

METROLOGY PARTNERSHIP

EURAMET

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