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JRC technical proposal on EU harmonised waste sorting labels under the packaging and packaging waste regulation

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Contents

Abstract

This report outlines a technical proposal for EU harmonised waste sorting labels based on insights from behavioural and participatory design research. Specifically, it proposes the harmonised visual and systemic design of consumer-facing labels applicable to packaging waste, to be applied on packaging and waste receptacles. The proposal is based on extensive desk research, systematically gathered empirical evidence from citizen workshops, surveys, and experiments, as well as insights from expert stakeholder workshops and consultations. The report outlines a comprehensive conceptual and visual proposal consistent with the Packaging and Packaging Waste Regulation—particularly its ambition to reduce internal market barriers—and the various waste sorting schemes existing in the Member States. It makes evidence-based recommendations for a flexible, yet harmonised conceptual approach based on informing consumers about the material composition of packaging and communicating correct sorting instructions through matching labels on packaging and waste receptacles, and for a flexible, yet harmonised visual approach ensuring consumer understanding and salience across Member States, while aiming to provide adequate flexibility for their use on packaging and waste receptacles. The report proposes a level of granularity specifying the distinct labels required based on theoretical and practical considerations. Importantly, the report also highlights challenges identified, compromises that had to be made, and need for future work given the complex interplay of regulatory requirements, citizen and expert stakeholder preferences, practical limitations and best practices from behavioural and design research. In its entirety, the report aims at informing the Directorate-General for the Environment in creating the implementing acts outlined in Articles 12(6) and 13(2) of the Packaging and Packaging Waste Regulation.

Foreword

This report is an outcome of the work conducted by the Joint Research Centre under part 2 (on medium-term actions) of the administrative agreement for support for the 2020 circular economy action plan (CEAP 2.0).

Acknowledgements

First and foremost, we thank all stakeholders—experts, industry, waste management, citizens, etc.—that contributed to different parts of this project to inform the content of this technical proposal and its associated reports.

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Executive summary

Policy context

This report supports the implementation of the **Packaging and Packaging Waste Regulation (PPWR)** within the framework of the European Green Deal and the Circular Economy Action Plan 2.0. Prepared by the Joint Research Centre (JRC) for the Directorate-General for Environment, it draws on contributions from external contractors, over 25 000 EU citizens, and more than 250 expert stakeholders. The study addresses the fragmentation of waste-sorting labels across Member States, a key barrier to **efficient recycling and the functioning of the internal market**. By presenting an evidence-based, behaviourally and design-informed proposal for EU harmonised packaging-waste labels, the report informs the forthcoming **implementing act** under Articles 12 and 13 of the PPWR and contributes to broader consumer information, product labelling, and environmental communication policies.

Key conclusions

The technical proposal sets out a harmonised system of waste-sorting labels for packaging and receptacles across the EU, aimed at removing market barriers while ensuring that consumers receive clear, consistent, and actionable sorting instructions. Current sorting practices remain suboptimal due to packaging complexity and the absence of a unified labelling approach, which generates market fragmentation for producers and inconsistent information for citizens.

The proposed system adopts a **material-based** approach, focusing on the identification of packaging materials rather than collection destinations, consistent with PPWR requirements. Its visual design combines **pictograms, colour coding, minimal text, accessibility features,** and **optional digital tools**. System-level design aspects cover **granularity** (which materials require distinct labels), labelling of **multi-component packaging**, **meta-labels** for receptacles, guidance for **digital information provision**, and recommendations on **awareness, education, and information campaigns**. All components are grounded in behavioural and participatory design research and extensive stakeholder consultation.

While the proposal offers an integrated and fit-for-purpose solution, it also recognises implementation challenges. These include aligning colours, text, and digital carriers across diverse regulatory contexts, and managing overlaps with existing labelling frameworks to prevent consumer confusion. The proposed level of label granularity balances material-specific sorting needs with practical limitations such as contamination, residual waste, and compostable packaging. It ensures both usability for consumers and applicability across Member States with varying waste-collection infrastructures.

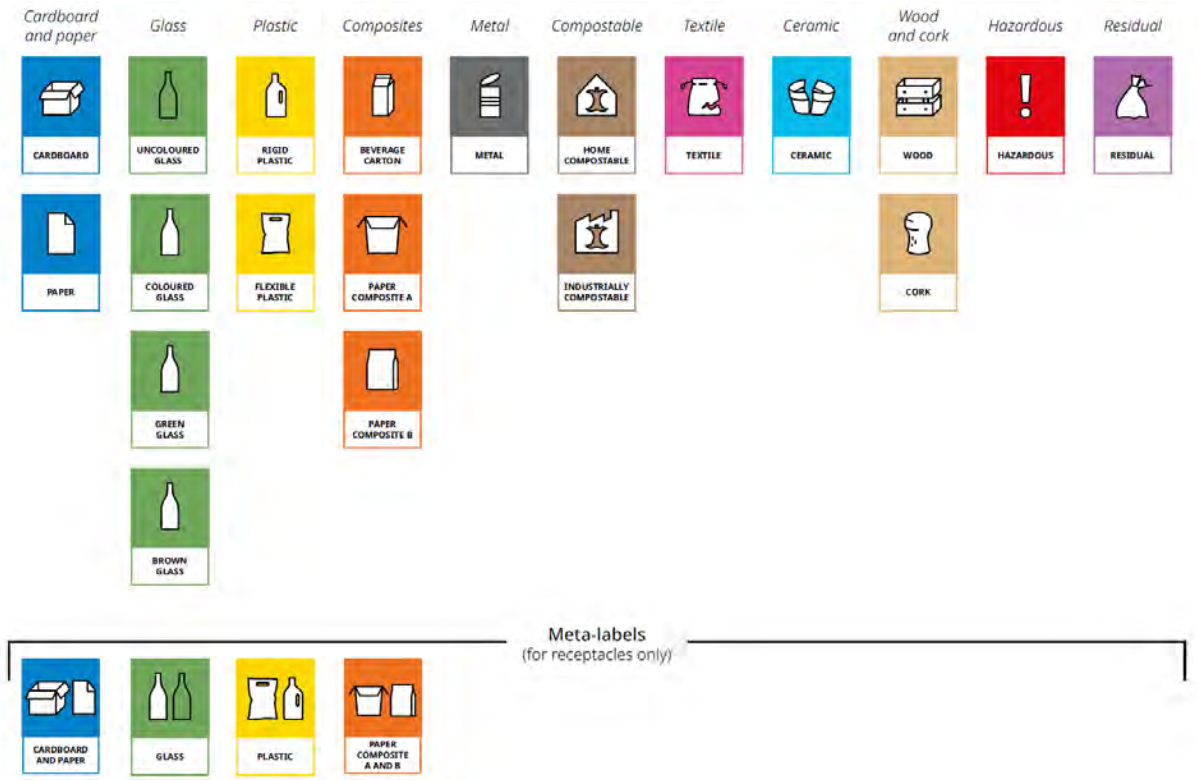
Implementation will entail costs related to adapting packaging designs, updating labelling systems, and relabelling waste receptacles, as well as phasing out existing national systems. These costs should be weighed against expected benefits—improved sorting accuracy, enhanced recycling performance, and reduced operational complexity for producers and waste managers—all of which are difficult to quantify ex ante.

Finally, while a **top-down harmonisation approach** through an EU implementing act is proposed, the report emphasises the need for **continuous stakeholder engagement**, **flexibility for future updates**, and **targeted communication and education campaigns** to ensure the system's long-term effectiveness and acceptance.

Main findings

The report defines principles for the **visual and conceptual design** of EU harmonised waste-sorting labels and provides a full set of label designs, including proposed colours and terminology (see Figure ES 1). It also presents conceptual considerations and practical guidance for relevant stakeholder groups—particularly packaging producers, waste managers, and citizens.

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



Source: Author's elaboration.

Related and future Joint Research Centre work

This report will inform the drafting of the implementing act(s) to be adopted by 12 August 2026 under Articles 12 and 13 of the PPWR. These acts will define the harmonised label and its specifications, including the visual design, technical formats, and digital provisions for packaging and receptacle labelling.

This work builds on previous JRC initiatives in support of EU policy in the fields of waste management and behavioural and design research, and on the separate collection of municipal waste and harmonisation of waste sorting instructions. Those produced a body of research work which forms the foundation of the present proposal.

This work is also connected to analytical and modelling work on Design for Recycling criteria and recyclability assessment methods for packaging materials. Both activities contribute to a coherent evidence base supporting the implementation of the PPWR and the broader objectives of the Circular Economy Action Plan 2.0.

Furthermore, this work interfaces with other labelling provisions established in the PPWR. These include the digital and physical labelling of reusable packaging, an optional harmonised colour label

for packaging part of a Deposit and Return System, a label containing information on the recycled content, and digital identifiers for Extended Producer Responsibility.

To support coordination and consistency across the Commission's numerous labelling initiatives, JRC.S.1 is also developing a community of practice on labelling. Its goal is to promote knowledge exchange, methodological alignment, and synergies across projects dealing with labelling, thereby enhancing coherence and efficiency in EU labelling policy support.

Quick guide

Packaging waste represents a major environmental challenge in the EU. Fragmented national labelling systems cause confusion among consumers, inefficiencies in recycling, and barriers to the internal market. Harmonised waste-sorting labels are intended to provide clear, intuitive guidance to consumers on how to correctly dispose of packaging waste, thereby improving recycling outcomes and facilitating market integration.

This proposal is based on a **multi-method research approach** combining desk research, citizen and stakeholder workshops, large-scale online surveys, and behavioural experiments. These activities involved more than **25 000 citizens** and **250 stakeholders**, ensuring that the proposed system reflects behavioural evidence, user preferences, and practical feasibility.

The report outlines how the empirical findings underpin the visual and conceptual design of the harmonised labelling system and discusses its implications for different stakeholder groups. Its ultimate aim is to provide a **scientifically sound and operationally viable proposal** to inform the implementing acts and guide the policy processes led by the Directorate-General for Environment.

1. Introduction

1.1. General introduction

Packaging waste is a major and growing concern in the European Union (EU), with nearly 84 million tonnes generated in 2022—equivalent to 187 kg per person. Packaging accounts for more than one third of municipal waste. Despite increasing awareness and recycling efforts, recycling rates for packaging waste in the same year varied widely across Member States (MS), ranging from below 40 % to 80 % (Eurostat, 2025). This disparity reflects, in part, fragmented national systems for waste collection and labelling, which hinder both consumer understanding and recycling performance.

A key policy challenge for the EU is to strengthen consumers' ability to sort packaging waste correctly at the source. Waste sorting labels currently differ considerably between and within MS in terms of visual design, terminology, and coverage (Bruns et al., 2024). The absence of standardisation and of a common visual language for waste sorting can lead to confusion. It also poses a barrier to the functioning of the internal market, as manufacturers and retailers must adapt packaging to national labelling rules, increasing costs and regulatory complexity.

To address these issues, the EU adopted Regulation (EU) 2025/40 on packaging and packaging waste (PPWR), which amends Regulation (EU) 2019/1020 and Directive (EU) 2019/904 and repeals Directive 94/62/EC. The PPWR mandates harmonised, material-based waste sorting labels for both packaging and waste receptacles. These labels aim to provide clear and consistent information to consumers across the EU, enabling correct sorting, improving recycling rates, and supporting the transition to a circular economy. At the same time, the harmonised system reduces the need for country-specific labelling, easing compliance for producers and helping to remove barriers within the internal market.

This proposal presents the design process and rationale for developing the harmonised labelling system. It builds on behavioural research, participatory design, and empirical testing across the EU to ensure that the system is intuitive, effective, and suitable for implementation within diverse national waste management infrastructures.

1.2. Policy context and background

Harmonised EU waste sorting labels are part of the EU's broader transition towards a sustainable, resource-efficient, and circular economy. Central to this transition is the Circular Economy Action Plan 2.0 (CEAP), a flagship initiative under the European Green Deal. CEAP 2.0 aims to minimise waste generation and maximise the value of materials within the economy by promoting re-use, repair, and high-quality recycling. A key objective of the European Commission's 2020 New Circular Economy Action Plan (COM(2020) 98) is to ensure that all packaging placed on the EU market is reusable or recyclable in an economically viable manner by 2030 (European Commission, 2020).

In line with these goals, the PPWR, which entered into force in February 2025, establishes a comprehensive framework to reduce the environmental impact of packaging while safeguarding the integrity of the single market. Among its measures, the PPWR mandates harmonised labelling for packaging and waste receptacles to support correct sorting of packaging waste by consumers. The relevant provisions, notably Articles 12 and 13, are further detailed in Section 3.1 of this proposal.

To operationalise these provisions, the European Commission will adopt an implementing act specifying the technical details of the harmonised labelling system. This act will define the visual and technical parameters of the labels to ensure uniformity across MS while accounting for national specificities in separate collection systems. Box 1 provides further insights on the challenges related to the scope of the PPWR, particularly regarding the focus on packaging, and discusses the related challenges for a comprehensive waste labelling approach.

Box 1. Scope of the PPWR and implications for non-packaging waste labelling

Although packaging waste constitutes a large share of municipal waste, the PPWR applies exclusively to packaging and packaging waste. This limited scope creates challenges for developing a comprehensive and fully coherent waste-sorting labelling system. While the labels proposed in this report are designed for packaging materials—as required by the PPWR—consumers encounter many non-packaging items made of similar or identical materials that also require proper sorting but will not carry harmonised EU waste sorting labels.

This discrepancy can lead to several issues:

— Inconsistent labelling across similar materials depending on whether they constitute packaging or non-packaging items.

— Unclear sorting instructions for consumers, given that the matching principle described in Section 3.1.3 relies on consistency across packaging and receptacle labels..

— Waste receptacles that collect both packaging and non-packaging materials may require complementary labels covering this broader scope.[1]

— Potential consumer confusion when sorting non-packaging items if they are accustomed to the packaging-specific labelling system.

— Difficulties in achieving a truly comprehensive and user-friendly labelling system encompassing all household waste streams.

— Risk of fragmentation if MS or sectors develop separate labelling systems for non-packaging items made of the same materials.

In summary, because the PPWR's legal scope is restricted to packaging and packaging waste, the harmonised EU labels can apply only to this fraction of household waste. This limitation may reduce the system's overall effectiveness in improving sorting behaviour, particularly if MS maintain complementary or divergent labelling approaches—for instance, for food waste, reusable items, or waste electrical and electronic equipment (WEEE) such as batteries and light bulbs.

[1] Typically, packaging producer responsibility organisations (PROs) limit their collection systems to packaging waste only, and this restriction is clearly indicated on the respective collection containers. The inclusion of non-packaging waste made of similar materials (e.g. household plastic items, metal objects, or paper products not used as packaging) is possible only under specific agreements with the competent authorities, such as municipalities, which may share or assume part of the collection costs. Separate collection systems for other waste streams—such as textiles, graphic paper (e.g. newspapers and magazines), WEEE, lamps, batteries, and biowaste—are generally organised independently, in line with EU and national legislation.

1.3. Purpose and objectives of the report

The purpose of this report is to present a technical proposal for EU harmonised waste sorting labels that will support the implementing act of the PPWR concerning the labelling requirements set out in Articles 12 and 13. The proposal is based on theoretical, conceptual, and empirical research in behavioural and participatory design conducted between 2023 and 2025. The research process combined complementary methods—including desk research, online surveys, participatory design workshops with citizens and expert stakeholders, behavioural experiments, and targeted stakeholder consultations—to provide evidence for the development of effective, clear, and user-friendly waste sorting labels and application rules.

The main objective of the report is to translate the evidence gathered from these research activities into a technically robust and policy-relevant labelling proposal. The process integrates the expertise of JRC researchers and external specialists, as well as the perspectives of over 16 000 EU citizens and more than 300 expert stakeholders, including waste management professionals, public authorities, and packaging producers. Their input has informed both the structural and visual design of the labels, and the accompanying rules for their application on packaging and waste receptacles.

This technical proposal seeks to contribute to the evidence base underpinning the implementing act by supporting the European Commission in designing a labelling system that is behaviourally informed, inclusive, and practicable across the EU.

Disclaimer: Following publication of this document and its technical proposal for EU harmonised waste sorting labels, DG Environment may decide whether to initiate the process leading to a potential implementing act. The preparation of technical recommendations by the JRC does not imply any commitment by the European Commission to adopt or follow this proposal. The Commission remains free to amend or depart from the technical recommendations contained herein.

1.4. Related JRC work

This technical proposal forms part of a broader programme of research by the European Commission's Joint Research Centre (JRC) supporting the improvement of separate collection of municipal waste and the implementation of harmonised waste sorting labels under the Packaging and Packaging Waste Regulation (PPWR). Several previous and ongoing JRC studies provide the analytical and empirical foundation for the present proposal.

The report *Separate collection of municipal waste: citizens' involvement and behavioural aspects* (Cristóbal Garcia et al., 2022) examines behavioural barriers and enablers influencing household waste sorting, highlighting the importance of intuitive and accessible labelling to encourage participation in separate collection systems. Building on these findings, *Behavioural insights for waste-sorting labels in the European Union* (Beaumais et al., 2024) reviews the scientific literature on label design, identifying key elements—such as salience, clarity, and accessibility—that shape consumer understanding and sorting performance. These behavioural insights were complemented by *Setting the scene for harmonised waste-sorting labels in the European Union* (Bruns et al., 2024), which provides an overview of packaging waste trends, national labelling schemes, and conceptual principles for harmonised labels based on the identification of material composition and matching labels on packaging and waste receptacles.

The present proposal directly builds on the *Design and behavioural research study to create evidence-based EU harmonised consumer waste sorting labels*, a multi-phase project conducted by

an external consortium led by Open Evidence together with JRC researchers from Unit S.1 (EU Policy Lab: Foresight, Design and Behavioural Insights) and Unit B.5 (Circular Economy and Sustainable Industry). The study outputs include:

- Inception Report – defining the research methodology and reviewing existing national waste-sorting label systems (not published; available on request);
- Interim Report 1 – describing the design and testing of the first prototype through surveys and participatory workshops (Liva et al., 2025);
- Interim Report 2 – reporting on behavioural experiments and further prototype development (Negrini et al., 2025);
- Factual Summary Report of Targeted Stakeholder Consultation – synthesising input from 163 stakeholders (Bruns et al., 2025);
- Factual Summary Report of a Second Targeted Stakeholder Consultation – (available upon request from the authors[2]), summarising input from more than 150 stakeholders; and
- Final Report for the Design and Behavioural Research Study – outlining the main conclusions from the citizen and stakeholder research (not published; available on request).

Together, these studies ensure that the proposed labelling system is technically sound and grounded in real-world user needs, behavioural evidence, and stakeholder perspectives.[3]

Additional relevant work includes *Development of an EU harmonised model for separate municipal waste collection and related policy support* (Albizzati, Antonopoulos et al., 2023), which supports broader harmonisation of collection systems, and *Impacts of the collection and treatment of dry recyclables* (Albizzati et al., 2024), which uses life-cycle assessment to evaluate the environmental and economic effects of different collection schemes. *Harmonised labelling of waste receptacles with matching product labels* (Albizzati, Cristobal Garcia et al., 2023) analyses the potential effects of implementing a harmonised EU-wide labelling system. The study concludes that the financial costs associated with such a harmonised labelling scheme are outweighed by the anticipated reductions in waste management expenses and environmental externalities—provided the system achieves a 2 % increase in capture rates and a 12 % increase in purity rates of separately collected waste. Notably, the net social benefits remain positive even under more conservative assumptions, such as a modest 1 % improvement in capture rates.

The Impact Assessment (IA) accompanying the proposal for the PPWR identified unclear and inconsistent labelling as a key information failure contributing to market inefficiencies and hindering packaging circularity (European Commission, 2022). It found that both mandatory national labels and voluntary schemes cause consumer confusion and reduce the effectiveness of separate collection systems. The IA also highlighted internal market barriers—such as higher compliance costs for packaging producers and lower capture and purity rates—which increase reprocessing costs in the absence of harmonised EU labelling. Without common specifications,

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2 The stakeholder contributions are also available on https://ec.europa.eu/eusurvey/publication/WSL-ESC-2.

3 Further documentation of key project steps is available on the EU Policy Lab Website: https://policy-lab.ec.europa.eu/index_en. The JRC also created country information sheets outlining information on packaging waste and waste sorting labels, which can be requested from the authors.

diverging national approaches risk further fragmenting the internal market. At the same time, the IA recognised the importance of labelling for informing consumers and supporting correct sorting behaviour. Under a moderately ambitious policy option, it proposed a harmonised pictogram-based labelling system, inspired by the Nordic pictogram scheme, to be applied to all packaging and corresponding waste receptacles. The objective was to reduce consumer confusion and improve sorting accuracy. The IA further reported strong stakeholder support for a language-neutral and digitally enabled system and for consumer testing, while NGOs emphasised the need for accompanying communication campaigns. The assessment also included cost–benefit simulations, assuming that Member State market surveillance authorities would oversee compliance.

Ongoing JRC work on the Ecodesign for Sustainable Products Regulation (ESPR) is also relevant. A dedicated group is mapping packaging materials currently on the market, whose conclusions may affect the proposed level of label granularity to ensure policy coherence. Their work on the standardisation of digital data carriers may likewise yield insights for the integration of digital information tools in the harmonised labelling system.

1.5. Report structure

The report is organised as follows. Section 2 summarises the methodologies used to gather evidence from multiple sources, including background research (Section 2.2), expert stakeholder engagement and consultation activities (Section 2.3), and citizen surveys, workshops, and experiments (Section 2.4). Section 3 outlines key aspects of the EU harmonised waste sorting labelling system, focusing on the relevant provisions of the PPWR (Section 3.1). It also discusses the importance of avoiding market fragmentation and reducing internal market barriers (Section 3.2) and highlights conceptual and practical challenges identified during the research (Section 3.3). Section 4 presents the technical proposal, divided into visual (Section 4.1) and system (Section 4.2) design elements. These sub-sections address specific aspects such as colour and text use, system granularity, and the concept of meta-labels. Section 5 provides conclusions and outlines key issues for further consideration.

Information is presented systematically: each section begins by defining the issue or material at stake, followed by a summary of relevant desk research, including PPWR specifications if applicable, and insights from stakeholder and citizen research. The JRC's assessment of the evidence then informs the proposed approach.

Given the interrelated nature of topics and evidence, some overlap between sections is unavoidable. Efforts were made to minimise unnecessary repetition and facilitate navigation through cross-references, information boxes, and visual elements that highlight complementary or contextual information.

2. Methodologies underlying the technical proposal

This section briefly outlines the methodologies used to gather evidence from various sources—going from background research (Section 2.2) and expert stakeholder engagement and consultation activities (Section 2.3), to citizen surveys, workshops and experiments (Section 2.4).

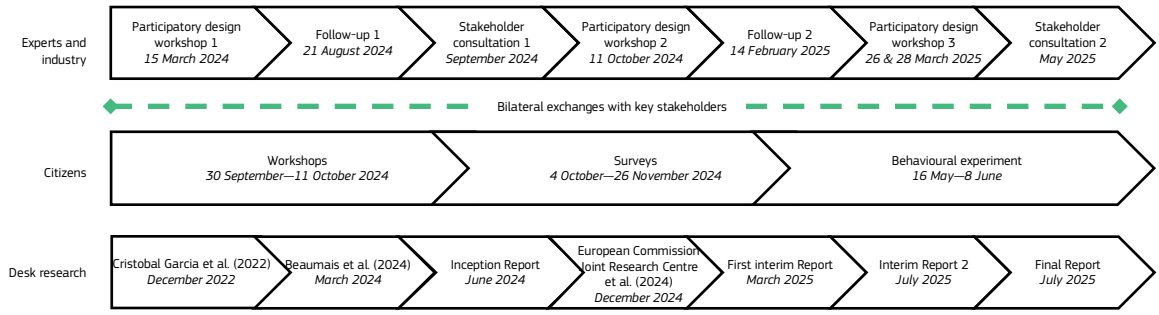
2.1. General approach

Figure 1 presents the overall approach used to gather the evidence underlying this proposal. It illustrates the approximate sequence of activities rather than a precise timeline. Further details on the individual reports produced through desk research and related JRC studies are provided in Section 1.4.

The evidence-gathering process followed a structured, multi-step, and iterative design combining two main sources: waste management and industry stakeholders, and EU citizens. Evidence was collected through participatory design workshops, targeted consultations, surveys, and behavioural experiments. These activities were complemented by a comprehensive programme of desk research, including literature reviews, comparative analyses of existing labelling systems, and iterative prototyping and reporting. Each method built upon insights from the previous steps, ensuring cumulative learning and targeted investigation of specific issues related to waste-sorting labelling.

For logistical and budgetary reasons, the JRC led interactions with expert stakeholders from industry and waste management sectors, while the external contractor managed activities involving citizens. JRC experts were however constantly involved in key decisions and other aspects of the citizen research. Throughout the process, additional expertise was sought from external specialists, including the designer of the Nordic pictogram scheme, Sille Krukow, as well as Ann Thor, Enzo Favorino, Cameron Brick, and consultants from Open Evidence.

Figure 1. Relative timeline of research gathering activities and outputs.



Source: Author's elaboration.

2.2. JRC background research

As part of the project's methodological approach, the JRC conducted extensive desk research. Although this work has not yet been published, it can be requested from the authors. Published outcomes from related desk research are referenced in Section 1.4. The background research included, but was not limited to, the following components:

— A visual database of bins, labels, and packaging collected between 2022 and 2023, providing an overview of consumer touchpoints related to waste-sorting labels. This supported the analysis of existing national schemes, the development of EU country sheets, and the design of participatory sessions.

— Information on waste collection practices in different MS, gathered primarily from public sources and the (European Environment Agency, 2025).

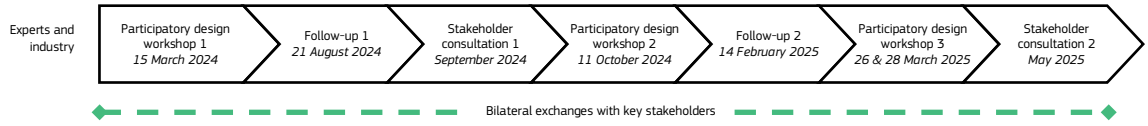
— EU country sheets on waste-sorting labelling, presenting country-level analyses of waste management systems and key aspects of labelling practices.

— A literature review on the design of visual information on labels, synthesising findings from 218 scientific articles.

— A mapping of the European Commission's own labelling initiatives and related schemes to support internal policy coherence and assist policymakers working on labelling issues (Annex II).

2.3. Interactions with expert stakeholders

Figure 2. Relative timeline of expert stakeholder engagement and consultation activities.



Source: Author's elaboration.

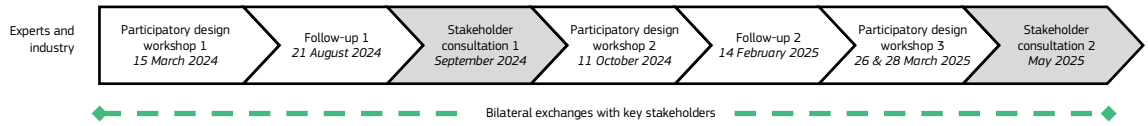
Interaction with expert stakeholders was an integral component of the project, planned from the outset (Figure 2). Engagement followed two interconnected approaches, each comprising three structured stages of systematic consultation. Stakeholders were identified through desk research, an open call for participation, and prior collaborations with the European Commission and the JRC on related topics. The JRC maintained and regularly updated a stakeholder list throughout the project, ensuring that interested parties could request inclusion and receive relevant information. This list formed the basis for all key communications and coordination activities.

Stakeholder engagement activities included online consultations, participatory design workshops with follow-up sessions, and bilateral (or trilateral, when involving DG Environment) exchanges. These interactions took place at planned intervals as well as on an ad hoc basis, depending on stakeholder availability and project needs.

The following three sub-sections outline the main features of the targeted consultation surveys, participatory design workshops, and bilateral exchanges conducted during the project.

2.3.1. Targeted online expert stakeholder consultation surveys

Figure 3. Relative timeline of targeted online expert stakeholder consultation surveys.



Source: Author's elaboration.

Two main online expert stakeholder consultations were conducted during the project (Figure 3):

- September 2024: An expert stakeholder consultation gathered feedback on the system and visual design of the waste-sorting label prototypes. It received 163 contributions (Bruns et al., 2025).
- May–June 2025: A second consultation collected feedback on key aspects of the prototypes and draft user manuals. It received 150 contributions (factual summary report available upon request).

An earlier **exploratory survey** in May 2023 (not shown in Figure 3) generated insights into country-specific waste-sorting and labelling practices underlying the EU country sheets (Section 2.2), with 92 responses.[4]

First consultation (September 2024):

The first consultation aimed to capture expert views on the labelling system's structure, design elements, implementation feasibility, and expected impacts. The 163 participants represented packaging and product design, labelling and manufacturing, receptacle labelling, and multiple aspects of waste management—including collection, sorting, transport, treatment, and policy. Product and packaging manufacturers were most prominently represented.

Stakeholders expressed broad support for harmonising consumer-facing waste-sorting labels, recognising the potential to simplify communication, reduce confusion, and improve separate collection performance. Many endorsed material-based pictograms, complemented by text or colour for clarity, and emphasised the importance of visual consistency between packaging and receptacle labels.

Key success factors identified included:

- flexibility to accommodate national collection systems and technical printing capabilities;
- clear guidance on label use; and
- accompanying awareness-raising campaigns.

[4] For more information on the initial stakeholder consultation, see https://policy-lab.ec.europa.eu/news/harmonising-waste-sorting-labels-across-eu-2023-05-02_en.

Some stakeholders highlighted the need to avoid creating market barriers, particularly through translatable text, and expressed concerns about the transition timeline and burdens on small and medium-sized enterprises (SMEs), related to packaging redesign and compliance costs. Further methodological details and insights are provided in European Commission. Joint Research Centre. (2025).[5]

Second consultation (May–June 2025):

The second consultation focused on stakeholder views regarding visual aspects of the prototype labelling system and rules in the accompanying draft user guidelines. The 150 participants represented the same professional domains as in the first consultation, again with strong representation from packaging producers.

Respondents could choose to answer questions related to packaging labels, receptacle labels, or both, to ensure relevance and focus. Responses were analysed collectively without weighting by focus area or stakeholder type.

This consultation largely confirmed earlier expectations and concerns, providing more detailed insights into label content, format, placement, and implementation feasibility. It assessed the clarity and granularity of pictograms across material categories (e.g. rigid vs. flexible plastics; coloured vs. uncoloured glass) and identified missing or confusing labels, such as for hazardous, composite, or compostable packaging.

Participants discussed practical implementation issues including printing constraints on small or irregular packaging, colour and text use, limited space, and interactions with other on-pack labels. Preferences again leaned towards non-prescriptive approaches, digital solutions (e.g. QR codes), and flexibility in label placement.

Further concerns related to the application of labels on waste receptacles, including accessibility for visually impaired users, and the cost and feasibility of mandatory implementation. Stakeholders consistently called for clear, harmonised EU guidance balancing regulatory objectives with technical and practical constraints. A draft factual summary report is available upon request.[6]

Selected insights from both consultations were incorporated into this technical proposal to substantiate key design decisions. All feedback was carefully reviewed by the JRC and considered—together with other empirical evidence—in developing the proposal.

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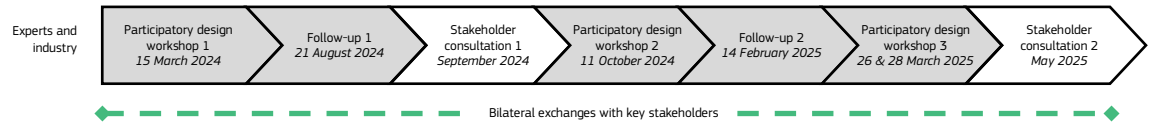
[5] Responses can be accessed under https://ec.europa.eu/eusurvey/publication/WSL-ESC (last accessed 24/07/2025).

[6] Responses can be accessed under https://ec.europa.eu/eusurvey/publication/WSL-ESC-2 (last accessed 24/07/2025).

2.3.2. Participatory design workshops with expert stakeholders

Figure 4. Relative timeline of participatory design workshops with expert stakeholders.



Source: Author's elaboration.

Participatory design workshops were organised throughout 2024 and early 2025 with systematically selected groups of 32–38 expert stakeholders:

- March 2023: first in-person participatory workshop.
- October 2024: second in-person workshop, focused on Prototype 1.
- March 2025: third workshop, held online, focused on Prototype 2 and the draft user guidelines.

Additional exchanges, including interviews, meetings and email correspondence, took place between and after the workshops. Four experts also conducted exploratory testing of labels in their workplaces.

The workshops followed a participatory and design-driven approach, engaging stakeholders with diverse profiles, interests, and experiences in waste sorting and labelling. Activities were designed to:

1. collect qualitative insights on participants' experiences, needs, and practical challenges related to waste sorting and labels;
2. explore and co-design potential solutions and applications for waste-sorting labels; and
3. foster collaboration and creative problem-solving through visual and participatory methods.

These workshops aimed to reduce the gap between product design and user needs by involving end-users and practitioners likely to interact with or be affected by the labelling system.

Participant selection

Experts for the first workshop were recruited through an open call.[7] From 171 applications, over 50 professionals were contacted to ensure diversity in profession, institutional role, Member State, age, and gender, while considering availability. Applicants with less than five years of relevant experience or from non-EU countries were excluded.

Participants were reminded that they were invited in their individual capacity, not as institutional representatives, to preserve the qualitative and exploratory nature of the methodology. The number of participants was limited to approximately 35 for reasons of practicality.

7 https://policy-lab.ec.europa.eu/news/call-experts-packaging-waste-sorting-or-waste-sorting-labels-european-union-2023-11-07_en (last accessed 24/07/2025).

Participants represented five main stakeholder categories, from around 20 MS (numbers varied by session):

1. producers and experts from industries creating and/or using packaging;
2. waste-policy experts from local, regional, national, or EU levels;
3. waste-management professionals, including infrastructure operators, treatment centres, extended producer responsibility (EPR) organisations, and municipal departments;
4. experts from organisations implementing national waste-sorting schemes; and
5. experts and scientists from environmental NGOs, educational or communication initiatives related to waste sorting.

Based on desk research, exchanges with workshop participants, and new challenges identified during the project, additional stakeholder profiles were invited to broaden perspectives and ensure balanced representation throughout the sessions.

Strategy and methodology:

Stakeholder engagement was maintained across all key project phases, primarily through workshops and online follow-up sessions, involving—wherever possible—the same group of expert stakeholders. Each of the three workshops was designed with distinct methodological objectives, aligned with specific work streams and deliverables of the project. Figure 5 provides an overview of the workshop series and their objectives. Detailed descriptions of tools, techniques, and methods applied in each session are available in the dedicated report for this work stream.

The first workshop focused on knowledge sharing and co-creation among participants from diverse professional backgrounds and MS. It aimed to develop a shared understanding of the current EU landscape regarding waste sorting and labelling. The session took place in Brussels and brought together 31 participants from 21 MS for a full-day, in-person workshop.

The second workshop, also held in Brussels, presented Prototype 1 and gathered feedback through interactive, hands-on co-design activities. These exercises helped identify profession-specific and country-specific needs and challenges related to the labelling system. A total of 38 participants from 20 MS took part in this full-day session.

The third workshop, conducted online, presented draft sections of the user guidelines and collected feedback on implementation-oriented challenges. To facilitate participation, two identical online sessions were organised, attended by a total of 28 participants from 17 MS.

Figure 5. Outline of workshop series structure.

Source: Author's elaboration.

Role of insights to inform prototypes and technical proposal:

The participatory workshops generated three main types of insights that directly informed the development of the EU harmonised waste-sorting labelling system. In addition, several broader systemic observations related to packaging waste, sorting, and collection practices were collected.

First, stakeholders shared profession- and country-specific practices throughout the project, highlighting detailed cases that go beyond general labelling needs. Examples included Member State–specific requirements for label granularity and their underlying rationales; approaches to labelling and collecting composite packaging and spray cans; the use of transparent bags for sorted waste; and technical constraints such as printing limitations or surface irregularities that influence label design.

Second, through hands-on co-design activities, participants collaboratively explored solutions to eight previously identified design challenges. These included:

— placement and size of labels on packaging;

— multi-country labelling;

— labelling of multi-component packaging;

— placement and size of labels on receptacles;

— alignment of waste-sorting and deposit-return system (DRS) labels;

— colour use;

— the design of citizen communication materials (flyer); and

— labelling for industrially compostable packaging.

For instance, one group developed four alternative approaches to labelling multi-component and multi-material packaging to provide flexibility for producers. Based on this work, the JRC formulated

three refined options addressing diverse packaging configurations while maintaining consumer clarity.

Third, the workshops helped identify key drivers, resistances, and stakeholder interests concerning different labelling options, along with the underlying rationales shaping their positions.

Finally, the design-driven methods used in the workshops also revealed systemic insights that extended beyond the project's primary focus on labelling. These included, for example, the need to expand collection points and kerbside services, or the potential for eco-design pressures arising from labelling requirements.

2.3.3. Interviews, meetings and email exchanges with key stakeholders

Throughout the project, the JRC maintained regular exchanges with key stakeholders through interviews, meetings, and written correspondence. Inputs were received both upon JRC request and through stakeholders' own initiative, including position papers and other written contributions. All inputs were reviewed and discussed with the aim of interpreting them objectively and scientifically, ensuring fair representation and balanced consideration of stakeholder views.

Where appropriate, the JRC responded directly to stakeholder queries or comments to clarify methodological aspects or provide factual information. A list of expert stakeholders who contributed input—whether through consultations or bilateral exchanges—is included in Annex IV (excluding participants from the expert stakeholder workshops to safeguard data privacy). Box 2 discusses challenges related to the handling of stakeholder input as part of the project phases to ultimately inform the technical proposal.

Box 2. Challenges in incorporating expert stakeholder preferences.

The empirical work underlying the JRC technical proposal for EU harmonised waste-sorting labels is based on a scientific and evidence-driven methodology. While many stakeholders expressed support for harmonisation and improved consumer outcomes, their feedback often reflected sectoral interests and operational priorities.

Several recurring dynamics were observed:

— Framing private interests as public interest: Certain stakeholders presented their own compliance or operational preferences as aligned with consumer needs, often without supporting evidence, and at times contrary to citizen-based findings from surveys and workshops.

— Neglect of citizen-based evidence: Some proposals discounted empirically validated consumer insights on salience, clarity, and behavioural effectiveness, instead prioritising cost-efficiency or technical simplicity.

— Overrepresentation of strong lobbying voices: Packaging industry representatives, supported by established associations and policy networks, were often more visible and active than consumer organisations or waste management actors. Despite invitations, consumer associations engaged only marginally, leading to limited representation of citizen and local authority perspectives.

These patterns highlight the need for a cautious and evidence-based interpretation of stakeholder input. Aggregating stakeholder preferences without behavioural validation could lead to suboptimal design choices. Instead, scientific evidence from participatory design and controlled experiments should guide label development to effectively improve sorting behaviour across the EU.

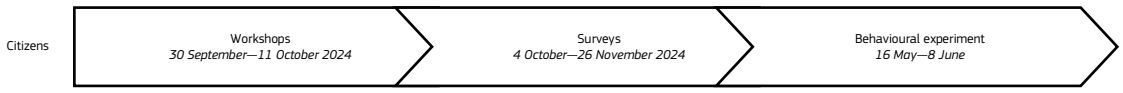
For transparency, it should also be noted that ongoing JRC scientific work on this topic was repeatedly targeted by packaging industry actors seeking to influence the proposal. The JRC consistently clarified that

its role was to conduct independent scientific analysis to inform the subsequent policy process led by DG Environment, within which further political negotiation and stakeholder input would take place.

All analyses were carried out with the objective of considering all stakeholder input in a fair and equitable manner, within the limits of available resources. The reflections presented here aim to provide transparency rather than to criticise any individual stakeholder or group, and to acknowledge the complexity of balancing diverse perspectives in an evidence-based policy support process.

2.4. Interactions with citizens

Figure 6. Relative timeline of interactions with citizens.



Source: Author's elaboration.

Citizen interaction formed an integral component of the project from its inception. The JRC, in collaboration with contractors led by Open Evidence, systematically engaged citizens at three distinct stages (Figure 6). These activities combined online and in-person participatory design workshops, an online experimental survey, and an online behavioural experiment conducted at different points in time.

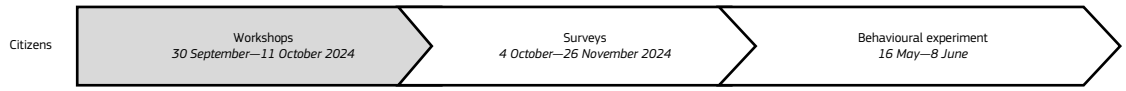
The three main citizen research activities were as follows:

1. Participatory design workshops (September–October 2024): Conducted by Politecnico di Milano within the Open Evidence Consortium, these workshops explored citizens' needs, expectations, and perceptions regarding the first labelling prototype, engaging 245 participants across six MS (Liva et al., 2025).
2. Citizen survey (October–November 2024): Led by Open Evidence, this large-scale online survey examined the influence of key label features—such as colour, text, and pictograms—on noticeability, understanding, and sorting accuracy. It included 16,380 participants from 21 MS (Liva et al., 2025).
3. Behavioural experiment (May 2025): Conducted by Open Evidence, this study tested the effectiveness of the second labelling prototype in improving sorting performance, involving 11,096 participants across 11 MS (Negrini et al., 2025).

Insights from these activities directly informed the iterative development and refinement of the labelling prototypes, ensuring that the final proposal was grounded in empirical evidence on citizen understanding, usability, and sorting behaviour.

2.4.1. Participatory design workshops with citizens

Figure 7. Relative time of participatory design workshops with citizens.



Source: Author's elaboration.

The project team, led by Politecnico di Milano within the Open Evidence Consortium, conducted participatory design workshops with citizens to collect their views, needs, and expectations regarding the design of the EU waste-sorting label system (Figure 7). Prototype 1 was used for this activity, allowing participants to provide detailed feedback and identify improvements for subsequent development (see Annex I).

Workshops took place between 30 September and 11 October 2024 in Italy, Austria, Poland, Estonia, Greece, and the Czech Republic, with two workshops held per country and a total of 245 participants. [8] Sessions in Italy were conducted in person, while those in other countries took place online, ensuring both the inclusion of diverse regional perspectives and the benefits of interactive, hands-on engagement.

The workshops aimed to assess the suitability and clarity of Prototype 1 and to generate evidence for the development of Prototype 2. Adopting a co-creation approach, citizens were actively involved as collaborators, contributing their lived experiences to inform intuitive and effective label designs through interactive group exercises.

Figure 8 presents the main components and activities of the citizen workshops. Each session, lasting around two hours, followed a standardised methodological template and was moderated by trained facilitators. Workshops began with an introduction to the study purpose, the broader context of EU waste-sorting labelling, and participants' roles, followed by a warm-up activity to familiarise participants with digital collaboration tools such as Miro and WooClap.

The core activities consisted of two phases:

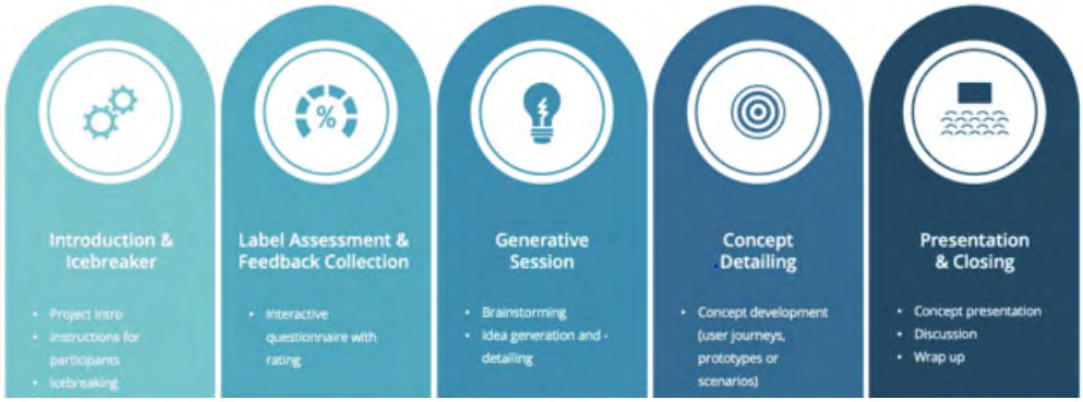
— Assessment phase: Participants reviewed Prototype 1 and evaluated the comprehensibility, attractiveness, and usability of label elements—including pictograms, colours, and text—both individually and in groups. Discussions focused on clarity, consistency with expectations, and alignment with local sorting practices.

[8] We selected 21 key countries for the empirical work (workshops, survey and experiment), guided by a structured methodology designed to maximize representation of the EU's diversity in waste-sorting practices. Countries were grouped based on five criteria: (1) consumer waste sorting practices, (2) the existence of a national visual waste-sorting system (on-pack, on bins, or none), (3) the recycling rate of municipal waste, (4) country population, and (5) geographical location. After categorizing MS according to these characteristics, a subset of countries was chosen to ensure broad coverage and reflect national contexts and waste-sorting peculiarities. This approach allowed us to capture the variation in European waste-sorting practices and the range of existing labelling systems, informing a balanced and comprehensive survey design. In the final selection of countries, practical considerations were also accommodated.

— Generative phase: Participants co-designed or adapted label elements, suggesting improvements to enhance intuitiveness and usability. They discussed how best to represent materials, distinguish similar waste types, and reflect local waste-sorting systems.

Each session concluded with a reflection phase, during which participants summarised key takeaways and recommendations. All input was documented in real time using digital tools, ensuring consistency and comparability across countries. The workshop design combined open expression with structured analysis, feeding directly into the iterative development of Prototype 2.

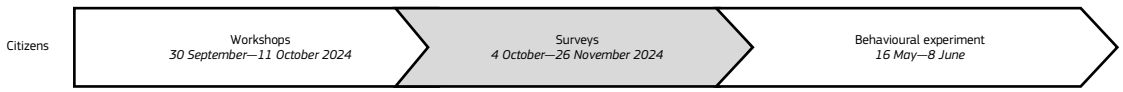
Figure 8. Building blocks and activities of the citizen workshops.



Source: European Commission. Joint Research Centre (2025).

2.4.2. Citizen survey

Figure 9. Relative time of citizen surveys.



Source: Author's elaboration.

The project team, led by Open Evidence, designed and conducted an online citizen survey to assess how key label elements influence consumer perceptions, understanding, and preferences (Figure 9). The survey explored the noticeability and comprehensibility of labels, associations between colours and materials, visual preferences, and broader attitudes and challenges related to waste sorting and labelling.

The survey ran from 4 October to 26 November 2024, engaging approximately 800 participants per Member State across 21 EU countries, namely, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Spain, Sweden (N = 16 380). Samples were broadly representative by gender,

age, education, income, and living area.[9,10] The survey used labels from the Nordic pictogram system, selected because it met key PPWR requirements—notably its material-based focus and matching approach between packaging and receptacles—at a time when an EU-specific prototype was not yet available. The rationale for using the Nordic scheme as a conceptual basis for EU harmonised labels is summarised in Box 3.

The survey began with an introduction and consent form, followed by demographic profiling to ensure representativeness. Its main body consisted of five experimental sections designed to capture different aspects of label perception and usability.

The first section, a salience task, tested the noticeability of labels in realistic visual contexts. Participants viewed images of packaging or receptacles featuring different label configurations and were timed on how quickly and accurately they identified them. Experimental variations included colour (black-and-white vs. coloured), presence of text indicating the material, presence of additional labels, and colour matching between packaging and receptacles. These elements were selected because their behavioural effects were not yet clearly established in the literature.

The second section assessed understanding. Participants were shown ten packaging items and asked to assign them to the correct bin based on labels applied to both packaging and receptacles. This task measured comprehension of label associations and the effectiveness of the system in guiding sorting behaviour. It varied the same design features as the first task and additionally tested the impact of component pictograms linking labels and individual packaging components for multi-component packaging. The task was conducted under a universal waste collection scheme rather than country-specific ones, allowing for controlled comparisons while still reflecting participants' prior sorting experiences.

The third section explored colour familiarity, measuring which colours participants naturally associated with different materials. The fourth section, the label builder task, allowed participants to create their preferred label design. They could choose between coloured or monochrome versions, with or without text, specify language, decide on the inclusion of material identifiers and QR codes, and select whether to use multi-component pictograms.

Finally, the ex-post questionnaire examined broader attitudes and behaviours related to waste sorting and labelling. It gathered information on label visibility and usefulness, motivation and perceived ability to sort correctly, environmental concern, social norms, and views on digital tools such as QR codes. These data supported interpretation of the experimental results and provided additional insights into contextual factors influencing sorting behaviour.

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9 See footnote 8 for a description of the procedure to select countries for the empirical work.

10 As described in European Commission: Joint Research Centre et al. (2025) there are some limitations concerning the representativeness of the survey sample. Despite extensive efforts to achieve a balanced distribution, challenges remained in reaching certain demographic groups, notably individuals with lower educational attainment, lower incomes, and those residing in rural areas. To mitigate these challenges, the consortium first enabled survey participation via mobile phones, then relaxed certain soft quotas—such as those for rural/urban residence, income, and educational level—allowing deviations of up to ±20 % while strictly adhering to core quotas gender and age. These adaptations, though essential to complete data collection, introduced some imbalances affecting the overall representativeness and generalizability of the survey results across all demographic segments of the population. Thus, caution is required in interpreting and extrapolating the findings to the broader EU population.

Box 3. Nordic pictogram scheme as a basis for EU harmonised sorting labels.

The Nordic pictogram scheme served as a conceptual reference for developing the EU harmonised waste-sorting labels. It was selected because it reflects several key design principles aligned with the PPWR, notably the material-based focus and the matching approach between packaging and receptacles. This assessment summarises its main advantages and limitations based on expert analysis, user manual reviews, and PPWR requirements. The IA for the PPWR also identified the Nordic scheme as a relevant starting point (European Commission, 2022).

Advantages:

— Material-based: The Nordic system primarily identifies materials rather than products or disposal destinations, aligning with the PPWR requirement to indicate material composition on labels.

— Modular: It follows a modular structure that allows combining different pictograms and colours on packaging and receptacles, making it adaptable to multi-material and multi-component packaging and to diverse national or regional collection systems.

— Matching principle: Identical labels appear on packaging and receptacles, enabling citizens to intuitively match them and thus improving sorting accuracy—an approach explicitly endorsed by the PPWR.

— Proven flexibility: The system is used across several Nordic countries with varying collection practices, demonstrating its adaptability and offering a practical foundation for broader EU application.

Limitations:

— Not purely material-based: Some Nordic labels refer to destinations or product categories (e.g. “residual waste,” “toys”), which complicates alignment with the PPWR’s strictly material-based scope but reflects real-world sorting complexities.

— Voluntary framework: As a non-mandatory scheme, its implementation and coverage vary across sectors. Transitioning to a mandatory EU-wide framework would require adaptations and validation under harmonised conditions.

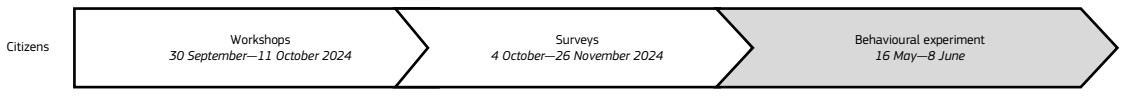
— Broader scope than the PPWR: The Nordic scheme also covers non-packaging waste (e.g. electronics, furniture). In countries retaining these broader applications, overlap with the packaging-specific EU system could create consumer confusion.

— Limited granularity: The scheme was not designed to capture the level of material differentiation required for EU harmonisation, particularly regarding composite, compostable, or bio-based packaging. Additional pictograms and categories are therefore needed to meet PPWR specifications.

In summary, the Nordic pictogram scheme provided a useful and evidence-based starting point due to its intuitive design, modularity, and demonstrated applicability. However, its voluntary character, broader material scope, and insufficient granularity necessitate substantial adaptation to meet the technical, regulatory, and behavioural requirements of the EU harmonised labelling system.

2.4.3. Behavioural experiment

Figure 10. Relative time of behavioural experiments with citizens.



Source: Author’s elaboration.

The project team, led by Open Evidence, conducted an online behavioural experiment to evaluate how Prototype 2 of the EU harmonised waste-sorting labels performed compared with a baseline condition without packaging labels, where only material names appeared on waste receptacles (Figure 10). The experiment replicated the correct sorting task from the online survey and was followed by comprehension and preference-elicitation tasks.

The experiment took place from 16 May to 8 June 2025 and included around 1 000 participants per Member State across 11 countries—Austria, Belgium, Czech Republic, Denmark, Estonia, France, Greece, Italy, Poland, Portugal, and Romania—resulting in a total sample of 11 096 participants.[11] The samples were somewhat representative based on gender, age, education, living area, and income.[12]

The study used Prototype 2 labels in coloured versions without text on packaging and coloured versions with country-specific text on receptacles. No additional label variations were tested in this task. As in the survey, sorting followed a universal rather than country-specific waste-collection scheme, ensuring comparability while acknowledging participants' national sorting experiences.

The experiment addressed three main research questions:

1. Does the new labelling system improve sorting accuracy?
2. Do participants understand its design principles and label elements?
3. Which label features and design attributes do participants prefer?

Accordingly, the experiment was divided into three main sections:

1. Sorting accuracy task: Participants sorted ten packaging items into the correct receptacles. Each was randomly assigned to either a control group (no packaging labels; text-only receptacle labels) or a treatment group (Prototype 2 labels on packaging and receptacles). Sorting accuracy was measured by the number of correctly sorted items. Participants also rated their confidence in selected choices and estimated others' expected accuracy.
2. Comprehension and perception task: This section assessed understanding of the matching logic and the association between materials and labels. It measured both objective comprehension and subjective clarity, before and after a brief explanation of the labelling system.
3. Preference-elicitation task: Participants indicated their preferred label features, including pictogram and colour use, ease of understanding, and attitudes toward digital tools such as QR codes. They also reflected on perceived implementation challenges.

The task sequence was designed to minimise priming effects, collecting behavioural measures before attitudinal responses. To maintain engagement, participants could earn a modest

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[11] See footnote 8 for a description of the procedure to select countries for the empirical work.

[12] As described in Negrini et al. (2025) there are some limitations concerning the representativeness of the experiment sample, like in the survey described in footnote 10. Soft quotas for characteristics such as education, income, and type of residence were relaxed to facilitate reaching difficult-to-recruit groups like individuals with lower education levels, lower income, and those living in rural areas. This relaxation resulted in deviations from the target distributions in certain countries. However, mobile participation was not possible.

performance-based bonus. This structure ensured robust, unbiased insights into how Prototype 2 affects sorting performance, comprehension, and user preferences.

3. Key aspects of the proposed EU waste sorting labelling system

This section presents the core parameters and requirements relevant to the design of EU harmonised waste-sorting labels, as defined in the PPWR (Section 3.1). It further examines the role of harmonised labelling in reducing internal market barriers created by divergent national packaging labelling requirements (Section 3.2), and discusses key conceptual and practical challenges inherent in the proposed approach (Section 3.3).

3.1. Design parameters and requirements defined in the PPWR

This section summarises the key provisions of the PPWR that define the framework for developing EU harmonised waste-sorting labels. It highlights the material-based focus of the labelling system and relevant exceptions (Section 3.1.1), followed by discussions on granularity (Section 3.1.2), the matching principle (Section 3.1.3), the modular approach (Section 3.1.4) and the concept of meta-labels (Section 3.1.5).

Table 1 outlines the principal PPWR articles and recitals with direct implications for label design.

Under Article 12(1), all packaging must bear a label indicating its material composition, supporting correct consumer sorting through material-specific pictograms. This provision also defines exemptions for certain types of packaging—specifically transport packaging (except for e-commerce) and packaging covered by DRS—reflecting their distinct collection and recovery pathways.

Articles 12(1) and 12(5) permit the use of optional digital data carriers (e.g. QR codes) to provide supplementary information, including on the destination of each separate component of the packaging. Article 12(5) also specifies the conditions under which such information may be provided exclusively through an electronically readable data carrier.

Article 12(1) and Recital 64 require that labels be pictogram-based, use minimal language, and remain easily understandable, including for persons with disabilities. Article 12(5) further allows MS to determine one or more languages in which the label must appear, provided that it remains comprehensible. It also stipulates that labelling information must be accessible to end users prior to purchase, including through online sales.

Regarding compostable packaging, Article 9 and Recitals 50, 51, and 66 specify that labels must clearly indicate whether a material is compostable, not suitable for home composting, and must not be discarded in nature.

Finally, Article 13(2) establishes the matching requirement, stipulating that labels on packaging must correspond to those on waste receptacles. This article also acknowledges the diversity of collection systems and composite packaging configurations across MS, requiring that these specificities be duly considered in the design of the harmonised labels.

Table 1. Labelling requirements relevant to the design of EU harmonised waste sorting labels defined in the PPWR.

Design parameter / requirement	**Article**
Indicate the material composition of the packaging	12(1)
Exempt transport packaging (except e-commerce) and packaging under DRS	12(1)
May include optional QR codes or other standardised, open, digital data carriers	12(1), 12(5)
Conditions for providing information exclusively via a single electronically readable code or another type of data carrier	12(5)
Be based on pictograms; use minimal language; be easily understandable, including for persons with disabilities	12(1), recital 64
Be provided in one or more languages easily understood by end users, as determined by the Member State	12(5)
Apply to certain types of compostable packaging indicating the material is compostable, not suitable for home composting, and shall not be thrown away in nature	12(1), 9, recitals 50, 51, 66
Label information to be made available to end users before the purchase of the product through online sales.	12(5)
Consider the specificities of composite packaging	12(6), 13(2)
Ensure label consistency on both packaging and waste receptacles	13(2)
Reflect specificities of national collection systems	13(2)

Source: Regulation (EU) 2025/40.

Although not directly related to label design, the PPWR also establishes transitional provisions for the removal of existing national and regional waste-sorting labels. In accordance with Article 12, such labels must be withdrawn from packaging by 12 August 2028, or 24 months after the entry into force of the implementing acts adopted pursuant to Article 12(6) or 12(7), whichever is later.

Furthermore, Article 12(12) allows packaging covered by Article 12(1), (2), and (4) that is manufactured or imported before these deadlines and non-compliant with the new labelling requirements to remain on the market for up to three years following the entry into force of the implementing acts establishing the harmonised labelling rules.

3.1.1. Material-focus (and exceptions)

According to Article 12(1) PPWR, EU harmonised waste-sorting labels shall indicate the material composition of packaging—not its waste stream destination. This approach allows labels to remain independent of MS' specific collection systems and avoids the need for country-specific destination labels. For example, while the material composition of a packaging item is identical across the EU, a destination-based label would have to refer to local systems (e.g. *"Yellow Bag"* in Germany, *"Bac de tri"* in France), requiring different packaging labels for each Member State and disrupting harmonisation.

Consequently, most labels in the proposed EU system—as in the Nordic pictogram scheme (see Box 3)—represent materials or broader material groups such as Paper, Flexible Plastic, or Paper and Cardboard.

However, three exceptions are proposed to ensure functional implementation, prevent contamination, and reflect unavoidable differences in national waste management rules. These exceptions also provide consumers with accurate sorting information in situations not fully addressed by material-based labelling.

- **Residual waste**: Residual waste refers to material remaining after recyclable, compostable, or otherwise separately collected fractions have been removed through source or subsequent sorting. This fraction is typically directed to disposal operations under the WFD (e.g. landfill or incineration). The proposed residual label applies to packaging that does not fall under any defined material group, or that must be sorted as residual despite its material composition due to local sorting rules. Although Article 6 PPWR requires all packaging placed on the market to be recyclable by 2030 and effectively recyclable by 2035, MS will continue to face residual waste streams—such as non-recyclable or contaminated packaging, mixed waste, or packaging disposed of in single-bin public settings. The residual label therefore serves as a fallback category, including for innovative packaging whose optimal sorting route is not yet established. Further detail is provided in Sections 3.3.4 and 4.2.1.12.
- **Compostable packaging**: Labels for industrially and home compostable packaging identify packaging designed for the respective composting processes (Article 9 PPWR), regardless of whether the polymers or fibres are of organic or fossil origin. Compostability concerns the end-of-life treatment, not the material itself. Article 12(1) specifies that labels shall indicate when a material referred to in Article 9(1) and, where applicable, 9(2), is compostable, not suitable for home composting, and must not be discarded in nature. Details are provided in Sections 3.3.3 and 4.2.1.9.
- **Hazardous packaging**: The hazardous packaging label addresses packaging with hazardous properties, typically due to its contents. Article 55(1)(c) PPWR requires MS to provide end-users with information on their role in the separate collection of such packaging. While the Regulation does not explicitly mandate a corresponding label, Sections 3.3.3 and 4.2.1.13 discusses why including it could help prevent incorrect sorting and improve safety. Its potential inclusion should be further examined during the negotiations of the implementing act.

3.1.2. Granularity

While Article 12(1) PPWR clearly focuses on labelling the material composition of packaging, it does not specify the required level of granularity—that is, how detailed the material identification on labels should be. Granularity refers to the number and specificity of distinct material categories for which harmonised waste-sorting labels are proposed. It determines whether materials are grouped under broader categories (e.g. plastic) or differentiated into sub-types (e.g. PET, high-density polyethylene, HDPE). Achieving the right balance is crucial: too little granularity provides vague guidance, while too much may overwhelm consumers and complicate implementation.

The following determinants of optimal granularity were derived from the JRC's own analysis and external research on Member State practices (European Environment Agency, 2025), as well as

from the PPWR (notably Annex II, Table 1) and related legislation (Commission Decision 97/129/EC [13]). Further reflections are provided in Section 4.2.1.

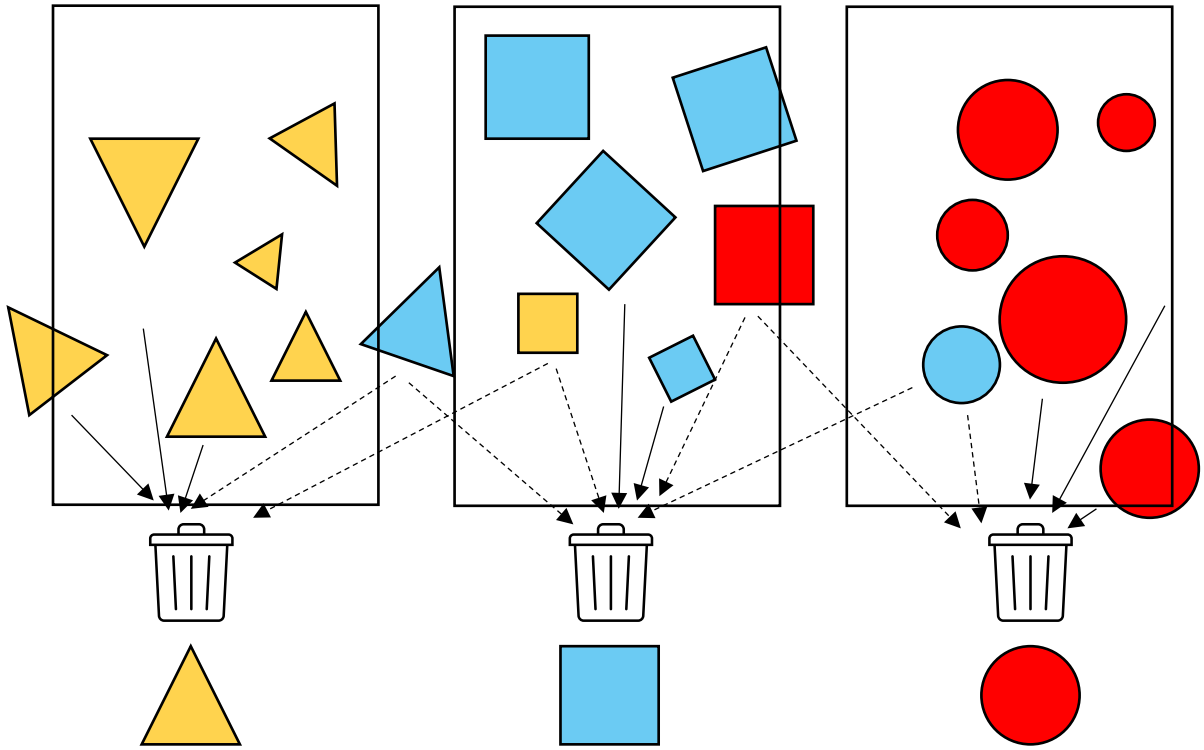
- **Simplicity & usability**: Increasing granularity raises the number of labels consumers and waste management operators must distinguish, making the system more complex and potentially reducing usability. It may also require multiple labels on multi-material packaging and on receptacles that collect several materials together.
- **Sorting practices and sorting infrastructure**: The harmonised system should support the finest level of sorting practiced in any Member State to ensure inclusiveness and avoid discouraging citizens from separating materials their local systems can handle. In a material-based matching system, if any Member State collects two materials separately, distinct labels are required for both to maintain consistency across the EU. For systems with lower collection granularity, optional meta-labels on receptacles can be used to group materials, though this may introduce challenges for consumer comprehension and accessibility (see Section 4.2.4).
- **Interplay of consumer sorting practices and industrial sorting capabilities**: In some contexts, industrial sorting technologies can achieve similar or better separation than consumers, justifying lower label granularity where it does not compromise recycling outcomes. However, merging visibly distinct materials under one label can undermine consumer confidence and trust. Effective communication and education are therefore essential to sustain understanding and acceptance. As waste management technologies evolve, the system should remain adaptable to future changes.
- **Clear definition of material categories**: Some materials lack harmonised EU-wide definitions, creating challenges for labelling. This is particularly relevant for composite and compostable packaging, where MS apply varying thresholds to determine the dominant material (e.g. the 5 % threshold in the PPWR; see Sections 4.2.1.5 and 4.2.1.9). Such inconsistencies should be addressed through clear and standardised definitions at EU level.

Figure 11 illustrates these trade-offs conceptually. Each geometric shape represents a material, while other attributes (colour, size, orientation) denote additional characteristics such as coatings or prior contents. Some of these are relevant for sorting, while others are not. Labels are intended to direct packaging into appropriate waste receptacles based on relevant criteria. In most cases (solid arrows), assignment is clear, while ambiguous in others (dashed arrows). This highlights the challenge in designing a comprehensive *and* user-friendly labelling, particularly when items share characteristics across categories.

This illustrates the challenge of label granularity: in the example, an unambiguous assignment based on both shape and colour would require receptacles and labels not just for material (shape), but also for each colour variant—e.g., separate bins for blue and yellow triangles, red, yellow, and blue squares, and so on. While this would eliminate classification ambiguity, it would significantly increase the complexity of the labelling system, both for system designers and for users. The figure thus captures the central trade-off between clarity and usability in designing effective labels.

[13] 97/129/EC: Commission Decision of 28 January 1997 establishing the identification system for packaging materials pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste (Text with EEA relevance).

Figure 11. Conceptual representation label objective to assign items varying along various dimension to the most suitable bins.



Source: Author's elaboration.

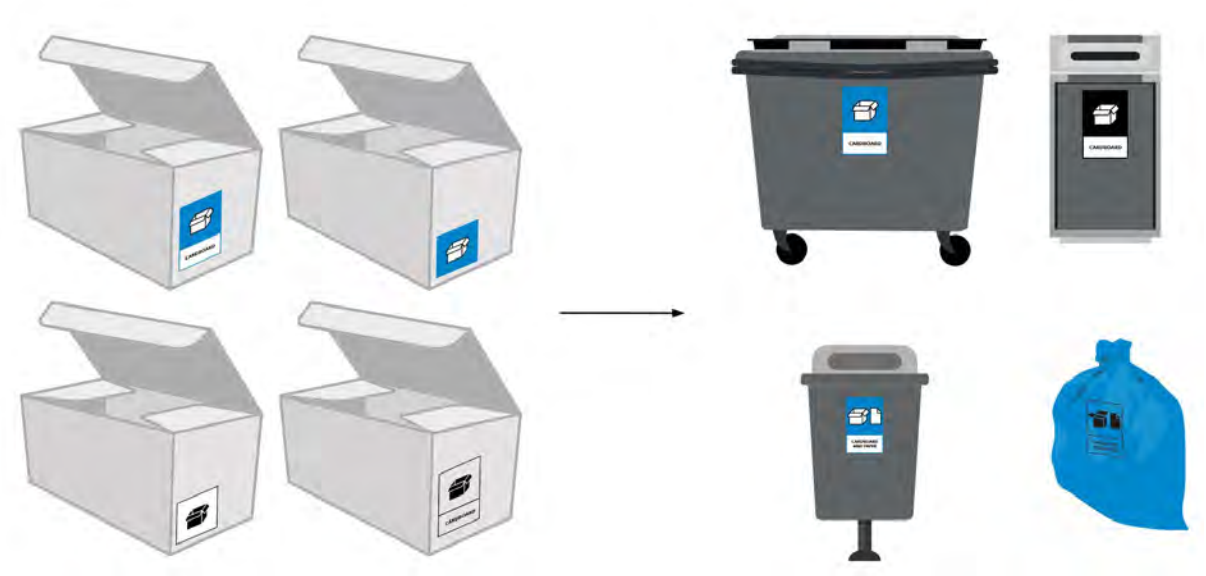
3.1.3. Matching

To guide correct consumer sorting, identical or corresponding labels are applied to packaging and to the waste receptacles into which they should be placed. This matching principle enables consumers to recognise the correct disposal option through visual alignment between the two labels.

The proposed label design allows a degree of controlled variation to accommodate different implementation contexts—particularly regarding colour and text. For example, a packaging label may appear in black and white without text, while the corresponding receptacle label may include colour and text in the local language(s). In such cases, the pictogram serves as the common and consistent visual cue that enables consumers to match the packaging with the appropriate receptacle.

Figure 12 illustrates this principle, showing how consumers will have to use shared visual features—at least pictograms—to align packaging and receptacle labels. Box 4 provides insights from the behavioural experiment on levels of understanding of this principle among citizens.

Figure 12. Visual depiction of the matching principle.



Source: Author's elaboration.

Box 4. Citizen understanding of the matching principle

The behavioural experiment tested participants' comprehension of the matching system by showing images of labelled packaging items and waste bins. Approximately 82 % of participants reported having all the information they needed to sort correctly, while 10 % reported lacking sufficient information (the remainder were unsure).

When asked to explain their reasoning, participants indicated relying primarily on colour, text, and pictograms, as well as on familiarity with materials and existing sorting habits. After receiving a brief visual and textual explanation of the matching concept, 68 % stated that the system had already been clear to them, 29 % said they had a general idea, and only 3 % reported that they did not understand it. Further methodological details are provided in European Commission: Joint Research Centre et al. (2025).

3.1.4. Modularity

Packaging and waste receptacles often consist of, or are designed to collect, multiple materials (see Section 3.1.2 on granularity). The modular approach in the proposed labelling system ensures that such complexity can be communicated clearly and consistently to consumers, while remaining adaptable to the diversity of waste collection systems across MS.

Under this approach, multiple labels may appear on a single packaging item or receptacle to reflect their respective material compositions or collection scopes:

— For packaging: Multiple labels can be applied to indicate the materials of different components (e.g. a plastic tray with a cardboard sleeve). This enables consumers to separate and dispose of each component correctly. Further guidance on the labelling of multi-component packaging is provided in Section 4.2.2.

— For receptacles: Multiple labels indicate that several material types can be deposited in the same bin (e.g. Plastic & Metal). This helps align consumer behaviour with local collection practices and ensures consistency between packaging and receptacle labelling.

3.1.5. Meta-labels

Meta-labels are combined labels representing two related materials under a single symbol that features two pictograms. They are particularly relevant for waste receptacles that collect several materials together—either commingled or separately—depending on national or regional waste management systems. Importantly, meta-labels are intended for receptacles only and should not be applied to packaging.

Functionally, meta-labels integrate the pictograms of their constituent materials to indicate which fractions can be deposited together. For example, the paper and cardboard meta-label combines both pictograms, reflecting their shared fibre-based composition and frequent joint collection in several MS. This approach simplifies visual communication and reduces space constraints on receptacles while preserving clarity about the materials included.

However, meta-labels may pose interpretation challenges if users do not clearly understand the relationship between the combined and individual material labels on receptacles and packaging. For this reason, their use should remain selective and well-justified, supported by clear communication and user guidance. Further detail and practical considerations are discussed in Section 4.2.4.

3.2. Avoiding market fragmentation

Creating EU harmonised waste-sorting labels directly addresses internal market barriers arising from divergent national packaging-label requirements (Pierri et al., 2024). Fragmented rules and vague specifications create uncertainty and additional costs for economic operators. Producers often need to print multiple label versions to comply with country-specific obligations, increasing material use and production complexity while limiting economies of scale. Consumers moving or travelling across MS face inconsistent visual signals, which can reduce sorting accuracy and confidence.

The PPWR mitigates these issues by mandating harmonised labels based on pictograms indicating material composition, rather than national sorting destinations. These pictograms appear both on packaging and on receptacles to enable intuitive matching. Design should therefore largely rely on language-independent visual cues, complemented by minimal text where needed to enhance clarity. Excessive use of text creates translation burdens for producers, enlarges label size, and risks semantic inconsistencies between languages (for example, “plastic” vs “carton”). Multiple translations may also reduce visual clarity and increase cognitive load for consumers. Although these challenges affect both packaging and receptacle labels, the implications for single-market functioning primarily concern packaging labels.

By focusing on materials rather than destinations, and by following a hierarchical and modular design, the proposed EU harmonised labelling system allows adaptation to different collection granularities while preserving its core harmonised elements. As discussed in Section 4.1.4, packaging labels are designed to use but not rely on text: the matching mechanism functions primarily through pictograms, supported by colour and, where helpful, short material names and complementary sorting information to assure providing consumers with sufficient information for accurate sorting. Behavioural and desk-research findings indicate that limited text can support consumer comprehension; therefore, its use is encouraged where space and feasibility permit.

Overall, the proposal seeks a balance between harmonisation and flexibility. It recommends clear, recognisable labels that ensure effective sorting guidance for citizens while remaining practicable for producers. As the PPWR defines the scope and obligations, this proposal does not introduce

exceptions regarding translation requirements set by MS. To prevent renewed market fragmentation, MS are strongly encouraged not to impose additional national text or language obligations beyond those foreseen in EU legislation. The technical proposal and user guidelines provide several non-binding recommendations aimed at supporting consistent understanding and implementation across the single market.

3.3. Key challenges

During the development of the EU harmonised waste-sorting labels, several challenges intrinsic to the conceptual design approach became evident. These challenges correspond to core elements described in Section 3.1 and reflect structural tensions between harmonisation, clarity, and national diversity in waste management systems.

This section discusses the main categories of challenges identified: the specification of granularity (Section 3.3.1), reliance on the matching principle (Section 3.3.2), non-material characteristics and related exceptions (Section 3.3.3), the definition of the residual waste stream (Section 3.3.4), and the need for supervision and coordination beyond project scope for implementation (Section 3.3.5).

These challenges are largely inherent to the chosen conceptual framework and cannot be fully resolved within the scope of this proposal. The following subsections describe each challenge in turn and outline potential approaches for mitigation and further consideration during implementation.

3.3.1. Specification of granularity

Key challenge: As outlined in Section 3.1.2, determining the optimal level of granularity involves balancing completeness and simplicity. MS, regions, and municipalities apply highly diverse and often detailed waste-sorting rules—many of which depend on factors beyond material composition Section 3.3.3). Consequently, it is impossible to define a universally “correct” level of granularity using purely objective criteria. Effective granularity therefore depends on an acceptable balance between oversimplification (risking inaccurate sorting instructions) and excessive complexity (risking confusion and inefficiency).

For example, a cardboard pizza box is typically sorted as cardboard and labelled accordingly. However, when contaminated with food residues, it may need to be disposed of as residual waste to preserve recycling quality. A hypothetical solution would be to introduce distinct labels for “clean cardboard” and “contaminated cardboard”. Yet contamination thresholds may differ across MS or municipalities—some allowing 10 % contamination, others up to 50 %. Similar discrepancies exist for other characteristics such as paper-content in composite packaging (Section 4.2.1.5), packaging size, shape, or coating. Attempting to reflect these local nuances through ever finer label differentiation would result in an unmanageable and counterproductive level of granularity.

Excessive granularity would also undermine consumer usability. A greater number of distinct labels on packaging and receptacles risks overwhelming citizens, reducing comprehension and motivation to sort correctly.

Proposal to address the challenge: The proposed level of granularity was iteratively developed through desk research and stakeholder input. It recognises that no EU labelling system can provide fully complete or context-specific sorting guidance. Given the continuous evolution of collection and sorting practices, any fixed level of detail would soon require adjustment.

The harmonised waste-sorting labels should therefore be understood as a baseline system: sufficiently detailed to represent the main material categories across the EU, yet general enough to remain applicable and recognisable in diverse local contexts. Complementary information channels—such as digital data carriers, local authority communications, or awareness campaigns—will remain necessary to convey context-specific rules (e.g. for contamination thresholds or special collection arrangements).

Ultimately, the success of the labelling system should be assessed not by perfect alignment with all local sorting rules, but by its ability to improve overall sorting behaviour and understanding among consumers across MS. This pragmatic approach accepts that the labels are a simplification tool rather than a complete decision framework. Addressing residual divergences and ensuring consistency over time will require continued coordination and monitoring beyond the scope of this technical proposal. Waste management stakeholders and MS might find this unacceptable, due to a potential negative impact on their sorting quality, risking their opposition during negotiations of the implementing act. We note that addressing these challenges will require work beyond the delivery of this technical proposal.

3.3.2. Reliance on matching

Key challenge In a matching-based labelling system, consumers infer how to sort packaging waste by aligning identical or corresponding labels on packaging and waste receptacles (see Section 3.1.3). However, the central matching element—the pictogram—may not always clearly convey which packaging items it represents. Stakeholders noted (see Section 4.1.2) that certain pictograms cannot capture the full diversity of packaging shapes and formats within a material category. For instance, some requested that glass labels feature multiple pictograms to represent different container types, or that pictograms be adapted to more closely resemble specific products.

Nevertheless, the pictograms are not intended to depict every possible packaging type. Their purpose is to provide a consistent visual cue that enables matching between packaging and receptacles, supported where appropriate by colour and text. When viewed in isolation, a packaging label may therefore appear ambiguous—particularly in achromatic versions, when colours differ from familiar national schemes, or when text indicating the material fraction is omitted. The correct interpretation becomes clear primarily when packaging and receptacle labels are seen together.

Proposal to address the challenge: Effective use of the matching system depends on consumer familiarity and learning. In MS already employing similar approaches (e.g. Denmark, Sweden), adaptation is expected to be straightforward. Elsewhere, targeted information and education campaigns will be essential to ensure that citizens, producers, and waste-management operators understand the system's logic and recognise its visual language.

This will require coordinated implementation efforts, communication materials, and sufficient transition time to allow users to learn through repeated exposure and experience. Building this understanding is critical to ensuring that the harmonised system functions as intended. Addressing these behavioural and communication challenges extends beyond the scope of this technical proposal but is fundamental to its long-term effectiveness.

3.3.3. Non-material characteristics

Key challenge: Although the EU harmonised waste-sorting labelling system is fundamentally material-based (Section 3.1.1), several non-material characteristics may influence how citizens are instructed to sort packaging correctly under specific collection rules. These include properties such

as contamination by residues, previous contents, surface treatments or printing, size, and particularities of local collection or sorting infrastructure. As these factors fall outside material composition, the proposed labels cannot fully capture them. Consequently, two packaging items made of the same material may require different disposal routes depending on such contextual characteristics.

Proposal to address the challenge: To address these cases, the proposed labelling system includes certain exceptions to the material-based principle—specifically for residual waste, compostable packaging, and hazardous packaging (see Section 3.1.1, These categories allow the system to convey more detailed sorting instructions that are not directly material-related. However, divergent national or regional rules may define or apply these exceptions differently, leading to inconsistencies in how identical packaging items should be sorted across MS. To mitigate this, the proposal foresees the optional use of country indicators on packaging labels when national variations are unavoidable (see Section 4.2.2). While this measure enhances transparency, it has clear limitations and should be complemented by further coordination at EU level. In particularly complex cases—such as packaging types whose correct sorting depends on multiple non-material criteria—it may be necessary to consider temporary exemptions from labelling obligations until harmonised solutions are defined.

Finally, when evaluating such exceptions, it is important to consider the economic and behavioural costs of mis-sorting caused by unclear or inconsistent labelling. These costs should be factored into future assessments and refinements of the system to ensure that harmonisation effectively supports both regulatory and behavioural objectives.

3.3.4. Residual waste stream

Key challenge: This challenge is closely linked to the issue of non-material characteristics discussed in Section 3.3.3. The concept of residual waste refers to waste that does not—or does not yet—belong to any recyclable material stream and is typically destined for incineration or landfill. It therefore represents a destination, not a material, creating a conceptual mismatch with the material-based focus of the PPWR and the harmonised labelling system.

Nevertheless, a residual label may be necessary to direct specific packaging items away from recyclable streams when their characteristics—such as contamination, composition, or innovative design—make them unsuitable for recycling. For example, innovative packaging materials as defined in Article 3(46) and addressed in Article 6(10) of the PPWR may not yet have an established recycling route.

Residual labels can pose challenges for consumers because they provide no direct information about the packaging material or why an item should be treated as residual. This can lead to confusion, particularly where similar items of the same material bear different labels, or where the term “residual” is interpreted as “non-recyclable.” It may also create challenges for producers, since what is classified as residual varies across MS. This context-dependence complicates harmonisation and may require producers to adapt labels to national sorting rules. In some cases, the residual label might need to be combined with material-based labels and country indicators (see Section 4.2.2).

Despite these limitations, a residual waste label can serve an important fallback function where no material label applies, or where local rules require items to be diverted from recyclable fractions. It may also be relevant for packaging exempted from the recyclability requirement under Article 6(11) of the PPWR. (see also Box 10).

Proposal to address the challenge: The proposal includes a residual label to provide specific sorting guidance for packaging that:

— must be sorted differently from its material-based label due to contamination or other conditions; or

— consists of innovative materials for which the appropriate treatment route has not yet been defined.

Whether this label must appear on packaging will depend on the relevant sorting rules and characteristics of the packaging. In some cases, a simple qualifier such as "sort as cardboard only when clean" may suffice—though this introduces language-related challenges. Complementary digital tools (e.g. QR codes) could provide country- or region-specific instructions and reduce reliance on multi-language text.

Residual labels will also be required for waste receptacles dedicated to residual waste, which exist in all MS. Their application, however, needs careful consideration. For instance, in public spaces where a single bin is available for all waste types:

(a) the residual label could be applied to indicate that all residual waste may be disposed of there, while encouraging the use of labelled bins for recyclable materials; or

(b) shared bins could display all relevant material labels to indicate the range of materials accepted.

3.3.5. Supervision beyond project scope needed for implementation

Key challenge: The harmonised labelling system is designed as a top-down approach, with the European Commission defining, through an implementing act under the PPWR, the overall label structure, visual specifications, and level of granularity at which sorting information is conveyed. While this ensures consistency across MS, it limits the ability to fully accommodate regional or local differences in waste collection practices. Furthermore, the approach must contend with an evolving and highly diverse landscape of packaging formats, materials, and waste management infrastructures.

Unlike systems that evolve organically within national contexts, it is difficult to predict the practical performance of the harmonised labels before large-scale implementation. The eventual "emergent" system—how the labels will function in practice across multiple contexts—cannot yet be fully assessed. Although stakeholders suggested pilot case studies across selected products and MS, such testing was not feasible within the available resources and timeframe, given the wide variety of packaging types and collection systems.

An additional challenge arises from the division of responsibilities between actors: packaging producers are responsible for applying labels to packaging, while waste management operators or local authorities determine and apply labels on receptacles. This decentralised implementation model draws on the expertise of both groups but risks creating inconsistencies in how sorting instructions align across systems and materials, as no central mechanism currently oversees the coherence of their combined application.

Proposal to address the challenge: Achieving and maintaining an optimal level of granularity and consistency will require ongoing supervision, monitoring, and adaptation beyond the scope of this technical proposal. Establishing structured processes for management, evaluation, and periodic

revision of the labelling system is recommended to ensure continuous alignment with technological progress, market developments, and evolving waste management practices.

The country sheets developed during this project (to be published, available upon request) can serve as an initial evidence base for future case studies and implementation monitoring. These should be complemented by systematic stakeholder feedback and empirical evaluations once the harmonised system is in use. Continuous learning and adjustment will be essential to safeguard the system's long-term functionality and credibility.

4. Technical proposal

This section presents the technical proposal for EU harmonised waste-sorting labels. The proposal defines—both visually and conceptually—a system that enables consumers to identify how to dispose of packaging waste correctly and consistently across MS.

The proposed labels are designed to provide sorting-relevant information that is:

— Correct: allowing consumers to make sorting decisions that are accurate within their local collection environment;

— Direct: available at the moment of disposal without requiring additional effort or information search;

— Clear: understandable, accessible, and relevant to all consumers, including those with disabilities;

— Harmonised: consistent across the EU to support the functioning of the internal market.

The proposal is organised into two complementary parts:

— Visual design (Section 4.1): the graphical and textual characteristics of the labels, including pictograms, colours, and accessibility;

— System design (Section 4.2): the conceptual framework governing label granularity, structure, and application rules.

Each subsection follows a consistent logic:

1. the issue is defined;
2. relevant evidence from desk research, stakeholder and citizen workshops, consultations, surveys, and behavioural experiments is summarised;
3. the JRC assessment of that evidence is presented; and
4. the resulting proposal is described.

Whenever empirical findings are cited, readers are encouraged to consult the detailed analyses in the accompanying reports:

— First interim report (Liva et al., 2025) – citizen workshops, survey, and Prototype 1 development

— Second interim report (Negrini et al., 2025) – behavioural experiment and Prototype 2 development;

— Final report (unpublished available on request) – integrated assessment of evidence and implications for label design.

4.1. Visual design

This section presents the key visual design elements of the proposed EU harmonised waste-sorting labels. Section 4.1.1 introduces the general layout of the labelling system, followed by detailed subsections on pictograms (4.1.2), colour (4.1.3), and text (4.1.4). Additional subsections address label size (4.1.5), positioning (4.1.6), accessibility (4.1.7), and packaging with multiple components (4.1.8). Further design elements include the integration of digital data carriers such as QR codes

(4.1.9), complementary “do not throw in nature” labels for compostable packaging (4.1.10), and country-specific information or indicators (4.2.2).

Each of these aspects is analysed primarily from a visual perspective, while certain elements are revisited later from a system design standpoint. The complete visual set of proposed EU harmonised waste-sorting labels is presented in Annex I.

4.1.1. General layout

The general layout of the EU harmonised waste-sorting labels is composed of four main visual components. These elements draw inspiration from the Nordic pictogram scheme, which has been adapted and refined to fit the EU context. While limited deviations may be permitted to accommodate technical or contextual constraints, maintaining a harmonised layout is essential to ensure a consistent and recognisable visual identity that supports consumer understanding and usability across MS.

Not all design components—particularly colour and text—are proposed to be mandatory. The system therefore foresees alternative label versions, such as achromatic (black-and-white), opaque, or transparent designs, and versions with or without text. These options allow flexibility for specific applications while preserving overall visual coherence. Their appropriate use is detailed in Sections 4.1.3 (Colour) and 4.1.4.3 (Text-free label versions).

The four core visual components are:

1. Pictogram: Each main label features a single pictogram, while meta-labels combine two. Pictograms represent a distinct material or waste fraction using simple, easily recognisable packaging-related imagery. Where materials are frequently collected together (e.g. paper and cardboard), both are shown on one meta-label.
2. Colour: Colour serves to group materials into broader categories and indicate waste fractions (e.g. blue for paper and cardboard, yellow for rigid and flexible plastics).
3. Text: Text identifies the material using clear, concise, and consumer-friendly language. It appears consistently below the pictogram.
4. Shape: Labels take a square or rectangular form, clearly delineated from the background by a coloured field or outline.

In accordance with Article 12(5) of the PPWR, the information conveyed by the labels must also be made available to end users prior to purchase, including for products sold online.

4.1.2. Pictograms

Issue description: Pictograms represent material categories or specific waste fractions at different levels of granularity, as outlined in Section 4.2.1. They are a core component of the matching system, enabling users to identify the correct receptacle for each packaging item by pairing identical symbols. Designing pictograms that are simple, recognisable, and representative across the full range of packaging materials poses challenges, but their role as matching indicators reduces the need for users to interpret each icon semantically.

Pictograms were developed according to three main criteria:

— Simplicity: ensuring easy recognition and printability, including for users with visual impairments.

— Packaging-focus: limiting icons to packaging-relevant materials in line with the PPWR scope (see Box 1), with exceptions as specified in Section 3.1.1.

— Representativeness: depicting clear and recognisable packaging items that users can intuitively associate with the corresponding material.

Because the matching principle ensures correct sorting even where users are uncertain about an icon's meaning, pictograms can remain simple and abstract without compromising usability.

Expert stakeholder insights: Feedback from expert stakeholders highlighted the need to revise or clarify several pictograms, notably for glass, wood, cork, composite materials (mixed canisters and other composites), textile, ceramics, and compostable packaging. The main concerns related to (i) limited representativeness of existing packaging forms (e.g. glass jars instead of bottles), (ii) unnecessary visual complexity or printability issues, (iii) inadequate reference to packaging materials (e.g. textile prototype 2), or (iv) possible confusion with non-packaging items (e.g. cork).

During the second expert workshop, participants proposed new pictograms for industrially and home-compostable packaging, suggesting factory and house icons to differentiate the two. These were incorporated into later prototypes.

Some stakeholders also discussed alternative pictograms for the rigid plastic label, which were not taken on board. Some participants also highlighted that some pictograms, such as those for wood, cork, and home and industrially compostable materials, were too detailed, raising concerns about their scalability and printability. Particularly during the second stakeholder consultation, respondents were encouraged to make concrete suggestions on alternative pictograms and provide graphical proposals. Some experts also recommended removing black outlines to improve legibility and enable smaller labels, consistent with packaging minimisation efforts.

The European Blind Union (EBU) advised against overlapping pictograms in meta-labels, as overlapping shapes reduced tactile and visual recognisability (see Section 4.1.7).

Specific concerns were raised for glass pictograms, where identical icons for coloured glass variants could cause confusion in the absence of text. Colour-filled glass pictograms were rejected by producers due to printing constraints (Section 4.1.3.2). Some stakeholders preferred bottle rather than jar symbols, provided they did not conflict with DRS designs. For compostables, clearer visual differentiation between home and industrial composting was requested.

In the second stakeholder consultation, participants ranked alternative pictograms for several materials. Table 2 summarises the pictograms most preferred by stakeholders.

Table 2. Stakeholders' preferred pictograms for specific labels

Material	Pictogram(s)	Share of stakeholders
Cardboard		88 %
Beverage Carton		84 %
Mixed Canisters		32 %, 23 %, 17 %
Glass	 s	61 %
Home and industrially compostable		48 %
Cork		52 %
Wood		53 %
Textile	 .	58 %, 21 %
Ceramics		55 %

Source: Second stakeholder consultation.

Citizen insights: Workshop participants strongly supported the overarching objective of unifying pictograms on packaging and waste receptacles. They favoured a consistent, minimalist design to enhance recognisability and user familiarity. Prototype 1 labels (Annex I) were generally perceived as cohesive, modern, and professional, with their minimalist style appreciated for being intuitive and easy to understand. Participants stressed that symbols and colours should be applied consistently across all public communications to reinforce the system's visual identity.

While the matching principle was widely appreciated, some participants initially misunderstood its function. Many assumed that a pictogram showing a single item (e.g. a can or bottle) referred only to that specific packaging type rather than to all packaging made of the same material. This highlights the need for communication and education campaigns accompanying the rollout of the EU harmonised waste sorting labelling scheme (Section 4.2.8).

Participants emphasised that pictograms should be large, clear, and visible within the label's square format. They also suggested that pictograms should visually connect to the packaging material they

represent (e.g. a bottle-shaped pictogram on a glass bottle) and be simple enough for children to understand.

Some pictograms were found insufficiently representative. The metal pictogram was seen as not covering the full scope of metallic packaging, while those for bio-waste and wood were sometimes unclear. The wood pictogram (not identical to the pictogram in this proposal), for instance, was likened to a crumpled milk carton or a book; participants suggested instead depicting logs or trees to better convey the material. Although they appreciated the use of wood texture, they noted that the pictogram did not capture all types of wooden packaging.

For glass, the depiction of coloured and uncoloured variants caused confusion—some citizens interpreted the filled bottle as "full" and the unfilled one as "empty." Participants proposed showing multiple bottle shapes or jars and exploring other visual ways to indicate colour differences. The residual waste pictogram, featuring a bag on a black background, received the lowest evaluations due to low clarity. Participants also recommended avoiding overlapping pictograms on meta-labels, a change implemented in Prototype 2.

In the behavioural experiment (Negrini et al., 2025), the vast majority of participants correctly identified the pictograms for paper (96 %), cardboard (96 %), metal (89 %), coloured glass (88 %), uncoloured glass (91 %), and rigid plastic (85 %). Recognition was lower for more complex materials: beverage cartons (80 %), flexible plastics (70 %), and cork (66 %). For the wood pictogram, only 53 % correctly associated it with a wooden fruit crate, and many confused it with food waste. Conversely, 78 % correctly identified ceramics.

Participants were also asked to indicate preferences between alternative pictogram designs for selected materials (Table 3). They generally favoured specific, realistic, and material-linked representations, such as a wine bottle for glass or tree-like imagery for wood. The apple-and-compost design was viewed as the most effective depiction of compostable packaging. For composite and mixed canister packaging, no single pictogram achieved consensus, reflecting their inherent visual and material complexity. For cork, a champagne-cap design was most preferred.

Table 3. Citizens' preferred pictograms for specific labels.

Material	Pictogram(s)	Share of citizens
Beverage Carton		91 %
Mixed Canisters		27 %, 21 %
Other composite		36 %
Glass		51 % (green and brown ≈ 50 %)
Home and industrially compostable		54 %
Cork		71 %

Source: Negrini et al. (2025).

JRC assessment of insights: At each stage of development, the design of pictograms integrated input from graphic designers, expert stakeholders, and citizen interactions. Graphic designers were instructed to ensure simplicity, packaging relevance, and representativeness, while maintaining visual and structural consistency across all labels. Stakeholder and citizen feedback was systematically reviewed, and—where compatible with these design principles—incorporated into the final version of the system. This was the case, for example, for the pictograms representing glass, beverage cartons, and cork.

Design choices were guided by two main priorities: (i) avoiding printing difficulties and (ii) preventing confusion with non-packaging items. Pictograms were therefore selected to clearly convey both material and packaging relevance, without introducing unnecessary complexity. Requests to adapt pictograms to specific packaging forms or to include multiple icons on a single, non-meta label were not taken on board, as such modifications would have compromised visual simplicity, recognisability, and consistency. Increasing the number of pictograms within one label also risked reducing their legibility, especially at smaller scales.

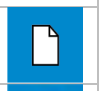
Citizen feedback confirmed that the overall label design was perceived as clear, modern, and intuitive, providing positive validation of the general approach. Nonetheless, certain pictograms—

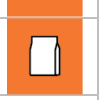
particularly for complex materials such as composites—were sometimes misunderstood. These misinterpretations were assessed as largely reflecting the inherent complexity of the underlying material categories rather than design shortcomings.

To identify the final pictogram options, the JRC relied primarily on the quantitative ratings from the second stakeholder consultation and behavioural experiment results, complemented by professional graphic design judgement.

Table 4 summarises the main stages of pictogram development, illustrating how stakeholder, citizen, and expert insights were progressively integrated throughout the project.

Table 4. Simplified evolution of pictogram designs during the project.

Version	1	2	3	4	Final
Cardboard and paper					
Paper					
Cardboard					
Glass					
Clear glass					
Coloured glass					
Brown glass					
Green glass					
Compost					
Food waste					
Home compostable packaging					
Industrially compostable packaging					
Industrially compostable in the EU					
Industrially compostable in some MS					
Residual					
Metal					
Wood and cork					

Cork					
Wood					
Plastic					
Rigid plastic					
Flexible plastic					
Plastic and cartons					
Fibre-based composite					
(Beverage) carton					
Mixed canister					
Fibre-based composite A: ≥85 % - 95 % fibre					
Fibre-based composite B: 50 % - <85 % fibre					
Other composite					
Ceramics					
Textile					
Hazardous packaging					

Source: Author's elaboration.

JRC proposal: The final pictogram set is presented in Figure 13. The pictograms were designed to be simple, minimalistic, packaging-focused, and representative of typical packaging items. Perspective (e.g. for beverage cartons and wood), texture (e.g. for ceramics), or other visual indicators (e.g. for textile and ceramic packaging) were used only where necessary to ensure clear recognition of the material or exemplar item. Each visual element serves a defined purpose, balancing clarity with simplicity to represent sometimes complex materials without visual overload.

The textile and ceramic pictograms intentionally depict broken items, indicated through a small "crack" symbol. This feature aims to remind users that these materials are often reusable and should only be discarded if damaged. While this principle could apply to other packaging types (such

as glass, wood, or plastic), its inclusion was limited to these two materials to avoid unnecessary visual complexity.[14]

The pictograms for coloured, brown, and green glass are identical, reflecting packaging producers' preference for a limited number of colour variations to minimise printing complexity. This means that in systems where brown and green glass are collected separately, consumers must rely on the colour of the glass itself rather than the pictogram to guide sorting. As colour-based separation remains relatively uncommon (see Section 4.2.1.8.2), and because glass colour is easily distinguishable to most users, this simplification was considered acceptable.

Finally, black outlines were added to all pictograms to ensure adequate contrast with background colours and to comply with the Web Content Accessibility Guidelines (WCAG). These outlines enhance both print and digital accessibility, ensuring that the pictograms remain legible under a wide range of applications and lighting conditions.[15]

[14] Under Article 12(2)–(3) of the PPWR, reusable packaging is exempt from the obligation to display the EU harmonised waste-sorting label required for single-use packaging. Instead, it must bear a reusability label together with a QR code or other standardised digital data carrier providing information on the packaging's re-use system, including conditions for return and available collection points. This distinction ensures that reusable packaging is correctly identified for return and re-use, rather than disposal. Article 12(3) further specifies that in open-loop re-use systems—that is, systems without a designated operator—the use of a reusability label and data carrier remains voluntary. This allows flexibility where no organised return infrastructure exists while maintaining consistency in cases where such systems are operational.

[15] As a reminder, the design of the EU harmonised labelling scheme builds on the Nordic pictogram system rather than introducing an entirely new framework. The iterative prototyping process therefore focused on adapting and improving this existing, well-established system—already implemented across five countries—to meet EU-wide regulatory and design requirements under the PPWR.

Figure 13. Pictograms and materials as used in the proposed EU harmonised waste sorting labelling scheme.

Source: Author's elaboration.

4.1.3. Colour

Colour plays a central role in waste sorting systems across EU MS and is a defining feature of several existing labelling schemes, including the Nordic pictogram system (Beaumais et al., 2024; Bruns et al., 2024; Eupicto, n.d.). When associated with specific waste fractions, colours provide a salient and intuitive cue that supports consumer understanding and correct sorting behaviour, even though there is no universal one-to-one correspondence between colours and materials (Schloss et al., 2018).

However, colour–waste associations vary considerably both across and within MS (see Figure 14). Neither the PPWR nor the WFD [16] currently mandates EU-wide harmonisation of colour schemes. Consequently, stakeholders differ in their preferences and practical requirements regarding the use of colour on packaging and receptacle labels.

This Section sets out the proposed approach to colour use in the EU harmonised labelling scheme.

Section 4.1.3.1 describes when the use of colour is permitted, required, or restricted, ensuring flexibility while maintaining consumer clarity. Section 4.1.3.2 presents the proposed colour scheme and the rationale behind its selection. Section 4.1.3.3 addresses the potential issue of colour

[16] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance) (last accessed 28/07/2025).

mismatches between packaging and receptacle labels. Section 4.1.3.4 outlines the design of achromatic (black-and-white) label versions for cases where colour printing is not feasible.

4.1.3.1. Colour use

Issue description: A harmonised waste sorting labelling scheme must define the circumstances under which colour use is permitted, required, or prohibited, ensuring both consistency and user clarity. Establishing these parameters requires balancing the diverging needs and preferences of stakeholder groups, given the well-established importance of colour in guiding consumer sorting behaviour (Beaumais et al., 2024).

Expert stakeholder insights: Stakeholder perspectives on colour use varied significantly by sector and role.

- Packaging industry representatives generally opposed mandatory colour use on packaging labels, citing potential environmental impacts, higher printing costs, technical limitations, and branding constraints.
- In contrast, waste collection and communication stakeholders supported the use of colour, recognising its value for consumer understanding and sorting accuracy. However, they frequently opposed altering existing national or local colour schemes, fearing that doing so could temporarily reduce recycling performance.

The first stakeholder consultation results reflected this divide. In the first expert stakeholder consultation, 39 % supported achromatic (black-and-white) packaging labels, while 28 % favoured coloured ones. For receptacle labels, preferences reversed: 41 % supported coloured versions and only 16 % preferred achromatic ones. These results confirm that colour use on packaging is more contested than on receptacles. Among those responsible for receptacle labelling, the specific colour choice was more important than the mere use of colour itself (see Section 4.1.3.2).

During the second stakeholder workshop, one working group focused on colour-related challenges and proposed black labels with transparent or inverted backgrounds to reduce ink use and printing complexity. They suggested variants featuring only black pictograms or outlines, while emphasising that the pictogram should remain the core element of the harmonised system. Although participants acknowledged the importance of colour for consumer comprehension, they warned against excessive or inconsistent colour use that could cause “visual pollution”.

In the second stakeholder consultation, packaging stakeholders remained particularly sceptical of mandatory colour use.[17] Nevertheless, only 15.33 % of packaging respondents indicated they could not print any of the coloured label alternatives provided in the user manual, and only 1.33 % of those involved in receptacle labelling reported such limitations.

[17] As a methodological note, in the second expert stakeholder consultation, participants were first asked whether they wished to respond to questions concerning packaging labels, receptacle labels, or both. Based on their choice, they were subsequently presented with the corresponding question set. Throughout this report, we therefore refer to these participants as “packaging stakeholders” and “receptacle stakeholders” for simplicity, even though the survey did not verify whether their responses aligned with their self-reported industry focus or professional role.

Across consultations, stakeholders consistently requested clear guidance in the user manual distinguishing between mandatory and recommended aspects of colour application, with packaging industry representatives emphasising the need for flexibility.

Citizen insights: Citizens generally responded positively to the use of colour in waste sorting labels. Across participatory workshops, participants consistently emphasised that colour-coded groupings facilitated rapid identification and enhanced overall usability, particularly when colours corresponded to familiar national conventions (e.g. yellow for plastics, green for biowaste; see Figure 14).

Survey data confirmed these preferences: nearly three-quarters of respondents favoured coloured labels for both packaging and receptacles, while slightly more than 20 % preferred achromatic (black-and-white) designs. Colour use was also associated with a small but statistically significant improvement in sorting accuracy in the survey experiment—39.8 % correct sorting with coloured packaging labels compared to 39.1 % with achromatic versions. This positive effect was primarily observed for mono-material packaging, whereas no clear advantage emerged for multi-material items. Coloured labels did not significantly increase overall noticeability but improved visual salience for certain fractions, particularly biowaste, though the underlying cause of this effect remains unclear.

Interestingly, colour appeared slightly more effective than text in supporting correct sorting. While the inclusion of text on packaging improved sorting accuracy by 0.5 percentage points (43.1 % with text vs. 42.6 % without), colour contributed a somewhat stronger effect.

Results from the behavioural experiment (N = 11,096) reinforced these findings. Participants exposed to Prototype 2 labels with colour—without text on packaging and with text on receptacles—sorted packaging items correctly 34.5 % of the time, compared to 25.0 % in the control group without labels, a relative improvement of approximately 38 %. When asked to explain the logic of the system, most participants correctly described the matching principle, citing colour matching as their primary cue, followed by pictograms, material recognition, and label text. This indicates that colour is perceived as the main organising element of the matching system, taking precedence over other label components.

However, the experiment also highlighted accessibility concerns. About 44 % of participants found black-and-white labels unclear, identifying them as a key potential barrier to user comprehension. Preferences varied by user group.

- Participants with colour blindness or visual impairments expressed stronger preferences for achromatic designs—approximately 9 percentage points higher for packaging and 8 percentage points higher for receptacles compared to non-impaired participants.
- Participants with cognitive impairments preferred achromatic receptacle labels by about 10 percentage points more than those without such impairments, though this difference was not significant for packaging labels.

Overall, the behavioural evidence confirms that colour coding substantially supports comprehension and matching accuracy by allowing users to quickly associate packaging with the corresponding receptacle. Nonetheless, the results suggest that in some cases colour reliance may reduce deliberate sorting accuracy, indicating that colour should complement, not replace, other visual elements such as pictograms and text.

JRC assessment of insights: The JRC's assessment confirms the central role of colour in enhancing the usability and effectiveness of harmonised waste sorting labels, as demonstrated by previous desk research (Beaumais et al., 2024), stakeholder surveys, and behavioural experiments. Colour-coding substantially supports users in associating packaging and receptacles with the correct waste fraction, particularly when applied through consistent and harmonised visual conventions. Experimental findings show that colour facilitates intuitive matching and improves sorting accuracy compared to achromatic designs.

At the same time, the assessment acknowledges legitimate stakeholder concerns, especially from the packaging industry, regarding the environmental footprint, printing costs, and branding limitations associated with colour use. Stakeholders from the waste management sector also pointed to the challenges posed by divergent colour–waste associations across MS and expressed reluctance to change long-established local colour schemes that citizens recognise and trust.

Balancing these perspectives, the JRC concludes that colour should remain an essential but flexible component of the harmonised labelling system. While colour demonstrably enhances comprehension and sorting performance, making it mandatory for all packaging could generate disproportionate implementation burdens and resistance from key actors. The available evidence supports mandatory colour use for receptacle labels—where it directly supports public communication—and optional use for packaging labels, where technical and branding constraints are more significant.

The JRC further notes that the labelling system could theoretically function without colour, for example through achromatic designs or combinations of black-and-white packaging labels and coloured receptacle labels. However, such configurations were not tested empirically and may reduce both comprehension and sorting accuracy. Consequently, they should only be applied when colour use is demonstrably infeasible.

Finally, behavioural evidence highlights that clarity and consistency in visual presentation are critical for user confidence. Mixing coloured and achromatic labels on the same surface or within the same context should therefore be avoided, as this may undermine the matching principle central to the system's intuitive use. The JRC thus supports a cautious, evidence-based approach: colour use should be encouraged wherever feasible and functionally justified, while achromatic alternatives remain available as a pragmatic solution in contexts where colour application is not viable.

JRC proposal: Building on the above insights, the JRC recommends that colour be used wherever feasible, particularly on receptacle labels, while maintaining flexibility for packaging labels, which may be constrained by national colour schemes and technical limitations. Given the strong citizen preference for colour and its demonstrated performance benefits, coloured packaging labels should be applied whenever this does not create significant implementation barriers.

For receptacle labels, the JRC proposes mandatory harmonised colour use across the EU. However, it recognises that this may conflict with certain national or local colour systems, potentially creating friction during the negotiation of the implementing act. In limited cases, achromatic versions may be necessary, but these should never alter or obscure the intended colour–waste associations defined in the harmonised scheme—for example, by applying a transparent label to a receptacle of a different colour. The use of white labels on receptacles is also discouraged due to the increased risk of soiling and subsequent loss of legibility. These and related practical challenges are discussed further in Section 4.1.3.3.

The proposed system includes a harmonised colour scheme (see Section 4.1.3.2) and clear rules specifying when and why achromatic versions may be applied (see Section 4.1.3.4). The JRC also

recommends considering a compromise approach for packaging labels—allowing the use of either colour or text—as this combination is more effective for consumers than achromatic, non-textual versions while offering flexibility to producers. This recognises that packaging types differ in their capacity to accommodate colour or text depending on factors such as printing technology, surface material, and available space.

Some stakeholders expressed strong opposition to framing colour and text use as preferred rather than optional design features. In response, the JRC proposal reflects a balance between consumer benefits and implementation practicability, acknowledging that overly prescriptive requirements could impede broad acceptance.

Finally, consistency in application is essential. Coloured and non-coloured labels should not be mixed on the same surface, as this undermines the coherence and recognisability of the system. Although the labelling system could theoretically function in fully monochrome configurations, or with achromatic packaging labels combined with receptacle labels using national colours, such options were not tested empirically and may reduce both user comprehension and sorting accuracy. These configurations should therefore be considered only as fallback solutions when colour use is demonstrably infeasible.

4.1.3.2. Colour scheme

Issue description: Where coloured labels are used, a harmonised waste sorting labelling scheme must define which colours correspond to which materials or waste fractions to ensure clarity, consistency, and recognisability for consumers. This is a particularly complex task within the EU, given the wide variation in existing colour–waste associations across MS. At the same time, designing an effective and harmonised colour scheme requires balancing clarity, distinctiveness, recognisability, aesthetic quality, and consistency across applications (Beaumais et al., 2024).

Developing such a scheme therefore necessitates a thorough understanding of current national colour conventions and stakeholder preferences, while ensuring that colours assigned to different materials remain sufficiently distinct and intuitive. One of the project's graphic designers aptly characterised this challenge as a "colour puzzle", reflecting the need to reconcile multiple technical, behavioural, and design considerations within a coherent EU-wide framework.

Expert stakeholder insights: Panel (b) of Figure 14 visualises the colour–material associations identified during the first expert stakeholder consultation.

If colour were to be used, many packaging stakeholders strongly supported harmonisation to prevent market fragmentation. Several emphasised the need for fibre-based composite packaging (FBCP) to share the same colour as paper and cardboard, reflecting their material similarity. The same principle was proposed for other composite materials, which stakeholders suggested should adopt the colour of their dominant constituent material (see Box 9 for a detailed discussion).

Accessibility considerations were also raised. Some colours—particularly yellow, light brown, and light green—were reported to pose challenges for partially sighted users due to insufficient contrast. Stakeholders referred to the design benchmark of a minimum luminance contrast ratio of 70 % to ensure adequate legibility. Similarly, insufficient distinction between hues (e.g. light and dark green) and the use of dark tones were noted as potential accessibility issues. Stakeholders further recommended avoiding red, green, and grey where possible, given their reduced distinguishability for colour-blind users.

Stakeholders from the waste management sector and related organisations placed strong emphasis on retaining existing national colour schemes or, where possible, aligning harmonised colours with familiar local conventions. Many expressed concern that introducing new colours could lead to confusion or lower sorting accuracy, advocating instead for flexibility or partial harmonisation of the colour scheme (see Section 4.1.3.3),

Some participants warned that using “atypical” colours such as orange, purple, or pink could cause confusion. Specific country-level issues were also highlighted—for instance, purple is already used for the re-use stream in France, making its adoption for residual waste problematic. Likewise, bright yellow, internationally associated with biohazardous waste, and orange, often used for warning signage, were considered unsuitable for the harmonised system.

From a technical perspective, several packaging stakeholders noted that the proposed colour palette was not fully optimised for printing. Many of the draft colours required the use of all four CMYK inks (Cyan, Magenta, Yellow, Key), whereas common industrial printing techniques—particularly flexographic printing—may be limited to two inks. Stakeholders therefore recommended that each label colour be designed to rely on no more than two inks, to improve print quality, cost-efficiency, and consistency. They also warned that small details or thin lines could fail to print accurately when using limited ink combinations.

Citizen insights: In the citizen workshops, participants raised several concerns regarding the proposed colour associations. The most frequent source of confusion was the use of similar colours for different categories, particularly green for both glass and bio-waste. Many participants suggested that brown would be a more appropriate and distinct colour for bio-waste. Others felt that the blue assigned to paper and cardboard appeared too pale and lacked visual salience, proposing more neutral tones, such as beige or white, as alternatives. The yellow used for plastics was also criticised for providing insufficient contrast between background, text, and pictograms.

Participants generally agreed that each material should be represented by a distinct and easily differentiable colour, ideally one that also evokes the material itself (e.g. grey for metal, brown for wood, blue or beige for paper). These preferences were further confirmed in the citizen survey, although data collected across 21 MS revealed that no single colour convention is uniformly recognised at the EU level. Panel (a) of Figure 14.

visualises the material–colour associations reported in the survey. It should be noted that the survey labels did not yet reflect the final material granularity, as certain categories (e.g. composite packaging) were not included at that stage.

Two main challenges emerged:

— One colour may be associated with multiple materials.

— One material may be associated with several colours.

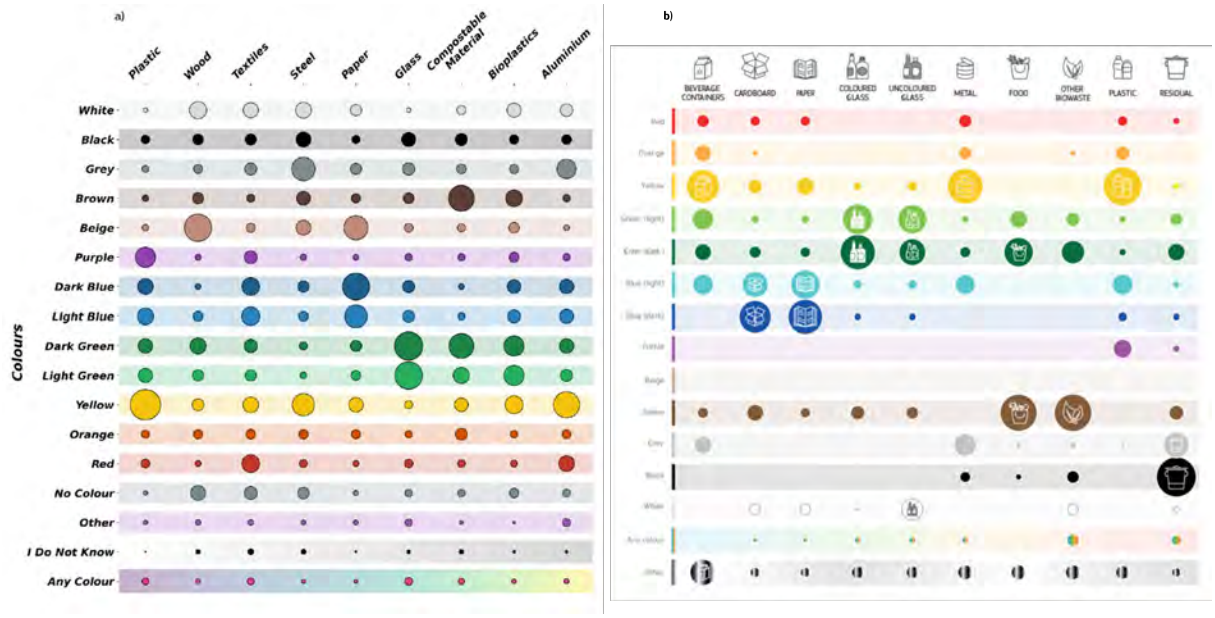
These ambiguities complicate the establishment of a universally intuitive and harmonised colour scheme, requiring careful design trade-offs (Schloss et al., 2018)

In the behavioural experiment, citizens were asked to identify the main challenges they might face with the introduction of the EU harmonised waste sorting labelling system. 17 % reported that using a system with colours different from those they are used to would be challenging.

In the behavioural experiment, citizens were also asked about potential challenges in adapting to the EU harmonised waste sorting labels. Seventeen percent indicated that adapting to a new colour

scheme differing from their national system would be difficult. This highlights the importance of communication and education efforts accompanying implementation to ensure smooth user adaptation.

Figure 14. Material-colour associations according to a) samples of around 1,000 participants each from 21 EU MS, and b) 82 experts from 25 MS.



Source: a) European Commission, Joint Research Centre et al., 2025) and b) https://policy-lab.ec.europa.eu/news/harmonising-waste-sorting-labels-across-eu-2023-05-02_en.

JRC assessment of insights: The JRC analysed EU-wide colour–waste associations through desk research, stakeholder consultations, and citizen surveys (see Figure 14). The project's graphic designer developed the initial colour scheme with the aim of aligning with existing conventions where possible, while ensuring that similar materials shared visual coherence and distinct materials were clearly differentiated. The final palette also accounted for printability, legibility, and durability under environmental conditions, particularly when applied to receptacles. Given the many dimensions influencing colour suitability, the process required balancing competing criteria—hence the recurring reference to the "colour puzzle."

A key design decision, taken jointly with DG Environment, was not to assign FBCP the same colour as paper and cardboard. Although FBCP predominantly consists of paper, its more complex recyclability and the fact that it is often collected separately (see Section 4.2.1.5.1) warranted the use of a distinct colour to avoid implying equivalent recyclability or encouraging mis-sorting. In contrast, other composite materials were assigned the colour of their main constituent material, as these are more frequently collected together (see Section 4.2.1.5.2).

Accessibility issues identified during stakeholder engagement were addressed by adjusting colour shades and tints, introducing white text backgrounds, and using black pictogram outlines to improve contrast, rather than changing the base colour itself—reflecting the limited number of colour options available within the harmonised scheme.

Throughout the iterative design process—from Prototype 1 to Prototype 2—colours were adapted to better integrate citizen preferences, Member State-specific associations, and design best practices. Key adjustments included:

— Glass: from light green to dark green;

— Residual waste: from black to purple;

— Compostable: from dark green to dark brown;

— Wood: from dark brown to light beige;

— Composite/carton: from yellow to orange.

New material categories introduced later, such as ceramics and textiles, adopted light blue and pink, respectively. Following the final stakeholder interactions, the colours for metal, cardboard and paper, glass, and compostable labels were further lightened to enhance contrast between pictograms and background fields.

Assigning residual waste the colour purple rather than black was an intentional choice to ensure adequate contrast with black-and-white packaging labels, which are expected to be common, and to avoid confusion with other label types. Purple was also selected for its synthetic appearance, considered fitting for a non-recyclable waste fraction.

Table 5 summarises the evolution of the colour scheme throughout the project, illustrating how stakeholder feedback, citizen input, and design evaluation were progressively integrated into the final proposal.

The proposed colours use the following number of different inks:[18]

— Plastic: 3

— Residual: 2

— Ceramic: 2

— Composite: 2

— Metal: 4

— Glass: 4

— Textile: 2

— Cardboard and paper: 2

— Hazardous: 2

— Compostable: 4

— Wood and cork: 3

[18] It may be feasible to reduce the number of colours used in each label to a maximum of three, depending on technical constraints and visual requirements. Achieving this balance is inherently subjective, as it must ensure that labels remain both web- and print-compatible while preserving clarity and recognisability. The colour scheme may therefore be subject to minor revisions at a later stage to further optimise printability, digital rendering, and consistency across applications.

Table 5. Evolution of colour scheme throughout the project visualised for web display, including hexadecimal colour codes.

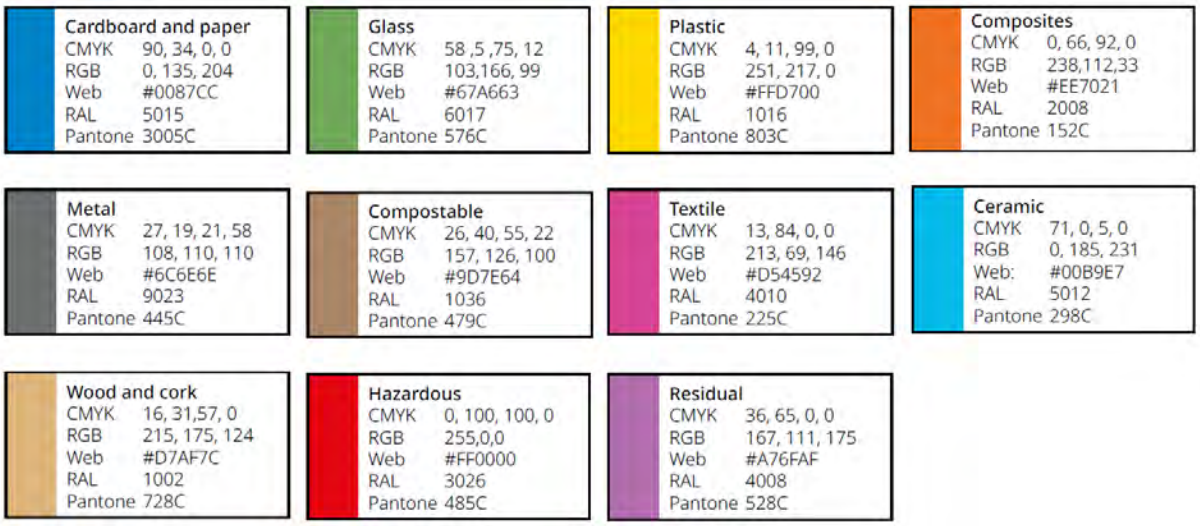
Version	1	2	3	4	Final
Cardboard and paper	#207FC1	#207FC1	#0077C0	#0082C8	#0087CC
Paper	#207FC1	#207FC1	#0077C0	#0082C8	#0087CC
Cardboard	#207FC1	#207FC1	#0077C0	#0082C8	#0087CC
Glass	#7BC466	#7BC466	#2C8E30	#70A65B	#67A663
Clear glass	#7BC466	#7BC466	#2C8E30	#70A65B	#67A663
Coloured glass	#7BC466	#7BC466	#2C8E30	#70A65B	#67A663
Brown glass				#70A65B	#67A663
Green glass				#70A65B	#67A663
Compost	#3C7548				
Food waste	#3C7548	#3C7548			
Home compostable packaging			#8E6540	#A88667	#9D7E64
Industrially compostable packaging			#8E6540		#9D7E64
Industrially compostable in the EU				#A88667	
Industrially compostable in some MS				#A88667	
Residual	#000000	#000000	#993B8E	#B06EAB	#A76FAF
Metal	#565B5C	#565B5C	#6B6E6F	#6C6F6E	#6C6E6E
Wood and cork			#CEA867		
Cork			#CEA867	#DDB57B	#D7AF7C
Wood	#78573B	#78573B	#CEA867	#DDB57B	#D7AF7C
Plastic	#F4B61B	#F4B61B	#F8D700	#FBD800	#FFD700
Rigid plastic	#F4B61B	#F4B61B	#F8D700	#FBD800	#FFD700
Flexible plastic	#F4B61B	#F4B61B	#F8D700	#FBD800	#FFD700
Plastic and cartons	#F4B61B	#F4B61B			
Fibre-based composite			#ED711F	#EE7121	#EE7021
(Beverage) carton	#F4B61B	#F4B61B	#ED711F	#EE7121	#EE7021
Mixed canister			#ED711F	#EE7121	#EE7021
Fibre-based composite A: ≥85 % - 95 % fibre					#EE7021
Fibre-based composite B: 50 % - <85 % fibre					#EE7021
Other composite			#ED711F	#EE7121	
Ceramics			#10B9E7	#06BAE8	#00B9E7
Textile			#D64492	#D64592	#D54592
Hazardous packaging				#E30613	#FF0000

Source: Author's elaboration.

JRC proposal: The proposed colour scheme (see Figure 15) assigns a distinct colour to each major material or waste category, drawing on evidence from stakeholder consultations, citizen surveys, and design evaluations. Each colour is specified in CMYK, RGB, hexadecimal, RAL, and Pantone formats to ensure consistent application across both digital and print media. This standardised

specification facilitates accurate reproduction of colours in diverse contexts and supports coherent implementation of the harmonised labelling system throughout the EU.

Figure 15. Proposed colour scheme for the EU harmonised waste sorting labels.



Source: Author's elaboration.

4.1.3.3. Colour mismatches on waste receptacles

Issue description: Developing a harmonised EU colour scheme for waste-sorting labels presents structural challenges due to the long-standing national and local colour conventions across MS and the absence of a parallel policy initiative to align them. When harmonised labels are applied to receptacles that retain different established colour codes, mismatches can occur—for example, applying a yellow plastic label to a blue plastic receptacle. Such inconsistencies can reduce the intuitive value of colour as a sorting cue and risk confusing users. Although the core functionality of the labelling system relies on pictogram matching, colour remains a salient visual element that users expect to be consistent. This issue is particularly sensitive in countries with mature colour schemes, where deviations could undermine the perceived credibility or usability of the harmonised system.

Expert stakeholder insights: This concern was raised by numerous stakeholders, particularly those representing national and regional waste-management systems. Many emphasised the need to preserve established receptacle colour codes. They cautioned that colour mismatches between labels and receptacles may generate confusion among citizens and weaken acceptance of both new and existing systems. Stakeholders also noted that, depending on the background colour of the bin (e.g. yellow for lightweight packaging (LWP) or black for residual waste), some label variants might lack sufficient contrast, reducing readability. They therefore recommended providing guidance on minimum contrast requirements to ensure visual clarity and accessibility.

Citizen insights[19]: Survey results showed that colour consistency between labels and receptacles improved the likelihood that respondents recognised the label as conveying relevant sorting information, particularly for the paper label. However, colour matching did not improve sorting accuracy in the experimental trials. In fact, it slightly reduced overall accuracy—by 8.7, 3.4 and 5.4 percentage points for mono-, dual-, and triple-material packaging, respectively. This suggests that while colour matching enhanced initial recognition, it may also have caused misclassification, likely due to reduced contrast between the label and the receptacle background. The findings underline the complexity of colour harmonisation and the trade-off between consistency, recognisability, and visual contrast.

JRC assessment of insights: From the outset, the project acknowledged the communicative importance of colour while recognising the diversity and persistence of national and local colour schemes across the EU. Based on input from stakeholders and DG Environment, the JRC concluded that colour mismatches between labels and receptacles must be accepted as an unavoidable drawback of introducing a harmonised, material-based colour scheme for labels alongside predominantly neutral receptacles (see Section 4.1.3.2).

Although the idea of a fully harmonised EU-wide colour-sorting system is conceptually attractive, stakeholder feedback confirmed that its implementation across MS with long-established colour codes would be highly challenging. Colour mismatches are most evident when receptacles themselves are visibly coloured—such as bins, lids, or bags—whereas they are less problematic for neutral receptacles (e.g. black, white, or transparent).[20]

From a design and user-experience perspective, colour mismatches are undesirable; however, ensuring a complete match between label and receptacle colours is generally unfeasible. The proposed system assigns colours based on material types rather than waste destinations. In practice, many waste fractions with different label colours are collected together in the same receptacle, resulting in bins associated with multiple label colours. A strict one-to-one correspondence between colour and receptacle would require redesigning collection systems and could complicate sorting for citizens. For certain fractions—such as glass—consistent colour alignment remains achievable, but extending this logic to all materials would undermine the material-based approach that underpins the harmonised system.

JRC proposal: The current proposal adopts a harmonised colour scheme for labels while explicitly recognising that label and receptacle colours will not align across all national and local contexts. This is primarily because the proposed scheme is material-based, whereas many existing national colour systems are destination-based. To accommodate this diversity, the proposal includes achromatic label versions (see Section 4.1.3.4), which provide flexibility for implementation where colour alignment is impractical. However, this flexibility necessarily entails a degree of reduced harmonisation and may weaken consumers' intuitive understanding and preferences.

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[19] Unlike the online survey, the behavioural experiment was not designed to test the effects of colour mismatches between receptacles and labels. To avoid potential interactions with existing national or regional colour schemes, the experiment used neutrally coloured receptacles instead of country-specific ones. This methodological choice ensured that participants' sorting decisions were influenced solely by the label design rather than by receptacle colour. Consequently, the behavioural experiment did not produce empirical evidence on the impact of receptacle–label colour mismatches.

[20] We are aware that coloured "printing" of labels on waste bags is not technically feasible.

To ensure adequate visibility and contrast, white or black outlines may be added around the label border, provided they do not encroach upon the label area itself. These outlines can also serve to visually link multiple labels on the same receptacle or packaging. Figure 16 illustrates examples of how labels with different colours should be applied to receptacles of various colours; the same principles apply to packaging.

These indications are framed as recommendations rather than prescriptive rules, reflecting the diverse contexts in which labels will be implemented. Nevertheless, the proposal maintains a strict prohibition against using colours in ways that would alter the intended material–colour associations defined in the harmonised system. Preserving these associations is essential to ensure consistency and consumer clarity. Finally, as noted in Section 4.1.3.1, the system remains theoretically functional without colour—such as through the exclusive use of achromatic labels or the retention of national receptacle colours—but this configuration has not been empirically tested and may carry risks of reduced user understanding and sorting accuracy.

Figure 16. Examples of possibilities to apply labels with various colours to waste receptacles.

Source: Author's elaboration.

4.1.3.4. Achromatic versions

Issue description: In view of the ongoing debate about the role of colour in packaging labels, the proposed EU harmonised labelling scheme includes provisions for achromatic (black-and-white) label versions in both opaque and transparent formats. These alternatives are essential to ensure that the system can be applied across diverse packaging types, materials, and printing technologies. However, their design requires particular care: mono- and bichrome versions may reduce the labels' immediate recognisability and make it more difficult to distinguish between material categories if contrast and clarity are insufficient. Ensuring the functional equivalence of achromatic versions is therefore crucial to maintaining the core matching principle of the harmonised system.

In addition, achromatic labels may be required for receptacles with technical printing limitations—such as waste bags—or where coloured printing is impractical. They may also provide accessibility benefits for users with visual or cognitive impairments, as discussed in Section 4.1.7.

Expert stakeholder insights: Many stakeholders—particularly from the packaging sector—requested flexibility in the use of achromatic labels (see Section 4.1.3.1). The need for adaptable label variants was reiterated during workshops, consultations, and follow-up exchanges. In the second expert stakeholder consultation, respondents expressed clear preferences regarding achromatic label variants in comparison with other design options. Packaging producers, in particular, emphasised that monochrome pictograms should always be permitted, including on transparent backgrounds. Several also proposed that transparent variants should be allowed in any colour, provided sufficient contrast with the packaging background is ensured.

Stakeholder rankings of label variations differed across applications. On packaging, non-textual and achromatic versions were preferred, while textual and coloured versions ranked lowest overall. On receptacles, textual labels were generally favoured, with coloured versions ranking first, followed by opaque and transparent black variants; non-textual versions scored lowest. On waste bags, textual versions were again preferred, with transparent black versions most favoured, followed by opaque black and coloured labels. More detailed rankings are provided in the stakeholder summary presented available upon request.

Overall, if a trade-off must be made between colour and text, stakeholders preferred *text over colour* for packaging. For receptacles, however, they favoured using both elements, with textual labels consistently ranking above non-textual ones.

Regarding technical feasibility, more packaging producers reported being able to print monochrome or bichrome labels, although all label types—including coloured ones—were technically achievable for at least some operators. Preferences for achromatic versions were mainly motivated by operational, economic, environmental, and recyclability considerations rather than technical limitations. Feasibility varied depending on material type, surface colour, and packaging size.

Stakeholders focusing on receptacle labelling noted that not all label variants were technically printable on receptacles and that certain combinations might lack adequate contrast, particularly on coloured surfaces. They also emphasised weathering and durability as critical factors. For waste bags, one stakeholder reported that only single-colour, low-quality flexographic printing was possible. Given the prevalence of pre-coloured bags and existing colour–waste associations, several stakeholders called for full flexibility in colour choice, provided that sufficient contrast and legibility were maintained.

Citizen insights: Citizens generally viewed coloured waste-sorting labels favourably, recognising that they enhance usability and facilitate quick identification—especially when colours align with familiar national or local conventions. Survey data indicated that nearly 75 % of respondents preferred coloured labels, which slightly improved sorting accuracy, particularly for single-material packaging. Overall, colour proved more effective than text in supporting correct sorting behaviour. The behavioural experiment confirmed these findings, showing that colour-coded labels significantly increased sorting performance.

At the same time, some participants—particularly those with visual or cognitive impairments—expressed a preference for black-and-white labels, which they found easier to distinguish under certain conditions. This suggests that while colour generally improves recognition and supports intuitive sorting, it may reduce accuracy in more complex sorting tasks. For further details on citizen insights related to coloured and achromatic labels, see Section 4.1.3.1.

JRC assessment of insights: The need for achromatic label versions was considered throughout the development process. Feedback from the packaging industry emphasised the requirement for

multiple label variants to address technical and operational constraints, leading to the further development of achromatic options. At the same time, citizen feedback highlighted accessibility limitations of coloured labels in the absence of specific measures to enhance visibility (see Section 4.1.7). The practical challenge of colour mismatches on receptacles also reinforced the rationale for including achromatic alternatives.

During the iterative design process, several alternative concepts were explored in response to stakeholder input. For instance, at the third stakeholder workshop, an outline-only label variant was designed for potential use on waste bags. Following consultation and assessment of stakeholder feedback, this option was discarded in favour of a black monochrome variant with a transparent background, which was judged more functional and visually consistent.

The Nordic pictogram scheme also allows the optional use of colours and text on packaging labels, suggesting that such flexibility is viable in practice and provides stakeholders with the necessary adaptability for implementation across packaging types and receptacles. However, increased visual variation inevitably reduces harmonisation; therefore, alternative label versions should be used only where strictly necessary.

Regarding stakeholder requests to allow free colour choice when sufficient contrast is ensured, the JRC notes the associated risks of undermining harmonisation. While permitting the use of sufficiently similar colours to accommodate technical or material constraints may be reasonable, ensuring that such flexibility does not lead to gradual dis-harmonisation remains an open challenge that will require clear implementation guidance.

JRC proposal: We propose four achromatic label variants to enable consistent application of the harmonised labelling system across diverse packaging and receptacle contexts. These variants accommodate technical, operational, and accessibility needs while maintaining legibility and visual coherence within the system:

a) Opaque black background with white pictogram(s) and black text on a white field (two-colour print)

b) Opaque white background with black pictogram(s) and black text on a white field (two-colour print)

c) Transparent background with black pictogram(s) and black text on transparent background (one-colour print)

d) Transparent background with white pictogram(s) and white text on transparent background (one-colour print)

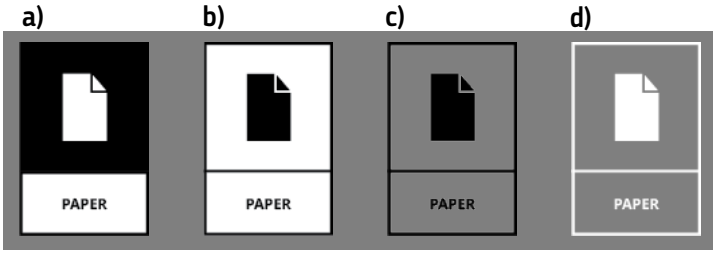
Figure 17 presents an example for each variant.

The use of these alternatives should follow clear recommendations to balance harmonisation and flexibility. In particular, transparent labels should only be applied on surfaces that provide strong contrast, ensuring that they remain clearly visible. They must not be used in a way that alters the intended colour associations defined in the harmonised scheme and should therefore be limited to neutral backgrounds commonly used for receptacles and bins (e.g. grey, black, or white).

All four achromatic versions may be applied to packaging, bins, and bags where colour printing is impractical, cost-prohibitive, or where achromatic designs improve— or at least do not reduce— legibility and contrast. The decision on which variant to apply should rest with the implementing party, given the diversity of packaging materials and receptacle types. However, this flexibility

entails a risk of inconsistent application and may require monitoring and enforcement to prevent misuse, as for other provisions of the proposal. Because colour plays a central role in user recognition, any deviation from the coloured versions should be justified by clear technical, economic, or accessibility-related considerations.

Figure 17. Examples of achromatic label alternatives: (a) opaque white, (b) opaque black, (c) transparent black, and (d) transparent white.



Source: Author's elaboration.

Box 5. Colour-mismatches between packaging labels and receptacle labels.

Section 4.1.3.3 addresses colour mismatches between receptacles and their labels. However, allowing packaging producers to use achromatic (black-and-white or transparent) labels on packaging also creates the potential for mismatches between packaging labels and receptacle labels, and in some cases even between packaging labels, receptacle labels, and receptacles themselves. In this context, a colour mismatch occurs when, for example, packaging labels are achromatic while receptacle labels are coloured.

Figure 18 shows which configurations are compatible with the current proposal. Figure 19 presents a tentative assessment of the desirability of each option, and Figure 20 provides a tentative assessment of their expected likelihood once implementation begins. These assessments are subjective and should be interpreted cautiously; their purpose is to support further reflection and discussion during the drafting of the implementing act.

In Figure 18, the right-hand side reflects the preferred configuration proposed in this report—coloured receptacle labels combined with either coloured or achromatic packaging labels. The left-hand side illustrates configurations that are either prohibited (e.g. achromatic receptacle labels on coloured receptacles, or labels applied in a way that alters the material–colour associations) or exceptionally permitted where justified (e.g. transparent labels on waste bags, provided they do not convey an incorrect colour association).

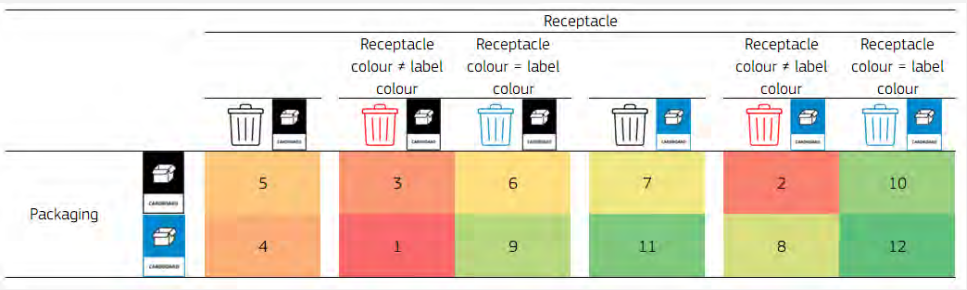
Figure 18. Potential of option based on technical proposal.

		Receptacle					
			Receptacle colour ≠ label colour	Receptacle colour = label colour		Receptacle colour ≠ label colour	Receptacle colour = label colour
Packaging		Exceptionally	Prohibited	Exceptionally	Yes	Yes	Yes
		Exceptionally	Prohibited	Exceptionally	Yes	Yes	Yes

Source: Author's elaboration.

Figure 19 provides an indicative ranking of the desirability of each possible combination of packaging and receptacle labels, taking into account their alignment with receptacle colours in national or local schemes.[21] The ranking reflects the main design principles of this technical proposal. While packaging industry preferences for achromatic labels are accommodated through implementation flexibility, behavioural evidence consistently supports the superior noticeability and usability of coloured (chromatic) labels over achromatic ones. Similarly, waste management stakeholders generally favour chromatic receptacle labels (right-hand side) over achromatic ones (left-hand side).

Figure 19. Prospective desirability of option (long-term ambition).



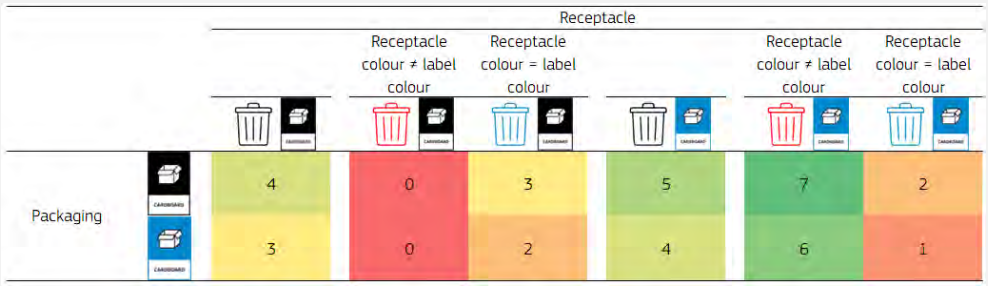
Source: Author's elaboration.

Figure 20 presents a tentative assessment of the likelihood of each combination occurring after implementation, using an ordinal scale from 0 (unlikely) to 7 (likely). This assessment is based primarily on stakeholder feedback summarised throughout this proposal. We expect achromatic labels to be relatively common on packaging—reflecting producers' preference for such designs—whereas chromatic labels are likely to remain predominant on receptacles, in line with the preferences of waste management stakeholders. Nonetheless, frequent mismatches between receptacle and receptacle label colours can be expected, particularly in the short term, as existing national systems are gradually adapted. Matching colours across all elements is therefore considered less likely, especially for receptacles that are not neutral in colour.

Overall, these figures are intended as illustrative and exploratory tools. They provide indicative guidance for policy discussion and decision-making, rather than prescriptive rules or formal assessments.

[21] The aggregate ranking was derived from five independent sets of pairwise comparisons provided by five JRC experts involved in this project. Each expert compared twelve options in all possible one-to-one combinations, indicating their preferred choice (or indifference). The resulting preference data were converted into Copeland scores, which count how often each option was preferred over others (Copeland, 1951). Averaging these scores across all five experts provides an overall measure of how strongly each option was favoured in relative terms, resulting in a single ranking that reflects the experts' collective views (List et al., 2010; Osborne et al., 2020). While each expert's input was grounded in their professional expertise and experience with the subject matter, the evaluations inevitably include an element of subjectivity, as is typical for expert-based preference elicitation. Therefore, the results should be interpreted as an informed but not purely objective consensus.

Figure 20. Prospective likelihood of option (short-term expectation).



Source: Author's elaboration.

4.1.4. Text

Text is a key element in many waste-sorting labelling systems across EU MS, including the Nordic pictogram scheme (Beaumais et al., 2024; Bruns et al., 2024; Eupicto, n.d.). As a communication tool, text can serve both as a core component—by identifying the material or waste fraction—and as a complementary element—by providing clear and accessible sorting instructions. When used effectively, textual information supports comprehension, reinforces visual cues, and enhances accessibility for a broad range of users.

At the same time, incorporating text introduces several regulatory and practical challenges**.** According to Article 12(1) and recital 64 of the PPWR, the use of language on labels should remain minimal and labels must be easily understandable, including for persons with disabilities.[22] Furthermore, Article 12(5) specifies that information must be provided in one or more languages easily understood by end users, as determined by the Member State in which the packaging is marketed.

The following subsections outline the approach to textual elements within the harmonised labelling system. Section 4.1.4.1 defines the proposed conditions for using text on labels, while Section 4.1.4.2 presents the recommended terminology for material names. Section 4.1.4.3 describes text-free label variants, and Section 4.1.4.4 addresses the provision of complementary textual sorting information. Translation guidance is provided in Section 4.1.4.5, and the rationale for excluding alphanumeric codes from the system is briefly discussed in Section 4.1.4.6.

4.1.4.1. Text use

Issue description: A harmonised waste-sorting labelling scheme must clearly define the conditions under which text can be used to convey sorting-relevant information. One key function of text—also applied in the Nordic pictogram scheme—is to specify the material or waste fraction represented by a label. Text is a widely used and effective communication tool, particularly when sorting instructions are complex, context-specific, or when pictograms and colours alone may not provide sufficient clarity. By allowing for precise and unambiguous communication, text helps reduce

[22] In our reading, "minimal" use does not mean "no" use. Consumers require text in certain circumstances to have clear indications for sorting.

misunderstanding and supports correct sorting behaviour across diverse linguistic and cultural contexts.

Expert stakeholder insights: During the first expert workshop, participants identified the excessive use of text in certain national labelling schemes—such as those of Austria and Italy—as a negative feature, arguing that it reduced visual clarity and recognisability. Nonetheless, they emphasised that textual information is necessary for multi-component packaging, where pictograms alone may not provide sufficient guidance. In the second workshop, stakeholders highlighted the importance of including text on packaging for new or unfamiliar packaging materials introduced to the market. While representatives from the packaging industry generally preferred text-free packaging labels, participants from national labelling schemes and the waste-management sector stressed the need for text, particularly when presented in the national language(s) of the market. When visualising their design concepts, stakeholders commonly placed text outside the core pictogram area of the label, allowing flexibility in size, font, placement, and content to accommodate both producers' and waste-management needs.

In the first stakeholder consultation, which focused on the use of text to indicate material fractions, views were divided for packaging labels (37 % opposed, 32 % in favour). By contrast, receptacle labels received stronger support, with 56 % in favour and only 13 % opposed. Packaging stakeholders cited several barriers to including text on packaging: potential market fragmentation, translation requirements, limited available space, and increased regulatory complexity. Conversely, text on receptacle labels was widely supported, as receptacles provide sufficient space for local language use and additional information. Across stakeholder groups, text was recognised as improving user comprehension.

During the third workshop, stakeholders reviewed draft user-guideline excerpts. Packaging industry representatives reiterated their opposition to recommending text on packaging, while all groups agreed on the need for text on receptacles. Concerns were raised regarding the consistency of terminology in the manuals, as differing interpretations across MS could undermine harmonisation. It was also noted that products sold exclusively within a single national market could include text in the relevant language. The need for complementary text on multi-component packaging was again emphasised, as it provides essential instructions on preparation or disassembly before disposal.

In the second consultation, stakeholders were asked about their ability to print label variants with text. Most indicated that all versions—including those with text—were technically feasible, though non-text labels were preferred on packaging for operational, economic, and environmental reasons rather than technical constraints. Stakeholders noted that text increases label size, occupies more packaging space, and can indirectly lead to larger packaging formats with associated environmental impacts. Nevertheless, 23 % of packaging stakeholders expressed a preference for supplementing labels with additional textual information (e.g. preparation, disassembly, or cleaning guidance), a topic further addressed in Section 4.1.4.4.

Some participants also stated that text should ideally appear on all labels, as pictograms alone may not suffice—particularly when consumers pre-sort waste at home without corresponding bin labels. As previously discussed, stakeholders generally preferred text over colour for packaging, with no strong opposition to either element on receptacles (see Section 4.1.3.1). Finally, some stakeholders opposed prescribing a common font for all text, requesting flexibility to use their own brand fonts, especially on packaging.

Citizen insights: Workshop participants consistently reported that textual information improved comprehension, particularly for users less familiar with recycling practices or specific materials. The

combination of pictograms and text was viewed as especially effective for accessibility, helping users with varying levels of literacy or visual ability. Participants also emphasised the need for high-contrast text to enhance readability, particularly for visually impaired users and in low-light conditions.

Survey results strongly supported the inclusion of text: approximately 84 % of respondents preferred labels with text for both packaging and receptacles, with many favouring bilingual formats (e.g. national language plus English). By contrast, only about 10 % preferred text-free labels. Empirical analysis showed that text improved sorting accuracy slightly but significantly—by 0.5 percentage points overall, and by 0.8 points for mono-material packaging. While the presence of text increased the time required to interpret labels, this was interpreted as more deliberate processing, likely contributing to more accurate sorting decisions. Text also enhanced the salience of packaging labels, although it slightly reduced that of receptacle labels, particularly for plastic and metal fractions.

Behavioural experiment data further indicated that 26 % of participants found textless labels challenging to interpret—making this the second most commonly reported difficulty, after the absence of colour.

JRC assessment of insights: The JRC acknowledges the legitimate concerns raised by packaging producers regarding limited space on packaging and the translation requirements under the PPWR. At the same time, strong citizen support for textual information—and its modest but measurable positive effect on sorting accuracy and user engagement—underscore the importance of maintaining a role for text within the harmonised labelling system. Text provides a clear and direct means of conveying complex information, complementing pictograms that may struggle to represent nuanced or context-specific instructions. However, given the PPWR requirement that any text on packaging must be translated into the official language(s) of the Member State where the product is marketed, the use of text on packaging faces significant practical and regulatory constraints.

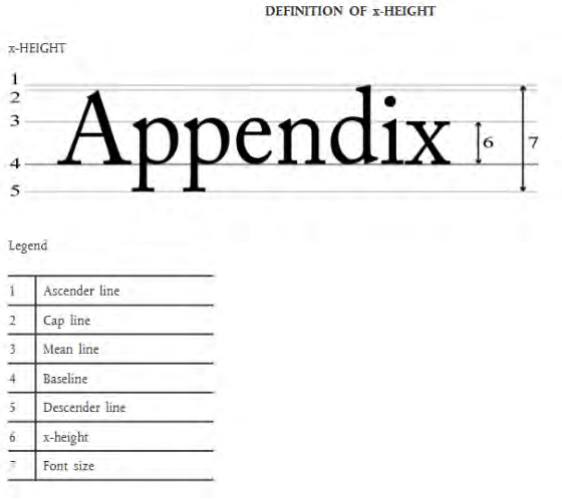
For receptacle labels, where opposition to text is limited and usability benefits are well established, the proposal fully supports its inclusion. Text on receptacle labels can also indirectly support comprehension of text-free packaging labels: through repeated exposure, users learn to associate specific pictograms with the corresponding material names and waste fractions, improving recognition and understanding over time.

Regarding font size and legibility, the JRC considered the relevant standards applied to consumer product information. Regulation (EU) No 1169/2011[23] defines “legibility” as the physical appearance of information that makes it visually accessible to the general population, depending on factors such as font size, letter spacing, contrast, and background. Article 13(2) specifies a minimum x-height of 1.2 mm (or 0.9 mm for packaging with a largest surface area under 80 cm^2). Evidence indicates that 1.2 mm x-height aligns with the threshold for fluent reading for adults with normal

[23] REGULATION (EU) No 1169/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2011on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004(Text with EEA relevance).

vision, while text smaller than 0.9 mm becomes difficult to read under suboptimal conditions. For older users, a font size of around 1.8 mm x-height may be required for adequate readability. Additional accessibility standards, such as ISO 24502 on luminance contrast for elderly users and ISO 24503 on Braille and tactile symbols (see Section 4.1.7), further inform these considerations. Figure 21 illustrates x-height and related typographic parameters as defined in Regulation (EU) 1169/2011.

Figure 21. Definition of x-height and other indicators of font size.



Source: Regulation (EU) 1169/2011

JRC proposal: We propose textual label versions that display the material or fraction name in a consistent and harmonised manner. Text is positioned centrally at the bottom of the label within a dedicated text box, maintaining sufficient spacing from the surrounding frame to ensure readability (see Figure 17). Non-text label versions are permitted on packaging where justified but should not be used on receptacles. Text on receptacle labels plays an important role in educating consumers about material categories and thereby enhances comprehension of text-free packaging labels through repeated exposure. Text should therefore be included by default and omitted only where clearly justified by technical, economic, or regulatory constraints.[24]

To ensure visual coherence, we propose the use of a harmonised font that supports all EU languages. The recommended font is Noto Sans,[25] used for material or fraction names in bold, all caps, and centred within the text box at the lower part of the label. No additional information should appear within this area to preserve clarity. Complementary textual information (see Section 4.1.4.4) should be set in sentence case and regular Noto Sans. While producers may use other fonts if required, readability and accessibility must remain the highest priority. The use of Noto Sans—an open-source, freely available typeface—ensures a harmonised visual identity without licensing costs.

[24] Again, such a statement of conditionality requires adequate monitoring and enforcement capabilities to be effective.

[25] https://online-fonts.com/fonts/noto-sans (last accessed 29/07/2025).

For packaging labels, we recommend a minimum x-height of 1.2 mm, corresponding to the standard print size for legibility at an approximate reading distance of 30 cm. Because text on labels is presented in all caps, the capital letter height is used as the reference measure, balancing compact label size with reliable legibility. If space constraints make this size impractical, a minimum of 0.8 mm x-height may be accepted as a compromise (see Section 4.1.5 on label size)

For receptacle labels, the minimum recommended x-height is 10 mm to ensure readability at 1–2 metres, with smaller sizes permissible on small household receptacles viewed from shorter distances. For visibility at 3–5 metres, a minimum x-height of 20 mm is recommended.

Where multiple receptacles are placed together, or when several labels appear on the same packaging or receptacle, uniform font sizes must be used to ensure consistent information hierarchy and visual coherence across labels.

4.1.4.2. Terminology

Issue description: To ensure a harmonised waste-sorting labelling scheme and facilitate user understanding across the EU, the terminology used to denote materials and fractions must be standardised. The proposal therefore defines a set of specific material and fraction names to appear on labels—where text is used. These terms were developed in English, the working language of the project, and will be translated into all relevant EU languages as part of the implementing act's translation process.[26]

While terminology is straightforward for most material categories, certain fractions—particularly composite packaging and residual waste—require careful linguistic and conceptual consideration to ensure clarity and cross-linguistic consistency. Furthermore, consistent terminology should also be applied in complementary textual sorting information to reinforce harmonisation and consumer comprehension (see Section 4.1.4.2).

Expert stakeholder insights: In the first stakeholder consultation, participants were invited to provide feedback on the terminology used for two complex fractions in the prototype: food waste[27] and drinking cartons (composite packaging). For the latter, opinions were divided: around 23 % of respondents preferred the term "beverage cartons", followed by "cartons", "composite packaging", "drink cartons", and no preference.

Several workshop participants continued to engage with the JRC after the first and second prototypes were presented—particularly regarding the categorisation, nomenclature, and pictograms for composite packaging. These exchanges, conducted during workshops, follow-up sessions, and subsequent correspondence, informed the preparation of the second stakeholder consultation, which sought more detailed feedback on the terminology for key waste fractions.

In this second consultation, stakeholders were asked which terminology they considered most suitable for the label currently referred to as "mixed canister", indicating fibre-based composites that are not beverage cartons. The most frequently suggested alternatives included "paper composite", "high paper content", and "fibre-based composite". Many stakeholders preferred "paper"

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[26] Preliminary translations of the labels were already developed for the languages of the countries involved in the behavioural experiment.

[27] This fraction is not relevant any longer due to the focus now being on compostable packaging.

over “fibre”, considering it clearer and more familiar to citizens. The term “canister” was broadly regarded as unclear, language-dependent, and potentially misleading, as it could cause confusion across MS and with material categories defined in Annex II, Table 1 of the PPWR. Conversely, some stakeholders noted that “paper composite” aligns with established standards such as the German Mindeststandard and may therefore be recognisable to some users.

Another suggestion concerned distinguishing FBCP by paper-content level—for instance, using terms such as “high paper content” and “medium paper content”—to better reflect existing collection systems across MS (see Section 4.2.1.5.1).

For other composites (i.e. non-fibre-based composites), stakeholders advised using terminology aligned with the main material of the composite, noting the need for careful linguistic adaptation to national contexts (see Section 4.2.1.5.2). Commonly suggested formulations included simply “composite” or “[material] composite” (e.g. “plastic composite”, “metal composite”).

With respect to textile, wood, and ceramics labels, some stakeholders expressed concern that these might be confused with non-packaging items made of the same materials. To address this, they recommended adding the word “packaging” (e.g. “textile packaging”) to improve clarity.

For the residual waste fraction, alternative terminology such as “mixed waste”, “non-recyclable”, or “refusal” was discussed. Some participants favoured “not recyclable”; however, others pointed out that, under the PPWR, all packaging placed on the EU market must be recyclable, making this wording inappropriate (see Section 4.2.1.12).

Citizen insights: Participants in the citizen workshops emphasised the importance of consistent and simple terminology as a foundation for a clear and user-friendly waste-sorting labelling scheme. However, regional linguistic differences emerged—for example, the use of *“Tetrapak”* (®, but used generically) instead of *“beverage carton”*—which cannot be fully accommodated within a harmonised EU-wide system. In Prototype 1, the term *“cartons”* was selected because it aligns with commonly understood language and with the terminology used in the Nordic system. Nevertheless, this approach presents challenges, as not all beverage cartons are made of identical materials, and using a single label for them risks inconsistency with the material-based approach required by the PPWR.

Regarding paper and cardboard, some participants proposed more explicit wording such as *“clean paper and cardboard only”* to reflect real-world sorting practices that distinguish between clean and contaminated fibre-based packaging (see Sections 3.3.3 and 4.2.6.3).

Findings from the behavioural experiment also indicated a need for clearer wording to distinguish home compostable from industrially compostable packaging. Participants reported persistent confusion between the two categories, reflecting broader public uncertainty surrounding compostable packaging and bioplastics (Ansink et al., 2022; Cristóbal Garcia et al., 2023).

JRC assessment of insights: The terminology used in the proposal was initially based on the Nordic pictogram scheme, complemented by logical and design best-practice considerations (Liva et al., 2025, p. 16ff). Terminology was iteratively updated throughout the project to reflect stakeholder feedback and adjustments in label granularity. At several stages, targeted consultations explicitly invited preferences on terminology for composite packaging and other complex categories. The development process also considered existing references, including Directive 97/129/EC and Tables 1 and 2 of the Annex to the PPWR, adapting these to the required level of detail and prioritising terms that are both technically accurate and easily understood by consumers. Achieving this balance often required trade-offs between precision, usability, and design coherence.

Regarding the terminology for residual waste, we share the stakeholders' view that the term *"not recyclable"* is unsuitable, as all packaging placed on the EU market must be recyclable. Similarly, *"mixed waste"* could be misleading, as it may imply inclusion of other labelled fractions. Consequently, *"residual"* was retained as the most appropriate and neutral designation for this category.

Table 6 summarises how the terminology evolved during the project, integrating the evidence, stakeholder perspectives, and design reflections gathered throughout the process.

JRC proposal: We propose a set of standardised terms to indicate the materials or fractions represented on the labels. For detailed explanations of these terms—including their relation to the proposed level of granularity and their correspondence with the alphanumerical codes in Directive 97/129/EC and Tables 1 and 2 of the Annex to the PPWR—see Table 8 in Section 4.2.1: These terms must be used exactly as defined to preserve harmonisation and avoid consumer confusion.

To maintain internal consistency, we decided not to add the word "packaging" to terms such as *ceramic*, *wood*, and *textile*. Instead, this clarification should be addressed through educational and communication campaigns, helping consumers understand that the harmonised labels apply exclusively to packaging (see Box 1).

Terminology used in the proposed labels:

- Beverage Carton
- Brown Glass
- Cardboard
- Cardboard and Paper
- Ceramic
- Cork
- Fibre-Based Composite
- Flexible Plastic
- Glass
- Green Glass
- Hazardous
- Home Compostable
- Industrially Compostable
- Metal
- Paper Composite A
- Paper Composite B
- Paper
- Plastic
- Residual
- Rigid Plastic
- Textile
- Uncoloured Glass
- Wood

Table 6. Evolution of terminology during the project.

1	2	3	4	Final
CARDBOARD + PAPER	CARDBOARD + PAPER	CARDBOARD + PAPER	CARDBOARD + PAPER	CARDBOARD AND PAPER
PAPER	PAPER	PAPER	PAPER	PAPER
CARDBOARD	CARDBOARD	CARDBOARD	CARDBOARD	CARDBOARD
	GLASS	GLASS	GLASS	GLASS
COLORED GLASS	COLORED GLASS	COLOURED GLASS	COLOURED GLASS	COLOURED GLASS
CLEAR GLASS	CLEAR GLASS	UNCOLOURED GLASS	UNCOLOURED GLASS	UNCOLOURED GLASS
			BROWN GLASS	BROWN GLASS
			GREEN GLASS	GREEN GLASS
COMPOST	BIOWASTE			
FOOD WASTE	FOOD WASTE			
		HOME COMPOSTABLE	HOME COMPOSTABLE	HOME COMPOSTABLE
		INDUSTRIALLY COMPOSTABLE		INDUSTRIALLY COMPOSTABLE
			INDUSTRIALLY COMPOSTABLE IN THE EU	
			INDUSTRIALLY COMPOSTABLE IN SOME MS	
RESIDUAL	RESIDUAL	RESIDUALS	RESIDUAL	RESIDUAL
METAL	METAL	METAL	METAL	METAL
		CORK + WOOD		
		CORK	CORK	CORK
WOOD	WOOD	WOOD	WOOD	WOOD
PLASTIC	PLASTIC	PLASTIC	PLASTIC	PLASTIC
HARD PLASTIC	HARD PLASTIC	RIGID PLASTIC	RIGID PLASTIC	RIGID PLASTIC
SOFT PLASTIC	SOFT PLASTIC	FLEXIBLE PLASTIC	FLEXIBLE PLASTIC	FLEXIBLE PLASTIC
PLASTIC + CARTONS	PLASTIC + CARTONS			
		FIBRE-BASED COMPOSITE		FIBRE-BASED COMPOSITE
CARTONS	CARTONS	BEVERAGE CARTON	BEVERAGE CARTON	BEVERAGE CARTON
		MIXED CANISTER	MIXED CANISTER	PAPER COMPOSITE A
				PAPER COMPOSITE B
		OTHER COMPOSITE	OTHER COMPOSITE	
		CERAMIC	CERAMIC	CERAMIC
		TEXTILE	TEXTILE	TEXTILE
			HAZARDOUS	HAZARDOUS

Source: Author's elaboration.

4.1.4.3. Text-free label versions

Issue description: Given the ongoing debate about the use of text on packaging labels, the EU harmonised labelling scheme allows text-free label versions, primarily intended for packaging. This flexibility enables adaptation to technical, linguistic, and spatial constraints while maintaining the overall harmonised structure of the labelling system.

Expert stakeholder insights: The first stakeholder consultation showed divided views on including text to indicate material fractions on packaging labels: 37 % opposed and 32 % in favour. In contrast, text on receptacle labels received stronger support (56 % in favour, 13 % opposed), as it was widely seen as helpful for user understanding. During the second consultation, most stakeholders confirmed they could technically print labels with text but preferred text-free packaging labels for economic, operational, and environmental reasons. About 23 % supported complementing labels with additional textual information. Some stakeholders, however, maintained that pictograms alone were insufficient and reiterated a preference for text over colour, even on packaging. Further details are provided in Section 4.1.4.1.

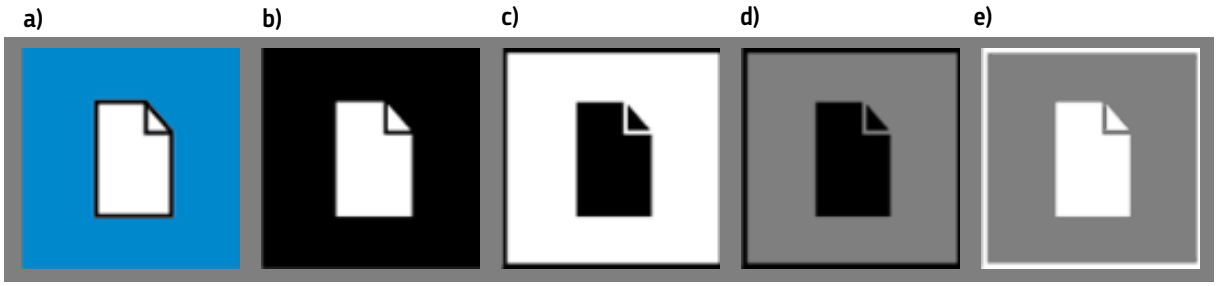
Citizen insights: Citizen workshops and surveys consistently highlighted the value of including text on labels to improve comprehension, particularly for users unfamiliar with recycling or for those with visual impairments. Participants regarded the combination of pictograms and high-contrast text as beneficial for accessibility. Approximately 84 % of survey respondents preferred labels with text—ideally in bilingual formats—while only about 10 % favoured text-free labels. Empirical findings indicated that text modestly improved sorting accuracy (+0.5 – 0.8 percentage points), especially for mono-material packaging. Although the presence of text slightly increased interpretation time, it likely prompted more deliberate and accurate sorting. Text enhanced the visibility of packaging labels but marginally reduced the prominence of receptacle labels, particularly for plastics and metals. In behavioural experiments, 26 % of participants found text-free labels difficult to interpret, making this the second most frequently reported challenge, after colour-free versions. See Section 4.1.4.1 for further detail.

JRC assessment of insights: The inclusion of text-free versions was considered throughout the label design process. The JRC evaluated the packaging industry's concerns about translation costs and internal market barriers alongside citizens' preference for text and the regulatory constraints associated with language requirements (see Section 4.1.4.2). The resulting approach seeks to provide sufficient flexibility for producers while maintaining clarity and accessibility for consumers.

JRC proposal: We propose text-free label alternatives for all colour variants, primarily for packaging applications. While the advantages of including text on receptacle labels—particularly for educational purposes—remain clear, limited exceptions may be warranted for non-textual versions where justified. Figure 22 illustrates examples of text-free labels for (a) coloured, (b) opaque white, (c) opaque black, (d) transparent black, and (e) transparent white variants.

We recommend allowing text-free labels on packaging, but not on receptacles. The final decision on whether to include text on packaging should rest with the entity applying the label, considering product type, available space, and distribution markets. However, given translation requirements and spatial constraints, it is expected that most packaging labels will omit text, while receptacle labels will retain it to support consumer learning and system coherence.

Figure 22. Examples of text-free label alternatives: (a) coloured, (b) opaque white, (c) opaque black, (d) transparent black, and (e) transparent white.



Source: Author's elaboration.

4.1.4.4. Complementary textual sorting information

Issue description: In certain cases, additional textual information may be necessary to help consumers correctly identify and dispose of packaging waste in accordance with local sorting rules—particularly when these rules depend on factors other than material composition. This applies primarily to:

1. the identification of specific packaging components to which a label refers (e.g. "tube," "sleeve"); and
2. complementary sorting instructions or clarifications, such as "separate before sorting," "clean before sorting," or—for compostable packaging—"Do not throw in nature" (DNTIN) (see Section 4.1.10).

Although this issue primarily concerns packaging labels, similar guidance may also be relevant for receptacle labels, for instance by specifying permitted or prohibited non-packaging waste items.

Expert stakeholder insights: Some stakeholders viewed text as a practical means of conveying additional information that pictograms or colours alone cannot easily communicate. In the first consultation, a small share of respondents (4.9 %) suggested using explanatory text to clarify that packaging components are made of different materials. Others preferred illustrations, strategic label placement, or a combination of both text and visuals to deliver this information (see Section 4.1.8).

Across all three workshops, stakeholders emphasised the importance of providing guidance on preparation before sorting, such as emptying, cleaning, or folding packaging. They also stressed the need to instruct users on separating components (e.g. removing sleeves or inner linings) and to offer context-specific directions—particularly where sorting depends on cleanliness or contamination. For receptacles, participants underlined the value of text for guiding citizens on what items are acceptable, how to interpret local sorting rules, and how to avoid common sorting errors. They also noted that municipalities may wish to add limited textual messages near the harmonised labels to address local issues or misuse.

In the second stakeholder consultation, most packaging stakeholders indicated that the harmonised labels already conveyed sufficient sorting information, though approximately 25 % said they would still need to provide additional text, and about 20 % were uncertain. When asked how they would prefer to provide such information, most identified QR codes or other data carriers as the preferred solution. However, 23 % of packaging stakeholders and 33 % of receptacle stakeholders said they would ideally complement the label with additional textual information.

The need for such complementary text ultimately depends on the specific packaging type and the national or regional collection system. Examples of additional text suggested by stakeholders include: reminders to check local sorting rules, notes on the separability of components, instructions to clean or prepare packaging before sorting, or clear indications of allowed and non-allowed items for receptacles. Some stakeholders argued that harmonised receptacle labels alone could suffice, provided that complementary information is supplied through leaflets, websites, or public communication materials.

Citizen insights: This aspect was not explicitly investigated in citizen workshops, surveys or experiments.

JRC assessment of insights: In response to stakeholder feedback—particularly calls for greater flexibility in the use of text on packaging—the proposal was refined to better integrate auxiliary textual information. Text remains essential for conveying clear and accurate sorting instructions in complex situations that cannot be communicated solely through pictograms or colours. The overarching objective is to ensure that sorting information provided to citizens is unambiguous, comprehensible, and correct. Where clarity cannot be achieved through the label alone due to complex sorting rules or local variations, complementary text should be used to resolve potential ambiguities.

At the same time, the PPWR requirement to provide text in the languages understood by the consumers in the destination Member State also applies to this auxiliary textual component. This creates practical challenges for packaging producers, including limited available space, potential conflicts with other labelling requirements, and, in some cases, increased packaging size with related environmental implications (see also Section 4.2.6.2).

JRC proposal: The proposal includes harmonised specifications for the use of auxiliary text accompanying the labels, covering both packaging component identification and supplementary sorting instructions. To preserve a clear and focused layout, no additional text should appear within the label's main text box, which is reserved exclusively for the material or fraction name.

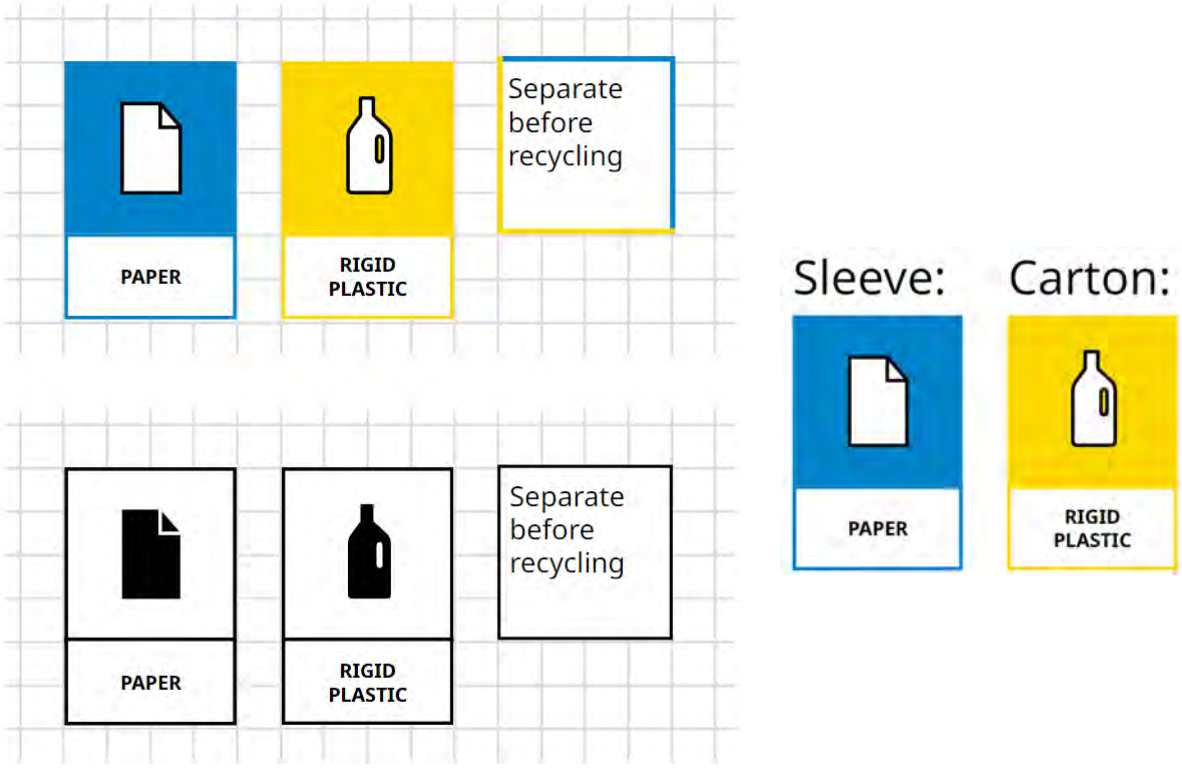
Design examples in Figure 23 illustrate the recommended placement and formatting of auxiliary text. Text-free alternatives for indicating component-specific information are described in Section 4.1.8 and for "DNTIN indications for compostable packaging in Section 4.1.10.

Additional sorting-relevant information may be placed above, below, or beside the label, provided it remains clearly associated with it. The recommended font is Noto Sans Regular, ensuring consistency with other textual elements of the system. Producers may choose the most effective layout for their packaging or receptacle, as long as:

- The text is in close physical proximity to the label, forming an integrated visual unit;
- The text is not visually dominant over the label, avoiding distraction from the core design; and
- The placement maintains a clear and intuitive link between the textual and graphical elements.

As illustrated in Figure 23, an additional text box is recommended to achieve visual alignment between labels and complementary information. Optional use of colour may be applied to support accurate and detailed sorting guidance. The figure also shows that specific component-related information can be positioned directly above or below each label to strengthen the link between the label and the relevant packaging element.

Figure 23. Examples for integrating textual information on packaging components and additional sorting instructions.



Source: Author's elaboration.

4.1.4.5. Language

Issue description: Article 12(5) of the PPWR stipulates that textual information on labels must be provided in one or more languages easily understood by end users, as determined by the Member State in which the packaging is marketed. For packaging sold across multiple MS, this entails including all relevant languages on the label to comply with national language requirements. This obligation introduces both design and implementation challenges, notably related to limited space on packaging, translation costs, and the risk of internal market fragmentation if multilingual requirements hinder the consistent application of harmonised labels.

Expert stakeholder insights: Packaging stakeholders expressed strong concerns about the translation requirements for textual information on packaging labels, particularly the space implications when multiple languages must be displayed. They warned that this could increase packaging size, with potential environmental impacts, and result in higher production and translation costs. Many therefore advocated for greater flexibility in the use of text—or, in some cases, for excluding textual elements altogether. A recurring concern was that MS might make text mandatory even if it were only recommended or optional at EU level (see Section 4.1.4.1).

In the first stakeholder consultation, only 26 % of respondents supported using national language(s) on packaging labels. A further 18 % preferred alphanumeric codes[28], and 17 % were undecided. In contrast, receptacle labels received stronger support for textual information: 44 % endorsed using national language(s), while only 9 % supported alphanumeric codes. Although these figures specifically relate to the identification of materials, it is reasonable to assume that similar preferences apply to sorting instructions or component identification text (see Section 4.1.4.4).

In the second stakeholder consultation, stakeholders reiterated concerns about including multiple languages, identifying it as particularly problematic for small packaging. Several respondents argued that country-specific packaging created to meet language requirements would contradict the PPWR's objectives of harmonisation and packaging waste reduction.

A key issue raised was the potential need to accommodate up to 26 languages (24 EU official languages plus two additional European Environment Agency (EEA) languages). While such an extreme case is unlikely, stakeholders stressed that even partial compliance could result in excessive space demands or force companies to create multiple stock-keeping units (SKUs) for different markets. Notably, 50 respondents reported needing to include textual information in at least 20 languages, and 47 indicated they required up to 24 languages.

For receptacle labels, stakeholders estimated that between two and five languages might be necessary: most expected two (national language and English, *n=15*), while larger MS such as Germany, France, and Spain typically required only one (*n=11*). Some reported regional variability (*n=3*), multilingual regions like Belgium and Finland required 3–4 languages (*n=4*), and Slovenia might require 4–5 languages due to its linguistic diversity.

To address these challenges, several stakeholders proposed using QR codes or other digital data carriers to provide multilingual, updatable sorting information without occupying label space or compromising design clarity (see Sections 4.1.9 and 4.2.5).

Citizen insights: In citizen workshops, many participants expressed a preference for bilingual labels combining their national language with English. Survey results confirmed this pattern: approximately 50 % of respondents preferred bilingual labels for both packaging and receptacles, while 36 % favoured labels exclusively in their national language(s) and 12 % preferred English-only versions. These findings were consistent across both packaging and receptacle labels. Although the results specifically relate to material identification text, they likely extend to broader preferences for supplementary textual elements (see Section 4.1.4.4 Language preferences also varied by demographic characteristics: older participants were more likely to prefer labels in their national language only, whereas higher education levels were associated with a 0.8–1.3 percentage point increase in preference for English-only labels.[29]

JRC assessment of insights: In line with Article 12(1) and recital 64 of the PPWR, the use of text in label design was limited to cases where no equally clear or easily understandable alternative was available. At the same time, Article 12(5) requires that any textual content must be presented in one or more languages easily understood by end users, as determined by the relevant Member State.

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[28] Referring to 97/129/EC.

[29] Although this option was included in the survey, it would not be permissible according to the PPWR.

To reduce the administrative and technical burden for packaging producers, the proposal does not mandate text on packaging labels (see Sections 4.1.4.3 and 4.1.4.4). However, where text is omitted, alternative design approaches—such as multi-component pictograms for multi-part packaging (see Section 4.1.8)—may be necessary to ensure sufficient clarity for users. This reflects a deliberate balance between legal compliance, design practicality, and effective consumer communication.

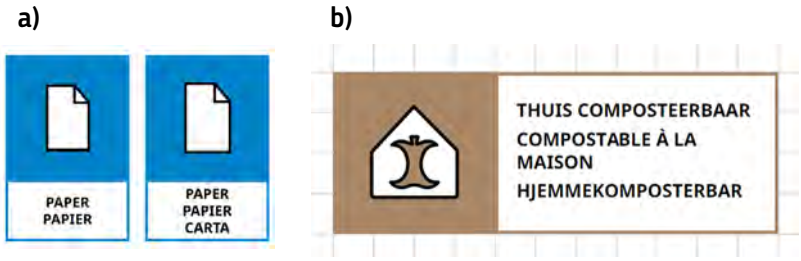
JRC proposal: Where text is included—whether for material identification or supplementary sorting guidance—it must be translated into one or more languages easily understood by end users, as determined by the Member State where the packaging or receptacle is placed on the market. To support consistent implementation, the proposal provides specific design recommendations for incorporating translations (see Figure 24).

f multiple languages are required, the text area within the label may be expanded proportionally to accommodate them. The primary language (typically the national language) should appear first, followed by secondary languages below. If only two or fewer lines are needed, the shape of the text box remains unchanged. Translations must not be placed outside the label's text box, to preserve visual coherence.

When more space is required, the text box may be expanded vertically by increments of 25 %, in accordance with the grid system. No other resizing ratios should be used, ensuring visual consistency across labels. If a translated term exceeds the label width, the text may be arranged horizontally using the 25 % grid spacing (see Figure 24 and Figure 25). This layout may also be applied as a secondary option to optimise packaging or receptacle design. The text box must remain within the overall label width. The font size should not be reduced or compressed to fit additional text; instead, the box size should be increased accordingly to maintain readability and harmonised design.

These visual rules apply equally to complementary textual elements. Given the wide diversity of packaging and receptacle formats, the proposal provides a limited set of design principles while leaving room for context-specific adaptation by packaging and receptacle designers.

Figure 24. Integration of translations of the material in the label in a) vertical and b) horizontal layout.



Source: Author's elaboration.

4.1.4.6. Alphanumerical codes

Issue description: Alphanumerical material codes, particularly those defined in Commission Decision 97/129/EC, offer two potential advantages: they identify materials in an objective and language-independent manner and avoid translation needs. However, they are rarely intuitive or easily understood by consumers. Their practical relevance has further declined given the planned repeal of Decision 97/129/EC.

Expert stakeholder insights: Stakeholders were divided on the usefulness of alphanumerical codes. In the first stakeholder consultation, almost 40 % opposed their use on packaging labels, while 27 % supported it; 56 % opposed their use on receptacle labels, with only 12 % in favour. Some cited existing national systems—such as those managed by CONAI (Italy) and Trennhinweis e.V. (Germany)—where such codes feature prominently.

Citizen insights: In the citizen survey, participants were asked whether material identifiers such as "PET 1" for plastic or "PAP 22" for paper should appear on labels. Around 77 % supported their inclusion for both packaging and receptacle labels, while 10 % were against.

JRC assessment of insights: The analysis considered both the advantages and drawbacks of alphanumerical identifiers. The JRC prototypes did not rely on them except to ensure that the proposed material granularity could be mapped to the 97/129/EC codes for reference and transparency.

The differing views of stakeholders and citizens are interpreted as reflecting divergent understandings of the question. Industry stakeholders may appreciate codes for their objectivity and lack of translation needs, whereas citizens likely saw them as optional complements to other, more user-friendly information. Decision 97/129/EC was designed for waste operators rather than consumers, and while some abbreviations such as "PET" or "PAP" are familiar, the numeric elements are not. Hence, citizens' support likely reflects an interest in additional information rather than a preference for replacing textual or pictorial elements.

Alphanumerical codes also raise accessibility concerns (Section 4.1.7), as they are harder to perceive or interpret for many users.

JRC proposal: The proposal does not foresee the use of alphanumerical codes in the harmonised label design. Given that Decision 97/129/EC will be repealed, that the codes were never intended for consumer use, and that they would not contribute to clearer sorting instructions, their inclusion is not justified. Moreover, codes exist only for certain materials—for instance, six for plastics—while consumers do not need to distinguish polymer types for correct sorting.

If future policy discussions indicate a need for material identifiers, a new system would have to be developed and tested for clarity and accessibility. However, mixed approaches—such as using codes only on packaging while relying on text on receptacles—could create confusion and undermine perceived harmonisation.

Transparent, descriptive naming of packaging materials provides clearer sorting guidance and supports informed, sustainable consumption choices.

4.1.5. Label size

Issue description: Label size is a key parameter for ensuring that EU harmonised waste sorting labels are easily visible, legible, and directly informative for consumers at the point of disposal—including users with visual impairments. Two dimensions are relevant:

1. the overall size of the label, which affects its salience and recognisability; and
2. the size of the text, for labels that include textual elements or complementary sorting information (see Sections 4.1.4.1 and 4.1.4.4).

Determining an appropriate minimum size is particularly important for small or irregular packaging, where available surface area is limited and other regulatory markings must also be accommodated.

The size requirements must therefore balance the need for visibility and readability with technical feasibility and printing constraints across different packaging types and materials.

In accordance with Article 12(5) of the PPWR, when it is not technically possible to place the harmonised label on the packaging due to its nature or size, producers may provide the required information via a QR code or other digital data carrier. This may be applied on grouped or outer packaging. If even this solution is not feasible or warranted, the required information must still be made available digitally through an accessible data carrier, ensuring that all users can retrieve the sorting information. Further details on these provisions and related marking requirements are discussed in Box 17.

Expert stakeholder insights: Stakeholders widely emphasised the need for flexibility in label size, particularly for packaging where surface space is limited. Many packaging producers, especially in sectors such as cosmetics or for products subject to additional labelling requirements under other EU legislation (e.g. the CLP Regulation), reported significant constraints in accommodating the harmonised waste sorting label alongside existing mandatory information. Several stakeholders noted that even adding a QR code or other digital data carrier posed challenges for small or irregularly shaped items.

In the second stakeholder consultation, 19.3 % of respondents identified limited space and label size as the main implementation challenge. Some reported that they could fit only the pictogram but not comply with the proposed 25 % clear-space requirement around it. These stakeholders therefore called for additional exemptions for small packaging, proposing that when space constraints make label placement impractical, the required information should be provided through digital means only (see Section 4.2.5).

Conversely, representatives of visually impaired users and accessibility advocates argued for larger labels and larger text, highlighting that small icons or letters risk undermining legibility and accessibility.

While opinions differed, many packaging stakeholders nonetheless requested a defined mandatory minimum size to ensure regulatory clarity and uniform implementation across MS.

Regarding receptacle labels, participants in the second stakeholder workshop discussed size and placement separately from packaging. Given the diversity of receptacle types and dimensions, most stakeholders considered strict standardisation of label size or placement impractical. However, there was broad agreement on the importance of consistency and recognisability, particularly for kerbside bins, street collection points, and large residential containers. Stakeholders proposed that receptacle label size should be proportional to the receptacle's surface, suggesting that the label cover roughly one third of the visible area. It was further recommended that labels be placed on the top and front lids, and, for multi-chamber receptacles, inside the lid as well. Some municipalities expressed concerns about visual clutter in public spaces, proposing black or transparent-background labels to reduce visual impact.

Citizen insights: Citizens consistently emphasised the importance of large, clearly visible text and pictograms to ensure readability, including in low-light conditions and for visually impaired users. No specific numerical preferences or size measurements were provided, as these technical parameters were considered too detailed for meaningful discussion in citizen workshops or surveys.

JRC assessment of insights: To define practical and inclusive size requirements, the JRC reviewed existing labelling systems across EU MS (European Commission, Joint Research Centre et al., 2024)

and relevant accessibility standards, including Regulation (EU) 1169/2011, ISO 24502, and ISO 24503. These references informed minimum recommendations for both label and text sizes.

The analysis considered the different needs of packaging and receptacles: packaging is subject to stronger space limitations, while receptacles typically offer more flexibility. The objective was to balance these constraints with the overarching goals of legibility, recognisability, and accessibility.

However, the diversity of packaging formats and materials makes it challenging to establish uniform quantitative size requirements that ensure both technical feasibility and sufficient readability under varying visibility conditions.

The JRC also noted the tension between accessibility objectives—ensuring visible and understandable information at the point of disposal (see Section 4.1.7)—and the industry preference for smaller labels on packaging. In addition, overlapping regulatory requirements (e.g. those under food, chemical, or cosmetic labelling legislation) further restrict the available space and complicate the introduction of mandatory minimum label sizes. These interactions, and potential conflicts with other labelling obligations, are further discussed in 4.2.6.2).

JRC proposal: The proposed size recommendations aim to ensure that harmonised waste sorting labels are clearly and rapidly recognisable at the point of disposal, including in visually demanding or distracting environments. The guidance provides differentiated recommendations for packaging and receptacles, acknowledging their distinct visibility requirements and technical constraints.

Packaging:

For packaging, the recommended minimum width for labels with text is 15 mm, corresponding to a text height of at least 1.2 mm, which supports sufficient legibility under typical lighting and handling conditions. Where necessary, a reduced label width of 10 mm may be used, ensuring a minimum x-height of 0.8 mm for text. Labels smaller than this threshold should be avoided, as they risk compromising recognisability and readability.

If available space is insufficient, a label without text may be applied. The minimum recommended width for such labels is 6 mm. This version omits the lower text box and therefore requires less surface area while maintaining visibility of the pictogram. In exceptional cases—such as very small packaging items—compliance with these minimum dimensions may not be possible. In line with Article 12(5) of the PPWR, the required sorting information may then be provided through grouped packaging labelling or digital data carriers such as QR codes (see Box 6).

Receptacles:

For waste receptacles, the recommended minimum width for labels with text is 120 mm, corresponding to a text height of approximately 10 mm, ensuring readability from a distance of 1–2 metres. Labels should be scaled proportionally to the size and use context of the receptacle:

- Where viewing distances exceed 2 metres, the minimum width should increase accordingly.
- For distances of 3–5 metres, a minimum width of 240 mm is recommended, allowing for a text height of around 20 mm.
- In large or poorly lit areas—such as recycling centres or basement waste rooms—larger sizes may be warranted to maintain visibility.

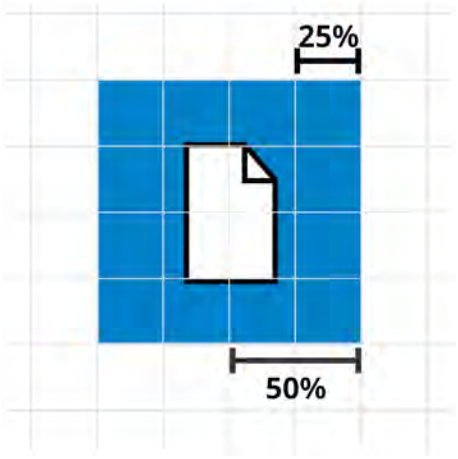
While precise dimensions for each receptacle type are not prescribed, the labels should be made as large as practically feasible to maximise legibility and recognisability.

Consistency in sizing across a single receptacle is essential: labels placed on the same bin (e.g. on the lid and front) should maintain proportional scaling and uniform sizing for all materials displayed (e.g. “paper” and “cardboard” labels). Different sized versions may be used on separate parts of the same receptacle only when dictated by space limitations.

The proposed grid system (Figure 25) ensures internal proportionality and visual balance across label sizes. The recommended minimum sizes refer to the full (100 %) label width; for instance, if a label measures 20 mm in width, the 25 % spacing equals 5 mm and the 50 % spacing 10 mm.

Further details on cases where label placement is not feasible due to packaging size or characteristics—and on relevant PPWR specifications—are provided in Box 6.

Figure 25. Proposed grid system for consistent label sizing.



Source: Author’s elaboration.

Box 6. Labelling where adequate placement is not possible due to nature and size of the packaging.

Article 12(5) of the PPWR establishes a tiered exemption mechanism for cases where the affixing, printing, or engraving of waste sorting labels and optional digital data carriers (e.g. QR codes) is not feasible or appropriate due to the nature or size of the packaging.

The provision can be summarised as follows:

Primary condition – Individual packaging

— CONDITION 1: if affixing, printing or engraving visibly, legibly and firmly the waste sorting label(s) *and*[30] optional complementary QR codes or other digital data carriers on the packaging is not possible…

— ALTERNATIVE CONDITION 2: …*or* not warranted on account of the nature and size of the packaging, …

— CONCLUSION: …the label, QR code or other standardised, open, digital data carrier shall be affixed to the grouped packaging.

[30] In our view, it is not clear in the PPWR text whether this should be interpreted as an ‘and’ or ‘or’. In our view, meaning ‘and’ makes more sense than ‘or’.

Secondary condition – Grouped packaging

— CONDITION 1: if affixing, printing or engraving visibly, legibly and firmly the waste sorting label(s) *and* complementary QR codes or other digital data carriers on the *grouped packaging* is not possible…

— ALTERNATIVE CONDITION 2: …*or* not warranted on account of the nature and size of the packaging…

— ALTERNATIVE CONDITION 3: …*or* where it is relevant to provide for non-discriminatory access to information for vulnerable groups, particularly visually impaired persons, …

— CONCLUSION: …the information shall be provided via a single electronically readable code or other type of data carrier.

This stepwise approach ensures that physical labels are used whenever possible, maintaining visibility and accessibility for consumers at the point of disposal, while allowing digital alternatives as a last resort.

Accordingly, the process can be visualised as a three-step decision tree (see *Figure 26*):

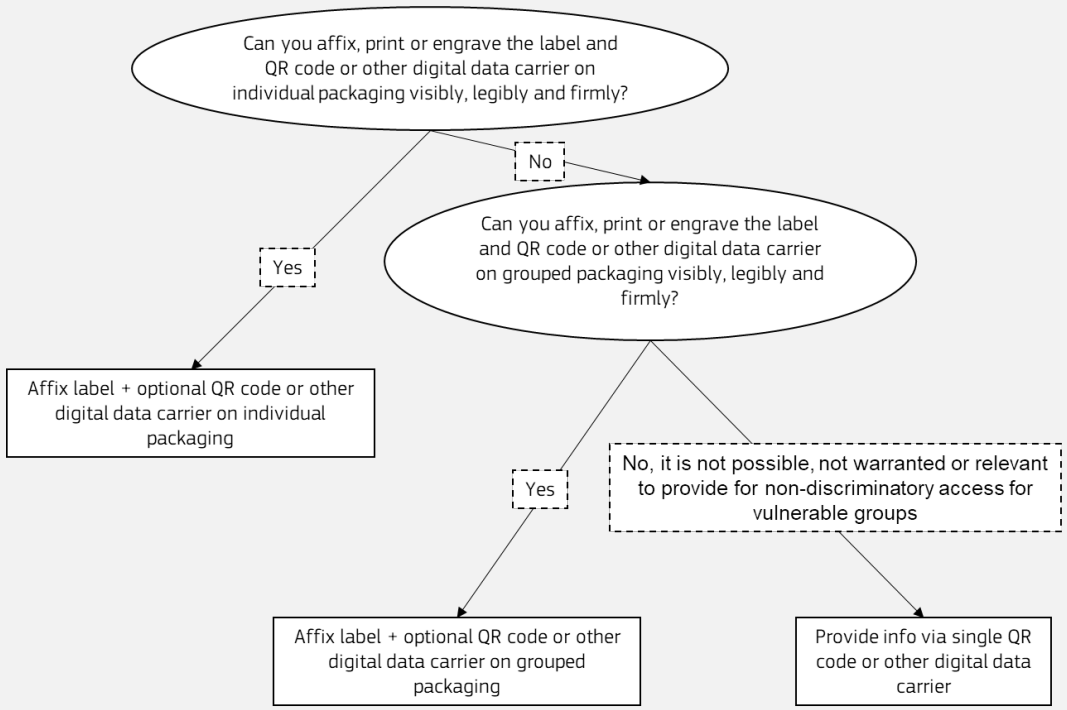
— Step 1: Label the individual packaging where technically feasible.

— Step 2: If not feasible, label the grouped packaging.

— Step 3: If neither is feasible or warranted, provide the information through a digital-only format (QR code or other open data carrier).

Both for individual and grouped packaging, digital data carriers may complement physical labels by providing additional or more detailed information, but should not replace them where physical labelling is feasible.

Figure 26. Decision tree to decide if labels must be attached to individual packaging, grouped packaging, or only via QR codes or other digital data carrier only.



Source: Author's elaboration.

4.1.6. Positioning

Issue description: The positioning of labels is a key factor in ensuring their visibility, clarity, and usability for consumers at the point of disposal. Its relevance and practical implications differ substantially between packaging and receptacles. Determining consistent placement is complicated by the wide variety of shapes, materials, and surface configurations across packaging types, as well as by the presence of other regulatory and branding elements that may compete for space or distract attention. For receptacles, positioning also relates to physical layout and user interaction—such as proximity to waste openings or other visual cues.

Expert stakeholder insights: Stakeholders—particularly packaging producers—consistently called for flexibility in determining label placement, arguing that optimal positioning depends heavily on available space and the label's size. Many cited the limited surface area and multiple mandatory information requirements on packaging (including other regulatory labels), which can create clutter and reduce consumer attention.

In the second stakeholder consultation, 8 % of respondents reported challenges in ensuring sufficient label visibility, mainly due to space limitations or competition with other on-pack information. Some stakeholders also warned that conflicting visual elements could distract consumers from sorting information.

For receptacles, the issue was less contentious but still relevant. Several stakeholders recommended placing labels above or directly adjacent to waste disposal openings to align with natural eye movements during disposal. Others stressed the need for consistent placement across similar receptacle types to promote intuitive use and recognition.

Citizen insights: Citizen workshops and surveys did not yield detailed preferences on label positioning. Participants primarily emphasised the need for clear visibility and easy recognition. Insights from the behavioural experiment provided additional evidence on label positioning for multi-component packaging (see Section 4.1.8).

JRC assessment of insights: The JRC acknowledges the broad stakeholder preference for flexibility in label positioning, given the wide diversity of packaging and receptacle formats and the coexistence of other required markings or branding elements. Nevertheless, positioning should be guided by the principle of maximising visibility and clarity at the point of disposal, while maintaining adequate separation from potentially distracting or conflicting information.

Given the heterogeneity of packaging and receptacle designs, strict prescriptive rules would be difficult to apply effectively. Instead, the proposed approach relies on principle-based guidance, encouraging stakeholders to prioritise visibility and accessibility for users. Clear recommendations on relative placement—especially on receptacles—will be provided in the user manuals accompanying the harmonised label system.

JRC proposal: All labels should be visible, legible, and durable at the point of disposal and must never be obscured (for example, placed under folds, seams, or movable parts of packaging or receptacles). This principle ensures that sorting information remains accessible to consumers under normal use conditions. These recommendations are without prejudice to the PPWR provisions allowing the use of markings on grouped packaging under specific circumstances (see Box 6). Labels applied together should have equal prominence in both size and positioning to maintain visual balance and coherence.

Packaging:

For packaging, consistent placement across product lines is strongly recommended to support consumer familiarity and quick label recognition. Labels should be positioned in intuitive and visible areas, ideally close to other key consumer information such as barcodes, ingredient lists, or recycling symbols—while maintaining sufficient spacing to preserve visual distinction. The grid system illustrated in Figure 27 provides guidance on spacing and visual alignment. Label placement for multi-component packaging is discussed separately in Section 4.1.8.

Receptacles:

For waste receptacles, precise placement decisions lie with waste management operators, given the diversity of receptacle formats. Nevertheless, a consistent and user-oriented approach is essential.

— Where multiple labels are used, they should be grouped together as a set in a single area, preferably near or above the waste opening, even if this requires minor deviations from the grid spacing.

— Labels may be applied to multiple faces of a receptacle (e.g. front and side, or front and lid) to improve visibility from different angles.

— Where possible, labels should be positioned within the natural eyeline of users—typically the upper third of the receptacle's height.

— The area immediately adjacent to the lid should be avoided to prevent wear due to frequent handling.

— All visible faces that users can approach directly should carry a label (e.g. side and rear panels for bins in open spaces).

— For low or flat-top bins, an additional label on the top surface enhances recognisability.

— Labels on waste bags should be centred to remain visible even when the bag is closed for kerbside collection.

Grid system for relative positioning:

As shown in Figure 27, the proposed grid system provides a reference framework for consistent spacing and alignment. The square portion of the label forms the basis of the grid, subdivided both vertically and horizontally into four equal parts—establishing 25 % and 50 % spacing intervals relative to the label's width.

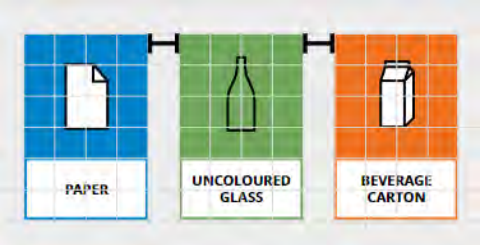
— Multiple waste sorting labels should be separated using the 25 % spacing measure.

— Additional, non-sorting information should be placed further away to ensure clear visual distinction between the harmonised waste sorting labels and other symbols.

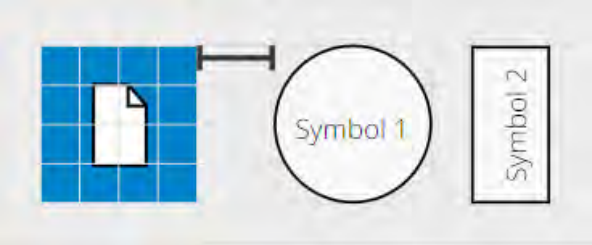
These grid-based spacing rules are recommendations, not strict prescriptions. Stakeholders may adapt them to accommodate limited space or specific design requirements. However, maintaining relative distances based on label proportions follows established design best practices, supporting optimal visibility, legibility, and recognisability of the harmonised label system.

Figure 27. Proposed approach to harmonised and consistent relative positioning of EU harmonised waste sorting labels (a) and other labels or symbols (b).

a)



b)



Source: Author's elaboration.

4.1.7. Accessibility

Issue description: Ensuring that waste sorting labels are accessible and usable for all individuals—including those with physical, sensory, or cognitive disabilities—is a fundamental design requirement of the EU harmonised labelling system. Accessibility supports equitable participation in waste sorting and enhances overall system effectiveness.

The PPWR explicitly addresses accessibility:

— Article 12(1) requires that labels be easily understandable, including for persons with disabilities.

— Article 12(5) further specifies that where it is not possible to affix or engrave a physical label, or where it is necessary to ensure non-discriminatory access to information for vulnerable groups—particularly visually impaired persons—the required information must be provided via a single electronically readable code or other digital data carrier.

Accessibility considerations encompass both the visual and structural design of the harmonised labelling system. This includes:

— designing pictograms, text, and colour contrasts that are easily distinguishable;

— maintaining visual clarity and simplicity to facilitate comprehension by users with cognitive or learning difficulties;

— ensuring consistent positioning and adequate sizing to assist users with visual impairments; and

— integrating alternative access options (e.g. digital data carriers) when physical labels cannot be sufficiently legible or tactile.

The concept of accessibility therefore applies not only to the design of individual labels, but also to the overall system architecture, ensuring that sorting information remains inclusive, intuitive, and effective for all users.

Desk research insights: Relevant national initiatives provide useful reference points for improving accessibility in consumer labelling. In particular, the Spanish Draft Royal Decree on accessible

labelling of consumer products seeks to ensure that essential information on packaging is accessible to all users, including those with disabilities.[31]

Although its scope differs from the PPWR—covering only products of particular relevance to safety, integrity, and quality of life—the Decree provides valuable guidance on practical implementation of accessible labelling. It specifies that accessible labels must reproduce, when present on the standard label, key information such as the product and manufacturer name, production or supply data, expiry or use-by date, and instructions for use and waste disposal.

Accessible information must be made available through one or more of the following means:

- Braille, at least in Castilian (Spanish);
- a QR code or equivalent digital system, marked by a tactile indicator in the form of a raised 90° angle, used when the full accessible information cannot be printed physically and subject to safeguards preventing user identification, data processing, or additional cost;
- cognitive accessibility tools or other technological means enabling comprehension by users with cognitive or learning disabilities.

Under the Decree, manufacturers and importers are responsible for ensuring compliance before products are placed on the market, while distributors must verify that only compliant products are sold. Violations are sanctioned under Spanish disability and consumer protection law.

The Decree also encourages companies to apply accessible labelling—especially Braille—to all products, not only those legally required, and to expand accessible content through open-access mobile applications. Voluntary collaboration with accessibility institutions and public authorities is promoted as good practice. Products already labelled before the Decree's entry into force may remain on the market for up to two years, after which accessibility features can be added using adhesive labels, inkjet printing, or equivalent methods.

Expert stakeholder insights: To identify accessibility needs and requirements for vulnerable users, bilateral exchanges were conducted with the EBU. The EBU gathered feedback from its Accessibility Committee, Accessibility Working Groups across nine EU countries (Austria, Germany, Denmark, Estonia, Finland, France, Hungary, the Netherlands, and Slovakia) as well as from its Braille Working Group. Their assessment was based on Prototype 1 used during the first stakeholder consultation (see Annex I).

EBU members noted that the pictograms in the prototype were not recognisable by touch, primarily due to their small size, complex shapes, use of perspective, and overlapping elements. However, they also pointed out that recognising pictograms by touch is inherently challenging, regardless of design. For partially sighted users, concerns focused on insufficient colour contrast (e.g. white text on a yellow background), small differences between similar colours, and the use of red, green, and grey, which should be avoided where possible due to low visibility or colour vision deficiencies. These issues were reiterated by participants in the second stakeholder consultation.

The EBU recommended the use of Braille—rather than tactile pictograms—on receptacle labels, as Braille offers greater legibility by touch. They also advocated for the inclusion of raised tactile

[31] https://technical-regulation-information-system.ec.europa.eu/en/notification/27007/text/D/EN (last accessed 30/07/2025).

letters, which benefit both blind and partially sighted users. The EBU positively noted examples from the Danish pictogram scheme, which had developed accessible prototypes including tactile letters, a raised pictogram, and Braille. They also referenced the ongoing work on the European "Tactile Lettering" standard (CEN/TC 293/WG1), which underscores the importance of raised tactile letters alongside Braille for accessibility.

The EBU cautioned that digital solutions should not replace physical accessibility features such as Braille, raised letters, and high-contrast pictograms. Reliance on technology (e.g. smartphones or QR codes) was considered burdensome in practical sorting contexts (see also Section 4.1.9).

he EBU provided the following general design recommendations for accessible labels:

— Labels should be as large as possible.

— Raised letters should be:

    - in Latin characters, Sans Serif, uppercase, bold, with block spacing, and a font size of 15–25 mm;
    - raised by at least 1 mm, with a cuneiform profile.

— The luminance contrast ratio should be at least 70 %.

— Use familiar and widely recognised colours where possible.

— The label area should extend at least 20 mm beyond the tactile elements on all sides.

— The label thickness should be at least 1.5 mm and easily identifiable by touch.

— Ensure sufficient contrast between the label and the receptacle surface.

— If a QR code is included, it should be placed on the right-hand side, at least 30 mm away from tactile elements.

— Labels should be positioned above disposal openings to prevent contact with waste.

— Consistent placement across receptacles is essential so that blind or visually impaired users can reliably locate them.

Citizen insights: Citizen workshops were designed to include participants with different types of impairments to gather inclusive feedback on the accessibility of waste sorting labels. Participants suggested several measures to make the system more accessible:[32]

— integrating Braille on labels;

— avoiding technical terms and using plain, everyday language;

— ensuring labels are easy to read for older people;

— using universal symbols and colour coding to minimise language barriers; and

[32] Note that due to this being sensitive data and due to data protection, the collected data does not allow identification of which insights were from people with any type of impairment.

— considering multilingual labels to support broader understanding.

Out of the 50 concepts co-developed during the workshops, 11 explicitly addressed accessibility, often alongside label redesigns or educational and communication measures to raise awareness and support inclusive use.

As noted in Section 4.1.3.4, participants with colour vision deficiencies or visual impairments were more likely to prefer achromatic (black-and-white) label versions, likely due to enhanced contrast and legibility. In addition, as discussed in Section 4.1.4.5, older participants tended to prefer labels in their national language only, while participants with lower education levels were less likely (by 0.8–1.3 percentage points) to prefer English-only labels.

Findings from the behavioural experiment further supported these patterns: participants with colour blindness showed shorter reaction times but lower sorting accuracy, suggesting reduced engagement or difficulty processing colour-based cues. The results indicated that textual elements on labels were particularly helpful for individuals with colour vision deficiencies.

JRC assessment of insights: Accessibility considerations were integrated into the label design wherever feasible, while recognising that several trade-offs were necessary due to factors such as limited space, printing constraints, colour differentiation requirements, and the challenge of identifying clear pictograms for all materials.

To improve accessibility:

— Pictograms with overlapping elements or use of perspective were simplified to improve visual clarity.

— Colour contrast was enhanced across all prototypes, meeting standard contrast and accessibility criteria for both print and digital use.

— EBU recommendations were reflected, where possible, in the accessibility sections of the user manuals.

However, the JRC did not propose mandatory requirements for tactile text, pictograms, or Braille on either packaging or receptacle labels. Instead, these are presented as recommended features, allowing implementing authorities and stakeholders to decide whether and how to adopt them within practical and technical limits.

The EBU-recommended text size of 15–25 mm (x-height) is substantially larger than the recommended minimum x-heights in this proposal—1.2 mm and 0.8 mm for packaging, and 10 mm for receptacles (see Section 4.1.4.1). Physical labels produced at these sizes therefore cannot be considered fully accessible according to EBU standards.

Finally, contrary to frequent stakeholder suggestions, the JRC notes that QR codes or digital data carriers alone do not ensure accessibility. In line with EBU feedback, digital tools should be considered complementary, not substitutes, for physical accessibility features such as Braille, raised letters, or high-contrast visuals.

JRC proposal: The proposed harmonised labels integrate accessibility features to enable inclusive participation in waste sorting. Their visual design prioritises clarity, legibility, and usability for all users, including those with visual, sensory, or cognitive impairments.

Key accessibility features include:

— High luminance contrast between elements;

— Clearly distinguishable colours with sufficient differentiation across materials; and

— Consistent and uncluttered layout to support intuitive recognition.

Text on labels is always printed in black on white or white on black to maximise contrast. For transparent labels or single-colour printing, the base colour of the packaging or receptacle must provide adequate contrast to ensure readability. Pictograms on colour labels appear as white icons with black outlines, creating strong contrast with the background colour. In cases where black icons are used (e.g. for uncoloured glass or compostable materials), the design complies with WCAG 2.1 AA standards for contrast between black graphics and coloured backgrounds.[33]

In addition to these visual standards, the JRC proposes optional accessibility features that can be applied to receptacle and, where feasible, packaging labels, depending on available space, materials, and technical capacity:

Braille

— Braille provides tactile reading for individuals who are blind and is recommended for receptacle labels and, where feasible, packaging labels.

— It should be positioned consistently, preferably in the lower right-hand area of the label, to facilitate recognition.

— On receptacles, tactile and Braille features should be placed between 900–1200 mm from the ground, ensuring accessibility for seated users, in line with universal design principles.

— Translation and language rules for Braille follow the same requirements as other textual elements under the PPWR.

— Braille should complement, not replace, visual or textual elements.

Raised letters and tactile pictograms

— These features assist individuals who rely on touch but do not read Braille.

— They are recommended for receptacle labels and, where technically feasible, packaging labels.

— Lettering should use the standard font family defined in this proposal, in bold uppercase Sans Serif, with block spacing and a minimum x-height of 15–25 mm.

— Tactile elements should be raised at least 1 mm, ideally with a triangular or angled (cuneiform) profile, and pictograms at least 1.5 mm thick to ensure durability and tactile clarity.

— Tactile pictograms must correspond exactly to the visual pictograms used in the standard label set and maintain proportional sizing.

QR codes and other digital data carriers

[33] https://www.w3.org/WAI/standards-guidelines/wcag/ (last accessed 30/07/2025).

— Digital data carriers provide supplementary accessible information, particularly where space or material constraints limit the inclusion of physical accessibility features.

— They may serve as complements or, in certain cases, as substitutes for physical labels (see Section 4.2.5 and Box 17).

— Digital content should be designed according to WCAG and may include audio explanations, screen-reader-compatible webpages, or high-contrast visuals.

— To support users with cognitive disabilities, content should be presented in plain language, optionally enhanced with audio or visual cues.

— QR codes should be placed adjacent to the main label, preferably to the right, and be easy to locate by touch or sight.

4.1.8. Multiple component packaging and complementary pictograms

Issue description: Multiple-component packaging refers to packaging made up of more than one component—either integrated or separate—that can be of the same or different materials as the main packaging unit. Components may be separated by consumers through simple mechanical actions such as unscrewing, pulling, or peeling. Section 4.2.2. provides detailed specifications and guidance on labelling rules for such packaging.

Under the PPWR, an

— integrated component is defined as a packaging component that is integral to the packaging unit and its functioning, does not need to be separated to ensure functionality, and is typically discarded at the same time as the main body of the packaging unit, though not necessarily through the same disposal route; and a

— separate component as a packaging component distinct from the main body that must be disassembled completely and permanently before disposal and is typically discarded separately, including components that can be separated through simple mechanical stress during transport or sorting.

Multiple-component packaging poses three main challenges. First, it can complicate correct consumer sorting, as users must identify and separate components before disposal according to local waste rules. Second, it requires a consistent approach to label placement so that each component can be clearly assigned to the correct waste fraction. Third, it calls for harmonised visual strategies to communicate this information effectively while leaving flexibility for packaging producers with limited surface space.

To address these challenges, three complementary approaches to labelling multi-component packaging were considered:

1. Labels applied together on the main component: a single area displaying all relevant material pictograms, allowing users to identify and separate components visually.
2. Complementary multi-component pictograms: additional pictograms indicating the presence and material of each detachable component (e.g. a bottle symbol with smaller icons for cap and label).
3. Labels applied directly on each component: each part of the packaging bears its own material-specific label, ensuring precise correspondence with the relevant waste fraction.

Evidence from the behavioural experiment confirms that citizens prefer clear, component-specific information. About 43 % favoured applying labels directly on each component, while 38 % preferred pictograms showing which part is made of which material. Both approaches improved understanding and sorting accuracy compared to aggregated labelling. Consequently, the harmonised design allows all three options, provided that visual coherence and the matching principle are maintained. Complementary pictograms must follow the same graphical standards—pictogram shape, contrast, and colour—as other labels to preserve the system's recognisability and accessibility.

Expert stakeholder insights: Stakeholders consistently highlighted both the practical and behavioural challenges associated with labelling multiple-component packaging.

In the first stakeholder consultation, more than half of the respondents supported including information on different packaging components within the waste sorting label. About 26 % preferred this to be communicated through illustrations, while 20 % were unsure, 10 % suggested achieving it through adequate label placement, 7 % through illustrations and text, 5 % through text only, and around 4 % expressed no preference. Packaging producers frequently pointed to limited label space and design constraints, emphasising the need for flexibility when labelling multiple-component packaging. Many producers advocated for applying the label only to the majority material of the packaging, arguing that multiple labels or complementary pictograms would be unnecessary. Some industry representatives believed that consumers would intuitively understand which component a label referred to, even without additional pictograms or placement differentiation.

During the second expert workshop, three groups addressed the challenge of labelling multiple-component packaging, while a fourth group evaluated their proposals. The groups prioritised labelling options as follows:

1. Labelling the consumption unit—the part of the packaging handled by the user until disposal—wherever space permitted;
2. Labelling components in the order of opening, use, or disposal, or, in the case of multipacks, at the level of the last component discarded;
3. Using multi-component pictograms to indicate separable parts.

Several stakeholders proposed avoiding distinct pictograms for components made of the same material (e.g. a plastic tube and plastic cap), suggesting instead a single label for the shared material. They also explored the use of visual cues—such as dotted lines or interlocking symbols—to indicate that materials should be separated before disposal. Stakeholders agreed that labelling alone would not improve the sustainability of multiple-component packaging and recommended a maximum of three components per packaging unit, beyond which producers should reassess their designs in line with design-for-recycling principles. Participants rejected the idea of using meta-labels for multiple-component packaging, considering them confusing for users.

In the second stakeholder consultation, 56.7 % of respondents stated that some of their packaging contained more than one material type covered by the labelling scheme and would therefore require multiple labels. Stakeholders expressed differing views on how these labels should be displayed:

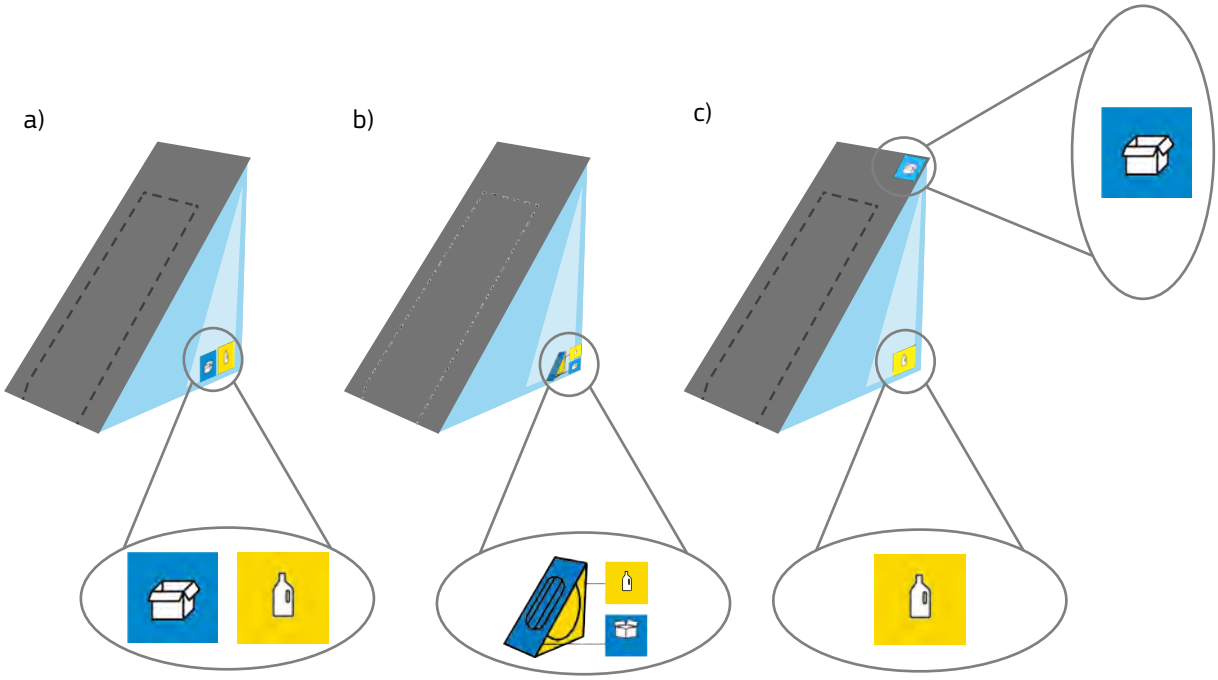
— 42.7 % preferred to apply all labels in the same place (Panel a in Figure 29), describing this as the most space-efficient, least disruptive to packaging design, and easiest for consumers to interpret.

— 28 % favoured placing all labels together with an illustration showing which waste label corresponded to each component (Panel b), considering this clearer for consumers but often impractical on small packaging due to space limitations.

— 23.3 % supported labelling each component separately (Panel c), noting its clarity for separation but also its higher costs, production complexity, and potential interference with branding.

The remaining respondents selected “none of the above” or provided no answer. Overall, stakeholders stressed that the system should balance clarity for consumers with technical and spatial feasibility for producers, allowing flexibility in how labels for multiple-component packaging are applied.

Figure 28. Proposed approaches to label multi-component packaging.



Source: Author’s elaboration.

Citizen insights: Citizens consistently reported that multiple-component or multiple-material packaging creates uncertainty and confusion during waste sorting. Participants in the citizen workshops noted that existing recycling and sorting instructions on packaging often include several symbols without clarifying which component each symbol refers to. They also highlighted the absence of a centralised information source explaining where different packaging materials should be disposed of, to what extent materials should be separated, and whether cleaning was required before disposal. The diversity of local waste collection rules across municipalities further increased confusion, as sorting requirements and bin systems differ considerably between locations.

Findings from the citizen survey confirmed that multiple-component packaging poses significantly greater sorting challenges than single-component packaging. While over 80 % of single-component items were sorted correctly, this dropped to approximately 16 % for dual-component and 21 % for

triple-component items. Incorporating component pictograms for multi-material packaging improved sorting accuracy, particularly for dual-component items, by about 0.7 percentage points. A large majority of respondents (81 %) supported the inclusion of multi-component labels, while only 8 % opposed it.

Results from the behavioural experiment corroborated these findings. When presented with different labelling options for multi-component packaging, 43 % of participants preferred labelling each component separately (Panel c) in Figure 29[34]), finding this clearest for indicating separation. Another 38 % favoured a pictogram showing which material corresponds to each component (Panel b), considering it an effective compromise between clarity and design simplicity. The least preferred option, selected by 19 %, was displaying all labels together without further indication (Panel a).

JRC assessment of insights: The consultations revealed a clear divergence between citizen and producer preferences regarding the labelling of multiple-component packaging. Producers expressed concerns about limited space on packaging surfaces and the practical challenges of applying labels to each individual component, particularly for small or irregularly shaped items. Many stakeholders therefore favoured simplified approaches—such as grouping all labels in one place or labelling only the majority material—to maintain feasibility and reduce production complexity.

In contrast, citizens consistently preferred options that explicitly link each component to its material, either through separate labels on each part of the packaging or through pictograms visually indicating the materials of all components. These approaches were perceived as clearer and more informative, improving confidence and accuracy in sorting.

Given the opposing preferences and the diversity of packaging formats, the JRC recommends allowing flexibility for producers to choose among the three labelling approaches, provided that the visual coherence and the matching principle of the harmonised system are maintained. Nevertheless, where technically and spatially feasible, the preferred options are either pictograms linking each component to its material (Figure 28b) or labels placed directly on each component (Figure 28c), as these convey the most actionable information to consumers.

It should be noted that these labelling options were not tested experimentally; the available evidence is based on citizen preferences and stakeholder feedback rather than behavioural performance data. As summarised in Table 7, each approach has specific advantages and limitations depending on packaging type, available surface area, and production processes. Consequently, no single option can be considered universally optimal, underscoring the need for a balanced and adaptable implementation framework.

JRC proposal: Packaging may consist of several components made of different materials, each covered by a corresponding label according to the proposed level of granularity.[35] All relevant material labels must be displayed to provide consumers with clear information about the material composition of the packaging and the correct sorting instructions.

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[34] Participants saw different examples of packaging and multi-component labels.

[35] To clarify, packaging may also consist of multiple components that have the same material and therefore associated material label (see also Beaumais et al., 2024). In such cases, single components do not have to be labelled separately with the same label.

To ensure flexibility for different packaging formats while maintaining visual consistency, three labelling approaches are permitted for multiple-component packaging:

a) Multiple material labels may be grouped together on the main body of the packaging. They can be arranged using the grid system (see Figure 25 in Section 4.1.4.5). Where appropriate, supplementary text may be added to clarify which label corresponds to which packaging component (see Section 4.1.4.4). A white background or grouping box may be used to visually link the labels (see Figure 29).

b) Complementary multi-component pictograms. Complementary pictograms may be used to visually associate each packaging component with its corresponding material label. When applied, these component pictograms must be designed by producers to proportionally match the size and style of the material labels and should be placed in direct proximity to them, preferably on the left-hand side. The pictograms must clearly and unambiguously represent the relevant packaging components, ensuring users can easily identify which label applies to which part. In line with the proposed colour and text conventions, all labels displayed on a single packaging unit must correspond to the same version (e.g. colour or text presence).

c) Labels applied directly on each packaging component. Where technically feasible, it is recommended to apply each label directly to the component it refers to. Consistency must be maintained across the packaging, ensuring that the same label version (in terms of colour, layout, and text inclusion) is used throughout the product.

Table 7. Discussion of pros and cons of options to label multi-component packaging for consumers (C) and producers (P).

Option	Pro	Con
a) All labels at the same location	- P: Often easier to apply. - C: Compact information for consumers.	- C: Less clear which components labels refer to (Without textual information)
b) Multi-component labels	- C: Clear relation between label and component.	- P: Space required. - P: Design required.
c) On respective packaging components	- C: Clear relation between label and component. - C: Clearer signalling that packaging requires disassembly.	- P: Printing may not be possible or difficult on component. - C: Consumers might not find (all) labels.

Source: Author's elaboration.

Figure 29. Proposal to link multiple labels with a white background area.

Source: Author's elaboration.

4.1.9. Digital data carriers

Issue description: Access to supplementary information may be provided through QR codes or other standardised, open digital data carriers, ensuring a harmonised, consistent, and accessible approach across the EU. In accordance with Article 12(1) of the PPWR, harmonised waste-sorting labels may be complemented by a digital data carrier on the packaging that provides information on the destination of each separate component to facilitate correct consumer sorting.

Furthermore, Article 12(5) specifies that where affixing, printing, or engraving a physical label is not possible or not warranted due to the nature or size of the packaging, and where neither the label nor the digital carrier can be affixed to grouped packaging, the required information shall be made available exclusively through a single electronically readable code or similar data carrier. This provision also applies when it is necessary to ensure non-discriminatory access to information for vulnerable groups, in particular visually impaired persons (see Box 6 and Box 17).

The same language requirements apply to information provided through digital means as to physical labels: it must be presented in one or more languages easily understood by end users, as determined by the Member State where the packaging is placed on the market (see Section 4.1.4.5). Physical labels must remain visible, legible, and indelible, guaranteeing accessibility in cases where digital technologies are unavailable or fail to function.

Further details on the specific information to be provided through QR codes or other digital data carriers are presented in Section 4.2.5.

Desk research: Based on publicly available technical sources[36], the minimum practical size for printing QR codes compliant with ISO/IEC 18004 is approximately 1 cm × 1 cm, which represents the smallest dimension ensuring scannability under optimal conditions. However, QR codes of this

[36] https://myqrcode.com/blog/whats-the-minimum-size-of-a-qr-code#:~:text=Minimum%20Size%20of%20a%20QR%20Code%20for%20Printing,x%200.8%20inches)%20is%20best (last accessed 30/07/2025) and https://scanova.io/blog/minimum-qr-code-size (last accessed 30/07/2025).

size can typically be read only by high-resolution or specialised scanners and are therefore not recommended for general use on consumer packaging.

For general-purpose applications, particularly where scanning by smartphones is expected, a minimum size of 2 cm × 2 cm is commonly recommended. The effective readability of a QR code depends on several factors, including scanning distance, camera resolution, lighting conditions, and print quality. Smaller versions such as Micro QR Codes can be used when the amount of stored data is minimal, but their data capacity is inherently limited due to a reduced number of modules.

The QR Code version (defining the total number of modules) and the error-correction level (L, M, Q, H)[37] directly influence the space required to encode information. Error correction determines how much of the code can be restored if damaged or obscured:

- L (≈ 7 %) – low redundancy, suitable for large and clean codes;
- M (≈ 15 %) – medium redundancy, suitable for general use;
- Q (≈ 25 %) – high redundancy, used when minor damage or dirt is expected;
- H (≈ 30 %) – very high redundancy, suitable for small codes or surfaces exposed to wear.

In advertising and packaging contexts, levels Q or H are typically chosen to ensure reliable scanning despite surface wear, branding overlays, or curvature. This implies minimum recommended printed sizes of approximately 2.5 cm × 2.5 cm (Level Q) and 3 cm × 3 cm (Level H).

According to ISO/IEC 18004, all QR codes must include a quiet zone—a clear margin of at least four modules on each side—free from any printing, colour, or pattern interference. This requirement contributes to the effective minimum printed size, making 1 cm × 1 cm an absolute lower limit under controlled conditions only.

A practical rule of thumb is the "10:1 rule", which recommends that the physical size of the QR code be at least one-tenth of the intended scanning distance (e.g. a 10 cm × 10 cm code for a 1 m scanning distance). Printing resolution should be at least 300 dots per inch to ensure clean module definition and avoid blurriness.

Finally, Recital 70 of the PPWR specifies that, to avoid duplication of labels, where EU law already mandates a digital information carrier (e.g. for a Digital Product Passport), the same carrier should be used to convey information required under the PPWR. This ensures consistency and efficiency across EU labelling systems.

Expert stakeholder insights: Stakeholders expressed a generally positive view of QR codes and other digital data carriers as tools to provide supplementary information on packaging and receptacles. In the first stakeholder consultation, approximately 31 % of respondents supported the use of QR codes to complement waste-sorting labels on both packaging and receptacles. The share of positive responses ranged between 20 % and 30 % for each category, while others indicated uncertainty or noted that their preference depended on contextual factors. Some stakeholders—particularly from the packaging sector—favoured using digital-only solutions, replacing physical

[37] https://www.qrcode.com/en/about/error_correction.html (last accessed 30/07/2025).

labels entirely. A few even proposed relying on automatic machine-readable technologies, such as digital watermarks (e.g. HolyGrail 2.0[38]), to enable sorting without consumer involvement.

The second stakeholder consultation confirmed that QR codes and digital carriers were viewed as a smart and space-efficient way to provide detailed, multilingual, and updatable disposal information, especially for multi-component packaging and small-format packaging where space constraints make text or pictograms difficult to display.

When asked how they preferred to provide additional information—for example, about preparation, disassembly, or cleaning of packaging, and avoiding contamination—66 % of stakeholders selected QR codes to complement the label, 25 % preferred another type of data carrier, 23 % favoured text, and 6 % chose other options. For receptacle labels, 31 % preferred QR codes and 12 % preferred other data carriers. Other frequently mentioned approaches included textual guidance on admissible waste materials (18 %), pictograms for non-admissible materials (17 %), images of admissible materials (17 %), and text on non-admissible materials (15 %).

Stakeholders also viewed QR codes as a promising way to improve accessibility for blind and visually impaired users, often preferring them over tactile or Braille labels on the assumption that visually impaired persons already use digital assistance tools.

However, several practical issues were identified. For small products such as cosmetics or tobacco packaging, stakeholders argued that even a 20 × 20 mm QR code could be too large and requested flexibility in size, suggesting that any machine-readable code should be considered sufficient. Others pointed to the overlap with other mandatory labelling requirements (e.g. product, safety, or environmental information), noting that a single integrated data carrier should be used to avoid duplication. Some also challenged the idea that QR codes must be positioned next to waste-sorting labels, since they may already serve multiple regulatory purposes.

In the expert workshops, participants reiterated that while QR codes can effectively complement physical labels, they should not replace essential sorting information on packaging. The majority supported flexibility in their implementation, particularly regarding size, placement, and information content, to ensure usability across diverse packaging formats and regulatory requirements.

Citizen insights: During the citizen workshops, participants frequently mentioned digital technologies such as QR codes, mobile applications, and Near Field Communication (NFC) as promising tools to make waste sorting more intuitive, accessible, and efficient. Approximately 20 % of the concepts developed by participants incorporated such technologies to provide real-time guidance and instant access to waste management information, including instructions on waste preparation (e.g. rinsing cans, removing labels, or separating components). Participants viewed these tools as valuable in helping citizens understand and follow correct sorting practices more easily.

Findings from the citizen survey further confirmed the perceived usefulness of QR codes. Around 60 % of respondents supported the inclusion of QR codes to provide supplementary information, with slightly stronger preference for packaging labels (65 %) than for receptacle labels (60 %). However, self-reported usage patterns indicated moderate engagement with such technologies: 31.8 % of respondents had not scanned any QR codes in the previous month (excluding menus at restaurants), 26.2 % had scanned 1–2 times, 25.5 % scanned 3–5 times, and 16.5 % scanned more

[38] https://www.digitalwatermarks.eu/ (23/05/2025).

than five times. This suggests that while citizens appreciate the idea of digital access, actual usage remains limited. Some participants may support QR codes more for their perceived usefulness to others—such as younger or more digitally literate users—than for their own anticipated use.

In the behavioural experiment, participants' views on QR codes were mixed. While 44 % believed QR codes would contain essential information for correct sorting, 33 % expected them to provide only additional, non-essential information. When asked about their willingness to scan, 32 % stated they would do so, 42 % said they would not, and 26 % were unsure. However, these responses reflected intentions rather than observed behaviour. In practice, only 4 out of 11,096 participants scanned the test QR code embedded on one of the ten packaging items presented in the experiment. Although participants were instructed to consider all available information, the lack of explicit mention that the QR code was functional likely mirrors real-world behaviour, where such cues are often overlooked.

Overall, the findings suggest that citizens regard QR codes as a useful complementary feature, valued mainly for providing additional or contextual information rather than for essential sorting instructions. Participants recognised their potential to improve understanding but emphasised that QR codes should not replace on-label information, which must remain directly visible and easily interpretable. While general attitudes toward QR codes were neutral to positive, several barriers were identified, including limited access for people without smartphones, the effort required to scan, and doubts about the practical relevance of such features in everyday waste sorting.

JRC assessment of insights: Packaging producers generally favour the prominent use of QR codes and other digital data carriers, primarily on packaging and, to a lesser extent, on waste receptacles. They emphasised the potential of digital tools to improve accessibility and provide flexible, updatable information. However, the EBU strongly opposed the excessive digitalisation of information, warning that it could lead to over-reliance on auditory aids for everyday tasks, thereby increasing the risk of hearing strain or impairment (see Section 4.1.7).

Citizen evidence supports the view that QR codes should remain optional. Less than 1% of participants in the experiment consulted the code, although they were instructed to use all information needed to make their sorting decisions. While this constituted a stringent test of QR code use, it underlines that while many participants recognised their potential usefulness, most reported limited or irregular use and uncertainty about their purpose, underlining the need for all essential sorting information to remain clearly visible on the physical label itself.

The JRC acknowledges that an approach relying solely on digital carriers would offer design and logistical advantages for packaging producers, particularly in cases of limited space. However, substituting physical labels with digital-only solutions is permitted only under exceptional circumstances, as stipulated in Article 12(5) of the PPWR. Moreover, QR codes and similar carriers may reduce accessibility for a substantial share of citizens, given that only a minority use them regularly. Their greatest value lies in providing complementary information, especially for complex or multi-component packaging where additional guidance—such as separation or cleaning instructions—cannot be easily expressed through concise text or pictograms.

Technologies designed to automate sorting, such as digital watermarking (e.g. HolyGrail 2.0), were also discussed by stakeholders. While promising, these solutions are not yet mature for large-scale market implementation and therefore were not considered in the current proposal.

Regarding QR code sizing, there is a clear trade-off between ensuring adequate readability (as discussed in the desk research) and accommodating the limited available space on packaging. The PPWR may not fully address the minimum size requirements necessary for functional scanning,

particularly if QR codes are intended as substitutes for physical labels. In practice, a QR code of adequate size for general smartphone use would often occupy more space than a standard printed label.

Alternative digital data carriers—such as Data Matrix codes (ISO/IEC 16022), Aztec codes (ISO/IEC 24778), Micro QR codes (subset of ISO/IEC 18004), or NFC tags—may require less space. However, they currently face limitations in smartphone compatibility and restricted accessibility, and are therefore unlikely to achieve higher adoption rates than QR codes in the near term.[39]

JRC proposal: QR codes are proposed primarily as optional complements to the EU harmonised waste-sorting label or set of labels. When used, the QR code should form an integral unit with the physical label(s), appearing directly alongside them. To ensure clear visual association, the QR code should be aligned according to the grid system and have approximately the same dimensions as a single label. Recommended layouts are provided in Figure 30. In line with EBU accessibility guidance, QR codes should preferably be positioned to the right of the label(s). For consistency and visual balance, the label should not be smaller than the adjacent QR code.

QR codes must be large enough to be reliably scanned by common consumer smartphones. Producers are responsible for verifying readability under real conditions using their own printing methods and packaging materials. The dimensions provided below refer to the active (encoded) area of the QR code; the mandatory quiet zone surrounding the code must be added in addition to these measurements.

On packaging, the recommended standard size is 20 mm × 20 mm, with a minimum permissible size of 10 mm × 10 mm. Smaller codes should be avoided, as their readability cannot be guaranteed on all devices, and may only be used in exceptional cases, provided that consumer usability is assured.

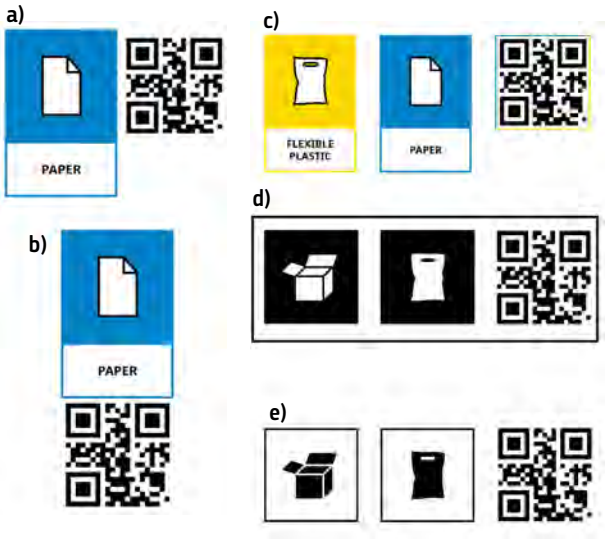
On waste receptacles, size and placement may be determined by producers or local authorities, provided that QR codes remain clearly visible and easy to scan, including for users with physical disabilities. The QR code must always be positioned in close proximity to the corresponding label(s) to ensure clear association.

The recommended size of QR codes on receptacles should follow the 10:1 rule, which specifies that the physical size of the code should be at least one-tenth of the expected scanning distance. For example:

- For small bins, where users are likely to scan from a distance of around 30 cm, a 3 cm QR code is sufficient.
- For large bins or signage mounted at a height, where users may be up to 2 m away, a 20 cm QR code is recommended.

[39] As we do not have access to ISO documents, we are relying on third party information here, as indicated.

Figure 30. Suggestions to use QR codes providing further sorting relevant information for packaging next to the physical label (a, b) or labels (c, d, e)..



Source: Author's elaboration.

4.1.10. Complementary "do not throw in nature" labels for compostable packaging

Issue description: Recital 66 of the PPWR specifies that EU harmonised waste-sorting labels should inform consumers about the composting properties of packaging while preventing confusion between industrially compostable and home-compostable packaging. This information should help ensure that compostable packaging is not discarded in nature.

Furthermore, Article 12(1) of the PPWR requires that, for packaging referred to in Article 9(1) and, where applicable, Article 9(2), the waste-sorting label must indicate that the material is compostable, that it is not suitable for home composting, and that compostable packaging must not be discarded in nature.

This section focuses on the visual proposal for the complementary DNTIN label, while further issues and challenges related to compostable packaging labels are discussed in Section 4.2.1.9.

Desk research: The DNTIN symbol was designed by the project's graphic designers, drawing inspiration from the marking specifications for single-use plastic products[40] under Directive (EU) 2019/904[41], which use a crossed-out packaging item and a natural element, typically coloured red, to discourage littering. The design concept combines visual simplicity with recognisability, aligning with existing EU pictographic conventions.

[40] https://environment.ec.europa.eu/topics/plastics/single-use-plastics/sups-marking-specifications_en (accessed on 12/06/2025).

[41] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (Text with EEA relevance).

Expert stakeholder insights: During the second stakeholder consultation, participants evaluated three options for conveying the DNTIN message on compostable packaging:

1. Auxiliary text in national languages,
2. Auxiliary pictogram, and
3. QR code or digital data carrier.

Among these, auxiliary text was most preferred (average rating 3.4/5), followed by the pictogram (3.2/5) and QR code (3.1/5). Some stakeholders emphasised that the logo should remain text-free and voluntary, noting that matching packaging–receptacle labels already imply correct disposal behaviour. Others highlighted space constraints as a major limitation for including additional labels.

Citizen insights: In the behavioural experiment, participants were shown the DNTIN label without text and asked to interpret its meaning. 65 % correctly identified that the label indicated not to discard packaging in nature, 13 % believed it meant that the item should be placed in residual waste, and 11 % were unsure of its meaning. A smaller fraction associated the label with home or municipal composting. These results suggest that the pictogram alone is largely understood, though not universally recognised without accompanying text.

JRC assessment of insights: As further discussed in Section 4.2.1.9, compostable packaging continues to cause confusion among citizens, particularly regarding its proper disposal and the mistaken belief that compostable items can be safely discarded in nature. In reality, compostable packaging must always be placed in designated waste receptacles, not in the natural environment.

Stakeholder input indicates that matching labels on packaging and receptacles already convey that waste should be placed in the correct bin, making the DNTIN label potentially redundant. At the same time, including an explicit “Do Not Throw in Nature” message could reinforce correct behaviour, especially where citizens remain uncertain about compostable materials.

JRC proposal: To address the specific objective of preventing littering of compostable packaging, an optional complementary DNTIN label is proposed to accompany industrially compostable waste labels. The symbol is available in several design versions and may be accompanied by the text “DO NOT THROW IN NATURE”, displayed in the relevant national language(s) in accordance with the rules set out in this proposal. The text should use Noto Sans Bold for typographic consistency.

The DNTIN label should be placed to the right of the corresponding waste-sorting label, following the standard grid alignment (see Figure 31). However, since the principle of matching packaging and receptacle labels already communicates correct disposal behaviour, the necessity of this additional label remains open for further discussion during the implementing act negotiations, particularly in view of space constraints on packaging and the aim to maintain a harmonised and uncluttered visual design.

Figure 31 Proposed complementary 'do not throw in nature' labels for compostable packaging a) with and b) without text.

Source: Author's elaboration.

4.2. System design

In this context, system design refers to the structural and conceptual framework underlying the proposed EU harmonised waste-sorting labelling system. It encompasses the matching principle and the modular structure of the system, including meta-labels, the specification of label granularity (i.e. which materials or waste fractions require distinct labels), and the categorisation of materials into groups. This approach implies that citizens must learn a system — understanding the relationships and rules established between visual elements applied to the two main touchpoints: packaging and waste receptacles.

The following sections and sub-sections outline the rationale and structure of the proposed system. Section 4.2.1 explains the reasoning behind the proposed label granularity — why certain materials and non-material categories receive distinct labels, while others are grouped. Section 4.2.2 addresses the labelling of multi-component packaging, Section 4.2.4 discusses the rationale and use of meta-labels (combined labels referring to two related materials often collected together), Section 4.2.5 considers the role and content of complementary digital information, Section 4.2.7 highlights special cases and challenges, Section 4.2.6 explores future adaptations and developments, and Section 4.2.8 presents reflections on complementary communication and education campaigns.

As in preceding chapters, each sub-section provides a description of the issue or material in question, relevant findings from desk research, insights from expert stakeholder and citizen engagement, and the JRC's assessment leading to the proposal.

4.2.1. Granularity

Issue description: As outlined in Section 3.1.2, granularity refers to the level of detail in the EU harmonised waste-sorting labelling system—specifically, which packaging materials require distinct labels and which can be grouped under broader categories. Striking the right balance is critical: too little granularity can produce vague or ambiguous guidance, whereas too much can overwhelm consumers and appliers, and complicate implementation.

The proposed approach focuses on waste-sorting practices by citizens. While more detailed sorting often occurs at later stages—such as in mechanical or manual sorting facilities—reflecting this level of precision in consumer-facing labels would result in unnecessary complexity. The system therefore seeks to achieve a level of granularity that is behaviourally effective, operationally feasible, and consistent with regulatory requirements.

Desk research: Citizen waste-sorting practices vary widely across MS, regions, and settings (e.g. households versus public spaces) and generally do not mirror the finer separation processes in treatment plants. As discussed in Section 3.1.2 granularity must therefore reflect user needs and cognitive capacities while remaining workable for different stakeholders. At the same time, the JRC sought to align—where possible—with Annex II, Table 1 of the PPWR and with Decision 97/129/EC[42], which establishes material identification codes.

In the following subsections, we will further detail granularity considerations against the backdrop of the collected evidence. Specifically, we considered

Granularity considerations were informed by:

- comparative information on waste-sorting practices in MS (Albizzati et al., 2024; Bruns et al., 2024; European Environment Agency, 2025);
- input from targeted stakeholder consultations and workshops (see Section 2.3), and
- conceptual and behavioural design principles outlined in Section 2.

Expert stakeholder insights: Stakeholders consistently emphasised that granularity should be "as simple as possible and as complex as necessary." The system should support consumer usability and consistency across MS, while remaining practical for packaging producers. Industry representatives particularly noted that higher granularity could increase space requirements on packaging. Many therefore favoured fewer, broader labels—such as not differentiating between coloured and colourless glass, given that this distinction is not required in all national schemes and can often be inferred by users.

Waste-management representatives focused mainly on problematic or hazardous packaging types, such as gas canisters, rather than on general material categories. Across consultations, the following materials were most often cited as candidates for lower granularity:

(1) Paper and cardboard (Section 4.2.1.4),

(2) Flexible and rigid plastic (Section 4.2.1.6), and

(3) Colourless and coloured glass, including green and brown glass (Section 4.2.1.8).

Stakeholders also contributed valuable feedback on composite packaging (Section 4.2.1.5) and industrially compostable packaging (Section 4.2.1.9.2).

In the second consultation, some questioned the need for distinct labels for home compostable, residual, and hazardous fractions (Sections 4.2.1.9.1, 4.2.1.12, 4.2.1.13.

[42] Commission Decision of 28 January 1997 establishing the identification system for packaging materials pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste (Text with EEA relevance).

Citizen insights: Participants in citizen workshops strongly favoured a simple, intuitive labelling system limited to essential material categories. They cautioned that excessive sub-categories would make the system harder to understand and apply, particularly in small homes or shared spaces where multiple bins may be impractical. Participants also expressed concerns about possible cost implications for municipalities and households, fearing that additional labels could require new bins or equipment.

Some frustration expressed by participants appeared to stem from a misunderstanding—namely, the assumption that the introduction of harmonised labels would entail changes in local collection systems. In reality, the harmonised labels are designed to support existing practices rather than redefine them. Nonetheless, citizens' emphasis on simplicity and the cognitive burden of excessive granularity were considered central design principles.

JRC assessment of insights: The proposed granularity was developed iteratively based on evidence from citizen and stakeholder engagement. Specific requests for additional evidence were directed to relevant experts—particularly for compostable and composite packaging, given their technical and regulatory complexity.

The JRC did not adopt several stakeholder proposals that would have reduced granularity below the level considered necessary for consumer clarity and effective sorting—specifically for:

1. coloured versus uncoloured (green and brown) glass;
2. paper and cardboard; and
3. flexible and rigid plastics.

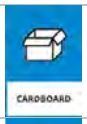
Rationale for maintaining these distinctions is detailed in the corresponding material-specific sections.

JRC proposal: Table 8 presents the proposed level of granularity. Each row represents a distinct single label, while meta-labels group related materials where appropriate. Label terminology corresponds to Section 4.1.4.2.

Based on this structure, Table 9 maps each material category to its counterparts in Decision 97/129/EC and the PPWR to ensure regulatory coherence. Detailed mappings of packaging materials, categories, and associated EU harmonised labels are provided in Annex III (see also Pierri et al., 2024).

Table 8. Proposed granularity of EU harmonised waste sorting scheme—with each row corresponding to a single label—and respective meta-labels.

Material—LVL 1	**Material—LVL 2**	**Material—LVL 3**	**Meta label(s)**[(1)]		**Single label**
Glass	Uncoloured glass	Uncoloured glass			
	Coloured glass	Green glass			
		Brown Glass			

Cardboard and paper	Cardboard			
	Paper			
Wood and cork	Wood			
	Cork			
Metal				
Plastic	Flexible plastic			
	Rigid plastic			
Composite packaging	Fibre-based composite	Fibre-based composite A: ≥85 % - 95 % fibre		
		Fibre-based composite B: 50 % - <85 % fibre		
		Beverage carton		
Textile				
Ceramics				
Compostable packaging	Industrially compostable packaging	Throughout the EU (Art. 9(1) PPWR)		
	Industrially compostable packaging	In some MS (Art. 9(2) PPWR)		 (2)
	Home compostable packaging			

Residual				
Hazardous packaging				

(1) Meta-labels are only applicable to receptacles, not to packaging (see Section 4.2.4 for more info).
(2) Including country indicators to specify the MS the label applies to.

Source: Author's elaboration.

Table 9. Proposed granularity of EU harmonised waste sorting scheme—with each row corresponding to a single label—and related indications in 97/129/EC and PPWR, Annex II, Table 1.

Level 1	**Level 2**	**Level 3**	**97/129/EC**	**PPWR, Annex II, Table 1**
Glass	Colourless glass	Colourless glass	70, 95-98	Glass and composite packaging, of which the majority is glass
Glass	Coloured glass	Green glass	71, 95-98	Glass and composite packaging, of which the majority is glass
Glass	Coloured glass	Brown glass	72, 95-98	Glass and composite packaging, of which the majority is glass
Paper and cardboard	Cardboard	Cardboard	20, 21	Paper/cardboard packaging
Paper and cardboard	Paper	Paper	22	Paper/cardboard packaging
Wood	Wood	Wood	50	Wooden packaging, including cork
Cork	Cork	Cork	51	Wooden packaging, including cork
Metal	Metal	Metal	40, 41	Steel and composite packaging of which the majority is steel, Aluminium and composite packaging of which the majority is aluminium—rigid, semi-rigid and flexible
Plastic	Flexible plastic	Flexible plastic	1-6, 90-92	PET/PE/PP/others, including multimaterials - flexible
Plastic	Rigid plastic	Rigid plastic	1-6, 90-92	PET/PE/PP/HDPE/PS/XPS/EPS/others, including multimaterials - rigid
Composite packaging	Fibre-based composite	Fibre-based composite A: ≥85 % - 95 % fibre	80-85	Composite packaging of which the majority is paper/cardboard
Composite packaging	Fibre-based composite	Fibre-based composite B: 50 % - <85 % fibre	80-85	Composite packaging of which the majority is paper/cardboard
Composite packaging	Fibre-based composite	Beverage carton	80-85	Composite packaging of which the majority is paper/cardboard
Textile	Textile	Textile	60, 61	Natural and synthetic textile fibres
Ceramics	Ceramics	Ceramics	n/a	Clay, stone

Compostable packaging	Industrially compostable	Throughout the EU (Art. 9(1) PPWR)	n/a	Packaging and packaging components made of industrially compostable packaging, including biodegradable plastics—rigid (e.g. PLA, PHB) and flexible (e.g. PLA). This refers to plastics that are readily biodegradable (meaning a proven ability to convert >90 % of the original material into CO2, water and minerals by biological processes within 6 months) and regardless of the feedstock used for their production.
Compostable packaging	Industrially compostable	In some MS (Art. 9(2) PPWR)	n/a	As above
Compostable packaging	Home compostable	Home compostable	n/a	n/a
Residual	Residual	Residual	n/a	n/a
Hazardous	Hazardous	Hazardous	n/a	n/a

Source: Author's elaboration.

4.2.1.1. Methodological notes on supporting evidence

4.2.1.1.1. Desk research insights

Insights from desk research are integrated into the respective sub-sections describing each label and the materials or fractions they represent. The primary source for this analysis was the European Environment Agency's (EEA) 2025 Early Warning Assessment on municipal and packaging waste reduction targets (European Environment Agency, 2025).[43] From this publication, we extracted information on which waste fractions are commonly commingled or separately collected across MS.

The EEA analysis differentiates between the following material categories: paper and cardboard, ferrous metals and aluminium, coloured and uncoloured glass, plastic, composite packaging, wood, food and garden waste, textiles, WEEE, residual, and other bulky and hazardous waste. It further classifies collection modes by type—door-to-door separate, door-to-door commingled, bring points (≥5 per km² or < 5 per km²), and civic amenity sites (CAS)—and by area type (cities, towns and suburbs, and rural areas).

For the purpose of this proposal, we simplified the dataset to differentiate only by collection type, not by geographical area, as this dimension was less relevant to label granularity. A summary of these findings is presented in Annex II.

To address gaps in the EEA dataset and to gather up-to-date information on packaging waste sorting practices across MS, we employed a complementary digital research strategy. Using ChatGPT (GPT-4o) and Perplexity, we conducted real-time web searches of official national, municipal, and EU sources through standardised queries for each packaging material and country. The retrieved responses were reviewed for internal consistency and cross-country comparability using GPT-4o. While this method enabled efficient and extensive data collection, results were not

[43] https://www.eea.europa.eu/publications/many-eu-member-states/early-warning-assessment-related-to (last accessed 30/07/2024).

systematically verified through human oversight and should therefore be interpreted as indicative rather than definitive.

This combined approach enhanced the breadth and traceability of information used to assess how waste fractions are commonly collected across the EU, thereby informing the proposed level of label granularity.

4.2.1.1.2. Citizen survey insights

Complementary evidence was drawn from survey data on citizen sorting practices, including questions from the initial and second stakeholder consultations and the EU-wide citizen survey (Liva et al., 2025). In the latter, participants were asked: "How do you usually sort the following packaging waste materials at home?"

Respondents indicated which of the following materials they typically collected together: paper, cardboard, metal, aluminium, aluminium cans, coloured glass, uncoloured glass, plastic, composite packaging (e.g. beverage cartons), wood, and residual waste. They could also select "unsure." The resulting data reflect self-reported sorting practices, which may diverge from official collection rules.

Two methodological limitations should be noted:

1. The matrix question required respondents to indicate sorting combinations for each material, creating a high cognitive load and potentially reducing response quality.
2. Some participants may have misunderstood the question, as suggested by a number of non-intuitive combinations.

Despite these limitations, the findings provide valuable complementary evidence on citizens' practical sorting behaviour, supporting the triangulation of desk research and stakeholder insights. Additional methodological details and results are presented in the Annex (see also Liva et al., 2025).

4.2.1.2. Metal

Material description: This label applies to packaging and packaging components made of metal. It covers both ferrous metals (steel) and non-ferrous metals (aluminium), including rigid and flexible forms. In Decision 97/129/EC, these materials correspond to the identification codes 40 (steel) and 41 (aluminium). In Annex II, Table 1 of the PPWR, they are listed as steel and aluminium (rigid and flexible), as well as composites whose main material is metal.

Desk research insights: Across MS, metal packaging (steel and aluminium) is almost always collected together by citizens. In most systems, metal is also commingled with plastics and composite packaging as part of LWP fractions. Separate collection of ferrous and non-ferrous metals by citizens is not practiced in any Member State; any separation occurs downstream at material recovery facilities using magnetic and eddy-current technologies.

According to the European Environment Agency (2025), aluminium is predominantly collected at CAS, but also through bring points (often located farther than 5 km) and door-to-door schemes, where it is typically commingled with other LWP. In a few countries (e.g. Luxembourg, Latvia, Finland, Netherlands, Greece), separate aluminium collection was reported, though this likely refers to aluminium beverage cans recovered through DRS. The collection pattern for ferrous metals is identical.

Complementary desk research using large-language-model searches confirmed that no Member State requires or commonly practices separate collection of aluminium and steel packaging. In some cases (e.g. Finland, Sweden, Denmark, Czechia), metal packaging is collected in a dedicated "metal" bin, but aluminium and steel are still mixed in that container.

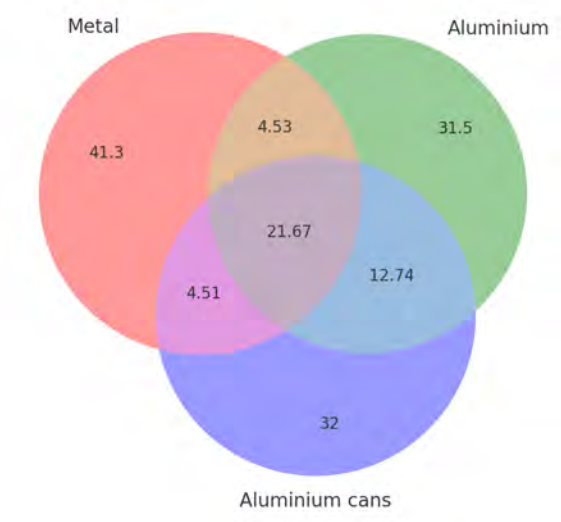
Expert stakeholder insights: During the first stakeholder consultation, respondents confirmed that metal packaging is generally collected together with plastics and composite packaging in mixed LWP streams. Only a few references (e.g. Denmark, Finland, Sweden, Czechia) mentioned separate "metal" bins, which may also include non-packaging metal waste. No stakeholder indicated that consumers separate ferrous and non-ferrous metals.

In the second consultation, some stakeholders proposed finer granularity—for instance, introducing labels for flexible or semi-rigid aluminium items such as food trays, lids, or confectionery wraps—or separate labels for aluminium and steel. Their rationale was that clearer labelling could help consumers recognise that all aluminium packaging, including composite aluminium, should be placed in the recycling stream rather than residual waste.

Citizen insights: Findings from the citizen survey (Liva et al., 2025) suggest some variation in perceived sorting practices. About 33 % of respondents reported commingling metal and aluminium, 30 % commingled metal with aluminium cans, and 42 % commingled aluminium with aluminium cans. Meanwhile, 41 %, 31 %, and 32 % reported sorting metal, aluminium, and aluminium cans separately, respectively (see Figure 32). These figures likely reflect differing interpretations of "separate" collection or local DRS rather than true material separation at home.

Citizen insights: In the citizen survey 33 % indicated they commingled metal and aluminium and 30 % indicated they commingled metal with aluminium cans. 42 % reported they commingled aluminium with aluminium cans. 41.3 %, 31.5 % and 32 % reported sorting metal, aluminium and aluminium cans separately, respectively (see Figure 32).

Figure 32. Venn diagram visualising self-reported sorting practices for metal, aluminium and aluminium cans indicated in the consumer survey.

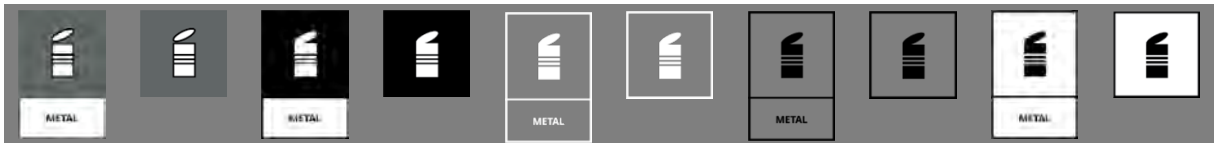


Source: Author's elaboration.

JRC assessment of insights: Evidence from all sources consistently shows that aluminium and steel packaging are commingled by citizens across the EU and effectively separated at sorting plants using standard technologies (ferromagnetic and eddy-current separation). While citizen data indicate occasional reports of separate sorting, these results are likely due to misinterpretation or reference to DRS schemes rather than household separation. Given the demonstrated efficiency of downstream sorting processes, differentiation between ferrous and non-ferrous metals at citizen level is unnecessary.

JRC proposal: A single label for metal is proposed, covering both ferrous and non-ferrous packaging materials. This label supports the separate collection of metal packaging from other materials—particularly plastics and composites—according to local waste-collection rules. It does not require citizens to separate steel from aluminium, as this distinction is managed downstream by waste-sorting facilities. Figure 33 shows all proposed label variants for metal.

Figure 33. All label variants for 'metal'.



Source: Author's elaboration.

4.2.1.3. Ceramics

Material description: This label applies to packaging and packaging components made of ceramic or porcelain stoneware. While there is no corresponding code in Decision 97/129/EC, the material category is listed in Annex II, Table 1 of the PPWR under clay and stone.

Desk research insights: Available evidence on the collection of ceramic packaging is limited, as this material category is not explicitly included in the EEA 2025 Early Warning Assessment on municipal and packaging waste reduction targets. Based on complementary desk research, ceramic packaging is generally not recyclable within standard municipal or packaging recycling systems in the EU.

Across MS, consumers are typically instructed to dispose of small ceramic items in residual waste and to bring larger items to CAS or bulky-waste collection points. Ceramics are explicitly excluded from all recyclable packaging fractions. In some cases, intact ceramic items—particularly non-packaging goods—may be suitable for reuse, resale, or specialised recovery, but broken ceramics are universally treated as residual waste due to contamination and safety risks.

Only a few national exceptions were identified. In Austria, certain ceramic packaging items may be accepted within the LWP fraction (together with plastics, metals, composites, and some wood) but not with glass or beverage cartons. In France, pilot initiatives such as *Ecomaison* are testing separate collection of ceramics at CAS (*déchèteries*), although these remain small in scale. Overall, no country differentiates between broken and intact ceramics in its general guidance to citizens.

Expert stakeholder insights: The ceramic label was not included in the first prototype presented during the initial stakeholder consultation. Some participants noted this omission and recommended including a dedicated ceramic label, even if ceramic packaging is relatively rare and seldom disposed of through household sorting systems.

Few stakeholders expressed detailed views, with some questioning the need to include ceramics in the harmonised system, given their low prevalence and the lack of dedicated collection infrastructure. In the second consultation, several participants confirmed that ceramics are usually sorted as residual waste or occasionally brought to CAS, and that they are not collected with glass or other packaging materials.

Citizen insights: Ceramic packaging was not part of Prototype 1 and was therefore not discussed in the citizen workshops or the online survey. It was introduced in Prototype 2 and tested during the behavioural experiment. In this test, 78 % of participants correctly recognised the ceramic label. Among incorrect interpretations, 21 % associated it with broken glass, 12 % with intact ceramic items, 3 % with glass bottles, and 2 % with intact glass objects; another 2 % were unsure of its meaning.

JRC assessment of insights: Evidence consistently indicates that ceramics are collected separately from recyclable materials, most often in residual waste. The inclusion of this label in the harmonised system reflects its formal recognition under the PPWR as a distinct packaging material category (clay and stone). Given the lack of recycling pathways and collection schemes for ceramic packaging, the main behavioural objective is to ensure that citizens do not place ceramics in glass or recyclable fractions.

JRC proposal: A dedicated label for "ceramic" is proposed, covering items made of ceramic or porcelain stoneware. The label distinguishes ceramics from recyclable materials but does not require separate sub-labels for ceramics and stoneware. In line with the visual design guidance in Section 4.1.2, the pictogram should depict broken ceramic items, conveying that intact ceramics may be reused. The label supports correct sorting by discouraging the misplacement of ceramics in glass or recyclable packaging streams. Figure 34 shows all proposed label variants for ceramic.

Figure 34. All label variants for 'ceramic'.

Source: Author's elaboration.

4.2.1.4. Cardboard and paper

Issue description: Cardboard and paper are frequently commingled in household and municipal collection systems across the EU. To reflect this practice while retaining flexibility for countries where the two materials are separated, the proposed system includes a meta-label for paper & cardboard, in addition to separate single labels for paper and cardboard. This section discusses the rationale for the meta-label, while the individual material labels are detailed in the following sub-sections.

Material description: This label applies to packaging and packaging components made of paper or cardboard. In Decision 97/129/EC, these materials correspond to:

— code 20 – corrugated fibreboard,

— code 21 – non-corrugated fibreboard, and

— code 22 – paper.

In Annex II, Table 1 of the PPWR, they are listed jointly as paper/cardboard packaging. Packaging materials with a grammage above approximately 250 g/m² (ISO 536:2012) are typically classified as paperboard (cardboard), while the Confederation of European Paper Industries (CEPI) defines paperboard as paper heavier than 220 g/m².[44]

Desk research insights: According to the and complementary desk research, paper and cardboard are commingled by consumers in nearly all MS, with limited exceptions. Only Latvia plans partial separation under a forthcoming DRS for cardboard packaging (from 2025). In Denmark, Finland, and Sweden, distinctions exist but usually apply to graphic paper rather than packaging. In Denmark, for example, clean printed paper is collected separately, while corrugated and non-corrugated cardboard go in the cardboard container. Sweden collects paper and cardboard packaging together but separates newspapers and other paper products.

In some countries (e.g. France, Greece, Ireland, Malta, Slovenia), paper and cardboard are collected together with other LWP fractions such as plastics or metals. Collection modes vary: CAS and bring points are widely used for large cardboard items, while door-to-door collection predominates for smaller household packaging.

Expert stakeholder insights: Most stakeholders in the first consultation confirmed that citizens commonly collect paper and cardboard together. Respondents from Denmark and occasionally Finland and Germany reported separate collection. In a few MS (e.g. Malta, Greece, Ireland, parts of Italy and France), paper and cardboard are commingled with LWP fractions.

When asked to choose between a shared or separate label, 47.9 % of respondents supported a shared label for paper & cardboard, while 23.3 % preferred separate labels for each material. In the second consultation, the majority (55 %) gave no response when asked whether the two materials were separated, while 19 % reported that they were never separated, 17 % sometimes, and 9 % always. Several participants argued that separate labels would unnecessarily increase system complexity, as many MS allow or encourage combined collection.

Some stakeholders requested that the corrugated cardboard pictogram—especially relevant for e-commerce and transport packaging—be clearly represented. Prototype 2 therefore assumes that both corrugated and non-corrugated cardboard are covered by a single label.[45]

Citizen insights: Results from the EU-wide citizen survey indicate similar patterns. Approximately 45 % of respondents reported commingling paper and cardboard; 37 % and 33 %, respectively, said they sorted them separately. Around 12 % and 11 % reported commingling each with FBCP such as beverage cartons. These findings suggest that while some consumers differentiate between paper and cardboard, commingling remains the dominant practice.

JRC assessment of insights: Evidence from desk research, stakeholder consultations, and citizen surveys confirms that paper and cardboard are predominantly collected together across the EU, with only limited national exceptions. In some MS, they are further commingled with other LWP

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[44] https://www.iggesund.com/insights/paperboard-know-how/about-paperboard/differences-between-paper-and-paperboard/ (last accessed 31/07/2025).

[45] In fact, this was an error in the survey, where explicit reference to corrugated cardboard under this label was missing. This was corrected afterwards.

fractions. Maintaining the possibility of separate labels accommodates those cases where finer sorting is required, while a shared meta-label supports simplified communication and labelling consistency in systems where paper and cardboard are collected jointly.

JRC proposal: A meta-label for "paper & cardboard" is proposed for use on receptacles that collect both materials together, alongside individual labels for paper and cardboard to allow flexibility where separate collection exists. The meta-label may be applied to receptacles but not to packaging, in accordance with the design principles set out in Section 3.1.5. This approach ensures harmonisation across MS while avoiding unnecessary complexity for citizens and producers. Figure 35 shows all proposed label variants for cardboard and paper.

Figure 35. All label variants for 'cardboard and paper'.

Source: Author's elaboration.

4.2.1.4.1. Cardboard

Material description: This label applies to packaging and packaging components made of cardboard (paperboard). In Decision 97/129/EC, it corresponds to code 20 (corrugated fibreboard) and code 21 (non-corrugated fibreboard). In Annex II, Table 1 of the PPWR, cardboard is listed under paper/cardboard packaging.

Desk research insights: See detailed in Section 4.2.1.4, cardboard is predominantly commingled with paper in household and municipal collection systems. Separation may also occur in commercial or industrial settings, where larger volumes of cardboard are generated. Businesses often have dedicated collection streams for cardboard to facilitate recycling efficiency and volume management.

Expert stakeholder insights: Stakeholders confirmed that cardboard and paper are generally commingled in most MS but occasionally separated, especially in the commercial sector. Some noted that a distinct cardboard label would help support business and institutional collection practices. The need for a pictogram representing corrugated cardboard, relevant to e-commerce and transport packaging, was also emphasised.

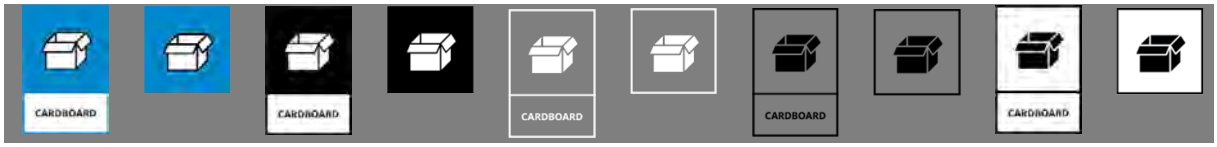
Citizen insights: Citizen insights are consistent with the findings presented in Section 4.2.1.4, showing that while most citizens commingle paper and cardboard, a smaller share reports sorting them separately, reflecting the diversity of national collection systems.

JRC assessment of insights: Providing a dedicated cardboard label accommodates those MS and commercial settings where paper and cardboard are collected separately, while maintaining the flexibility to use the paper & cardboard meta-label in commingled systems. This approach supports both household and business collection practices without increasing label complexity for consumers.

JRC proposal: A single label for cardboard is proposed to represent packaging made of corrugated and non-corrugated fibreboard. This label ensures alignment with systems that distinguish cardboard from paper and facilitates recognition of bulky or transport-related packaging. Where

paper and cardboard are collected together, the meta-label “paper & cardboard” may be applied to receptacles but not to packaging. Figure 36 shows all proposed label variants for cardboard.

Figure 36. All label variants for ‘cardboard’.



Source: Author’s elaboration.

4.2.1.4.2. Paper

Material description: This label applies to packaging and packaging components made of paper. In Decision 97/129/EC, paper corresponds to code 22 (paper), and in Annex II, Table 1 of the PPWR, it is included under paper/cardboard packaging.

Desk research insights: As detailed in Section 4.2.1.4, paper packaging is generally commingled with cardboard in most MS. However, in a few countries—notably Finland—specific paper types such as newspapers and printed paper are collected separately from other paper packaging through door-to-door systems, bring points, or CAS. These distinctions primarily concern graphic paper rather than packaging materials.

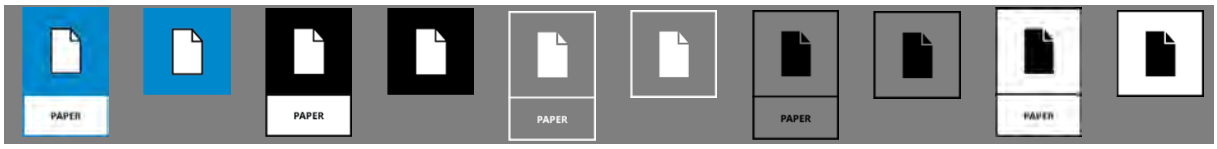
Expert stakeholder insights: Expert stakeholders largely confirmed that paper and cardboard packaging are collected together in most national systems. However, some noted that separate paper collection persists for non-packaging paper streams (e.g. newspapers, office paper), which may cause confusion among citizens when similar materials are subject to different sorting rules.

Citizen insights: Findings from the citizen workshops and survey align with these observations, indicating that consumers typically place paper and cardboard together in the same receptacle. In the behavioural experiment, the introduction of Prototype 2 (including the revised paper label) was associated with improved sorting purity in the paper bin, although capture rates did not increase.

JRC assessment of insights: A dedicated paper label remains relevant to accommodate MS or local systems where paper packaging is collected separately from cardboard. It also supports clarity for citizens in distinguishing paper packaging from other materials. At the same time, it is important to clarify that non-packaging paper (graphic paper such as newspapers, magazines, and office paper) is not within the scope of the PPWR, as the regulation applies exclusively to packaging and packaging waste. The existence of separate collection streams for graphic paper in some MS should therefore not affect the labelling system proposed under the PPWR. Maintaining both individual and combined labels allows the system to reflect existing diversity in packaging waste collection practices while remaining consistent with the legal scope of the regulation.

JRC proposal: A single label for paper is proposed to represent packaging made of paper. This label enables alignment with systems requiring distinct paper collection, while the meta-label “paper & cardboard” may be used on receptacles collecting both materials jointly (but not on packaging). Figure 37 shows all proposed label variants for paper.

Figure 37. All label variants for 'paper'.



Source: Author's elaboration.

4.2.1.5. Composite packaging

Issue description: Articles 12(6) and 13(2) of the PPWR require that implementing acts for harmonised labels on packaging and on waste receptacles explicitly consider composite packaging. In addition, by 12 August 2026, methodologies for identifying material composition—including for composite packaging—shall be adopted, potentially using digital data carriers under Article 12(7).

Material description: The PPWR defines composite packaging as "a unit of packaging made of two or more different materials which are part of the weight of the main packaging material and cannot be separated manually and therefore form a single integral unit, unless one of the materials constitutes an insignificant part of the packaging unit and in any event no more than 5 % of the total mass of the packaging unit and excluding labels, varnishes, paints, inks, adhesives and lacquers; this is without prejudice to Directive (EU) 2019/904."[46] As per recital 13, the definition should not exempt single-use packaging partially made of plastics, regardless of the threshold level, from the requirements of Directive (EU) 2019/904. Recital 13 clarifies that single-use packaging partially made of plastic remains subject to Directive (EU) 2019/904 regardless of thresholds. Packaging that contains <5% by mass of a second material is not considered composite and should be labelled according to its main material.

Composite packaging often comprises three or more layers (e.g. PE, PET, polyamide, ethylene vinyl alcohol, aluminium foil, paperboard). Strong interlayer adhesion supports performance but hinders separation and recycling, contributing to sorting complexity. Composite packaging is commonly seen as complex packaging in terms of its material properties, recycling practices, and consumer sorting (Torkelis et al., 2024; Walker et al., 2020; Wang et al., 2022).

Annex II, Table 1 lists composite types by predominant material:

1. Glass
2. Paper/cardboard
3. Steel
4. Aluminium—rigid
5. Aluminium—semi-rigid and flexible

Desk research insights: Publicly available information more often distinguishes FBCP than other composite types. EEA sources typically do not break out composite flows by predominant material,

[46] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (Text with EEA relevance). Link: https://eur-lex.europa.eu/eli/dir/2019/904/oj/eng.

limiting comparability across MS. Where reported, composite packaging is largely collected at CAS, bring points, and commingled at kerbside; separate kerbside collection appears less common. Given data gaps, and the prevalence of FBCP in consumer packaging, we assume FBCP constitutes a substantial share of composite packaging. For the respective insights, see Sections 4.2.1.5.1 and 4.2.1.5.2.

Expert stakeholder insights: Stakeholder feedback was most extensive for FBCP, though needs for labelling non-FBCP composites were also raised (see Sections 4.2.1.5.1 for FBCP and 4.2.1.5.2 for non-FBCP). Industry stakeholders cautioned against both over- and under-granularity, asked for clearer guidance for special composite formats, and noted practical limits for using colour and larger labels due to costs and material constraints. Several favoured labelling by predominant material instead of using a distinct composite label (e.g. applying a cardboard label where the fibre content exceeds a threshold), regardless of the impact on recyclability, and some advocated digital watermarking to reduce reliance on consumer sorting.

A subset of workshop participants engaged closely with the JRC between prototypes, providing detailed input on composite fractions. Using the prototypes as a basis, they drafted alternative label concepts and shared them with the JRC by email and in online meetings.

In the second stakeholder consultation, specific feedback concerned the then “mixed canister” label: it did not distinguish items above or below an ~85 % fibre threshold. Stakeholders pointed to divergent Member State (MS) thresholds for fibre content—ranging from about 50 % to 95 %—and suggested introducing higher granularity for FBCP to align with these systems. The prevailing suggestion was to split FBCP into two pictograms reflecting A: ≥85–95 % fibre and B: 50–<85 % fibre (with beverage cartons kept distinct), to better accommodate MS practices. See Section 4.2.1.5.1 for the detailed discussion and Figures referenced therein.

Citizen insights: Many workshop participants reported uncertainty about how to correctly dispose of composite packaging. Confusion often arose from multi-material items that could be partially separated, as it was unclear whether separation was required before disposal. Participants also cited unclear recycling symbols and a lack of simple, consistent instructions, noting that mis-sorting appeared common. They criticised the absence of centralised and easily accessible guidance, which led to inconsistent disposal practices and uncertainty. Some respondents were unsure whether a composite item should be placed in the residual bin, especially when its components could not be separated.

Survey participants frequently reported placing composite packaging in either the paper/cardboard or plastic fraction. This may reflect confusion, variations in national collection systems, or a methodological limitation of the survey, which did not distinguish between different types of composites based on their main material (see methodological note on the survey in Section 4.2.1).

JRC assessment of insights: Labelling composite packaging according to its main material, without distinguishing between different types of composites, does not provide sufficient granularity to account for variations in sorting and recycling practices across MS. For FBCP in particular, some MS collect it with paper and cardboard, while others collect it with LWP, depending on the fibre content and national thresholds. Therefore, using only the main material label would not adequately guide consumers, as identical packaging could bear the same label but require different sorting actions in different MS. See Section 4.2.1.5.1 for further detail.

JRC proposal: It is proposed to reflect the most common sorting practices for FBCP explicitly through dedicated labels, as described in the respective subsections below. Non-FBCP should be

labelled according to its predominant material. Note that the focus of this work is on sorting instructions: in all the sections below on composite packaging, recommendations for grouping or separating composite materials (typically with the corresponding single-material fraction) are provided as a compromise solution for sorting purposes, considering insights from various sources as described.

However, these proposals are formulated without prejudice to the actual recyclability of the materials concerned (which is the object of separate workstreams) or more generally the downstream destination of the materials in different regions/countries. In other words, proposing that a composite should be grouped with the corresponding main mono-material stream for sorting purposes, does not mean that it will automatically be recyclable in the same process. As we highlight in each case, further refinement will generally be needed in future to address the complex issues related to each composite stream.

4.2.1.5.1. Fibre-based composite

Material description: In line with recital 24 of the PPWR, FBCP refers to a unit of packaging made predominantly of fibre-based material such as paper or cardboard, combined with one or more additional materials (e.g. plastic, metal, aluminium) that contribute to the total weight and cannot be separated manually, thus forming a single integral unit. Materials that constitute an insignificant part of the packaging unit—defined as no more than 5 % of the total mass—are excluded, as are labels, varnishes, paints, inks, adhesives and lacquers.

While Annex II Table 1 of the PPWR mentions only "composite packaging of which the majority is paper/cardboard", Decision 97/129/EC distinguishes six FBCP types according to their secondary and tertiary materials (codes 80 to 85): fibre-based composites with miscellaneous metals, with plastic, with aluminium, with tinplate, with plastic and aluminium, and with plastic, aluminium and tinplate. A JRC report recommends that this category also include paper cups laminated with polyolefin (with or without aluminium), trays, plates and cups made of metallised or plastic-laminated paper or cardboard (Pierri et al., 2024).

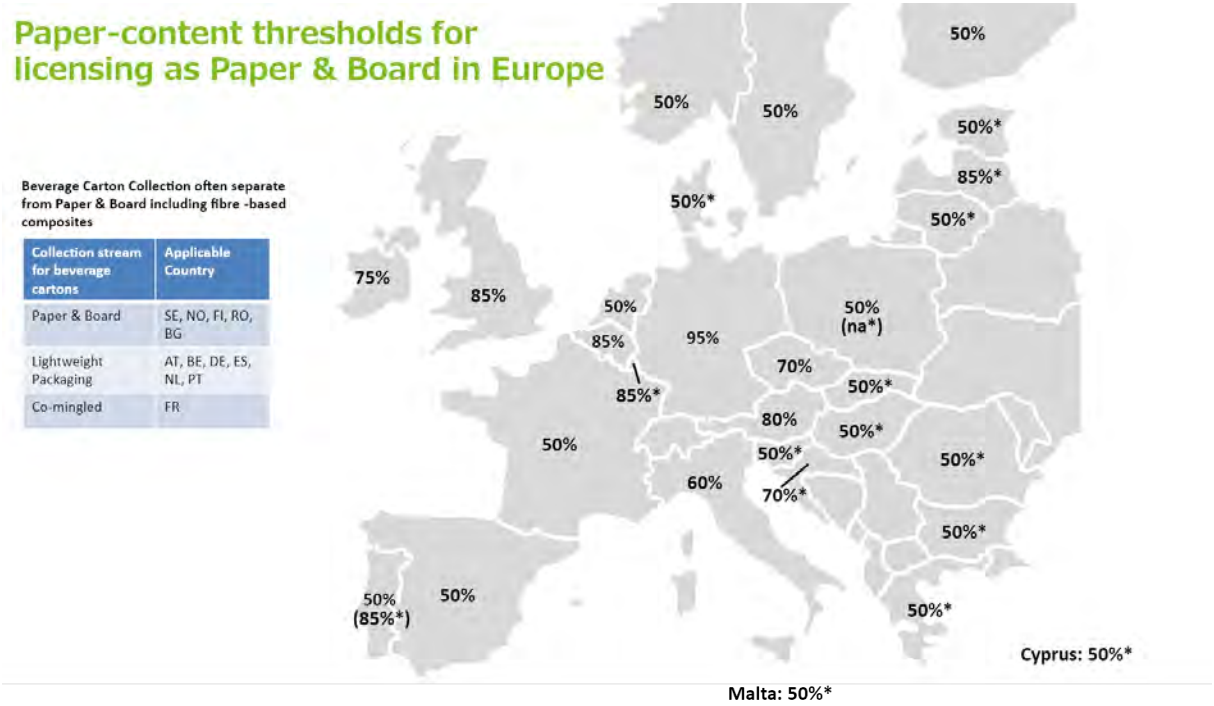
Desk research insights: Many MS define thresholds specifying the minimum fibre content required for a packaging to be licensed as paper or cardboard. Licensing as paper/cardboard typically implies that the item is collected and sorted with this fraction, rather than with LWP. Thresholds are established either in legislation or by EPR organisations. Figure 38 provides an overview of country-specific thresholds relevant to FBCP and lists countries collecting used beverage cartons (UBC) separately (European Environment Agency, 2025).

Across MS, thresholds range from 50 % to 95 % paper or cardboard content (by weight). According to stakeholder information, 18 MS apply the lower 50 % threshold, allowing any packaging with at least 50 % fibre content to be licensed as paper/cardboard. Higher thresholds apply in 9 countries: 60 % (Italy), 70 % (Czechia, Croatia), 75 % (Ireland), 80 % (Austria), 85 % (Belgium, Luxembourg, Latvia, Portugal) and 95 % (Germany). In Germany, all FBCP are therefore collected separately from the paper/cardboard fraction. Stakeholder feedback indicated uncertainty for Portugal and Poland (see Table 10 and accompanying notes).

According to the desk research using LLMs, only a few countries—such as France, Czechia, Ireland and Sweden—occasionally allow high-fibre-content composites to be sorted with paper/cardboard, provided they meet the required fibre threshold and are appropriately labelled. In most other MS, FBCP are sorted by consumers into the LWP fraction, together with plastic and metal packaging.

Licensing and reporting thresholds exist mainly for producer obligations and do not directly guide consumer sorting behaviour.

Figure 38. Paper-content thresholds for licensing as paper & board in the EU. Figures marked with an asterisks (*) were provided through the second stakeholder consultation. For 'na' value in PL and different values in PT, see table notes in Table 10.



Source: Graphic Packaging, Europen, International Confederation of Paper and Board Converters in Europe (CITPA) and FEFCO, The European Federation of Corrugated Cardboard Manufacturers through the second stakeholder consultation.

Table 10. Country-grouping according to paper-content thresholds.

Threshold	50 %	60 %	70 %	75 %	80 %	85 %	95 %
MS	BG, CY, DK, EE, EL, ES, FI, FR, HU, LT, MT, NL, NO [1], PL [2], PT [3], RO, SE, SI, SK	IT	CZ, HR	IE	AT	BE, LU, LV, PT [3], UK [1]	DE

[1] Non-EU country.

[2] One stakeholder stated that there were no thresholds in this respect in Poland, and that any composite packaging was commingled with plastic and metal packaging.

[3] Original value of 50 % differs from value provided by stakeholders (85 %). One responded in the second stakeholder consultation stated that in Portugal beverage cartons were collected in the yellow bin for LWP and needed to have more than 75 % of paper by weight. At the same time, FBCP that are not beverage cartons were collected in the blue bin for paper/cardboard and needed to have more than 85 % of paper and could only be coated on one side.

Source: Graphic Packaging, Europen, International Confederation of Paper and Board Converters in Europe (CITPA) and FEFCO, The European Federation of Corrugated Cardboard Manufacturers through the second stakeholder consultation.

Expert stakeholder insights: Many stakeholders acknowledged that developing a harmonised labelling system for FBCP that accommodates both material composition and the diverse collection practices of all MS represents a major challenge. Industry stakeholders noted that the varying national thresholds for fibre content would, in practice, require producers to apply either a "composite" or "paper/cardboard" label depending on the destination country's threshold and collection system—an outcome regarded as impractical and undesirable.

Several stakeholders raised concerns about the interpretation of the 5 % rule in the PPWR, which defines when additional materials are considered insignificant in composite packaging. They pointed out that it was unclear whether the threshold applies to each individual packaging component or to the total weight of the entire packaging unit. To illustrate, one example described a large cardboard box containing a small laminated user manual, which some misinterpreted as a composite rather than a multi-component packaging. The latter can be separated manually and should therefore be labelled as distinct components, not as a composite unit.

Stakeholders also reported widespread consumer confusion about how to dispose of FBCP and emphasised the need for clear and consistent definitions and thresholds across MS. The variation in national criteria for identifying the main material was viewed as a major barrier to labelling harmonisation and effective consumer guidance.

Considering the thresholds outlined in Figure 38 and the related sorting practices, most packaging stakeholders supported a three-tiered labelling approach for FBCP, consisting of:

1. Beverage cartons;
2. FBCP A, with high fibre content (≥ 85 % – 95 %); and
3. FBCP B, with lower fibre content (50 % – < 85 %).

These subcategories were seen as the most practical way to reflect differences in collection systems across MS while maintaining a coherent structure for consumer-facing labels. An alternative approach proposed by the JRC, but not widely supported by stakeholders, is discussed in Box 7.

Among the 78 stakeholders who rated this three-tier approach, 60 % considered it to perform poorly in addressing the complexity of composite packaging sorting. Specifically, 19 respondents rated it "very poorly", 16 "poorly", 12 "somewhat poorly", 10 "somewhat well", 14 "well", and 7 "very well"; 72 participants did not provide an answer. This question was only presented to respondents for whom composite packaging was relevant. For stakeholder assessments of the alternative proposal, see Box 7.

In the second stakeholder consultation, responses indicated that separate collection of composite packaging remains inconsistent. When asked about fibre-based composites and beverage cartons, 18 % reported that these materials are never separated, 11 % that they are sometimes separated, 9 % that they are always separated, and 4 % were unsure (57 % provided no answer). For non-fibre-based composites, 16 % said they are never separated, 10 % sometimes, 13 % always, and 4 % were unsure. Overall, only a minority of respondents indicated consistent separation of composite materials.

Citizen insights: Citizens reported similar difficulties for FBCP as for composite packaging in general (see Section 4.2.1.5). In workshops, participants expressed uncertainty about whether and how to separate multi-layered packaging before disposal. They noted that composite items combining cardboard with plastic or aluminium coatings were especially confusing when the label or

material appearance was ambiguous. Some citizens perceived such items as "paper-like" and disposed of them with paper and cardboard, while others placed them in the plastic or residual fractions. Survey findings indicated that this confusion leads to inconsistent sorting across MS, reflecting both cross-country variation in collection systems and limited public understanding of what constitutes a composite.

JRC assessment of insights: The proposed labelling approach—differentiating three FBCP sub-categories, namely (1) beverage carton, (2) FBCP A with high relative fibre content (≥ 85 %–95 %), and (3) FBCP B with low relative fibre content (50 %–< 85 %)—represents a practical compromise between harmonisation and recognisability. However, it cannot fully accommodate all MS sorting practices illustrated in Table 10 and Figure 38.

For example, under this proposal, two packages with 60 % and 75 % fibre content would both display the same label on packaging. Yet, only in countries with thresholds up to 60 % would both go into the same receptacle. In countries such as Czechia, where the threshold is 70 %, the 60 % composite would be sorted with LWP, whereas the 75 % composite would go with paper and cardboard. Consequently, identical labels could communicate conflicting sorting instructions to consumers in certain MS.

This limitation would affect countries with thresholds between 60 % and 85 % (Austria, Czechia, Hungary, Italy, and Ireland) as well as Germany, where only packaging with ≥ 95 % fibre content is collected with paper and cardboard. In such cases, national authorities would need to decide whether to accept minor commingling of FBCP with paper/cardboard above or below their thresholds, or to reallocate them to the LWP stream.

Although this issue may raise concerns in negotiations of the implementing act, the alternative percentage-based approach (outlined in Box 7) presents its own challenges in terms of consumer comprehension and feasibility. While the current three-category model reflects stakeholder preference and the available evidence base, the JRC recommends further consultation with MS and stakeholders to balance regulatory clarity with behavioural effectiveness. As discussed in Box 2, predominant input from packaging industry representatives should be considered alongside the operational needs of MS and the objective of clear consumer guidance.

Box 7. Discussion on the issue of 'percentage labels' to reflect sorting practices in MS.

In the second stakeholder consultation, the JRC tested a percentage-based labelling concept for FBCP. This approach aimed to address divergent national thresholds (50 %–95 %) by linking label content directly to the material's fibre composition, thereby offering a theoretically comprehensive alignment with MS sorting rules.

Two variants were considered:

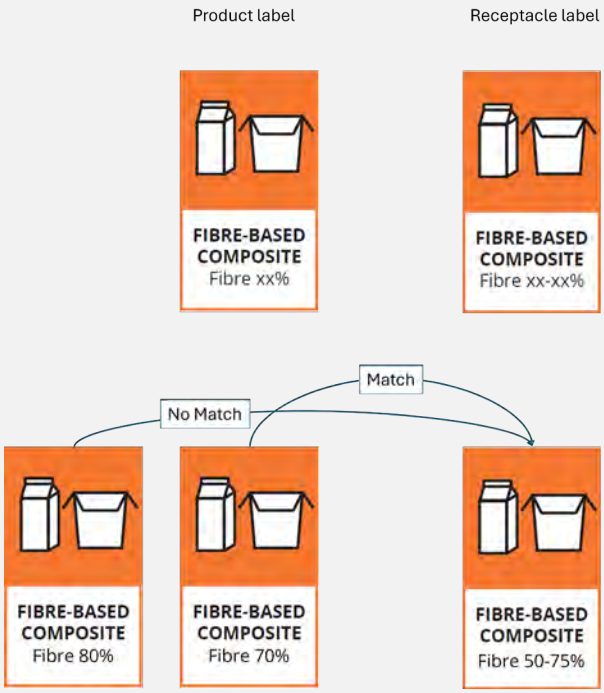
— Option 1: Indicating the exact fibre percentage on packaging (e.g. "X % FIBRE") and corresponding threshold ranges on receptacle labels (e.g. "Y % – Z %").

— Option 2: Introducing two categorical FBCP labels based on fibre-content ranges—high (≈ 85 %–95 %) and medium (≈ 50 %–85 %)—which corresponds to the simplified version adopted in the current proposal.

While Option 1 offered full precision, it presented significant communication barriers. Stakeholders and behavioural experts highlighted that numeric percentages and mathematical symbols (">", "<", "≤", "≥") would be difficult for many citizens to interpret under real-life conditions. Textual alternatives such as

"above" or "below" would require translation and were opposed by the packaging industry for multilingual and space-constraint reasons.

Figure 39. Discussed percentage-based FBCP labels.



Source: Author's elaboration.

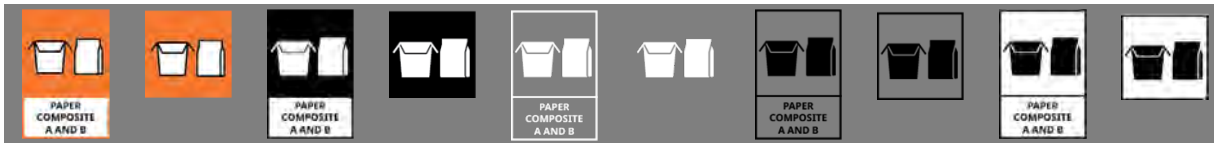
Among the 78 stakeholders who evaluated this option, 77 % rated it at least somewhat poorly in addressing the complexities of composite packaging sorting (31 "very poorly", 18 "poorly", 11 "somewhat poorly", 11 "somewhat well", 7 "well", 0 "very well"). Seventy-two participants did not provide an answer. Respondents acknowledged the conceptual robustness of the approach but considered it too complex for consumer communication and difficult to implement consistently across MS.

JRC proposal: The JRC therefore proposes maintaining the three-category approach aligned with the most prominent stakeholder preference, distinguishing:

1. Beverage carton (see Section 4.2.1.5.1.1),
2. FBCP A: high relative fibre content (≥85 % and 95 %) (see Section 4.2.1.5.1.2), and
3. FBCP B: low relative fibre-content (50 % and <85 %) (see Section 4.2.1.5.1.3).

This structure provides a workable degree of differentiation while retaining consumer comprehensibility and compatibility with most MS collection systems. Meta-labels combining FBCP A and B may be used on receptacles in countries where all FBCP are collected together. Figure 40 illustrates the proposed meta-label variants for FBCP.

Figure 40. All meta-label variants for 'FBCP.



Source: Author's elaboration.

4.2.1.5.1.1 Beverage carton

Material description: In line with the definition of composite packaging provided in recital 24 of the PPWR, this label refers to a specific type of FBCP, namely beverage cartons (also referred to as liquid cartons or UBC). Beverage cartons are made predominantly of fibre-based material (paper or cardboard), combined with one or more additional layers—typically plastic and/or aluminium—that cannot be separated manually and together form a single integral unit. Materials representing no more than 5 % of the total mass are considered insignificant and excluded, as are labels, varnishes, paints, inks, adhesives, and lacquers.

Many MS operate separate recycling streams for beverage cartons. Unlike other FBCP, beverage cartons are designed for liquid foods and drinks and are therefore coated with PE on both sides to ensure moisture resistance. They may also contain a thin aluminium layer to protect against light and oxygen and often include closures made of HDPE.

Desk research insights: Beverage cartons typically consist of approximately 75 % paperboard, 21 % polymer, and 4 % aluminium.[47] According to industry stakeholders, the beverage carton sector is investing in specialised recycling mills that can process UBC and similar multi-material packaging. These facilities are capable of separating fibre layers from polymer and aluminium components and managing food residues. The polyolefin/aluminium residuals are further reprocessed to recover secondary materials. The industry reports gradual increases in recycling rates, with an EU-wide average recycling rate of around 52 % in 2021, compared to 83 % for all fibre-based packaging in 2022 (4evergreen, 2025).

Most other FBCP types cannot be recycled in these dedicated UBC facilities and may instead be suitable for standard paper/cardboard mills or specialised composite-processing mills.

As summarised in Section 4.2.1.5.1, beverage cartons are subject to differing sorting practices across MS. Based on stakeholder and desk research, five countries collect beverage cartons with paper and cardboard, six with LWP, and one (France) within a mixed packaging stream. Large language model–supported desk research further suggests that beverage cartons are most frequently collected together with plastic and metal packaging but may also be collected with paper/cardboard in systems that classify them as predominantly fibre-based (e.g. parts of Bulgaria and Greece). Collection practices also vary in Austria, Belgium, Denmark, and Finland. Box 8 outlines how packaging producers adapt packaging to thresholds.

Box 8. Thresholds and how packaging producers adapt packaging to thresholds

Differences in national thresholds for defining the predominant material of composite packaging stem from variations in recycling infrastructure, industry standards, legal frameworks, and EPR schemes. Multinational packaging producers often adapt product designs to comply with national thresholds—for instance, by adjusting coating thickness or material composition.

These divergent thresholds hinder the development of harmonised labelling that reflects national sorting practices while maintaining packaging uniformity across the internal market. A harmonised EU threshold for FBCP would enable a single label for beverage cartons and other FBCP, reducing complexity and improving consistency in both packaging design and consumer guidance.

[47] https://hedra.nl/wp-content/uploads/2024/02/JAN2024_ACE-Recycling_BROCHURE.pdf (last accessed 31/07/2025).

Expert stakeholder insights: Expert stakeholders consistently highlighted that many MS operate separate recycling streams for beverage cartons and therefore supported the creation of a dedicated label and pictogram. Further stakeholder insights on FBCP are provided in Section 4.2.1.4.1.

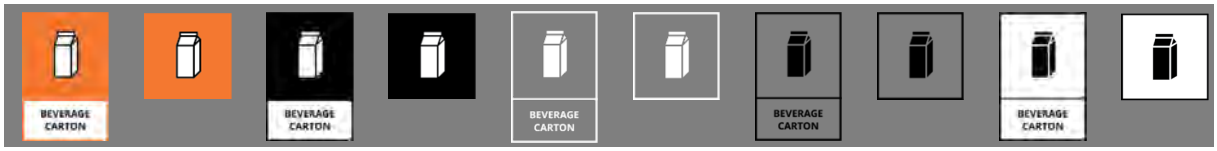
Citizen insights: Citizen findings mirror those for composite packaging more broadly (see Section 4.2.1.5). Complex or less familiar materials—such as beverage cartons—elicited lower recognition rates and higher uncertainty than common packaging types. Beverage cartons frequently caused mis-sorting, with citizens unsure whether to dispose of them with paper/cardboard or plastics. Many participants referred to beverage cartons generically as "Tetra Pak". In the behavioural experiment, Prototype 2 labels significantly increased correct sorting of beverage cartons, producing a moderate positive effect on capture rates.

JRC assessment of insights: Stakeholder feedback consistently supports assigning beverage cartons a dedicated label, reflecting their distinct collection and recycling streams. In line with the principles set out in Section 3.1.2, a separate label is justified as long as beverage cartons and other FBCP are not consistently commingled in MS collection systems. However, if beverage cartons and other FBCP were regularly sorted together based on their fibre content, a shared label would be preferable to reduce the total number of labels on receptacles and simplify the system.

Current evidence does not conclusively indicate harmonised treatment of beverage cartons across MS. Therefore, the necessity of a distinct beverage carton label should be further examined during negotiations on the implementing act, considering both collection practices and the behavioural implications for citizens.

JRC proposal: Figure 41 illustrates all proposed label variants for beverage cartons. If, following consultation, beverage cartons are found to be sorted identically to other FBCP, their separate label could be discontinued. In that case, beverage cartons would instead be labelled according to their fibre content, as FBCP A (≥ 85 %–95 %) or FBCP B (50 %–< 85 %), thereby simplifying the overall labelling system and preventing the issuance of labels that incorrectly imply separate collection requirements.

Figure 41. All label variants for 'beverage carton'.



Source: Author's elaboration.

4.2.1.5.1.2 Fibre-based composite A: ≥85 % - 95 % fibre

Material description: In line with recital 24 of the PPWR, this label applies to FBCP that is not beverage cartons and consists of a high fibre content—specifically, between 85 % and 95 % paper/cardboard by weight. Above 95 % fibre content, packaging is considered mono-material paper/cardboard rather than composite. These packages are made predominantly of fibre-based materials (e.g. paper or cardboard) combined with one or more additional materials (e.g. plastic and/or aluminium) that cannot be separated manually and therefore form a single integral unit. Materials that constitute no more than 5 % of the total mass are considered insignificant, and labels, varnishes, paints, inks, adhesives, and lacquers are excluded.

Unlike beverage cartons, high-fibre FBCP are typically coated or laminated only on one side to provide specific barrier properties, such as resistance to grease, moisture, or oxygen, depending on the product. Barrier coatings are most often polyethylene (PE)-based but may also include polyethylene terephthalate (PET), multilayer laminates, waxes, or varnishes. These types of packaging are common in food service applications, such as takeaway boxes, disposable tableware, or trays for ready-to-eat foods.

Desk research insights: See Section 4.2.1.5.1 for a detailed overview of collection practices, threshold variations, and recycling routes for fibre-based composites across MS.

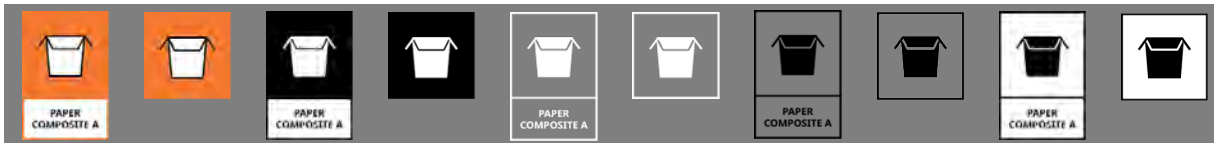
Expert stakeholder insights: See Section 4.2.1.5.1 for consolidated feedback from stakeholders on FBCP classification and labelling granularity.

Citizen insights: See Section 4.2.1.5.1. These specific label categories were not directly tested with citizens, as they were introduced during later development stages of the labelling system following stakeholder feedback and JRC assessment.

JRC assessment of insights: See Section 4.2.1.5.1 and Box 7 for the discussion of the alternative percentage-based labelling proposal. The current approach, based on categorical thresholds, offers a more feasible and consumer-friendly solution while maintaining alignment with the variation in national collection systems.

JRC proposal: Figure 42 presents all proposed label variants for fibre-based composite A. This label applies to high-fibre-content composites (≥ 85 % – 95 %) and is intended for use on both packaging and waste receptacles in MS that collect these items separately from fibre-based composite B.

Figure 42. All label variants for 'fibre-based composite A: ≥85 % - 95 %'.



Source: Author's elaboration.

4.2.1.5.1.3 Fibre-based composite B: 50 % - <85 % fibre

Material description: In line with recital 24 of the PPWR, this label applies to FBCP that is not beverage cartons and consists of a medium fibre content—specifically between 50 % and less than 85 % paper/cardboard by weight. Below 50 % fibre content, the item would no longer be considered fibre-based; above 85 %, it falls under fibre-based composite A (see Section 4.2.1.5.1.2). These packaging items are made predominantly of paper or cardboard combined with one or more additional materials—such as plastic and/or aluminium—that contribute to the overall weight and cannot be separated manually, thus forming a single integral unit. Materials constituting no more than 5 % of the total mass are considered insignificant, and coatings such as labels, varnishes, paints, inks, adhesives, and lacquers are excluded.

Compared with beverage cartons, these composites are typically coated or laminated only on one side, providing limited barrier protection against grease, moisture, or oxygen depending on the product. Common coatings include PE, PET, or multilayer laminates. Such materials are frequently used for dry food packaging, folding boxes, and flexible packaging with a fibre-based outer layer.

Desk research insights: See Section 4.2.1.5.1 for an overview of FBCP collection practices, national thresholds, and recycling routes across MS.

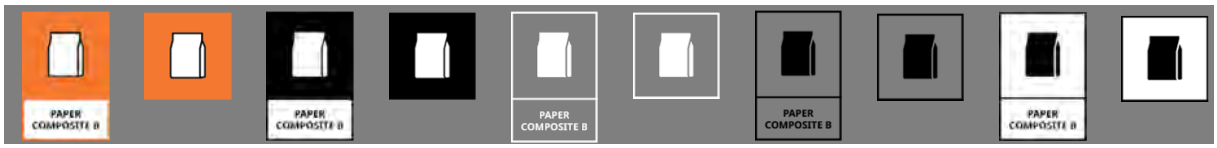
Expert stakeholder insights: See Section 4.2.1.5.1 for consolidated stakeholder views on FBCP classification and labelling granularity.

Citizen insights: See Section 4.2.1.5.1. These specific subcategories were introduced after citizen testing and were therefore not directly examined in workshops or surveys.

JRC assessment of insights: See Section 4.2.1.5.1 and Box 7 for discussion of the alternative percentage-based labelling proposal. Categorising FBCP into ranges rather than using numeric percentages provides a more practical and comprehensible approach for consumers while maintaining alignment with the diversity of national collection systems.

JRC proposal: Figure 43 presents all proposed label variants for fibre-based composite B. This label applies to FBCP with 50 % – < 85 % fibre content. It is intended for use on packaging and receptacles in MS that distinguish these materials from fibre-based composite A.

Figure 43. All label variants for 'fibre-based composite B: 50 % - <85 %'.



Source: Author's elaboration.

4.2.1.5.2. Other composites

Material description: Annex II, Table 1 of the PPWR identifies six different kinds of non-FBCP, differentiated according to the predominant material:

1. Glass
2. Steel
3. Plastic—rigid (referred to as 'other rigid plastics (e.g. polyvinyl chloride (PVC), polycarbonate, PC) including multi-materials—rigid")
4. Plastic—flexible (referred to as 'other flexible plastics including multi-materials—flexible")
5. Aluminium—rigid
6. Aluminium—semi-rigid and flexible

Decision 97/129/EC distinguishes plastic-based composites (separately for the second material aluminium, tinplate, and miscellaneous metals, numbered 90, 91, and 92, respectively) and glass-based composites (separately for the second material plastic, aluminium, tinplate, and miscellaneous metals, numbered 95, 96, 97, and 98, respectively).

In line with recital 24 of the PPWR, these categories cover composite packaging made predominantly of glass, steel, rigid or flexible plastic, or rigid, semi-rigid, or flexible aluminium, combined with one or more additional materials that contribute to the total weight of the main material and cannot be separated manually. Materials constituting no more than 5 % of the total

mass are considered insignificant. Labels, varnishes, paints, inks, adhesives, and lacquers are excluded.

Desk research insights: Desk research supported by LLMs indicates that the sorting of non-FBCP largely follows a predominant material rule: consumers are instructed to dispose of packaging in the stream corresponding to the main material by weight or volume. For example, a plastic–aluminium snack pouch is placed in the plastic stream if plastic predominates, or in the metal stream if aluminium predominates.

In many MS (MS), including Austria, Belgium, Bulgaria, Germany, and Italy, composites with plastic, aluminium, or steel as their main component are collected together with mono-material plastic or metal packaging. Examples include foil-lined snack wrappers, toothpaste tubes, and metal tubes with plastic caps. Where glass is the dominant material (e.g. bottles with plastic pumps), the item is generally sorted into the glass stream after the removal of non-glass components. If separation is not feasible, automated sorting at treatment facilities typically removes contaminants. Composite packaging is not co-collected with wood, cork, textiles, or compostable materials.

Expert stakeholder insights: Many packaging stakeholders—consistent with their overall preference for low granularity—advocated for labelling composite packaging, and sometimes multi-component packaging, according to its main material.

In the second stakeholder consultation, five main sorting practices were reported for non-FBCP, reflecting local and national differences:

1. Sorting according to the predominant material (plastic, metal, etc.);
2. Automatic sorting as part of the LWP stream;
3. Disposal as residual waste when sorting rules are unclear or not defined;
4. Separate collection through designated drop-off points; or
5. Inclusion in special “mixed packaging” containers.

Citizen insights: The same challenges identified for composite packaging in general (Section 4.2.1.5) apply. Citizens often find it difficult to identify the predominant material and are uncertain whether such items belong in plastic, metal, or residual streams.

JRC assessment of insights: A distinct label for “other composites” (tested in Prototype 2) was found to be impractical. Such a label could not meaningfully convey the item’s composition or provide clear sorting instructions. Consistent with the granularity principles outlined in Section 3.1.2 —particularly the aim to balance completeness with usability—the JRC concludes that labelling composites according to their main material is the most pragmatic and user-friendly approach, provided that these items are consistently sorted with their predominant material within and across MS.

A distinct label would only be warranted if sorting rules differ significantly between MS or if separate collection schemes for composite variants exist. Otherwise, increasing the number of composite-specific labels would add unnecessary complexity, potentially reducing clarity and recognition for consumers (see also Section 3.1.5).

While separate FBCP labels are justified (Section 4.2.1.5.1), evidence for non-FBCP does not support the same approach. The lack of comprehensive data on sorting practices reinforces the need for a

simplified system. It should also be noted that other composites may occasionally be collected based on non-material characteristics, such as contamination or product type (see Section 3.3.3).

A limitation of this approach is that it cannot capture cases where composite variants are intentionally sorted separately from their main material (e.g. certain glass composites). However, such cases appear to be exceptions rather than standard practice.[48]

JRC proposal: In line with the assessment above, other composites should be labelled according to their predominant material, with the caveat specified in section 4.2.1.5 above. Thus:

1. Glass-based composites → Glass label
2. Steel-based composites → Metal label
3. Rigid plastic-based composites → Rigid plastic label
4. Flexible plastic-based composites → Flexible plastic label
5. Rigid aluminium-based composites → Metal label
6. Semi-rigid and flexible aluminium-based composites → Metal label

This ensures consistency with existing material categories (Section 4.2.1) and keeps the system intuitive for consumers. As stressed above however, this is without prejudice to the downstream recyclability of the composite with the corresponding mono-material.

Box 9. Colours for composite materials: single colour vs. main-material-specific colours

As discussed in Section 4.1.3 , selecting colours for composite materials within the harmonised labelling system has proven complex and controversial.

Prototype 1, inspired by the Nordic system, used yellow for a combined “plastic & cartons” category. In Prototype 2, this was changed to orange, and the terminology updated to “Beverage cartons” and “Composite materials”. The change was made to avoid implying that fibre-based composites share the same recyclability characteristics as paper/cardboard and to reduce the risk of consumers mis-sorting based on colour alone.

Several stakeholders have since proposed removing the dedicated “composite” colour (orange) and instead using the colour of the predominant material—for example, blue for paper or yellow for plastic.

[48] Note on the distinction between composite and multi-component packaging. It is important to clearly distinguish composite packaging from multi-component packaging. Composite packaging consists of at least two different materials—each representing at least 5 % of the total mass (excluding labels, varnishes, paints, inks, adhesives, and lacquers; see section 4.2.1.5)—that cannot be separated manually, thereby forming a single integral unit. The materials are physically bound or laminated in such a way that separation by the consumer is not feasible without damaging the packaging. Multi-component packaging, by contrast, as defined in section 4.2.2, consists of two or more components—integrated or separate—that may be made of the same or different materials as the main packaging and that can be separated manually by the consumer through the application of normal mechanical force during sorting. This definition does not rely on a minimum percentage threshold for each component but instead on the possibility of physical separation as the criterion for distinct labelling. For example, a glass bottle with a removable metal cap is multi-component packaging, as the parts can be manually separated and labelled individually. Conversely, a perfume bottle with a permanently attached plastic atomiser and inner tube constitutes composite packaging, as the non-separable materials form one integral unit.

Under the current JRC proposal, other composites (glass, metal, plastic, aluminium) would be labelled in the colour corresponding to their main material, as defined in Section 4.1.3.2. FBCP remain assigned to orange to maintain differentiation from paper/cardboard (blue).

This colour distinction could, in principle, be reconsidered. Given ongoing stakeholder debate regarding the harmonised colour palette, the JRC retains the current colour assignments for now, while acknowledging that this issue is likely to remain a point of discussion during negotiations of the implementing act (see also Section 4.1.3).

4.2.1.5.2.1 Glass-based composite

Material description: In line with the definition of composite packaging provided in Recital 24 of the PPWR, glass-based composite packaging refers to packaging made predominantly of glass combined with one or more other materials (e.g. plastic, metal, or aluminium) that contribute to the total mass of the main packaging material and cannot be separated manually, thereby forming a single integral unit. Materials representing less than 5 % of the total packaging mass are considered insignificant and excluded from this definition, as are labels, varnishes, paints, inks, adhesives, and lacquers.

Desk research insights: Desk research indicates that glass-dominant composites—such as glass bottles with non-removable pumps, lids, or internal plastic tubes—are generally sorted by consumers into the glass stream when the glass body constitutes the main material. In countries such as Austria, Germany, and Finland, consumers are advised to remove non-glass parts where feasible and place the glass body in the appropriate bin for clear or coloured glass. When removal is not possible, the entire item is typically disposed of in the glass container, relying on automated sorting to remove foreign materials. This practice distinguishes glass-based composite packaging from multi-component packaging including glass (see footnote 48), as the latter involves separable components.

In contrast, Belgium and Italy instruct consumers to place only mono-material, fully recyclable glass in bottle banks, directing glass composites or coated glass items to residual waste. France and Greece, where unified collection systems cover all packaging materials, generally exclude glass composites from mixed recyclable streams. Czechia and Hungary provide particularly strict guidance, accepting only clean, mono-material glass; other items are considered residual waste. Local differences remain, as some Belgian municipalities allow certain glass composites if correctly labelled. Overall, glass-based composites are rarely grouped with other composite packaging and are usually sorted according to practical separability and dominant material.

Expert stakeholder insights: As noted in Section 4.2.1.5.2, glass composite labels were not explicitly discussed with expert stakeholders, although they sometimes mentioned this fraction as a possible challenge.

Citizen insights: The same considerations apply as for composite packaging in general (see Section 4.2.1.5). Glass composite labels were not separately investigated in the citizen studies, since these fractions were defined later in the system's development.

JRC assessment of insights: Drawing on LLM analyses, country-specific sorting rules for glass composites show that several MS require separate disposal of such items—typically in the residual waste fraction—whereas others accept them in the glass stream. For a harmonised labelling system, this divergence could be addressed through (i) country-specific adaptations of the residual and glass labels combined with supplementary textual or country-indicator information (see Sections 4.1.4.4 and 4.2.2), or (ii) the creation of a distinct label for glass-based composites. Given

stakeholder feedback and the goal of maintaining a manageable number of labels, the current proposal classifies glass composites according to their dominant material—glass. Future discussions during the implementing-act negotiations may revisit this approach, particularly if national definitions of *glass composite packaging* diverge from the PPWR's material-based definition (see Section 3.1.2).

JRC proposal: Glass-based composite packaging should be labelled as *glass*, following the specifications set out in Section 4.2.1.8. Further consideration of potential divergences between national practices and the harmonised system is expected during implementation discussions.

4.2.1.5.2.2 Steel-based composite

Material description: In accordance with the definition of composite packaging provided in Recital 24 of the PPWR, steel-based composite packaging refers to packaging made predominantly of steel, combined with one or more other materials (e.g. plastic, glass, or aluminium) that contribute to the overall weight of the main packaging material and cannot be separated manually, thereby forming a single integral unit. Materials constituting less than 5 % of the total packaging mass are considered insignificant and excluded from this definition, as are labels, varnishes, paints, inks, adhesives, and lacquers.

Desk research insights: Desk research supported by LLMs indicates that steel-dominant composites—such as tins with plastic lids, aerosol cans with valves, or laminated steel pouches—are generally sorted by consumers into the metal or LWP stream, reflecting the predominant material. In many MS, including Germany, Austria, Belgium, and France, such composites are co-collected with mono-material metal and plastic packaging in yellow bins or PMD bags, even when non-metal elements are non-detachable. Consumers are usually encouraged—but not always required—to remove plastic caps or seals before disposal.

In Italy and Finland, steel-based composites with a clear metal predominance typically follow the metal stream, whereas items with inseparable or extensive plastic layers may be directed to residual waste depending on local guidance. Czechia and parts of Hungary apply stricter rules, accepting only clean, mono-material items in metal collection streams; composite steel packaging is often treated as residual waste unless explicitly covered by a dedicated scheme (e.g. aerosols). Overall, MS tend to classify steel composites according to the dominant material by weight or volume, although collection thresholds and labelling rules differ between schemes.

Expert stakeholder insights: As noted in Section 4.2.1.5.2, these fractions were not explicitly discussed with expert stakeholders, although they sometimes mentioned this fraction as a possible challenge.

Citizen insights: The same considerations apply as for composite packaging in general (see Section 4.2.1.5). Steel-based composites were not specifically addressed in citizen studies, as these fractions were defined in later stages of system development.

JRC assessment of insights Country-specific guidance for steel composites varies, with some MS directing such items to the residual waste stream, while others collect them with metal packaging. To reflect this diversity within a harmonised EU system, options could include (i) applying either the residual or the metal label with complementary textual or country-indicator information (see Sections 4.1.4.4 and 4.2.2), or (ii) developing a distinct label for steel-based composites. To avoid unnecessary complexity and additional labels, the current approach is to classify and label steel composites according to their dominant material—metal. Differences between the PPWR definition

and national interpretations of steel composites may require further clarification during implementation (see Section 3.1.2.

JRC proposal: Steel-based composite packaging should be labelled as *metal*, following the specifications set out in Section 4.2.1.2. Diverging national practices and interpretations may be further addressed in the negotiations of the implementing act.

4.2.1.5.2.3 Plastic-based composite

Material description: In line with the definition of composite packaging provided in Recital 24 of the PPWR, plastic-based composite packaging refers to packaging made predominantly of plastic, combined with one or more other materials (e.g. steel, glass, or aluminium) that contribute to the total weight of the main packaging material and cannot be separated manually, thereby forming a single integral unit. Materials that account for less than 5 % of the total packaging mass are considered insignificant and excluded from this definition, as are labels, varnishes, paints, inks, adhesives, and lacquers.

Desk research insights: Desk research supported by LLMs shows that plastic-dominant composites—such as multilayer pouches, laminated films, or blister packs—are usually sorted by consumers into the *plastic* or *LWP* stream when plastic is the main material. This is common practice in MS such as Germany, Austria, Belgium, France, and Estonia, where these items are co-collected with mono-material plastics and metals in yellow bins or PMD containers. However, differences persist in how dominance is defined and how non-removable layers are handled.

In Italy and Finland, plastic-based composites such as beverage cartons or plastic–paper laminates are sorted differently depending on which material is considered dominant, with some municipalities classifying them as plastic and others as paper. In Czechia, Hungary, and parts of Slovakia, stricter contamination rules mean that composite packaging with non-plastic layers or poor recyclability is often directed to residual waste. Multi-layer laminates (e.g. aluminium–plastic) are particularly challenging and may be excluded from recycling even when plastic predominates. Consumer guidance therefore varies widely between and within countries, depending on local sorting rules, signage, and infrastructure. Overall, while plastic-dominant composites are generally sorted with plastics, significant regional variation remains in practice and acceptance criteria.

Expert stakeholder insights: As noted in Section 4.2.1.5.2, plastic-based composites were not explicitly discussed with expert stakeholders, although they sometimes mentioned this fraction as a possible challenge.

Citizen insights: The same insights and challenges identified for composite packaging in general apply here (see Section 4.2.1.5). Plastic-based composites were not specifically investigated with citizens, as these fractions were added subsequently.

JRC assessment of insights: Country-specific sorting rules for plastic-based composites vary considerably. Some MS direct them to residual waste, while others include them in plastic collection. In a harmonised labelling system, this divergence could be addressed through (i) country-specific adaptations of the residual and plastic labels with complementary textual or country-indicator information (see Sections 4.1.4.4 and 4.2.2), or (ii) creation of a separate label for plastic-based composites. To maintain simplicity and avoid excessive label proliferation, the preferred approach is to classify these items by their dominant material—plastic. Further clarification may be needed in implementing act discussions, particularly regarding differences between PPWR and national definitions of composite packaging (see Section 3.1.2).

JRC proposal: Plastic-based composite packaging should be labelled according to the form of its dominant plastic component:

— Rigid plastic-based composites should be labelled as rigid plastic, following the specifications in Section 4.2.1.6.1.

— Flexible plastic-based composites should be labelled as flexible plastic, following the specifications in Section 4.2.1.6.2.

This approach balances harmonisation with system simplicity while acknowledging the need for further discussion in the implementing act process.

4.2.1.5.2.4 Aluminium-based composite

Material description: In line with the definition of composite packaging provided in Recital 24 of the PPWR, aluminium-based composite packaging refers to packaging made predominantly of aluminium, combined with one or more other materials (e.g. plastic, steel, or glass) that contribute to the overall weight of the main packaging material and cannot be separated manually, thereby forming a single integral unit. Materials constituting less than 5 % of the total packaging mass are considered insignificant and excluded from this definition, as are labels, varnishes, paints, inks, adhesives, and lacquers.

Aluminium-based composites can broadly be divided into:

1. Rigid aluminium composites, such as trays or containers; and
2. Semi-rigid and flexible aluminium composites, such as foil sachets, laminated pouches, and tubes.

Desk research insights: Desk research supported by LLMs indicates that aluminium-dominant composites—such as foil sachets, drink pouches, and tubes with plastic caps or internal plastic layers—are generally sorted by consumers into the metal or LWP stream when aluminium is the dominant material. In MS such as Germany, Austria, Belgium, and France, these items are accepted in the yellow bag or PMD bin alongside aluminium cans and trays, even when small plastic parts are present. Consumers are commonly encouraged—but not required—to remove plastic caps or spouts before disposal.

Italy and Finland apply similar principles, directing aluminium composites into the metal collection stream, although tolerance for multi-layer formats and contamination can vary locally. In contrast, Czechia, Hungary, and parts of Slovakia often exclude heavily laminated aluminium composites from selective collection, directing them to residual waste where the layers cannot be separated or recognised by local sorting facilities. National and local guidance rarely distinguishes explicitly between pure and composite aluminium packaging, leaving municipalities discretion in interpreting sorting rules. Overall, while aluminium composites are widely sorted with metals where aluminium predominates, variation persists due to differences in recyclability, local infrastructure, and definitions of “composite” packaging.

Expert stakeholder insights: As noted in Section 4.2.1.5.2, these fractions were not explicitly discussed with expert stakeholders, although they sometimes mentioned this fraction as a possible challenge. However, one stakeholder in the second consultation noted the absence of specific labels for semi-rigid and flexible aluminium and proposed additional pictograms such as “semi-rigid container” (e.g. take-away trays), “aluminium lid” (e.g. yoghurt lid), and “confectionery wrap.” This

suggestion primarily reflected graphical design preferences rather than the granularity criteria outlined in Section 3.1.2.

Citizen insights: The same considerations apply as for composite packaging in general (see Section 4.2.1.5). Aluminium-based composites were not separately investigated with citizens, as this category was defined later in the development process.

JRC assessment of insights: Country-specific sorting guidance for aluminium composites varies. In some MS, these items are sorted with metals, while in others—especially where composite layers are inseparable—they are directed to residual waste. In a harmonised labelling system, this variability could be addressed through: (i) country-specific combinations of the metal and residual labels supported by complementary textual or country-indicator information (see Sections 4.1.4.4 and 4.2.2), or (ii) a distinct label for aluminium-based composites. To maintain simplicity and minimise the number of labels, the current approach is to classify aluminium composites according to their dominant material—metal. Differences between PPWR definitions and national interpretations may require clarification during implementation (see Section 3.1.2).

JRC proposal: Rigid, semi-rigid, and flexible aluminium-based composite packaging should be labelled as metal, following the specifications set out in Section 4.2.1.2. Further discussion during the implementing-act negotiations may address divergences between national and EU definitions and assess the potential need for more specific differentiation.

Box 10 provides a proposed decision tree to support the choice between composite and non-composite labels.

Box 10. Decision tree for choosing between composite and non-composite labels.

In accordance with Article 12(1) of the PPWR, the decision tree below (Figure 44) illustrates how to determine whether a composite or non-composite label should be applied to packaging or a packaging component. The tree supports consistent identification of composite packaging in line with the 5 % threshold and the definitions provided in Recital 24 of the PPWR.

Application:

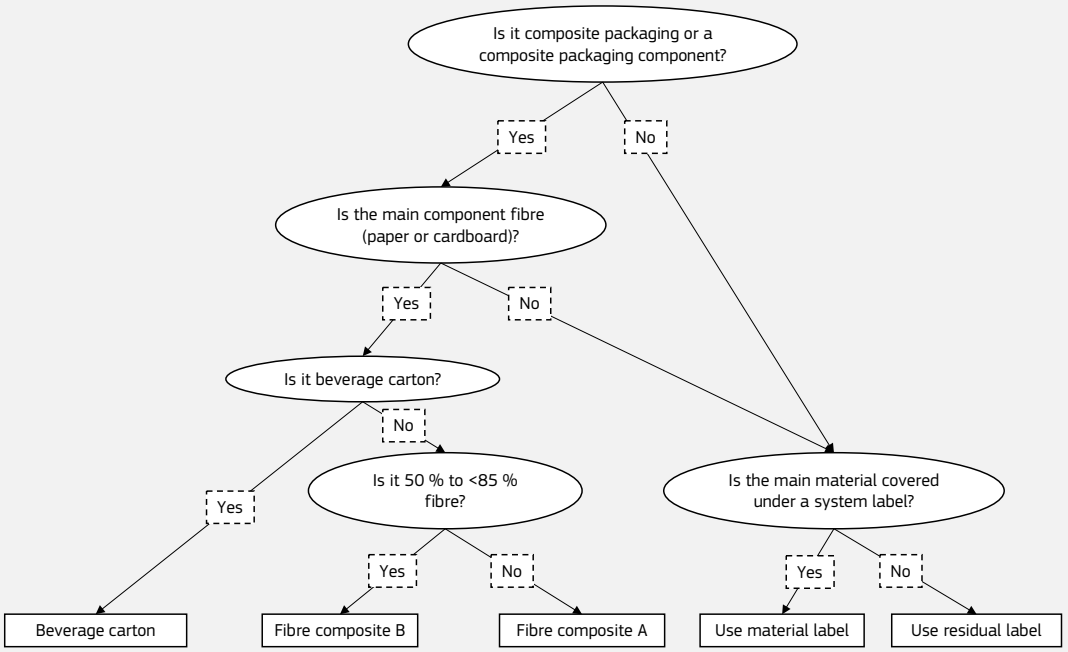
The procedure starts by establishing whether the packaging or its component qualifies as a composite packaging. If so, it assesses whether the main component is fibre-based (paper or cardboard) or another material. Fibre-based composites are classified as beverage carton or not beverage carton, with the latter being further subdivided into fibre composite A or fibre composite B depending on fibre content:

— Fibre composite A: 85 %–95 % fibre

— Fibre composite B: 50 %–< 85 % fibre

If the main material is not fibre, the next step is to verify whether it falls under an existing material category of the harmonised system (e.g. glass, metal, plastic, aluminium). If yes, the respective system label should be used. If no dedicated label exists, the residual waste label applies.

Figure 44. Decision tree to determine if a composite or other label must be applied on packaging.



Source: Author's elaboration.

4.2.1.6. Plastic

Issue description: For plastic packaging, a meta-label combining rigid and flexible plastic is proposed, as these fractions are frequently but not consistently commingled in national collection systems. The present section addresses the meta-label, while the individual material labels are described in the following subsections.

Material description: This label applies to packaging and packaging components made of rigid or flexible plastic. Specifically, it covers both categories represented under Commission Decision 97/129/EC with the polymer codes 1 (PET), 2 (HDPE), 3 (PVC), 4 (low-density polyethylene, LDPE), 5 (polypropylene, PP), and 6 (polystyrene, PS).

In Annex II, Table 1 of the PPWR, this corresponds to:

— Rigid plastics: PET, PE, PP, HDPE, PS, extruded polystyrene (XPS), expanded polystyrene (EPS), and other rigid plastics such as PVC, PC), and non-biodegradable biobased polymers.

— Flexible plastics: PET, PE, PP, and other film-form or laminated plastic materials.

Desk research insights: According to the European Environment Agency (2025), there is no evidence that rigid and flexible plastics are routinely separated by consumers in any Member State. Plastic packaging is most often commingled with other materials—particularly metal and composite packaging—and sometimes also with paper and cardboard (e.g. in Bulgaria, France, Greece, Ireland, Italy, Malta, and Slovenia). The distinction between rigid and flexible plastics originates from the Danish version of the Nordic pictogram scheme and reflects the material classification in the PPWR, though it may not be maintained in future iterations of national systems.

Plastic packaging is predominantly collected via CAS, bring points, and door-to-door collection systems, often commingled with other packaging types.

In Denmark, consumers are instructed to separate rigid (e.g. bottles, trays) and flexible plastics (e.g. films, bags) into different bins, while Estonia partially differentiates between them, with flexible films and pouches excluded from general packaging collection. In most other MS, all household plastic packaging is placed in a single mixed stream—commonly combined with metal packaging and beverage cartons in PMD or yellow-bin systems. Sorting by polymer type (e.g. PET, PE, PP) is not expected at household level, as these distinctions are handled by optical and mechanical sorting technologies in material recovery facilities.

According to Torkelis et al. (2024), the composition of plastic packaging in the EU in 2021 was approximately: LDPE 29 %, PP 23 %, PET 19 %, HDPE 16 %, PS 8 %, PVC 1 %, and other plastics 4 %.

Expert stakeholder insights: Stakeholders broadly confirmed that rigid and flexible plastics are not separately collected by consumers in any MS. Several questioned the need for this differentiation in the harmonised labelling system. In the second stakeholder consultation, 55 % of respondents did not answer the question on separate collection; 29 % reported that rigid and flexible plastics are never separated, 11 % indicated sometimes, and only 3 % said they are always separated. Less than 1 % were unsure.

Citizen insights: Participants in the workshops found the distinction between rigid and flexible plastics difficult to understand and visually complex, reporting that separate pictograms could increase confusion for users unfamiliar with such detailed sorting practices.

In the citizen survey, 49 % of respondents indicated that they sorted plastic separately, while 22 % reported commingling it with composite packaging, 15 % with aluminium cans, and 14 % with aluminium generally. Ten per cent indicated mixing with coloured glass and 10 % with uncoloured glass. Other commingling fractions remained below 10 %. The survey did not distinguish between flexible and rigid plastics.

In the behavioural experiment, Prototype 2 improved purity rates in the plastic bin but did not significantly affect capture rates.

JRC assessment of insights: Evidence suggests that rigid and flexible plastic packaging are sometimes—but not systematically—collected separately. Both are often commingled with other materials in household collection streams. These findings indicate that maintaining distinct labels for rigid and flexible plastics, alongside a combined meta-label, could accommodate diverse national practices. However, since clear separation occurs only in a limited number of countries and without consistency, simplification to a single *plastic* label might be appropriate to reduce system complexity. This issue may warrant further discussion during the negotiations of the implementing act.

JRC proposal: The proposed label variants for plastic, including the meta-label and single labels for rigid and flexible plastic, are shown in Figure 45.

Figure 45. All label variants for 'plastic'.

Source: Author's elaboration.

4.2.1.6.1. Rigid plastic

Material description: This label applies to packaging and packaging components made of rigid plastic. Specifically, it covers materials classified under Commission Decision 97/129/EC with the polymer codes 1 (PET), 2 (HDPE), 3 (PVC), 4 (LDPE), 5 (PP), 6 (PS) insofar as these occur in rigid form. In Annex II, Table 1 of the PPWR, this corresponds to rigid PET, PE, PP, HDPE, PS, XPS, EPS, and other rigid plastics such as PVC, PC, and biobased polymers that are not readily biodegradable).

Desk research insights: See Section 4.2.1.6.

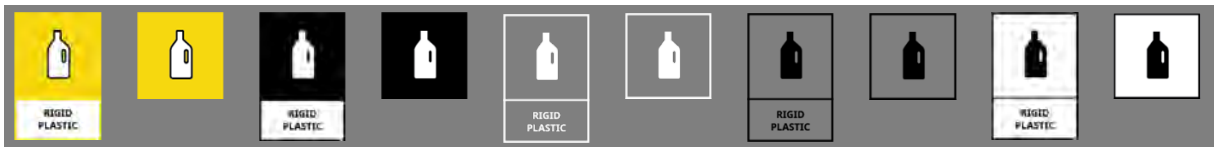
Expert stakeholder insights: See Section 4.2.1.6.

Citizen insights: See Section 4.2.1.6.

JRC assessment of insights: See Section 4.2.1.6.

JRC proposal: Figure 46 presents the proposed label variants for rigid plastic.

Figure 46. All label variants for 'rigid plastic'.



Source: Author's elaboration.

4.2.1.6.2. Flexible plastic

Material description: This label applies to packaging and packaging components made of flexible plastic. Specifically, it covers materials classified under Commission Decision 97/129/EC with the polymer codes 1 (PET), 2 (HDPE), 3 (PVC), 4 (LDPE), 5 (PP), 6 (PS) insofar as these occur in flexible form. In Annex II, Table 1 of the PPWR, this corresponds to flexible PET, PE, PP, and other flexible plastic materials such as multi-layer films or laminates.

Desk research insights: See Section 4.2.1.6.

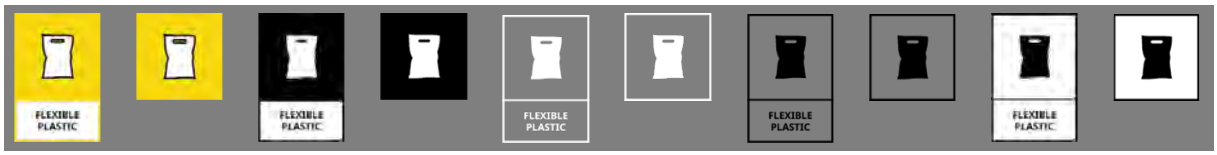
Expert stakeholder insights: See Section 4.2.1.6.

Citizen insights: See Section 4.2.1.6.

JRC assessment of insights: See Section 4.2.1.6.

JRC proposal: Figure 47 presents the proposed label variants for flexible plastic.

Figure 47. All label variants for 'flexible plastic'.



Source: Author's elaboration.

4.2.1.7. Textile

Material description: This label applies to packaging and packaging components made of natural or synthetic textile fibres. This material is not represented in Commission Decision 97/129/EC, but it is included in Annex II, Table 1 of the PPWR under natural and synthetic textile fibres. The label applies exclusively to textile packaging, such as fabric pouches or small cloth bags, and not to used clothing or similar textile items, which fall outside the scope of the PPWR and are covered by separate collection schemes.

Desk research insights: Textile packaging is typically collected separately from other waste fractions, although practices vary and the distinction between packaging textiles and non-packaging textiles (e.g. clothing, linens) is not always clear. Textile waste is predominantly collected at CAS and bring points, and only rarely through door-to-door systems. This approach is consistent with the targeted revision of the Waste Framework Directive, which requires MS to establish separate collection systems for textile waste to ensure that textiles are not discarded with general household waste (European Environment Agency, 2025).[49]

According to desk research using LLMs, there is no uniform classification or collection pathway for textile packaging across EU MS. In most countries, packaging made of textiles is not accepted in standard packaging streams (such as plastics or composites) and is instead treated as residual waste or, where feasible, collected with textiles in dedicated schemes. For example:

- Austria collects textile packaging with LWP (plastics, metals, composites) in yellow bins, supported by post-sorting technologies. Non-packaging textiles are collected separately.
- Belgium treats textile packaging in the same way as non-packaging textiles, directing both to textile collection systems.
- Finland, Denmark, Czechia, Croatia, and Cyprus typically treat textile packaging as residual waste.

Overall, textile packaging often falls outside harmonised collection systems, exposing a regulatory and infrastructural gap within the EU. It is also important to note that torn clothing should not be mixed with textile packaging waste, as these materials follow different regulatory and management pathways.

Expert stakeholder insights: The textile label was not included in the first stakeholder consultation, and several participants highlighted its omission and the need for such a label. During the second consultation, stakeholders reported varying citizen instructions: textile packaging was collected in the residual waste bin, with LWP, with other textiles (e.g. clothing or home textiles) in textile collection bins, or at CAS together with non-packaging textiles.

Citizen insights: The textile label was introduced only in Prototype 2, evaluated during the behavioural experiment. This version featured a pictogram depicting a torn T-shirt. Results showed that 79 % of participants interpreted the label as referring to damaged clothing, 17 % to textile packaging, 13 % to cotton shopping bags, and 6 % to jute shopping bags; 11 % believed it applied

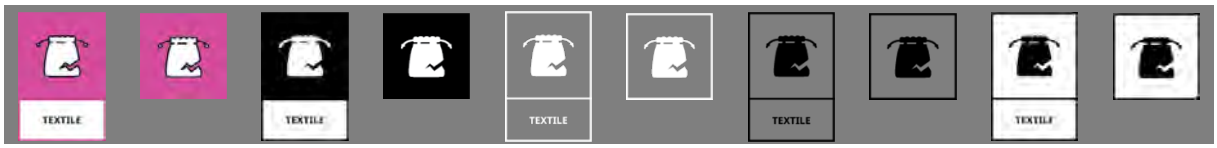
[49] https://data.consilium.europa.eu/doc/document/ST-7258-2025-INIT/en/pdf (last accessed 05/06/2025).

to reusable textile items. These findings indicate a risk of misinterpretation if the pictogram resembles apparel rather than packaging.

JRC assessment of insights: Based on stakeholder feedback, a distinct textile label was introduced and the pictogram modified to depict textile packaging rather than clothing. Since textile packaging is a minor but distinct fraction, a dedicated label helps ensure clarity and accommodates varying sorting practices among MS. The label should avoid depicting wearable garments to prevent confusion and should encourage citizens to reuse textile packaging that remains intact while discarding only damaged items as waste.

JRC proposal: We propose a single label for textile packaging, visually representing non-reusable textile items to promote re-use where possible (see Section 4.1.2). This label reflects current variations in Member State sorting practices while maintaining a coherent approach within the harmonised labelling system. Figure 48 shows the proposed label variants for textile packaging.

Figure 48. All label variants for 'textile' packaging.



Source: Author's elaboration.

4.2.1.8. Glass

Issue description: For glass, a meta-label is proposed to represent both coloured and uncoloured glass, as these are frequently collected together. This section focuses on the meta-label, while single labels for coloured and uncoloured glass are described in the respective sub-sections below.

Material description: This label applies to packaging and packaging components made of glass, both coloured and colourless. It corresponds to codes 70 (colourless glass), 71 (green glass), and 72 (brown glass) in Decision 97/129/EC, and to glass packaging and glass-based composites (where glass is the predominant material) in Annex II, Table 1 of the PPWR.

Desk research insights: Glass is collected differently across MS (MS):

(a) all types of glass commingled,

(b) coloured and uncoloured glass collected separately, or

(c) colourless, green, and brown glass collected separately.

Occasionally, glass is commingled with small amounts of non-glass materials, typically metal lids. In most MS, glass is collected via CAS, bring points, or separate door-to-door systems, and only rarely commingled via door-to-door. DRS for glass bottles exist in several MS, either mandatory or voluntary (European Environment Agency, 2025).

According to desk research, consumer sorting of glass packaging varies but generally follows clear patterns. Most MS require separation into at least two streams: clear (uncoloured) and coloured glass. Austria, Belgium, Germany, Hungary, and Czechia mandate this split, with separate receptacles for white (clear) glass and a combined stream for coloured glass (green, brown, and

others). Some German municipalities collect three distinct fractions—clear, green, and brown glass—achieving higher recycling quality.

In contrast, several countries, including France, Finland, Denmark, Estonia, Bulgaria, Greece, and Croatia, collect all glass colours together. Instructions to remove closures (metal or plastic caps and lids) are widespread, either recommended or mandatory, to improve recycling quality.

Expert stakeholder insights: A significant share of stakeholders opposed differentiating between glass colours on packaging labels, arguing that it would be unnecessary or confusing where colour separation is not practiced. They emphasised that consumers can identify glass colour visually without explicit indication on the label. Some confusion also arose regarding the modular structure of the proposed system: several stakeholders initially misunderstood the role of the coloured-glass meta-label and assumed that all sub-labels (green, brown, colourless) would need to be displayed even in countries that do not separate glass by colour. Clarification was required to show that the modular system allows adaptation to national practices, with the meta-label used when fractions are commingled.

During the second expert consultation, most respondents did not provide an answer regarding colour separation practices (56 %), while 26 % indicated that coloured and uncoloured glass are never separated, 11 % that they are sometimes separated, and 6 % that they are always separated.

The European Federation of Glass Recyclers expressed its position against colour differentiation on labels, noting that "all glass is treated in the same way and ends up in the same recycling process," and that any colour-specific sorting instructions should instead be provided on glass receptacles.

Citizen insights: Citizen workshops revealed mixed understanding of the distinction between coloured and uncoloured glass. Participants requested clearer information on whether closures (caps and lids) should be removed and where they should be disposed of.

In the citizen survey, 38 % reported commingling coloured and uncoloured glass, while 39 % and 40 % reported sorting coloured and colourless glass separately, respectively. Commingling of glass with other materials was below 10 %.

In the behavioural experiment, the introduction of Prototype 2 labels did not significantly affect purity or capture rates for glass items.

JRC assessment of insights: Evidence confirms that collection practices for glass vary substantially across MS. The labelling scheme therefore needs to accommodate both commingled and colour-separated systems. A modular design that allows either detailed or aggregated use of labels is appropriate: single labels for "clear," "green," and "brown" glass should coexist with a combined meta-label ("glass – coloured and uncoloured") for countries collecting all colours together. For receptacle labels, the meta-label can simplify communication, while packaging should retain the specific material label. Box 11 provides additional considerations on how colour differentiation can be represented visually within pictograms.

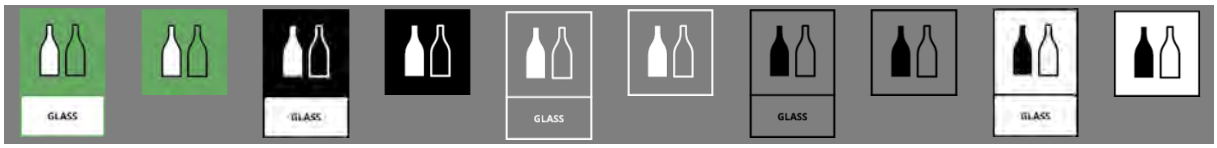
JRC proposal: A meta-label for glass is proposed, covering both coloured and uncoloured glass. Separate single labels remain available for clear glass and for coloured glass (further subdivided into brown and green, see Section 4.2.1.8.2) to reflect the more granular collection schemes used in some MS. This approach ensures flexibility while maintaining harmonisation:

— Packaging: carries the specific label corresponding to its material (e.g. "clear glass" or "coloured glass").

— Receptacles: may use the meta-label where multiple glass types are collected together.

This system supports existing colour-specific collection while avoiding unnecessary complexity in countries with commingled glass streams. Figure 49 presents all proposed label variants for glass.

Figure 49. All label variants for 'glass'.



Source: Author's elaboration.

4.2.1.8.1. Uncoloured glass

Material description: This label applies to packaging and packaging components made of uncoloured (transparent or colourless) glass. It corresponds to code 70 (colourless glass) in Decision 97/129/EC and to "glass" in Annex II, Table 1 of the PPWR.

Desk research insights: See Section 4.2.1.8.

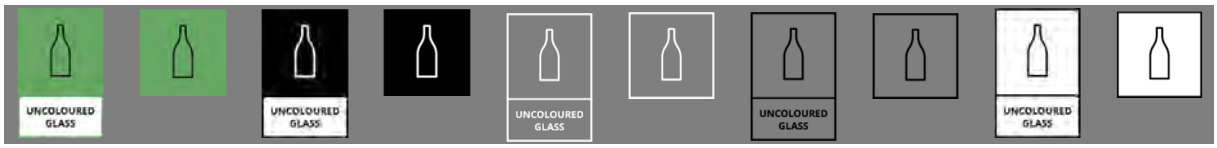
Expert stakeholder insights: See Section 4.2.1.8.

Citizen insights: See Section 4.2.1.8.

JRC assessment of insights: Citizens are generally capable of distinguishing uncoloured glass from coloured glass without additional labelling cues. However, omitting this distinction from the harmonised system would undermine the principle of consistent granularity across materials (see Section 3.1.2) and create inconsistencies with national collection schemes where uncoloured glass is collected separately. Dedicated labels are therefore required for receptacles used for uncoloured glass, ensuring that they visually align with the EU harmonised design rather than with existing national symbols. To maintain coherence and support the matching principle, corresponding labels must also appear on packaging. Further considerations on how colour differentiation is visually represented in pictograms are provided in Box 11.

JRC proposal: A single label for uncoloured glass is proposed to reflect sorting practices in MS that collect this fraction separately from coloured glass. The harmonised label ensures consistency with other material-specific labels and with the overall system design. Where glass is collected without colour separation, the general meta-label for glass (Section 4.2.1.8) may be used for receptacles, but not for packaging. Figure 50 presents the proposed label variants for uncoloured glass.

Figure 50. All label variants for 'uncoloured glass'.



Source: Author's elaboration.

4.2.1.8.2. Coloured glass

Issue description: For coloured glass, a meta-label is proposed that combines the separate material labels for brown and green glass, as these fractions are frequently collected together. This section focuses on the meta-label, while the single labels for brown and green glass are detailed in the following sub-sections.

Material description: This label applies to packaging and packaging components made of coloured glass, primarily brown and green. It corresponds to codes 71 (green glass) and 72 (brown glass) in Decision 97/129/EC, and to "glass" in Annex II, Table 1 of the PPWR.

Desk research insights: See Section 4.2.1.8.

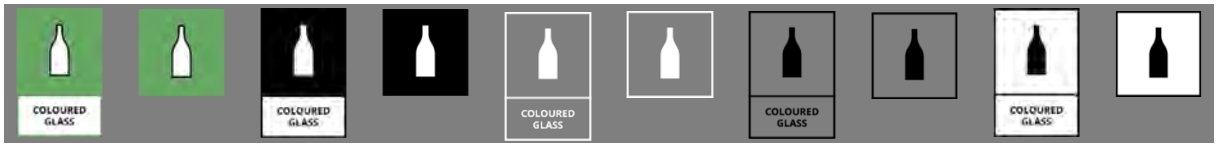
Expert stakeholder insights: See Section 4.2.1.8.

Citizen insights: See Section 4.2.1.8.

JRC assessment of insights: Evidence indicates that MS apply different practices for the collection of coloured glass. Some collect brown and green glass separately, while others collect all coloured glass together. The labelling system must therefore allow sufficient granularity to accommodate both approaches while avoiding unnecessary complexity. Meta-labels can be applied on receptacles to represent commingled fractions, reducing the number of labels needed without compromising clarity. For visual considerations on colour differentiation in pictograms, see Section 4.2.1.8.1 and Box 11 for further insights.

JRC proposal: We propose a meta-label for coloured glass that encompasses brown, green, and other coloured glass types. Separate single labels for brown and green glass remain available to reflect more detailed sorting schemes used in some MS. This design allows differentiation between uncoloured and coloured glass, and among the latter, between the main colours brown and green. The meta-label for coloured glass may be applied on receptacles when these colours are collected together, while packaging should bear the specific label corresponding to its actual glass colour. Figure 51 presents the proposed label variants for coloured glass.

Figure 51. All label variants for 'coloured glass'.



Source: Author's elaboration.

4.2.1.8.2.1 Green glass

Material description: This label applies to packaging and packaging components made of green glass. It corresponds to code 71 (green glass) in Decision 97/129/EC and to "glass" in Annex II, Table 1 of the PPWR.

Desk research insights: See Section 4.2.1.8.

Expert stakeholder insights: See Section 4.2.1.8.

Citizen insights: See Section 4.2.1.8.

JRC assessment of insights: Evidence indicates that only a limited number of MS collect green glass as a distinct fraction. Nevertheless, the harmonised labelling system should maintain sufficient granularity to reflect these practices and ensure coherence with countries that differentiate between green, brown, and uncoloured glass. This level of detail supports both flexibility in national implementation and visual consistency within the overall labelling scheme. Further considerations on the visual differentiation of glass colours are provided in Section 4.2.1.8.1 and Box 11.

JRC proposal: A single label for green glass is proposed to represent packaging made of green glass, supporting collection systems that separate this fraction from other types of glass. The label ensures visual and conceptual consistency with other glass labels within the harmonised system. Where glass fractions are collected together, the corresponding meta-labels—either the general "glass" (Section 4.2.1.8) or "coloured glass" (Section 4.2.1.8.2) —may be used for receptacles, but not for packaging. Figure 52 presents the proposed label variants for green glass.

Figure 52. All label variants for 'green glass'.

Source: Author's elaboration.

4.2.1.8.2.2 Brown Glass

Material description: This label applies to packaging and packaging components made of brown glass. It corresponds to code 72 (brown glass) in Decision 97/129/EC and to "glass" in Annex II, Table 1 of the PPWR.

Desk research insights: See Section 4.2.1.8.

Expert stakeholder insights: See Section 4.2.1.8.

Citizen insights: See Section 4.2.1.8.

JRC assessment of insights: Evidence shows that only a few MS collect brown glass separately from other glass fractions. Nevertheless, maintaining a distinct label for brown glass ensures that the harmonised system can accommodate countries with such practices and remain coherent with the overall principle of material-based granularity. This approach supports flexibility for national implementation and ensures visual and conceptual consistency across all glass labels. For related visual design considerations, see Section 4.2.1.8.1 and Box 11.

JRC proposal: A single label for brown glass is proposed to represent packaging made of brown glass, reflecting the collection practices in some MS that separate this fraction. The label maintains alignment with other glass labels in terms of visual identity and system hierarchy. Where glass fractions are collected together, the corresponding meta-labels—either the general "glass" (Section 4.2.1.8) or "coloured glass" (Section 4.2.1.8.2)—may be used for receptacles, but not for packaging. Figure 53 presents the proposed label variants for brown glass.

Figure 53. All label variants for ‘brown glass’.

Source: Author’s elaboration.

Box 11. On the use of non-textual glass labels

The pictograms for glass (as visual elements of the label) do not, on their own, allow users to distinguish between green and brown glass without accompanying text. During the project, alternative pictogram versions incorporating colour cues to indicate glass colour were developed and tested. However, stakeholders reported that these variants were difficult to apply in practice because the additional colours complicated printing and increased production costs.

For this reason, such variants were excluded from the final proposal. Consequently, pictograms alone do not visually differentiate between coloured and uncoloured glass, or between individual glass colours, depending on the label version used.

This design choice presents both advantages and disadvantages:

— Advantages: fewer colours simplify printing and application on packaging, ensuring better technical feasibility and cost-efficiency;

— Disadvantages: consumers must infer the glass colour when labels are used without text, which may cause confusion if different pictogram versions (e.g. filled or unfilled icons) appear inconsistent across contexts.

Although this specific aspect was not directly investigated in the citizen survey or behavioural experiment, it is expected that consumers can adapt to this practice over time through exposure and consistent use of the harmonised system.

4.2.1.9. Compostable packaging

Compostable packaging comprises both industrially compostable and home compostable packaging. Unlike in the case of materials such as paper and cardboard, no meta-label is proposed, as these two waste streams are inherently distinct in their treatment requirements and disposal pathways. The definitions established in the PPWR are presented in Sections 4.2.1.9.1 (home compostable packaging) and 4.2.1.9.2 (industrially compostable packaging).

Industrially compostable packaging refers to packaging that can be composted under controlled industrial conditions, either across the EU or in specific MS, in line with the PPWR provisions outlined in Box 12. Packaging that is home compostable is also industrially compostable, but the reverse does not apply.

Compostability is a functional characteristic of packaging or packaging materials rather than a distinct material category (see Section 3.3.3). Accordingly, the corresponding labels indicate a packaging property that may apply to different materials. These labels are therefore not strictly material-based but are included to support correct sorting and disposal in systems that accept compostable packaging.

Box 12. Key PPWR specifications on compostable packaging.

Article 9 of the PPWR establishes the rules and scope for compostable packaging. It allows MS (MS) to require that certain types of compostable packaging be home compostable, while ensuring harmonised EU-wide standards for compostability.

— Article 9(1), referring to Article 3(1)(f), specifies that permeable tea, coffee or other beverage bags, soft single-serve units containing such products, and sticky labels attached to fruit and vegetables must be industrially compostable and may be required by MS to be home compostable. These items are intended to be used and disposed of together with their contents.

— Article 9(2), referring to Article 3(1)(g), covers non-permeable single-serve beverage units intended for use in machines, made from materials other than metal, as well as very lightweight and lightweight plastic carrier bags and other packaging for which MS already required compostability before the PPWR's date of application.

— Article 9(6) mandates the development of harmonised European standards specifying the technical requirements for compostable packaging. These standards will be established by European standardisation organisations within 12 months after the PPWR enters into force and will apply uniformly across all MS.

In practice, this means that one MS may, for example, require permeable tea bags to be industrially compostable, while another may require them to be home compostable, according to the harmonised standards. Once adopted, these standards ensure that packaging certified as home or industrially compostable in one MS is recognised as such throughout the EU.

However, as clarified through exchanges with European Bioplastics[50] and under Article 9(2), harmonised standards do not oblige every MS to accept industrially compostable packaging in their biowaste collection streams. For instance, a compostable carrier bag may meet the EU standard for industrial compostability and thus be recognised as such EU-wide, but some MS may allow its disposal with biowaste, while others may require it to be discarded with another fraction. This distinction applies specifically to industrially compostable packaging; home compostable packaging can be composted domestically in MS where this is permitted.

4.2.1.9.1. Home compostable packaging

Material description: This label applies to packaging and packaging components that are home compostable, i.e. compostable under non-industrial conditions. According to the PPWR, home compostable packaging "means packaging that can biodegrade in non-controlled conditions that are not industrial-scale composting facilities and the composting process of which is performed by private individuals with the aim of producing compost for their own use." (recital 51). This category does not correspond to any specific code in Decision 97/129/EC or in Annex II, Table 1 of the PPWR.

Desk research insights: The European Environment Agency (2025) reports data on biowaste collection, but not specifically on compostable packaging. Biowaste collection practices vary across MS: some collect food and garden waste together, others separately. In line with Directive

[50] https://www.european-bioplastics.org/ (last accessed 05/06/2025).

2008/98/EC (Article 22),[51] door-to-door collection does not commingle food and garden waste. Biowaste is also sometimes disposed of at CAS or bring points.

Expert stakeholder insights: Several stakeholders argued that labels for home compostable packaging on receptacles are unnecessary, as kerbside collection systems for home compostable packaging do not exist and household composting systems are typically managed privately. Others warned that consumers may misinterpret such labels as referring to non-packaging items. Uncertainty also remains about which plastic materials qualify as home or industrially compostable, and whether MS will be required to accept the packaging types listed under Article 9(1) of the PPWR in biowaste collections. Some stakeholders expressed a preference for industrially compostable over home compostable packaging, citing clearer infrastructure and processing conditions.
A few stakeholders questioned whether Articles 9 and 12 of the PPWR require a distinct label for home compostable packaging, noting that home composting does not qualify as recycling and therefore does not contribute to the PPWR's recycling targets.

Citizen insights: Prototype 1 used in citizen workshops and surveys did not include a specific label for compostable packaging but referred instead to "biowaste." Discussions nonetheless revealed frequent confusion between compostable materials, biowaste, and biodegradable products. Citizens highlighted challenges linked to garden waste, which is produced in large volumes and requires different handling than food or compostable packaging waste. While participants expressed interest in sustainable packaging, few explicitly mentioned compostable packaging.

Survey data showed limited understanding of compostability concepts. About 50 % of respondents correctly recognised "compostable" as encompassing both home and industrial composting; 25 % understood it as industrially compostable only; and 16 % as home compostable. For "home compostable," 48 % correctly associated it with home composting, while 32 % interpreted it as including both home and industrial composting (the latter not being incorrect).

In the behavioural experiment, 26 % of participants correctly understood that home compostable packaging could be composted both at home and in industrial facilities, while 56 % believed it could only be composted at home. Prototype 2 improved capture rates but slightly reduced purity rates in the home compostable fraction.

JRC assessment of insights: The interpretation that Articles 9 and 12 of the PPWR do not require a label for home compostable packaging requires clarification. Article 12(1) mandates labelling for compostable packaging, which must state that:

— the material is compostable,

— it is not suitable for home composting, and

— it must not be discarded in nature.

This labelling requirement applies to compostable packaging referred to in Articles 9(1) and, where applicable, 9(2). Therefore, if packaging is declared compostable, a label is legally required;

[51] Consolidated text: Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance).

however, the regulation explicitly restricts the claim of home compostability unless validated according to the relevant harmonised standards.

It is correct that home composting does not count towards recycling under the PPWR or the WFD.[52] Recycling refers to the reprocessing of materials into products, including organic recycling (e.g. industrial composting), but excludes uncontrolled processes such as home composting. Consequently, home composting does not contribute to meeting the recycling targets defined in the PPWR.

JRC proposal: Figure 54 presents the label variants for home compostable packaging developed during the project. However, given the limited legal basis and the uncertainties regarding implementation under the PPWR, it is proposed that these labels be reconsidered or potentially excluded from the final harmonised system. Their inclusion should remain subject to the outcomes of the implementing act negotiations and the development of harmonised standards for compostability.

Figure 54. All label variants for 'home compostable' packaging.

Source: Author's elaboration.

4.2.1.9.2. Industrially compostable packaging

Issue description: In line with the provisions outlined in Box 12, labels for industrially compostable packaging must distinguish between (a) packaging that is mandatorily compostable throughout the EU under Article 9(1) PPWR, and (b) packaging that may be required to be compostable only in certain MS under Article 9(2) PPWR.

Material description: This label applies to packaging and packaging components that are industrially compostable, i.e. biodegradable under controlled industrial conditions. According to recital 50 PPWR, compostable packaging "means packaging that biodegrades in industrially controlled conditions or that is capable of undergoing biological decomposition in such conditions, including through anaerobic digestion, but not necessarily in a home-composting environment, combined, if necessary, with physical treatment, resulting ultimately in the conversion of the packaging into carbon dioxide or, in the absence of oxygen, methane, and mineral salts, biomass and water, and that does not hinder or jeopardise the separate collection and the composting and anaerobic digestion process."

The PPWR distinguishes between:

— packaging that must be compostable across the EU (Art. 9(1)), and

[52] To clarify, generally, home composting as a management option is not considered to contribute to the mandated recycling targets of the Directives, and therefore it is not covered by the provisions of the Directives. However, in physical terms, home composting is still recycling.

— packaging that may be required to be compostable only in some MS (Art. 9(2)).

This category does not correspond to a specific code in Decision 97/129/EC. In Annex II, Table 1 of the PPWR it refers to packaging and packaging components made of industrially compostable material, including rigid biodegradable plastics (e.g. polylactic acid (PLA), polyhydroxybutyrate (PHB)) and flexible biodegradable plastics (e.g. PLA films). These materials are characterised by their proven ability to biodegrade by > 90 % within six months under industrial composting conditions, irrespective of the feedstock used.

Desk research insights: Although biowaste is not equivalent to industrially compostable packaging, their management is closely related, as such packaging is sometimes directed to biowaste streams. Across the EU, biowaste is primarily collected separately—mainly through door-to-door systems—and also at CAS or bring points. Garden waste is mostly collected at CAS or via separate door-to-door systems, and food waste predominantly through door-to-door schemes (European Environment Agency, 2025).

Desk research indicates that sorting of industrially compostable packaging by consumers is highly inconsistent and often counterintuitive. While most such packaging is certified under EN 13432, it is rarely accepted in municipal biowaste bins. In many MS—including Austria, Belgium, and others—industrially compostable items are instead directed to the residual waste stream or co-collected with LWP (plastics and metals). This is mainly because local industrial composting facilities often operate on shorter treatment cycles or under process conditions insufficient for complete biodegradation.

For example:

— In Austria, certified compostable packaging is placed in the “yellow bin” for plastics and metals, not in biowaste.

— In Belgium, compostable packaging is excluded from both PMD recycling and biowaste streams and is typically incinerated.

— In Finland and Croatia, EN 13432-certified items may be accepted in biowaste under specific conditions.

Overall, most industrially compostable packaging in the EU is treated as residual waste, causing consumer confusion and undermining its perceived environmental benefit.

Expert stakeholder insights: During the second stakeholder workshop, two groups developed a four-fraction framework for compostable materials, proposing:

1. Garden waste (labelled only on receptacles)
2. Food and kitchen waste
3. Home compostable packaging
4. Industrially compostable packaging

Stakeholders agreed on the need for two distinct labels—home and industrially compostable—emphasising that the term “compostable” alone is insufficient for consumer understanding. Labels should be applied directly to product packaging when feasible, or to the selling unit otherwise. In regions without industrial composting infrastructure (e.g. Portugal), the industrially compostable label could be associated with residual waste receptacles. Participants also highlighted the potential for

confusion with non-packaging items and the need for clear differentiation between industrially compostable materials and garden waste.

It was further noted that the acceptance of industrially compostable materials depends on local infrastructure and may vary case by case (e.g. inclusion of food residues, bones, or compostable inks). Stakeholders emphasised the importance of textual labels and intensive information campaigns to avoid misinterpretation. Some suggested that all compostable packaging should by default be labelled as industrially compostable, with an additional home-compostable indication where applicable under national rules.

Feedback from the second consultation revealed that the distinction between EU-wide and country-specific compostability was perceived as complex and not directly relevant to consumers, who mainly need to know whether the packaging is compostable in their own MS.[53] Stakeholders also raised the risk of misuse of the label on non-compliant packaging and called for certification requirements. Several referred to the EN 13432 "Seedling" logo (see Figure 55) as a possible complementary certification mark.

Figure 55. Logo ("The Seedling") reflecting industrial compostable packaging certified according to EN 13432 standards.

Source: https://www.european-bioplastics.org/bioplastics/standards/labels/ (last accessed 01/08/2025).

Citizen insights: See Section 4.2.1.9.1.

JRC assessment of insights: Compared to the proposal discussed during the second stakeholder consultation—which envisaged two distinct labels for industrially compostable packaging (one applicable across the EU and one for certain MS)—we propose an alternative approach based on country indicators or additional textual information. As outlined in Section 4.2.2, this approach may face resistance from some packaging stakeholders who prefer a uniform EU-wide label. Nevertheless, the complexity of the legal and practical situation under the PPWR makes a single, clear-cut labelling solution difficult to achieve.

A limitation of this approach is that packaging producers must determine and indicate the geographical scope of the label's applicability. They must ensure that consumers can identify where the label applies by matching packaging and receptacle labels and paying attention to country indicators.

[53] The evaluated proposal contained two separate labels for industrially compostable packaging: "industrially compostable in the EU" and "industrially compostable in some MS".

The option of maintaining two separate labels—"industrially compostable in the EU" and "industrially compostable in some MS"—appears incompatible with the matching principle that underpins the harmonised labelling system. This principle assumes consistent rules for all packaging carrying the same label. However, evidence suggests that national acceptance of compostable packaging in biowaste streams is not uniform and may depend on both national policy and the specific type of compostable packaging.

For instance, according to LLM analyses:

- Belgium allows certain certified compostable items (e.g. tea bags, coffee pads, fruit stickers) in biowaste but prohibits others, even if EN 13432-certified.
- France accepts selected certified items (e.g. paper-based capsules, compostable biowaste bags) in some municipal schemes but excludes others.
- Austria allows specific products such as *Bio-Kreislauf-Sackerl* (certified compostable liners) and certain cellulose films in pilot projects.

These examples show that a strict binary differentiation between "EU-wide" and "some MS" compostability does not capture the nuanced reality of national acceptance practices. Box 13 discusses the potential role of a certification scheme supporting these labels within the implementing act.

JRC proposal: Figure 56 presents the proposed label variants for industrially compostable packaging. We recommend addressing the distinction between packaging that is industrially compostable throughout the EU (Art. 9(1)) and packaging that is compostable only in some MS (Art. 9(2)) by using country indicators on packaging labels (see Section 4.2.2). These indicators would identify the MS where the label applies, while alternative labels (e.g. the residual label) could be used for countries where it does not.

This solution acknowledges the current lack of shared definitions and harmonised acceptance practices for industrial compostability. Discussions on this topic are expected to continue during the negotiations of the implementing act.

While an alternative solution—introducing two separate "industrially compostable" labels—remains technically feasible, it would face similar challenges as the glass colour labels. In particular, pictograms alone would not allow consumers to distinguish between the two, as compostability cannot be inferred visually from the packaging. Textual versions would therefore be required, complicating design and potentially reducing consumer clarity. During development, no clear and intuitive visual differentiation could be identified.

Figure 56. All label variants for 'industrially compostable' packaging.

Source: Author's elaboration.

Box 13. Certification for compostable packaging.

Several stakeholders emphasised the importance of establishing a certification scheme for compostable packaging. From the perspective of packaging producers, certification provides credibility and market value for compostable products, while for citizens and other stakeholders, it ensures that claims of compostability can be independently verified.

Stakeholders cautioned that, in the absence of certification, the compostable packaging label could be misused as a marketing or "green" claim rather than serving its intended purpose of providing reliable waste-sorting guidance. This could lead to the inappropriate use of the label on packaging that does not meet compostability standards, misleading consumers and undermining trust in the system.

Under the PPWR, compostability constitutes a market access requirement. Economic operators that demonstrate compliance with harmonised standards—presumed to be established under Article 9—benefit from a presumption of conformity. In practice, such compliance is expected to be verified through certification by accredited bodies, with national authorities responsible for enforcement. This provides an existing assurance mechanism for most compostable packaging placed on the EU market.

However, European Bioplastics highlighted the risk that harmonised waste-sorting labels could weaken or disconnect from the established certification marks and pictograms (e.g. those referenced in the IA). Ensuring coherence between certification schemes and the harmonised label system would therefore be essential to maintain consumer confidence and regulatory integrity.

From the JRC perspective, mandating certification for the use of compostable packaging labels could represent an appropriate safeguard, provided it is legally feasible. Such a requirement should be considered as part of the implementing act to ensure that only packaging meeting recognised compostability standards can bear the corresponding harmonised label.

4.2.1.9.2.1 "Do not throw in nature" text

Issue description: Recital 66 of the PPWR stipulates that EU harmonised waste sorting labels should inform consumers about the composting properties of packaging and help prevent confusion, particularly regarding compostable packaging that is not suitable for home composting but only for industrial composting.

Article 12(1) of the PPWR further requires that, for packaging referred to in Article 9(1) and, where applicable, in Article 9(2), the waste sorting label must indicate that the material is compostable, not suitable for home composting, and must not be discarded in nature. This last requirement specifically addresses consumer misconceptions about industrially compostable packaging. Box 12 provides additional context and references to the relevant PPWR provisions.

This section focuses on the proposed rules for using the textual instruction, while the corresponding symbol is addressed in Section 4.2.1.9.2.2.

Desk research insights: The formulation "do not throw in nature" is derived directly from the language in Recital 66 of the PPWR: "Such information should therefore prevent compostable packaging from being thrown away in nature."

Expert stakeholder insights: The first stakeholder consultation did not specifically address the auxiliary "do not throw in nature" text, though it noted its reference in the PPWR. In the second stakeholder consultation, 41 respondents evaluated this wording—alongside the pictogram and QR code or other digital data carriers—as a means to communicate that the material is compostable, not suitable for home composting, and must not be discarded in nature.

A majority (54 %) rated it positively (four or five out of five), 20 % neutral (three), and 26 % negatively (one or two).

One stakeholder proposed that this message should be optional for all packaging, as no packaging should be disposed of in nature. Others reiterated their general preference to minimise text on labels, noting translation burdens and space constraints. Some argued that the compostable label itself already implies proper disposal in an appropriate receptacle, making the text redundant.

Citizen insights: The specific wording *"do not throw in nature"* was not tested in citizen workshops or surveys.

JRC assessment of insights: Most stakeholders considered the text an adequate means to prevent consumer misunderstanding, though concerns persist regarding translation requirements and the resulting costs for producers. The text provides a clear behavioural instruction and aligns with the PPWR's intent, but its mandatory use could create implementation challenges, particularly for multilingual packaging or space-limited designs.

JRC proposal: We propose that the label for industrially compostable packaging—and optionally any other packaging label—may be complemented by the text "DO NOT THROW IN NATURE", presented in one or more languages in accordance with Section 4.1.4.3 and formatted according to the user manuals. The text should be set in Open Sans Bold (see Section 4.1.4.1) to ensure visibility and consistency.

Where the addition of text is not feasible due to economic, technical, or accessibility constraints, the same information should be provided through digital means (e.g. QR code or other data carrier) to ensure compliance with Article 12(1) PPWR while maintaining design flexibility.

4.2.1.9.2.2 "Do not throw in nature" symbol

Issue description: See Section 4.2.1.9.2.1 for background on the PPWR requirements related to compostable packaging. This section focuses on the rules for using the symbol, while the visual design of the symbol is discussed in Section 4.1.10.

Expert stakeholder insights: The first stakeholder consultation did not explicitly address the auxiliary DNTIN pictogram, though it noted the relevant PPWR provisions. In the second stakeholder consultation, 39 respondents evaluated the pictogram—alongside the auxiliary text and digital data carriers—as a means to indicate that the packaging is compostable, not suitable for home composting, and must not be discarded in nature.

Overall, 44 % rated the pictogram positively (four or five stars), 26 % neutrally (three stars), and 30 % negatively (one or two stars).[54]

Some stakeholders reiterated their general opposition to the use of text or auxiliary symbols, arguing that the main compostable label already implies proper disposal and that adding a DNTIN symbol should remain voluntary. Concerns were also raised about limited space on packaging and potential design complexity.

[54] See also footnote 53**Error! Bookmark not defined.**.

Citizen insights: Findings related to citizen understanding of this symbol are presented in Section 4.1.10.

JRC assessment of insights: Nearly half of the stakeholders considered the DNTIN pictogram an adequate and intuitive way to remind consumers that compostable packaging must not be discarded in nature. At the same time, producers highlighted practical constraints linked to packaging space, printing feasibility, and the general preference for non-textual, minimalistic designs. The DNTIN symbol could therefore serve as an optional but valuable behavioural cue, particularly where text translation or limited space restricts the use of the written message.

JRC proposal: We propose that the DNTIN symbol may be used as an optional complement to the waste sorting label for industrially compostable packaging—or to any other packaging label where relevant. The symbol should follow the visual specifications presented in Section 4.1.10 and be used consistently to support the behavioural message prescribed in Article 12(1) PPWR.

Where the inclusion of the symbol on packaging is not feasible due to technical, economic, or accessibility constraints, the same information should be made available through digital means (e.g. QR code or other data carriers). This ensures that all consumers can access the required information without imposing disproportionate labelling burdens.

4.2.1.10.Wood

Material description: This label applies to packaging and packaging components made of wood. Specifically, it corresponds to code 50 (wood) in Decision 97/129/EC and to wooden packaging in Annex II, Table 1 of the PPWR. The label covers only wooden packaging—such as boxes, crates or small baskets—and not wood in general. Non-packaging wood items (e.g. furniture, tools, or structural materials) remain outside the PPWR scope.

Desk research insights: Wood packaging is primarily collected at CAS and, less frequently, via separate door-to-door or bring-point systems. Available data suggest that these collection channels mostly target bulky non-packaging wood items, while small wooden packaging (e.g. fruit baskets or presentation boxes) rarely has a dedicated receptacle in household collection (European Environment Agency, 2025).

According to desk research and LLM-based synthesis, collection practices for wooden packaging vary considerably across MS. In some (e.g. Austria, Germany, France, Luxembourg, Romania and Slovakia), wooden packaging may be accepted with LWP—subject to local variation—whereas in most other countries it must be disposed of in residual waste or taken to drop-off points and CAS.

Expert stakeholder insights: Wood was only marginally addressed in the first stakeholder consultation. Some stakeholders noted that the term wood may mislead citizens to include non-packaging wood. They reported divergent national practices: for instance, wooden packaging is sometimes collected with paper, cardboard, plastics or metals (France), with biowaste (Finland), or separately (the Netherlands). Common guidance suggests that small wooden items are usually placed in residual waste, while large crates or pallets are collected as bulky waste at CAS. In a few cases, small wooden packaging may enter the LWP stream.

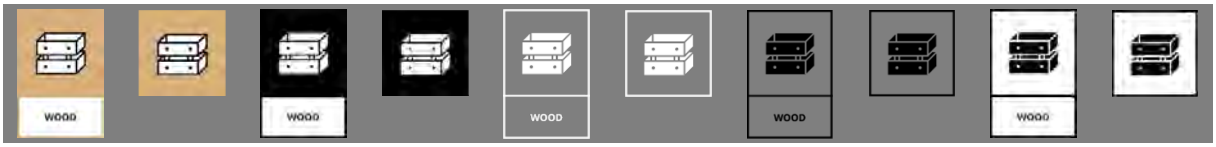
Citizen insights: Participants in the citizen workshops generally perceived wood as a new and unfamiliar waste category within household sorting, underlining the need for clear communication and education. Several considered the wood label unnecessary or potentially confusing, associating it mainly with furniture or other large items taken to recycling centres. In the citizen survey, 53 % reported sorting wood separately, though 26 % mixed it with residual waste, 11 % with composite

packaging, 7 % with plastic, and 8 % were unsure. Reported commingling with other fractions remained below 5 %.

JRC assessment of insights: Two main challenges were identified: (1) clarifying that the label applies only to wooden packaging, and (2) addressing the absence of dedicated household receptacles for this material in most MS. Adding the qualifier packaging to the label could increase clarity but would reduce consistency with the concise, material-focused approach of the overall system (see Section 4.1.4.2). The label must therefore rely on communication and guidance materials to explain its scope. Box 14 briefly discusses the decision to remove the earlier meta-label for wood and cork.

JRC proposal: Figure 57 presents the proposed label variants for wood packaging.

Figure 57. All label variants for 'wood' packaging.



Source: Author's elaboration.

4.2.1.11.Cork

Material description: This label applies to packaging and packaging components made of cork. Specifically, it corresponds to code 51 (cork) in Decision 97/129/EC and is referred to in Annex II, Table 1 of the PPWR as *cork packaging*. The label covers only packaging items made of cork—such as cork stoppers or closures—and not other cork products, in line with the PPWR scope.

Desk research insights: Cork is rarely mentioned in official EU waste collection documentation and is not explicitly covered in the (European Environment Agency (2025) overview. Sorting streams for cork packaging are often unclear and vary substantially between MS. According to desk research and LLM-assisted analysis, cork stoppers are the most common packaging application and are sometimes donated for reuse or recycling, for instance in France. In Austria, Latvia, and Lithuania, cork may be collected together with LWP (plastics, metals, and beverage cartons). In most other MS, cork is disposed of in residual waste or brought to CAS. Some regional differences exist: in Spain, cork can occasionally be placed in organic waste bins, while in Italy it may enter organic streams only if certified compostable. In Estonia, cork is usually treated like wood packaging or residual waste, although some specialised streams exist.

Expert stakeholder insights: Cork was not initially included in the first prototype presented during the first stakeholder consultation. Several stakeholders subsequently highlighted the need for a specific cork label, given the material's use in packaging and its differing treatment from wood. Inputs gathered during the second consultation described diverse practices across MS, including disposal in residual waste, collection with LWP, collection at CAS, or—less frequently—together with glass.

Citizen insights: Cork was not included in the first prototype and thus not discussed in the citizen workshops. In the behavioural experiment, 75 % of participants correctly associated the cork label with a cork stopper. Some confusion persisted: 15 % linked it to a synthetic stopper, 8 % to a wooden box, and smaller proportions to unrelated materials (e.g. metal caps or food waste). Nine percent reported being unsure.

JRC assessment of insights: Two main issues were identified: (1) ensuring citizens understand that the label refers only to cork packaging, not other cork products, and (2) addressing the lack of specific receptacles for cork in most MS. This confusion appears less significant than for wood but remains relevant for consistency and correct sorting. Adding the term packaging to the label would enhance clarity but is inconsistent with the concise, material-based naming approach used across labels (see Section 4.1.4.2). Box 14 explains the rationale for removing the earlier combined wood–cork meta-label from previous prototypes.

JRC proposal: Figure 58 presents the proposed label variants for cork packaging.

Figure 58. All label variants for 'cork' packaging.

Source: Author's elaboration.

Box 14. Removal of the wood and cork meta-label.

Earlier prototypes included a combined meta-label for wood and cork. However, feedback from stakeholders indicated that these two materials follow distinct collection and recycling routes and are rarely commingled in practice. Given these differences in sorting and treatment, the meta-label was considered potentially misleading for citizens. Consequently, it was removed from the labelling system in the second stakeholder consultation and is not included in the final proposal.

4.2.1.12.Residual

Issue description: The residual waste label differs fundamentally from the material-based labels for several reasons. First, it does not identify a material but a destination or function within the waste system. This breaks with the principle that all other labels refer to material composition (see Section 3.3.4). Second, residual waste streams are defined nationally or locally and typically capture non-recyclable or non-compostable materials, or those unsuitable for commingling with other fractions for technical or regulatory reasons (see Sections 3.3.3 and 3.3.4). Finally, residual waste may include packaging materials that do not yet have an established recycling route within the national collection scheme. This section therefore focuses on the dedicated label for residual waste.

Fraction description: The residual label applies to packaging that does not fall under any defined material category, or to packaging that must be disposed of separately due to local waste sorting rules. It does not correspond to any code in Decision 97/129/EC or to any entry in Annex II, Table 1 of the PPWR. The label may also apply to packaging for which no recycling route has yet been established—such as innovative packaging under Article 3(46) and Article 6(10) PPWR—or to packaging temporarily exempted from recyclability requirements under Article 6(11).

Desk research insights: Residual or mixed waste is predominantly collected door-to-door, less frequently through bring points, and almost never at CAS. Collection rules and the scope of residual waste vary substantially across MS (European Environment Agency, 2025). According to desk research and LLM-based synthesis, residual waste (or general waste) refers to non-recyclable materials or those unfit for designated recycling streams because of contamination, composite structure, or small size. Contaminated packaging—particularly food-soiled, multilayered, or

technically non-recyclable items—is typically placed in residual waste across the EU. Oversized or very small packaging elements (e.g. thin foils, caps, soft films) may also be directed to residual waste where sorting technologies cannot process them efficiently.

Expert stakeholder insights: Stakeholders discussed two main issues: (1) the most appropriate terminology (see Section 4.1.4.2), and (2) the conditions for applying a residual label to packaging. Many industry stakeholders stressed that, under the PPWR, packaging should be recyclable and therefore should not bear a residual label. Others noted that not all materials are yet separately collected in every MS, which can cause confusion about whether a material-based or residual label should apply. The potential need for country-specific labelling, depending on national collection systems, was frequently raised. Some participants questioned the long-term relevance of the residual label, assuming that all packaging will become recyclable at scale by 2035. Practical questions also arose, such as how to label adhesive tapes or packaging made of hard-to-classify materials like rubber, where clear guidance would be required.

Citizen insights: In citizen workshops, participants expressed uncertainty about what items the residual category referred to, emphasising the need for clearer examples and explanations that might vary by country or locality. In the online survey, 63 % of respondents reported sorting residual waste separately, 11 % together with composite packaging, and 8 % with plastic (all other combinations ≤ 5 %). In the behavioural experiment, Prototype 2 improved both capture and purity rates for the residual fraction, indicating that the label effectively supported correct sorting behaviour.

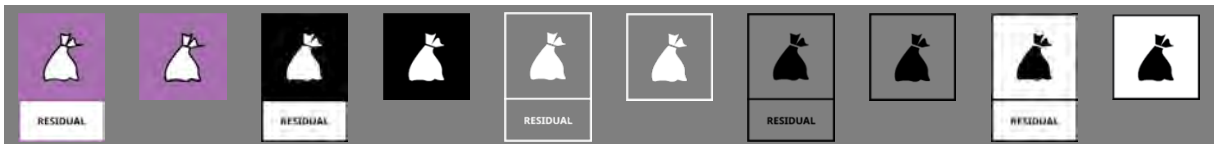
JRC assessment of insights: There is broad acceptance of using the residual label on waste receptacles, since residual waste streams are universally established across MS. However, applying it on packaging remains contentious. Divergent national rules mean that the same packaging type may belong to the residual stream in one MS but to a recyclable stream in another, creating potential inconsistency. Packaging producers argued that they may lack knowledge or control over national waste sorting rules, complicating compliance. Nonetheless, under the PPWR, producers (or producer responsibility organisations, PRO) placing packaging on the EU market must ensure that their packaging can be correctly identified and disposed of. Article 55 PPWR requires producers to provide end users with up-to-date information on prevention, reuse, separate collection, and label meanings. This implies responsibility for communicating how packaging should be sorted—through physical labels, digital tools, and awareness campaigns—even where residual disposal applies. The issue of when and how to apply a residual label to packaging is therefore expected to remain under discussion during the implementing-act process.

JRC proposal: Figure 59 presents the proposed label variants for residual waste. The residual label should be used for:

- packaging that does not fall under any defined material group;
- innovative packaging for which consumer sorting guidance is not yet defined; and
- packaging that must be disposed of separately due to national waste sorting rules or exemptions from recyclability under Article 6(11) PPWR.

Given the national variation in residual waste definitions, country indicators (see Section 4.2.2) may be necessary to clarify applicability in specific MS.

Figure 59. All label variants for 'residual' waste.



Source: Author's elaboration.

4.2.1.13.Hazardous packaging

Issue description: Like the residual and compostable labels, the hazardous packaging label does not refer to a material but to a *characteristic* of the packaging, which may stem from its composition or from its current or former contents. This departs from the material-based logic of the labelling system (see Section 3.3.3).

Because the classification of hazardous packaging is largely harmonised across the EU, this label poses fewer challenges for country-agnostic application than, for instance, the industrially compostable label. Packaging considered hazardous in one Member State would also be regarded as hazardous in all others, although sorting and collection methods may differ.

In practice, hazardous packaging may require both a material label and a hazardous label. This dual labelling can clarify when packaging ceases to be hazardous (e.g. after complete emptying or cleaning) or when it must be disposed of through dedicated hazardous waste channels. Communicating this distinction to consumers requires concise additional text, country indicators, or a clear pictogram.

Relying solely on a material label could lead citizens to dispose of contaminated or pressurised packaging together with non-hazardous materials, while using only a hazardous label might lead to clean, non-hazardous packaging being wrongly sorted as hazardous waste.

A further challenge arises from the matching principle: hazardous packaging is not typically disposed of in a single receptacle but through specialised collection systems. As indicated in Commission Notice 2018/C 124/01, hazardous waste is subject to fine-grained separation for safe treatment, which limits the relevance of applying a single "hazardous" receptacle label.

Fraction description: This label applies to packaging that is hazardous due to its former contents or intrinsic material characteristics—such as paint cans, pesticide containers, solvent bottles, or aerosol sprays (see Article 55(1)(c) PPWR).[55] The label does not correspond to any code in Decision 97/129/EC or Annex II, Table 1 of the PPWR. While the PPWR governs packaging and packaging waste, it operates without prejudice to Directive 2008/98/EC on waste, which regulates the management of hazardous waste.

[55] Art. 55(1) (c) PPWR states that MS shall make available to end users (particularly consumers) information on the "role of end users in contributing to the separate collection of packaging waste materials, including handling of packaging containing hazardous products or waste."

Desk research insights: HHW is mainly collected at CAS, and occasionally through bring-points or door-to-door schemes. From January 2025, separate collection for HHW becomes mandatory under Article 11(1) of Directive (EU) 2018/851[56] (European Environment Agency, 2025).

Desk research and LLM-based synthesis indicate that EU consumers must separate hazardous waste from ordinary household waste, following national or municipal systems aligned with EU legislation. Hazardous packaging—such as non-empty aerosol cans, paint tins, motor oil containers, gas cartridges, pesticide bottles, or chemical residues—is excluded from standard packaging streams because of the risks posed by their contents.

Austria's system exemplifies this approach: consumers must bring hazardous items to dedicated municipal collection points. Items are treated as hazardous if they contain residues, are pressurised, or bear hazard pictograms. Some, like batteries and lamps, are always treated as hazardous, whereas others (e.g. empty aerosol cans) may re-enter standard packaging streams once fully emptied and cleaned. Retail take-back schemes also complement municipal collection for specific categories such as medicines or batteries.

Classification guidance:

Commission Notice 2018/C 124/01 provides technical guidance on classifying packaging waste. The assessment follows the logic summarised in Figure 60.[57] In brief:

- If packaging still contains its original contents or contaminants, it is *not* considered packaging waste but classified according to the content (e.g. varnish rather than metal).
- Packaging that is nominally empty and only minimally contaminated is assessed according to whether it displays hazardous properties.
- If residues or the packaging material itself exhibit hazardous properties, the packaging is classified under codes 15 01 10* (contaminated) or 15 01 11* (dangerous).
- If neither residues nor material are hazardous, the packaging is classified under 15 01 01–15 01 09, according to the material.[58]

Good practice recommendations:

Commission Notice 2018/C 124/01 highlights that all actors managing HHW—local authorities, waste operators, and EPR organisations—should provide clear, consistent, and simple instructions for the prevention, identification, sorting, and disposal of hazardous waste, including improved labelling of hazardous products.

Public communication should use simple messages and practical examples to avoid confusion. Local partnerships with schools, community organisations, or neighbourhood groups can strengthen awareness and participation. Educating children about the importance of proper HHW disposal has proven particularly effective in indirectly influencing adult behaviour. Information campaigns should

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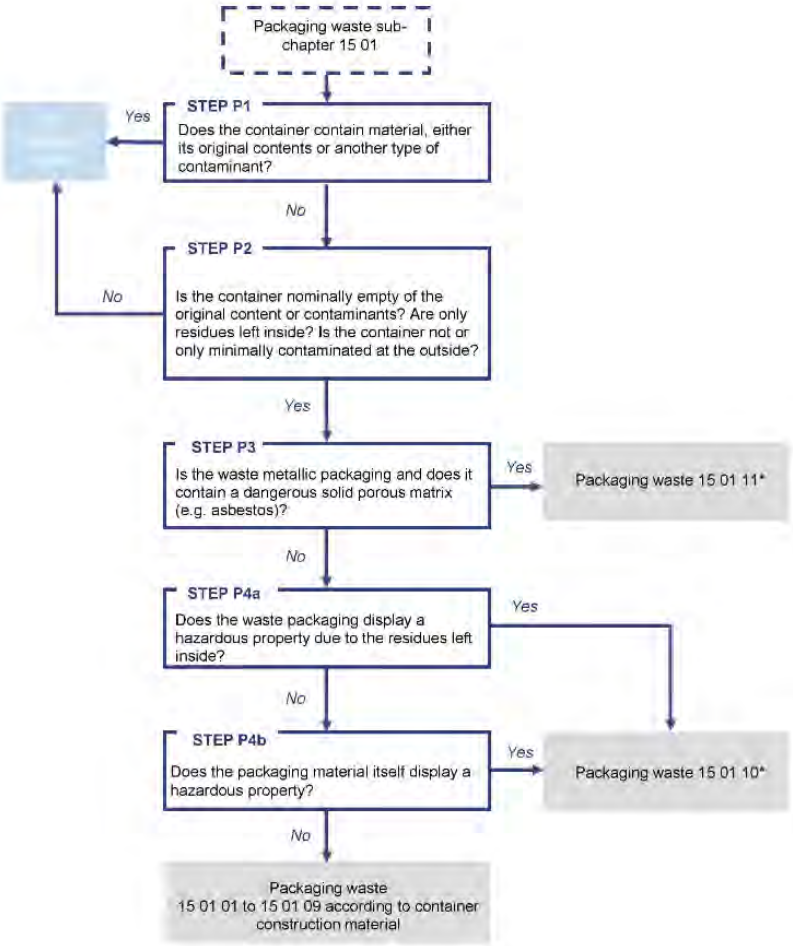
56 Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance).

57 Commission notice on technical guidance on the classification of waste (2018/C 124/01).

58 For more information on separate collection of HHW, see Commission Notice on Separate Collection of Household Hazardous Waste (2020/C 375/01).

also explain the health and environmental risks of incorrect disposal to promote responsible sorting practices.

Figure 60. Flow chart for classification of packaging waste according to 2018/C 124/01.



Source: 2018/C 124/01 Commission notice on technical guidance on the classification of waste.

Expert stakeholder insights: Earlier prototypes did not include a hazardous packaging label, leading several stakeholders—particularly from the waste management sector—to emphasise the need for its inclusion, given the EU requirement for separate collection of hazardous household waste from January 2025.

In the second stakeholder consultation, which introduced such a label, respondents recognised that certain packaging types—such as aerosol spray cans (e.g. hairspray), pesticide containers, paint tins, packaging containing mineral oils, hazardous cleaning agents (e.g. benzene, acetone), and some pharmaceutical packaging—should be classified as hazardous and collected separately. These items were considered to pose contamination risks that could compromise recycling quality. However, some respondents expressed uncertainty about whether specific categories, such as pharmaceutical packaging, should receive the hazardous label.

Overall, 17 % of packaging stakeholders confirmed that some of their packaging was considered hazardous and should therefore not be sorted with packaging of the same material, while 59 % answered no and 24 % indicated they did not know. Among stakeholders responsible for waste

receptacles, 69 % stated that certain packaging should be treated as hazardous and collected separately from other packaging materials (14 % answered no and 17 % did not know).

Respondents also noted several implementation challenges for the hazardous packaging label:

- Uncertainty regarding which receptacles (kerbside, public, or household) should bear the label, since many hazardous items are collected separately at CAS or specific collection points in line with the CLP Regulation;[59]
- Cases where even emptied packaging (e.g. aerosol cans for shaving foam or hairspray) must still be collected separately from the main fraction;
- Potential confusion or overlap with existing hazard symbols (e.g. explosive, toxic, or serious health hazard icons);
- The absence of a specific pictogram in Article 55(1)(c) PPWR and ambiguity as to which receptacle such a label would correspond;
- The fact that the label describes a *characteristic* rather than a *material*, complicating its application within a material-based system;
- Risk of consumer misunderstanding, particularly regarding whether the label refers to the packaging itself or the product, and how this may change after proper emptying or cleaning.

While many stakeholders agreed that additional explanatory text (e.g. instructions to clean or return packaging to a collection point such as a pharmacy or CAS) would enhance consumer understanding, packaging producers generally opposed this solution (see Section 4.1.4).

The question of whether the proposed label would be appropriate to deal with this situation was only asked to stakeholders that indicated they were concerned with receptacle labels. When asked, 49 % of 65 respondents considered it suitable, 31 % found it unsuitable, and the remainder were uncertain. Several stakeholders proposed that such information might be better communicated through awareness campaigns, PRO websites, municipal channels, or digital tools rather than through physical labels.

Citizen insights: The citizen research did not specifically address hazardous packaging labels in workshops, surveys, or the behavioural experiment. One workshop participant noted the inconvenience of travelling to CAS for hazardous waste disposal and observed that common household sorting practices often diverge from official rules for HHW.

JRC assessment of insights: Article 55(1)(c) of the PPWR does not foresee a dedicated pictogram for hazardous packaging. Instead, it requires communication to end users by providing information on "the role of end users in contributing to the separate collection of packaging waste materials, including handling of packaging containing hazardous products or waste." As such, a *hazardous packaging label* would not be material-based and may therefore fall outside the direct scope of the PPWR.

[59] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (Text with EEA relevance).

Nevertheless, omitting any visible indication for such packaging could increase the risk of incorrect disposal if consumers rely solely on material-based labels without further clarification. An alternative—excluding hazardous packaging from labelling obligations altogether—would simplify the system but leave citizens without clear guidance on proper disposal routes.

A further issue concerns potential regulatory overlap (see Section 4.2.6.2). The CLP Regulation already mandates the labelling of hazardous substances and mixtures, but its purpose is to prevent harm to human health and the environment, not to guide waste sorting behaviour.[60] Using the term *hazardous* on waste sorting labels could inadvertently suggest that the packaging material itself poses a risk under CLP, which may mislead consumers.

Practical implementation challenges also remain. It is unclear which receptacles, if any, should display a hazardous label, as many stakeholders caution against placing such labels on residual waste bins. This could lead citizens to dispose of non-packaging hazardous items in these receptacles, creating safety risks. Digital tools, such as QR codes, might provide additional guidance, but reliance on them alone could be insufficient if consumers overlook or fail to access the information.

JRC proposal: Figure 61 presents potential label variants for hazardous packaging waste. However, given the limited scope of the PPWR, its focus on material indicators, and the challenges specific to hazardous packaging, these labels may ultimately not form part of the harmonised system.

If excluded, further clarification will be needed to ensure that hazardous packaging is not incorrectly labelled with a standard material symbol. One possible approach would be to explicitly exempt such items from labelling obligations, accompanied by clear guidance for citizens on appropriate disposal.

Where packaging can become non-hazardous after proper emptying or cleaning, we recommend applying the corresponding *material* label only when supplementary sorting information is provided—preferably on the physical label rather than through digital means alone (see Section 4.1.4.4). In the absence of a dedicated hazardous label, information on correct sorting should follow the guidance outlined for contaminated packaging in Section 4.2.6.3 and the provisions for additional textual clarification described in Section 4.1.4.4.

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[60] However, certain hazard statements under the CLP Regulation may already include disposal instructions, such as advising consumers to "dispose of contents and container in accordance with local regulations." It can be assumed that packaging not carrying such statements can generally be disposed of together with its main material. The list of products requiring these indications is periodically updated by the European Commission. Packaging bearing these statements might not require a separate WSL, as disposal guidance is already provided through the CLP label. Nevertheless, this approach presents limitations. The visibility and salience of CLP disposal instructions for consumers are uncertain, and their design differs from the harmonised waste sorting labels, potentially leading to confusion. Moreover, these disposal statements are voluntary for producers, given that the CLP label must already display multiple, higher-priority safety indications. See also: https://single-market-economy.ec.europa.eu/publications/simplification-certain-requirements-and-procedures-chemical-products_en (last accessed 01/08/2025).

Figure 61. All label variants for 'hazardous' waste.

Source: Author's elaboration.

4.2.2. Country-specific information and country-indicators

Issue description: Given the diversity of waste-sorting practices across MS and the inherent limitations of a material-based, modular, and matching labelling system, there may be cases where country-specific information is required to prevent consumers from drawing incorrect conclusions about sorting instructions. The following potential use cases were identified:

1. MS-specific sorting practices related to non-material characteristics (e.g. contamination).
2. MS-specific participation of certain packaging types in DRS.
3. MS-specific guidance on component separation or other preparation steps prior to disposal.

Expert stakeholder insights: Stakeholders viewed country-specific labelling requirements as one of the most difficult challenges for harmonisation. In the second stakeholder consultation, 54 % of respondents rated such requirements as very or extremely challenging, 20 % as moderately or slightly challenging, and only 2 % as not challenging at all; 26 % did not provide a response.

Packaging industry representatives expressed strong opposition to any country-specific information on packaging labels, arguing that it could fragment the internal market and undermine harmonisation—one of the central objectives of the PPWR.

Stakeholders provided several concrete examples illustrating these difficulties:

— Collection differences across MS: In some countries, paper composites may be collected with paper waste, while in others they must go into residual waste. This means identical packaging could require different labels depending on where it is marketed. (see Section 3.3.4).

— Variation in hazardous waste classification: National rules differ significantly. For instance, Denmark classifies all aerosols as hazardous, while in many other MS empty aerosols are treated as standard metal packaging. In Italy, packaging from hazardous products (e.g. detergents) can enter normal recycling if emptied. These examples show how destination-based categories (such as residual or hazardous waste) complicate a uniform approach (see Section 3.3.4).

Several stakeholders questioned the need for country indicators, arguing that harmonisation should remain the system's main purpose and that national differences should instead be reflected through receptacle labelling, not on packaging labels.

During the second expert workshop, a dedicated group briefly discussed the possibility of adding country codes to address such national variations but did not propose concrete solutions. Participants generally opposed the use of text or colour to indicate country-specific elements. For DRS-related information, some stakeholders experimented with layout options placing DRS marks next to the EU waste-sorting label, while others suggested adding a complementary information box to indicate that DRS may apply in some countries.

Citizen insights: These aspects were not investigated with citizens.

JRC assessment of insights: Based on our assessment, the diversity of waste-sorting practices across MS, combined with the inherent limitations of the harmonised labelling approach—centred on material-based classification, modularity, and matching—may necessitate the inclusion of country-specific indicators in certain cases. Such indicators could help prevent consumers from drawing incorrect inferences about sorting rules where national variations in waste management practices exist.

Country indicators could provide a flexible means to adapt packaging labels that require both material and destination information (see Section 3.3.3) for use in multiple markets. For example, identical packaging may:

- be classified as residual waste in one country but sorted with its main material in another;
- be considered hazardous in one MS but non-hazardous elsewhere; or
- be treated as compostable packaging in one country but as non-compostable in another.

Similarly, packaging covered by a DRS in one country but marketed in others could benefit from country indicators clarifying its status Section 4.2.6.1).

However, this approach presents significant conceptual and design challenges. From a visual perspective, indicating multiple countries on a single packaging item risks producing cluttered or visually complex labels, particularly when more than one national exception applies. From a conceptual perspective, the inclusion of multiple national indicators may appear confusing or unintuitive to consumers, potentially leading to incorrect sorting decisions.

To mitigate linguistic complexity, country abbreviations following the ISO 3166-1 alpha-2 standard[61] could be used. These two-letter codes would not require translation, avoiding additional language-related barriers to the internal market.

While country-specific information could also be provided through digital means, reliance on digital data carriers alone may not ensure correct consumer behaviour. In the absence of clear physical indicators on packaging, citizens might fail to consult digital information, resulting in mis-sorting despite the availability of accurate data online.

JRC proposal: Waste collection practices differ across MS (Annex V provides an illustrative overview of what applying the labels could look like in each country), and accommodating these variations may require providing additional country-specific information to ensure that consumers receive accurate sorting instructions. When a product is distributed in multiple MS that collect a given material or component differently, country indicators or additional explanatory text may be added to the label. This helps consumers correctly identify how the packaging should be sorted in their country of use and prevents incorrect sorting behaviour.

While complementary information can also be provided through QR codes or other digital data carriers, any essential sorting information must be displayed directly on the physical label. This ensures accessibility and prevents misinterpretation when digital tools are not used.

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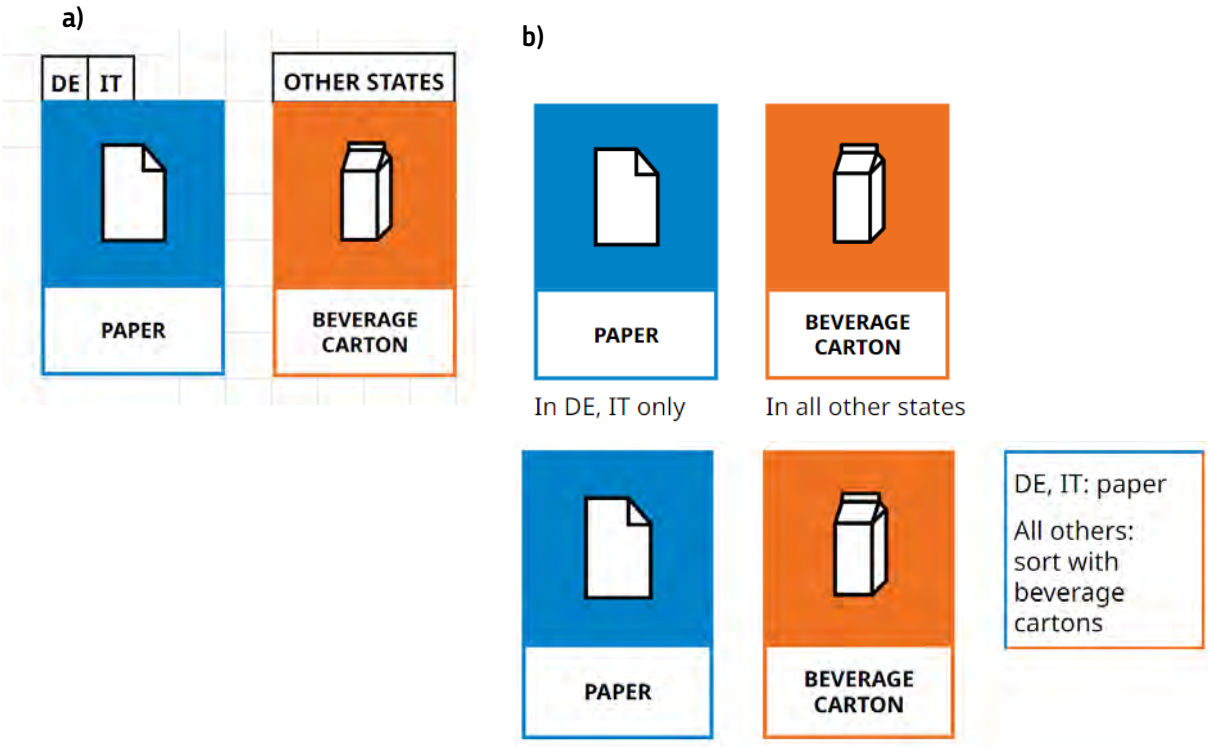
[61] https://www.iso.org/iso-3166-country-codes.html (last accessed 30/07/2025).

Country indicators may be added to labels to indicate the Member State(s) to which a specific sorting instruction applies. These indicators are placed within white square boxes positioned along the top edge of the label, each occupying 25 % of the label width and outlined in black. A maximum of four country indicators may appear on a single label (see panel a) of Figure 62).

If additional country-specific guidance is required, a text box may be used (see panel b) of Figure 62). This text must follow the formatting and placement rules for complementary textual information described in Section 4.1.4.4, and it may refer to multiple labels where applicable.

Country codes should be set in Noto Sans Bold and follow the ISO 3166-1 alpha-2 abbreviation standard. These two-letter codes are universally recognisable and do not require translation, thereby maintaining linguistic neutrality and avoiding market fragmentation.

Figure 62. Proposal to accommodate a) country-specifiers and b) country-specific information as complementary information.



Source: Author's elaboration.

4.2.3. Labelling of multiple-component packaging

Issue description: Whereas Section 4.1.8 addresses the *design* of labels for multiple-component packaging, this section specifies when individual components should be explicitly labelled. Several key questions arise in this context:

— Which components—integrated and/or separate—require labelling?

— Should components made of the same material be labelled individually?

— Can digital labelling substitute physical labelling of components?

— Should labels refer to the *material composition* or the *disposal destination* of components?

Desk research insights: The relevant definitions of *integrated* and *separate* components are provided in Section 4.1.8 and are derived from Article 3(1) PPWR. In the context of this proposal, *multiple-component packaging* refers to packaging consisting of at least two components—either separable or integrated—that can be made of the same or different materials. Box 15 below illustrates typical examples and their expected sorting behaviour by consumers.

Box 15. Examples of integrated and separate packaging components

Integrated components are elements essential to the packaging's function, not intended to be removed by the consumer, and generally disposed of together with the main packaging. Examples include:

— Pull-tab on a metal can (e.g. soft drink or canned food): remains attached during and after opening and is not expected to be removed for recycling.

— Plastic spout or cap on a carton (e.g. milk or juice): integral to pouring and typically discarded with the carton, even if made of a different material.

— Windows on envelopes or pasta boxes: thin plastic film glued to paperboard, usually not removed manually but handled during recycling.

— Labels or sleeves that do not interfere with recycling: for instance, printed shrink sleeves accepted in automated sorting.

Separate components must be completely and permanently removed before or during disposal and are not essential to the core packaging function. Examples include:

— Plastic film around a bottle cap (tamper-evident seal): manually removed before first use and discarded separately.

— Outer box or sleeve for toothpaste or cosmetics: not required for the product's function and discarded separately.

— Plastic or aluminium lids on yogurt or cream cups: removed before consumption and sorted according to their material.

— Multipack shrink wrap (e.g. wrapping cans or bottles): removed to access items and placed in the appropriate separate waste stream.

Article 12(1) PPWR allows economic operators, in addition to the physical harmonised label, to include a QR code or other type of standardised, open, digital data carrier that provides information on the destination of each separate component to facilitate correct consumer sorting. This provision implies that:

1. Digital information may complement, but not replace, the harmonised physical label.
2. The digital information concerns the sorting destination rather than the material composition of components.

However, the PPWR does not specify whether this digital information must also cover integrated components, nor how the material composition of different components should be indicated. Since the harmonised physical labels are primarily material-based, digital extensions should remain consistent with this framework. Consequently, any digital destination information must be clearly linked to the underlying material classification used for physical labels.

Expert stakeholder insights: Packaging stakeholders generally advocated for reduced or more flexible labelling requirements and largely opposed distinct labelling of separate packaging components. The main reasons cited were limited available space, design constraints, and concerns that multiple labels on one product might confuse consumers.

In the second stakeholder consultation, the most preferred option (39 %) was to apply all labels in the same place on the packaging, followed by including an additional component pictogram to indicate multiple materials (26 %), placing labels directly on each packaging component (22 %), and applying none of these options (13 %).

Many packaging stakeholders further proposed that only the main or majority material of the packaging should be labelled. They also pointed to ambiguities in the PPWR—particularly whether component labelling requirements under Article 12 refer to integrated and/or separate components. Some interpreted Article 12(5) as allowing digital-only labelling of separate components, whether to indicate material or destination, thereby substituting physical labels for digital information.

A few stakeholders encouraged explicit consumer instructions to separate packaging components even when they are made of the same material. They referred to the "+" sign used in the French Triman system managed by Citeo, which they considered well understood by consumers.

Further, respondents highlighted that sorting instructions for detachable components such as lids and caps vary across MS. Including component-specific instructions in the harmonised system could therefore risk conflicts with existing national guidance.

One stakeholder also raised a definitional concern, noting a potential inconsistency between the 5 % material threshold used to define composite packaging (see Section 4.2.1.5), and the lack of any quantitative criterion to determine what constitutes a separate component in multiple-component packaging.

Finally, there was some uncertainty among packaging stakeholders regarding when multiple labels were required. Around 13 % of respondents stated that they did not know whether their packaging required more than one material label, while 67 % indicated that it did. Those expressing uncertainty often appeared confused about the distinction between multi-component and composite packaging.

Citizen insights: As discussed in Section 4.1.8, citizens frequently reported confusion and uncertainty when sorting multi-component or multi-material packaging. These difficulties were attributed to the absence of clear, centralised guidance on which waste fractions different materials belong to, whether or when components should be separated, and if cleaning was required before disposal. Participants also noted that sorting rules vary by municipality, which further complicates consistent understanding.

Results from the behavioural experiment showed that while Prototype 2 significantly improved sorting accuracy for mono-component and residual waste packaging, it did not yield measurable gains for dual- or triple-component packaging. Participants performed almost identically in the labelled and unlabelled conditions, suggesting that the labels provided little additional benefit in these cases.

Several factors likely explain these findings. First, all material labels for multi-component items were displayed together on a single panel, without clear indication of which label referred to which component, reducing interpretability. Second, many test items—such as glass jars with metal lids—were visually self-explanatory, allowing participants to rely on prior knowledge rather than the

labels. Third, the absence of explanatory text and guidance about the new system likely hindered comprehension, especially for users unfamiliar with its matching logic. Preference data also indicated that participants would have found it clearer if each packaging component had been labelled individually or if pictograms linked each component to its respective material.

JRC assessment of insights: Regarding stakeholder concerns about the 5 % threshold, we clarify that this limit—referring to 5 % of the total mass of the packaging unit—applies only to composite packaging, not to multi-component packaging. The key distinguishing factor is functional separability: composite packaging is defined by the inseparability of materials within a single component, whereas multi-component packaging is defined by the separability of components. The percentage share of component materials is therefore irrelevant for the definition of multi-component packaging. [62]

In practice, a single packaging unit may include:

— one or more composite components;

— non-composite components made of distinct materials;

— components representing either less or more than 5 % of the unit's total mass.

The unit-level criterion in the composite packaging definition applies to the entire packaging unit. However, within a multi-component unit, an individual component can itself be composite. In such cases, assessing composite status at the component level is both reasonable and necessary—though this interpretation is not fully aligned with the current PPWR definition. For example, a multi-component packaging unit could consist of:

— a plastic bottle (mono-material),

— a multilayer aluminium–paper–plastic cap that cannot be separated manually (a composite component), and

— a paper label (< 5 % of total mass).

The overall packaging unit is not composite, since the bottle and cap are separable, but the cap qualifies as a composite component and should be labelled accordingly. We recommend that the implementing acts carefully address the definitional overlap and potential ambiguities between multi-component and composite packaging.

The PPWR also provides limited detail on whether and how packaging components should be labelled—specifically, on the scope (integrated and/or separate components) and the content (material composition and/or destination). The phrasing "in addition to the label" in Article 12(1) PPWR is ambiguous, but our interpretation is that digital labelling is complementary, not substitutive, to physical labelling.

Which components—separated and/or integrated—should be labelled?

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[62] In other words, composite packaging requires at least one second material making up at least 5 % of the total mass of the entire packaging unit. Multi-component packaging can have two components, even if one of the components makes up only 3% of the overall packaging if it can be separated by consumers simply through mechanical stress.

From both behavioural and technical perspectives, labelling should cover all components that can be separated through simple mechanical action by consumers (see Box 16). Failing to label integrated components made of different materials could reduce sorting accuracy. However, we expect packaging producers to oppose this approach due to design and space constraints.

Should components of the same material be labelled (or identified)?

The PPWR does not require separate labels for multiple components made of the same material. Nevertheless, explicitly labelling each physically distinct component could support consumer understanding by signalling that each part should be handled individually, which may improve separation behaviour in systems requiring it. When all labels are grouped in a single location—as will likely be the case for most packaging—repeating identical material labels appears unnecessary and potentially confusing. While the "+" indicator used in the French Triman system serves this purpose, we do not consider this solution compatible with the proposed EU label design, and sorting rules may vary across MS.

Can digital labelling of components substitute physical labelling?

No. Under the current legal framework, digital labelling (e.g. via QR codes) may complement but not replace mandatory physical labels. Article 12(1) PPWR explicitly allows digital data carriers "in addition to" the physical label. As detailed in Section 4.1.9, Article 12(5) PPWR provides exceptions only for cases where affixing a physical label is not technically possible or warranted due to the packaging's nature or size, or when digital means are required to ensure accessibility for vulnerable users. Physical labels must remain "visibly, legibly and indelibly" affixed to packaging to guarantee access when digital tools are unavailable (see Box 6).

Should the material composition or destination of components be labelled?

To remain consistent with the overarching material-based logic of the harmonised labelling system (see Section 3.1.1), component labels should primarily indicate the material composition rather than the disposal destination. The latter can be communicated digitally or through user guidance if needed, but maintaining a material-based approach ensures coherence, consumer clarity, and compatibility with the receptacle labelling framework.

JRC proposal: Labelling should include both separated and integrated components when these can be detached from the main packaging—or from each other—through simple mechanical action by consumers during sorting.

Components made of the same material may be labelled individually when multiple-component pictograms are used or when labels are applied directly to the respective components, as this can improve consumer understanding and sorting behaviour. However, when labels for all materials are grouped in one location on the packaging, a single label per material is sufficient. In such cases, additional visual or textual information should be provided to help consumers correctly associate each label with the relevant packaging component.

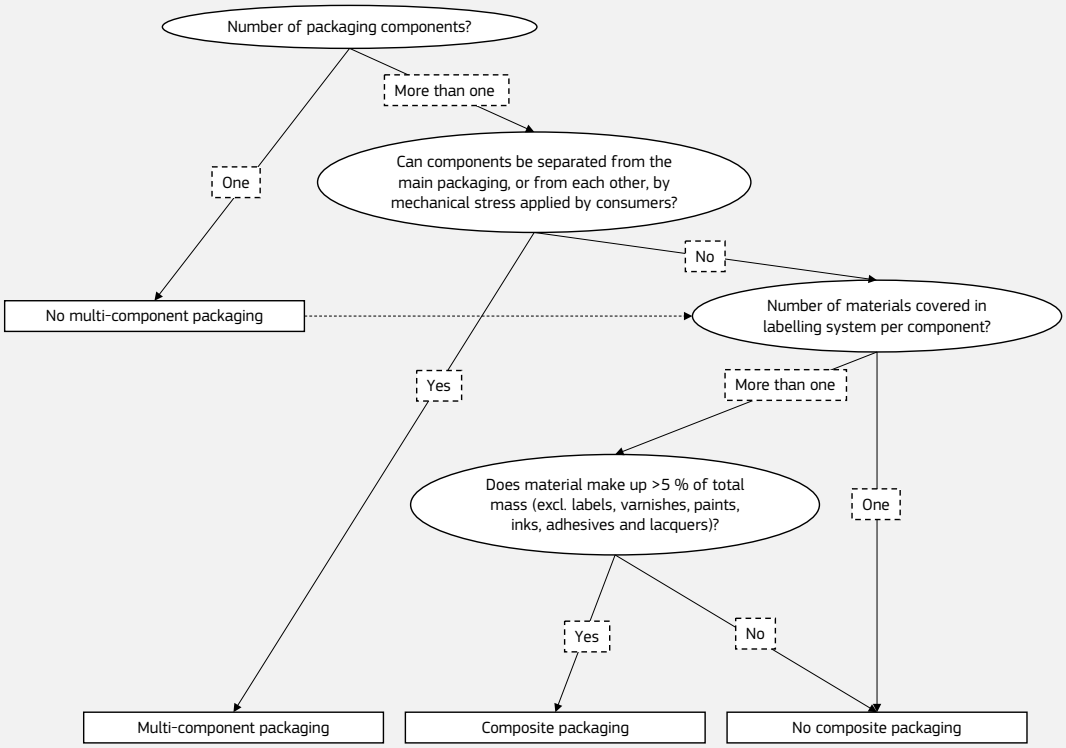
Digital labelling (e.g. QR codes or other standardised, open data carriers) may complement, but not substitute, physical labels. It can be used to provide additional component-level information, such as sorting instructions or guidance on disassembly, consistent with the harmonised physical material labels.

All packaging components should be labelled consistently with the harmonised EU waste sorting labels and corresponding rules for colour, text, and pictograms.

Box 16. Decision tree to decide between multi-component and composite packaging.

According to the specifications in Article 12(1), Figure 63 provides a decision tree illustrating how to determine whether packaging should be classified as multi-component or composite.

Figure 63. Decision tree to decide between multi-component and composite packaging.



Source: Author's elaboration.

4.2.4. Meta-labels

Issue description: Meta-labels combine two single labels into one and are defined in Section 3.1.5. Their main purpose is to simplify the labelling of waste receptacles in systems where several material fractions are collected together. This section clarifies when and how meta-labels should be used and why they are not intended for packaging.

Desk research insights: Meta-labels were introduced to limit the overall number of labels needed on receptacles in commingled collection systems (e.g. in France). For instance, a single meta-label "Plastic" may replace two single labels "Rigid plastic" and "Flexible plastic" while preserving the pictogram-based matching logic.

Meta-labels must not be used on packaging. Packaging labels are material-specific and must provide clear, unambiguous information about the packaging's composition. Applying a meta-label that merges several materials would compromise this precision. In contrast, receptacles represent collection points that may legitimately combine several material types. For these, meta-labels accurately reflect the accepted waste fractions and reduce visual clutter without changing sorting rules.

Expert stakeholder insights: Packaging producers frequently expressed interest in extending meta-labels to packaging to reduce the number of required labels. Meta-labels are not part of the Nordic pictogram scheme which, as reported by experts involved in their development, was a

conscious decision to keep the system simple and to avoid a situation where various stakeholders request additional meta-labels for materials relevant to them. Some recommended against their use for these reasons.

In the second stakeholder consultation, respondents could select relevant labels for receptacles, including both single and meta-labels ("cardboard & paper", "fibre-based composite", "plastic", "glass").[63] Among 72 respondents, 43 % preferred to apply both types, 24 % only meta-labels and 22 % only single labels, suggesting moderate support for their use on receptacles.[64] See factual summary report available upon request for more information.

Citizen insights: Workshop participants were generally sceptical of meta-labels, fearing that additional label types could make sorting more complex if local authorities introduced new categories. Concerns were also raised about limited container capacity and collection frequency. In the behavioural experiment testing comprehension of meta-labels, participants performed well (average accuracy 84 %), indicating that, once understood, meta-labels do not reduce sorting performance. For more details, see European Commission: Joint Research Centre et al. (2025).

JRC assessment of insights: Some workshop participants appeared to misinterpret meta-labels as implying changes in sorting rules. In fact, meta-labels merely communicate existing commingled fractions in a different, condensed format. They do not alter how citizens should sort their waste. The main challenge lies in determining which materials are similar enough to be represented jointly. This decision should balance material properties and common collection practices.

For FBCP, developing comprehensive meta-labels proved impractical because Prototype 2 distinguishes three specific sub-categories ("beverage carton", "FBCP A", and "FBCP B"). Creating meta-labels for each possible combination would generate unnecessary complexity.

JRC proposal: Figure 64 presents all proposed meta-label variants. The use of meta-labels is optional and limited to waste receptacles. Actors responsible for labelling receptacles may choose between meta-labels or single labels, provided they apply a consistent approach across similar receptacle types (e.g. all kerbside bins in a municipality). To maintain coherence and ease of recognition, the JRC recommends using single labels where feasible, and applying either single or meta-labels uniformly on each receptacle.

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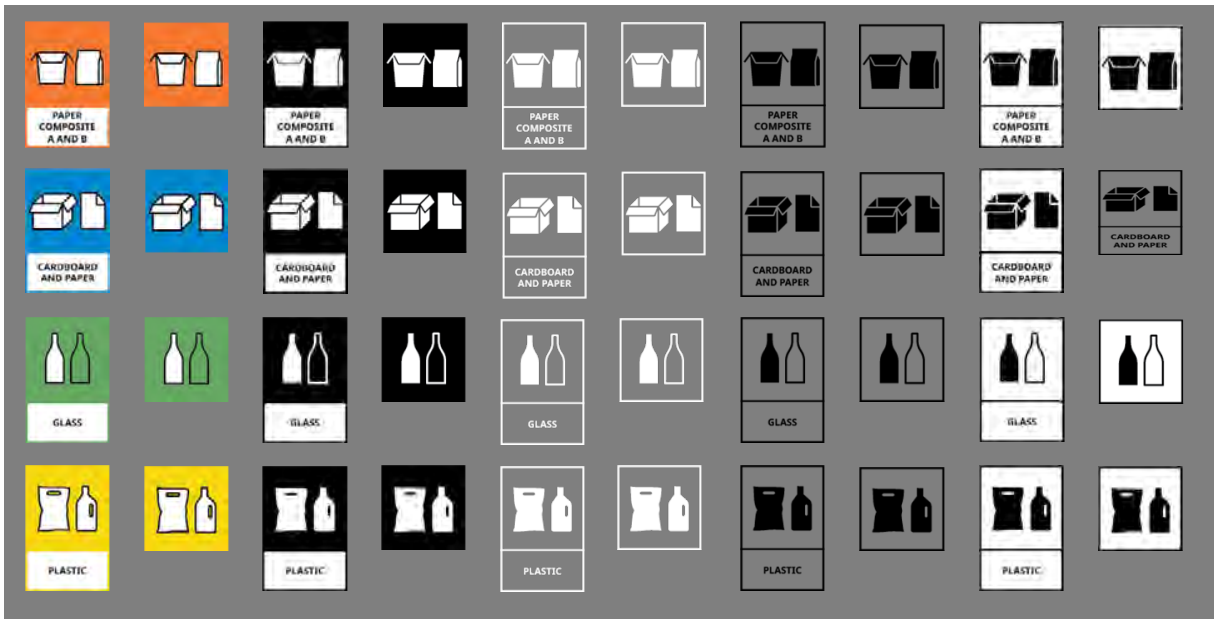
[63] The label for 'coloured glass' refers to both green and brown glass but only contains one pictogram. We thus do not consider it to be a meta-label in the 'classical' sense.

[64] We interpret this as "depending on the receptacle, I would either apply single labels or a meta-label for the respective materials" instead of "I would apply both single labels and meta-label of the same material on the same receptacle", because the latter would not make sense and would thus not be recommended.

Figure 64. All label variants for ‘meta-labels’.



Source: Author’s elaboration.

4.2.5. Provision of complementary digital information

Issue description: This section addresses the type of sorting-relevant information that may be provided through digital means and clarifies responsibilities for content and maintenance. For rules on when digital data carriers may substitute or complement physical waste-sorting labels on packaging and receptacles, see Section 4.1.9.

Expert stakeholder insights: Around one quarter (25 %) of packaging stakeholders indicated a need to communicate additional sorting-related information beyond that shown on physical labels (55 % answered no, 19 % were unsure). The information considered relevant—such as instructions for disassembly, cleaning, or compacting—varies according to packaging type and national or local sorting rules.

Most stakeholders preferred digital data carriers, particularly QR codes, to deliver such information. When asked how additional instructions should be provided, 67 % chose QR codes or other data carriers, compared with 17 % preferring short textual guidance, 4 % other types, and 11 % none of these.

For waste receptacles, stakeholders again favoured QR codes (38 %) over text (29 %), pictograms or images indicating admissible and non-admissible materials (29 % combined), and no addition (5 %). Several suggested complementing on-bin labels with printed leaflets, public information boards, or municipal websites.

A short generic phrase such as “Check local collection rules” was proposed as a possible solution to reflect local differences, although it would require the use of text.

Citizen insights: Results from the behavioural experiment showed mixed perceptions of QR codes. While 44 % of participants saw them as essential for sorting, 33 % viewed them as a supplementary aid and 24 % were unsure of their purpose. Only 32 % said they would actively scan a QR code, while 42 % would not and 26 % were undecided. In the experiment, only 4 out of 11 096

participants actually scanned the QR code placed on one of the test items, even though scanning was necessary to obtain the information needed for correct sorting. This outcome suggests that in real-world conditions, reliance on scanning is limited.

JRC assessment of insights: The findings confirm that behavioural and practical barriers make QR codes and other digital tools unsuitable for conveying essential sorting information. Waste sorting is typically a quick, habitual action, leaving little time or motivation for scanning. Therefore, all information required for correct sorting should, wherever feasible, appear directly on the physical label.

Nevertheless, in accordance with Article 12(5) PPWR, digital data carriers may be used to provide non-essential or complementary information that cannot reasonably fit on the packaging—for instance, detailed preparation or disassembly instructions, explanations of local collection rules, or contextual education material.

Technical implementation will require coordinated data management between regulatory authorities, waste operators, and packaging producers. To avoid multiple QR codes and redundant data carriers on packaging, alignment with other EU digital-information frameworks will be essential.

JRC proposal: Essential sorting information should always be available on the physical label. Complementary information may be provided digitally—through QR codes or equivalent means—only when this information is non-essential or cannot be displayed directly on packaging, and in full compliance with Article 12(5) PPWR. Access to digital information must be free of charge, anonymous, and available in relevant EU languages. Responsibility for ensuring accuracy and maintenance should rest with the information provider designated under the implementing act.

4.2.6. Special cases and challenges

This section addresses specific situations and challenges affecting the implementation of harmonised waste sorting labels and outlines proposed approaches for handling them. Section 3.3 discusses the broader challenges and limitations of the system, while the following subsections focus on:

- Deposit and Return Systems (DRS) (Section 4.2.6.1),
- Interactions and regulatory overlap with other labels (Section 4.2.6.2),
- Contaminated packaging waste (Section 4.2.6.3), and
- Costs of introducing the new system (Section 4.2.6.4).

4.2.6.1. Country-specific Deposit Refund Schemes

Issue description: Packaging placed on the market across several MS may be fully or partially covered by a national DRS. Such packaging may therefore require both a material-specific waste-sorting label (indicating where it applies) and a DRS label, in line with Article 12(1) PPWR. This ensures that consumers receive unambiguous and accurate sorting or return instructions.

Desk research insights: Table 11 summarises the existence and scope of DRS across MS for selected packaging types (European Environment Agency, 2025). According to Article 12(1) PPWR, packaging covered under a DRS is exempt from the harmonised waste-sorting labelling requirement, since the DRS label already directs consumers towards the appropriate return route.

However, DRS coverage differs substantially between MS. While many countries operate mandatory or voluntary systems for beverage containers made of aluminium, glass, or plastic, other packaging types (e.g. wine, spirits, dairy, or multipacks) are often excluded. Such variation implies that a single packaging design distributed in several MS may be subject to both DRS and standard sorting requirements depending on the market.

Expert stakeholder insights: Stakeholders generally agreed that DRS labels should be clearly distinguishable from waste-sorting labels to prevent confusion. Opinions diverged, however, on whether DRS packaging should be entirely exempt from the harmonised labels or display both systems when sold in multiple countries.

In the second stakeholder consultation, 31 % of respondents expected to apply DRS labels for some countries and sorting labels for others, 42 % answered “No”, and 27 % were uncertain. Several stakeholders expressed concern about future DRS expansion and inconsistencies in national coverage—for example, beverage categories or multipack arrangements where the DRS mark might appear on both the outer and inner packaging.

When asked whether there were packaging types covered by a DRS in their country but not elsewhere, 35 % answered “Yes”, 44 % “No”, and 21 % “I don’t know”.

Citizen insights: Although citizens did not provide direct feedback on DRS in the survey or experiment, participants in workshops frequently referred to DRS for bottles and cans as examples of good practice. They emphasised the need for sufficient and accessible return points, including in rural areas.

JRC assessment of insights: The PPWR exemption for DRS packaging is clear; however, packaging distributed in several MS may face mixed coverage. Where the same item is part of a DRS in one country but not in another, consumers outside the DRS must still receive reliable sorting information. A DRS label alone will not ensure correct disposal where no return system exists.

Stakeholders’ reluctance toward multiple labels and country indicators is recognised, yet these elements are essential to preserve clarity and trust in the system. Consistent differentiation between DRS and harmonised sorting labels helps avoid misinterpretation and supports consumer compliance.

JRC proposal: In cases where packaging is covered by a DRS in some countries but not in others where it is marketed, shipped, or disposed of, a harmonised waste-sorting label must be applied in addition to the DRS indication. The label must clearly specify the countries or markets to which it applies—through country indicators or complementary textual information—to provide consumers with unambiguous sorting instructions.

Conversely, when packaging is fully covered by a DRS in all countries where it is placed on the market, the waste-sorting label may be omitted, as end-of-life handling by consumers is already fully communicated through the DRS label(s).

Table 11. Deposit Refund Schemes for different packaging items existing in MS.

Country	Aluminium Drink Cans	Glass Drink Bottles	Plastic Drink Bottles	Plastic Crates	Wood Packaging
Austria	None	Voluntary [1]	Voluntary [2]	Voluntary [2]	Voluntary [2]
Belgium	None	Voluntary [1]	None	Voluntary [2]	Voluntary [2]
Bulgaria	None	Voluntary [1]	None	Voluntary [2]	Voluntary [2]
Croatia	Mandatory [1]	Mandatory [1]	Mandatory [1]	None	None
Cyprus	None	None	None	None	None
Czechia	None	None	None	Voluntary [2]	Voluntary [2]
Denmark	Mandatory [1]	Mandatory [1]	Mandatory [1]	Voluntary [2]	None
Estonia	Mandatory [1]	Mandatory [2]	Mandatory [1]	None	None
Finland	Voluntary [1]	None	Voluntary [1]	Voluntary [2]	None
France	None	None	None	None	None
Germany	Mandatory [1]	Mandatory [1]	Mandatory [1]	Voluntary [2]	None
Greece	None	None	None	None	None
Hungary	None	Voluntary [2]	Voluntary [2]	Voluntary [2]	Voluntary [2]
Ireland	None	None	None	None	None
Italy	None [3]	None [3]	None [3]	None [3]	None [3]
Latvia	Mandatory [2]	Mandatory [2]	Mandatory [2]	None	None
Lithuania	Mandatory [1]	Mandatory [2]	Mandatory [2]	Voluntary [2]	Voluntary [2]
Luxembourg	None	Voluntary [2]	Voluntary [2]	Voluntary [1]	None
Malta	None	None	None	None	None
Netherlands	None	None	Mandatory [1]	Mandatory [1]	Voluntary [2]
Poland	None	None	Voluntary [2]	None	None
Portugal	None [3]	None [3]	None [3]	None [3]	None [3]
Romania	None	Mandatory [2]	None	None	None
Slovakia	None	None	None	None	None
Slovenia	Voluntary [2]	Voluntary [2]	Voluntary [2]	Voluntary [2]	Voluntary [2]
Spain	None	None	None	None	None
Sweden	Mandatory [1]	None	Mandatory [1]	None	None

[1] For nearly all.
[2] For some.
[3] Or voluntary for some.

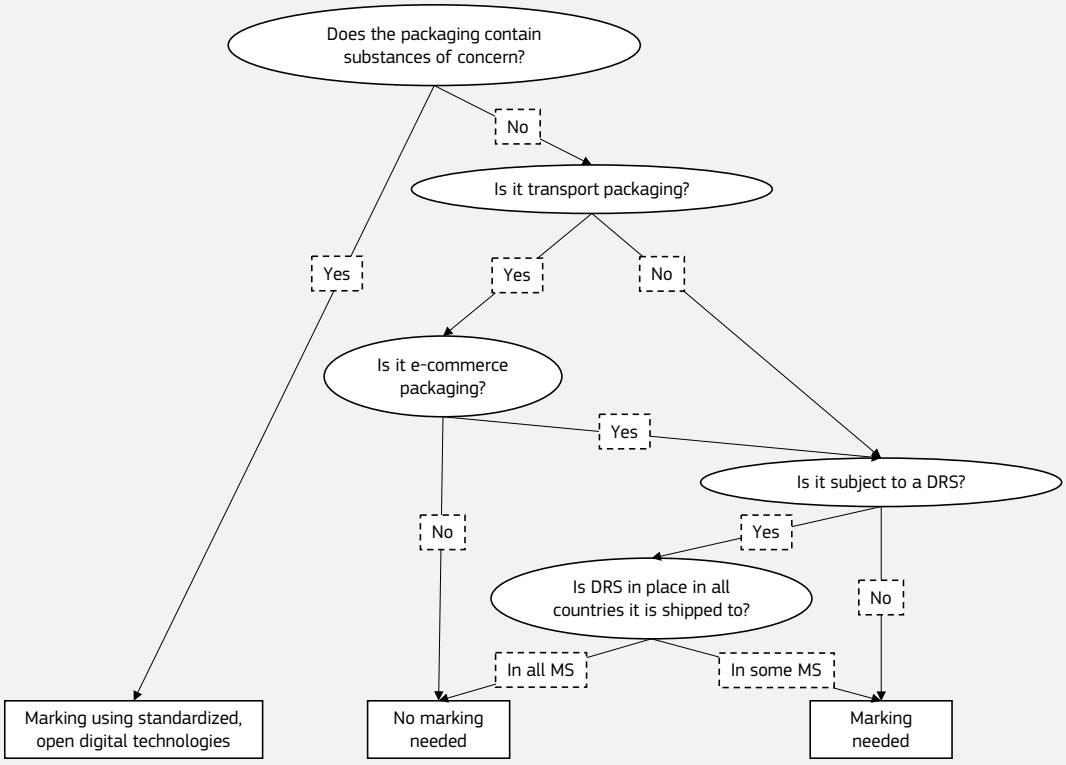
Source: European Environment Agency (2025).

Box 17. Decision tree for when labels are required on packaging.

According to the specifications set out in Article 12(1) PPWR, Figure 65 presents a decision tree indicating when packaging must bear a harmonised waste-sorting label or, where permitted, a digital marking (e.g. QR code or equivalent open digital technology), and when labelling is not required.

The decision logic considers whether packaging contains substances of concern, serves as transport or e-commerce packaging, and whether it is subject to a DRS in one or more MS. Packaging fully covered by a DRS in all countries of sale is exempt from the waste-sorting labelling requirement, while packaging only partially covered remains subject to it.

Figure 65. Decision tree to determine if a label is likely to be required on a packaging.



Source: Author's elaboration.

4.2.6.2. Interaction and regulatory overlap with other labels

Issue description: To ensure that consumers can easily recognise and correctly interpret the EU harmonised waste-sorting labels, their visual integrity must be preserved when displayed on packaging and waste receptacles. Clear guidance is therefore needed on how these labels should appear in conjunction with other mandatory markings. However, packaging is often required to display multiple EU or national labels simultaneously—such as those related to safety, environmental performance, or product information—which can create visual competition, overlap, or conflicting requirements. Identifying and managing these overlaps is essential to maintain the label's recognisability and avoid consumer confusion.

Desk research insights: Numerous EU and national labelling requirements may interact with or visually compete with waste-sorting labels, particularly on packaging with limited surface area. Studies by UNEP and Consumers International (2020) and the United Nations Conference on Trade and Development (2025) highlight how overlapping labels—especially on plastic packaging—can obscure sorting information and reduce consumer comprehension.

Recital 70 of the PPWR explicitly cautions against unnecessary multiplication of labels. It further specifies that where other EU legislation already mandates digital information provision through a data carrier (e.g. a Digital Product Passport), the same carrier should also be used for PPWR-related information. This approach minimises duplication while ensuring that digital data remain accessible and user-friendly.

Under Article 12(1) PPWR, packaging containing substances of concern must be marked using standardised, open digital data carriers so that waste operators can access relevant information for appropriate end-of-life treatment. The article also requires packaging falling under EPR schemes to be marked digitally (e.g. via QR codes) rather than using physical labels.

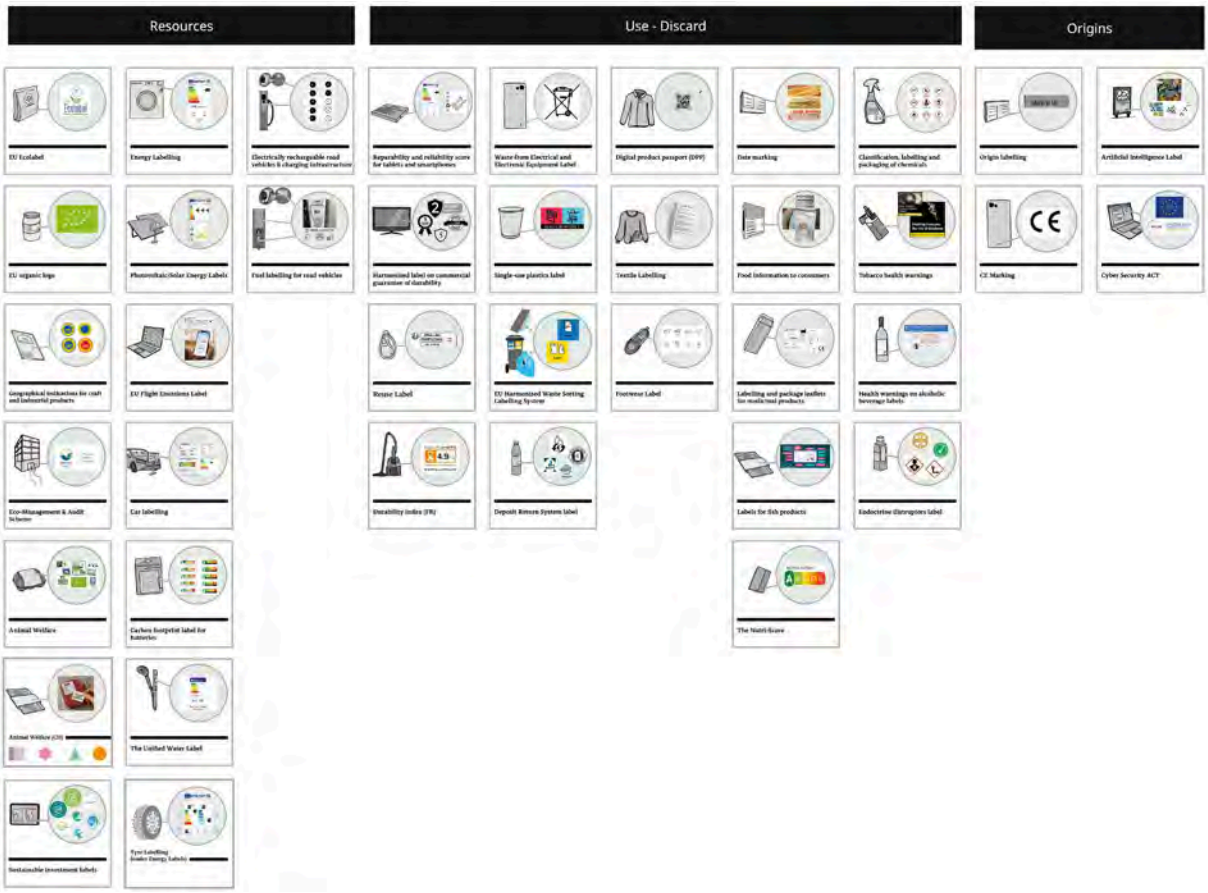
For DRS, packaging is generally exempt from the harmonised sorting label requirement; however, Recital 72 allows MS to retain national DRS labels if these systems predate the PPWR.

In parallel with the harmonised waste-sorting labelling project, the JRC initiated a complementary mapping of EU product and packaging labels to inform coordination across EU labelling initiatives and address the risks of over-labelling and cognitive overload for consumers. Figure 66 illustrates a non-exhaustive overview of existing and emerging EU label types, grouped according to their primary focus:

1. Resources – information on environmental performance, efficiency, or sustainability (e.g. EU Ecolabel, energy labelling).
2. Use – Discard – instructions on product use, disposal, or health and safety (e.g. waste-sorting labels, food information, textile labels).
3. Origins – information related to product source, conformity, or traceability (e.g. CE marking, origin labelling, cybersecurity or AI-related labels).

This mapping exercise supports cross-service discussions within the European Commission on developing coherent labelling strategies and mitigating the proliferation of overlapping or visually competing labels across policy areas.

Figure 66. Non-exhaustive overview of product and packaging label requirements in the EU.



Source: Author's elaboration.

Expert stakeholder insights: In the second stakeholder consultation, packaging producers were asked to assess the challenges posed by (1) country-specific and (2) general labelling requirements. Of the 111 (109) respondents who answered these questions, 73 % (for country-specific) and 48 % (for general requirements) rated them as very or extremely challenging. When asked to indicate their main labelling-related challenges, respondents most frequently mentioned:

- introduction of unilateral measures by MS (89 mentions);
- unclear methodologies underlying calculations for labels or logos (53);
- uncertainty about whether a label or logo was mandatory or voluntary (50);
- unclear definitions (49); and
- national prohibitions on specific logos (42).

Additional issues included: mandatory text and translation requirements acting as internal market barriers; the growing number of labelling elements and the limited space on small packaging; short transition periods affecting stock management; withdrawal of existing national schemes; and overlapping requirements with sector-specific regulations (e.g. pharmaceuticals). Further details, including examples of label categories and specific national schemes, are provided in the factual summary report of the second stakeholder consultation (available upon request).

Stakeholders also identified potential regulatory overlaps between the harmonised waste-sorting labels and other EU labelling frameworks:

- Medicinal Product Directive (2001/83/EC): Uncertainty persists regarding whether waste-sorting labels are permitted on medicinal packaging, and if so, where they may be placed (e.g. within the blue box following the QRD template). Some stakeholders noted that label changes may require prior approval from national health authorities.
- Classification, Labelling and Packaging (CLP) Regulation (1272/2008): Some stakeholders expressed concern that a "hazardous packaging" label could conflict with CLP labelling requirements.
- Single-Use Plastics (SUP) Directive (2019/904): One stakeholder reported confusion caused by national EPR schemes, where compostable plastic cups labelled under the SUP Directive also carried biowaste sorting information, sending mixed signals to consumers.
- Ecodesign for Sustainable Products Regulation (2024/1781): Policy stakeholders highlighted potential overlap between the Digital Product Passport (DPP) requirements under the ESPR and the PPWR's provisions on digital data carriers.

One respondent also emphasised the need to ensure compatibility between the harmonised waste-sorting labels and Regulation (EU) 2019/1020[65] on product compliance and market surveillance. Others suggested that waste-sorting labels should explicitly indicate that they are EU-specific, given their regulatory basis does not extend to jurisdictions outside the EU.

Citizen insights: Citizen workshops did not yield specific feedback on interactions between the waste-sorting labels and other regulatory marks. However, results from the citizen survey indicated that the presence of other labels—notably the Green Dot[66], Triman[67], and SUP label—slightly reduced the noticeability of the harmonised waste-sorting labels. The effect, although small, was statistically significant across all tested packaging types (mono-, dual-, and triple-component packaging).

JRC assessment of insights: Packaging producers report significant challenges arising from the coexistence of multiple EU labelling requirements. These challenges—stemming from both existing and forthcoming EU regulations and directives—can create administrative and compliance burdens that risk fragmenting the internal market. While the harmonisation of national waste-sorting labels under the PPWR is intended to reduce such burdens, its effectiveness will depend on detailed implementation choices, such as the treatment of colour (see Section 4.1.3) and text (see Section 4.1.4).

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65 Regulation (EU) 2019/1020 of the European Parliament and of the Council of 20 June 2019 on market surveillance and compliance of products and amending Directive 2004/42/EC and Regulations (EC) No 765/2008 and (EU) No 305/2011 (Text with EEA relevance.)

66 The 'Green Dot' (Der Grüne Punkt) is a registered trademark used in many European countries to signify that the producer has financially contributed to the recovery and recycling of packaging waste through a licensed compliance scheme. It does not indicate that the packaging is recyclable or has been recycled.

67 The Triman logo (Logo Triman + Info-Tri) is a statutory French recycling symbol used on household packaging, electronics, textiles, furniture, and batteries sold in France. It indicates that products or packaging must be sorted separately and provides specific disposal instructions for French consumers.

Feedback on regulatory overlaps should therefore be carefully considered in drafting the implementing acts to ensure consistency, clarity, and legal compatibility across EU labelling frameworks. The following observations summarise the main areas of interaction and their implications for the harmonised waste-sorting labels:[68]

— Medicinal Product Directive (2001/83/EC): This directive governs the labelling of medicinal products and has a scope distinct from the PPWR. Additional labels on such packaging are not categorically prohibited but are strictly regulated and require prior approval from competent authorities, including the European Medicines Agency (EMA). Under Article 62, supplementary pictograms or labelling are permissible only if they (a) comply with the conditions set out in that article, and (b) do not obscure or conflict with the particulars listed in Article 54. In practice, any modification or addition to pharmaceutical packaging labelling requires agreement between the European Medicines Agency and Member State authorities and can take up to a year. As of August 2025, a revision of the directive is ongoing, expected to conclude in early 2026, with a focus on digitalising labelling information. Transitional provisions will allow continued use of existing packaging for up to five years.

— Classification, Labelling and Packaging (CLP) Regulation (1272/2008): The CLP Regulation governs the classification and labelling of hazardous substances and mixtures. It does not prohibit additional labels such as waste-sorting labels, provided they do not undermine the clarity or credibility of hazard communication. Under Article 32(6), "label elements resulting from the requirements provided for in other Union acts shall be placed in the section for supplemental information on the label referred to in Article 25." However, as noted in Section 4.2.1.13, the terminology used for hazardous packaging under the PPWR (e.g. "hazardous") must be carefully aligned to avoid conflicts with CLP provisions, which may already include disposal-related information.

— Single-Use Plastics (SUP) Directive (2019/904): This directive establishes harmonised marking requirements for certain single-use plastic products (e.g. sanitary items, wet wipes, tobacco filters, and beverage cups). It does not preclude the inclusion of other markings, including waste-sorting labels, provided that they do not compromise the visibility, legibility, or integrity of the mandated SUP markings. The SUP label aims to inform consumers about (a) the presence of plastic in the product, (b) appropriate disposal routes to avoid (e.g. flushing or littering), and (c) environmental impacts of improper disposal. Importantly, products made from biodegradable plastics remain subject to the same labelling requirements as conventional plastics. This may, however, be re-evaluated as new biodegradability standards are developed. SUP labelling also applies to certain fibre-based composite cups, which are typically not recyclable and thus require particular clarity in waste-sorting communication.

[68] Note that we did not conduct a complete and systematic investigation into regulations and directives that could create problematic overlaps but that we relied on those being pointed out by stakeholders. We consulted colleagues from the respective Directorate-Generals to get information on the files below.

— Digital Product Passport (DPP) under the ESPR (2024/1781): The DPP is designed to store and share product-level sustainability data, including information on recyclability, material composition, and reparability. The ESPR and PPWR partially overlap, as the former applies to products and the latter exclusively to packaging. In cases where the product itself falls within the scope of an ESPR delegated act, the packaging may also be referenced within the DPP. To avoid duplication of data and support regulatory coherence, information on packaging material composition could be integrated into the DPP structure (Circular Analytics, 2024). Such integration would require close coordination between the ESPR and PPWR implementing acts, ensuring consistent data standards and user-facing communication. This is particularly relevant given that the DPP primarily provides information digitally rather than on the packaging itself (see also Section 4.2.5).

While no fundamental incompatibilities between the PPWR and the above regulations have been identified, the coexistence of multiple labelling frameworks underscores the need for cross-regulatory alignment, particularly regarding the visual hierarchy of labels, use of digital carriers, and scope definitions. Harmonisation efforts should aim to maintain clarity for consumers while minimising duplication and administrative burden for producers.

JRC proposal: While the issue of multiple, overlapping labelling requirements on packaging extends beyond the scope of the present proposal, it is essential to ensure that EU harmonised waste-sorting labels remain clearly identifiable and legible alongside other mandatory marks. To this end, we propose the use of a grid system for label placement on packaging and receptacles, complemented by minimum distance specifications between the waste-sorting label and unrelated symbols or text (see Figure 27). This approach supports visual clarity, reduces cognitive load for consumers, and safeguards the recognisability of the harmonised labels.

Given the growing number of EU and national labelling frameworks, there is a strong need for regulatory oversight and inter-service coordination to ensure coherence across policy areas. Figure 66 provides an indicative overview of existing EU product and packaging labelling requirements that should be considered in such coordination efforts.

QR codes and other digital data carriers offer an effective, harmonised, and space-efficient means of providing complementary information and ensuring that content remains up to date. However, as highlighted in sections 4.1.7 and 4.1.9, certain key information must remain physically accessible to consumers without relying on digital tools. Therefore, while digital means can complement physical labels, they should not fully replace them.

We encourage continued cross-DG coordination within the European Commission to align the provision of digital information on packaging across policy domains, thereby avoiding duplication, enhancing consumer usability, and supporting a coherent labelling ecosystem.

4.2.6.3. Contaminated packaging waste

Issue description: A recurring challenge concerns how to label packaging that must be sorted differently when contaminated, to ensure consumers receive accurate sorting instructions. Contaminated packaging often requires adequate preparation (e.g. cleaning or emptying) before disposal. This issue closely relates to the handling of hazardous packaging (see Section 4.2.1.13).

Desk research insights: According to desk research using large language models, contaminated packaging is typically disposed of in residual waste across most EU MS, particularly when food-

soiled, multilayered, or otherwise unsuitable for standard recycling streams. Few countries provide explicit guidance or purity thresholds defining when packaging should no longer be recycled.

Expert stakeholder insights: In the second stakeholder consultation, 32 % of packaging stakeholders stated they would need to inform consumers that sorting instructions might change if packaging was contaminated (e.g. by food or liquid residues), 48 % said no, and 20 % were uncertain.
Among respondents focusing on receptacle labels, 67 % confirmed that contaminated packaging must sometimes be sorted separately from clean packaging of the same material, 23 % said no, and 10 % did not know.

When asked how to communicate such information, stakeholders indicated the following preferences:

— 49 % preferred QR codes;

— 19 % other types of digital data carriers;

— 17 % textual information;

— 4 % other types of information; and

— 11 % none of the above. Some stakeholders emphasised that QR codes were acceptable only if kept minimal in size (see also Section 4.1.9).

Regarding receptacles, 45 % favoured combining a material label, residual label, and clarifying text; 32 % preferred a material label combined with a QR code or other digital carrier; and 21 % were unsure. Only one stakeholder opted for a combination of material and residual labels alone. Many highlighted the importance of clarity, simplicity, and speed of comprehension, suggesting that digital solutions should be complemented by physical information or educational campaigns (see Section 4.2.8).

Several stakeholders also noted that highly contaminated packaging (e.g. oil-stained cardboard or paper) should be disposed of with mixed waste, though no clear thresholds or purity standards exist for such cases.

Citizen insights: Consumers frequently reported difficulties deciding how to dispose of food-contaminated packaging. Workshop participants cited uncertainty when dealing with dirty items, such as pizza boxes or yoghurt pots, and expressed a need for clearer guidance.
In the behavioural experiment, a pizza box with visible food residues was labelled with the cardboard symbol and an adjacent QR code explaining that such contaminated packaging should go into the residual waste bin. Despite this, only 4 out of 11 096 participants scanned the QR code. In self-reported responses, 32 % said they would be willing to scan a QR code, 42 % would not, and 26 % were uncertain—confirming the limited practical use of digital aids for such decisions (see sections 4.1.9 and 4.2.5).

JRC assessment of insights: Providing additional sorting-relevant information on packaging is inherently challenging due to space constraints and the limited behavioural impact of purely digital tools. The evidence supports maintaining key sorting instructions directly on the physical label. This aligns with earlier findings for hazardous packaging (Section 4.2.1.13) and the recommendations on text use (Section 4.1.4.4). Digital solutions can play a complementary role but are unlikely to substitute physical information effectively for quick sorting decisions.

JRC proposal: Information on the adequate preparation or sorting of contaminated packaging—where necessary to ensure correct disposal—should, whenever possible, be provided directly on or next to the physical waste-sorting label, in line with the principles set out in Section 4.1.4.4.

If this is not feasible and in accordance with Article 12(5) PPWR, or when the information is not essential for correct sorting, it may be provided digitally (e.g. via QR code or other open data carrier).

In addition, the use of country indicators (Section 4.2.2) may support clarity where waste management rules differ between MS—for example, by indicating that packaging should be placed in the residual waste bin in certain countries when soiled. This approach could also accommodate different collection schemes, such as displaying a material label for clean packaging and a residual label applicable under specified contamination conditions.

4.2.6.4. Costs of introducing the new system

Issue description: Implementing the EU harmonised waste-sorting labels will require substantial effort and investment from multiple stakeholder groups, including packaging producers, retailers, waste management operators, and public authorities. These efforts cover both the application of labels on packaging and updating of waste receptacles to ensure visual alignment.

Desk research insights: Articles 12(1) and 13(1) of the PPWR stipulate that labels must be applied to packaging and waste receptacles by 12 August 2028, or 30 months after adoption of the implementing acts, whichever is later.

According to Albizzati et al. (2023), assuming that additionally collected waste is recycled and displaces the virgin material counterpart (i.e. that a market for absorbing the recycled material exists), the financial costs of implementing an EU harmonised labelling scheme are expected to be outweighed by the resulting reductions in waste management costs and environmental externalities, provided the system achieves at least a 2 % increase in capture rates and a 12 % increase in purity rates of separately collected waste. Even under more conservative assumptions (e.g. a 1 % improvement in capture rates), the study found the net social benefits remain positive.

Expert stakeholder insights: Stakeholders responsible for existing national labelling schemes highlighted the significant financial, technical, and administrative costs associated with introducing and maintaining such systems. Anticipated expenses include:

— redesigning and reprinting all packaging to incorporate new labels;

— investments in additional printing colours and technical capacity;

— equipment adaptation and additional human resources for implementation; and

— ongoing costs for coordination, stakeholder communication, and user support.

Stakeholders emphasised the need for sufficient transition periods to manage existing stocks, redesign production lines, and adjust organisational processes. The coexistence of current national schemes was also identified as a key financial and logistical challenge (Pierri et al., 2024).

When asked how implementation of the proposed labels within the next two years would affect them, 36 % of respondents expected a very negative impact, 26 % a moderately negative one, and 12 % a slightly negative one. Only 3 % reported no impact, and 11 % expected a positive or slightly

positive outcome. These responses underline a general concern about the financial and operational burden of a rapid transition (see Section 4.2.6.2).

Citizen insights: Workshop participants frequently voiced concerns that introducing new labels could lead to increased costs for waste sorting, particularly for municipalities required to invest in additional infrastructure, equipment, and communication resources. These concerns were often accompanied by frustration about the expected financial and spatial implications for households, such as the need to purchase extra bins or accommodate multiple containers in limited home and shared spaces.

The behavioural experiment provided quantitative evidence to estimate the potential effect of the EU harmonised labelling prototypes on sorting performance compared with a baseline scenario without labels. Results indicated that Prototype 2 improved both purity and capture rates, though with substantial variation across materials. On average, participants in the treatment group achieved an 8-percentage-point increase in purity—the proportion of correctly sorted items among all placed in a bin—and a 5-percentage-point increase in capture rate—the proportion of target materials correctly sorted—relative to the control group. However, these results should not be interpreted as direct evidence that the expected system-wide improvements estimated in Albizzati et al. (2023) would be achieved, given the limited external validity of the experiment.

More specifically, purity gains were strongest for industrially compostable packaging and residual waste, moderate for paper and plastic, and declined for home compostables. No significant change was observed for glass, which was already sorted accurately before labelling. Capture rates increased notably for industrially compostable packaging, residual waste, home compostables, and beverage cartons, while remaining unchanged for paper, plastic, and glass.

The variation in performance across materials likely reflects differences in label clarity, visual distinctiveness, and pre-existing consumer familiarity. The redesigned residual label—with improved colour coding and terminology—appears to have driven particularly strong gains, whereas confusion between the home and industrial compostable labels likely reduced purity for the former. Similarly, less familiar or visually complex pictograms, such as those for flexible plastic or cork, may have been harder to identify. The absence of further gains for glass likely represents a ceiling effect, as sorting accuracy was already high without additional cues. Overall, these heterogeneous outcomes underline that label design clarity, recognisability, and consumer understanding are key determinants of sorting performance.

JRC assessment of insights: The project did not explicitly quantify the financial costs associated with implementing the proposed labelling system. However, cost considerations were systematically taken into account when evaluating stakeholder feedback and developing a technically and economically feasible proposal.

As already noted, the behavioural experiment provides indicative rather than definitive evidence of the system's potential performance effects. Therefore, the observed improvements in purity and capture rates should not be interpreted as direct confirmation of the assumptions used in Albizzati et al. (2023), given the experiment's controlled conditions and limited external validity. The true cost–benefit balance of implementation will depend on how effectively the system can be introduced at scale and under real operational circumstances.

JRC proposal: To ensure a cost-efficient and practicable implementation, a phased and flexible approach is recommended.

— Transitional flexibility: MS and stakeholders should be allowed to use existing packaging stocks for a limited period after the entry into force of the implementing acts to reduce waste and financial burden.

— Cost awareness: Any future modifications to label design or specifications (see Section 4.2.7) should be approached cautiously, as even minor adjustments can entail significant redesign and investment costs for producers and waste management operators.

— Iterative implementation: Given the top-down nature of the harmonisation process (see Section 3.3) and the fact that the proposed system has not yet been tested under real-world, cross-country conditions, an iterative rollout is advisable. This would enable systematic monitoring, feedback collection, and evidence-based adjustment of design or application rules.

Such an adaptive implementation strategy would support the long-term effectiveness and acceptance of the EU harmonised waste-sorting labels. However, it requires adequate resources, cross-sectoral collaboration, and sustained coordination—including active involvement from the European Commission and relevant stakeholders beyond the scope of this project—to ensure a consistent and fit-for-purpose transition across the Union.

4.2.7. Future changes and developments

Issue description: Future adaptations to the harmonised labelling system may be required to reflect evolving packaging materials, waste management practices, or policy priorities. This raises questions about how new labels can be introduced or outdated ones removed, under which conditions such updates should occur, and which institutional actors should be responsible for coordinating them. Consideration must also be given to potential extensions of the labelling approach beyond packaging waste.

Desk research insights: While the centralised, material-based matching approach proposed offers conceptual flexibility to incorporate new or revised labels, this advantage is largely theoretical. In practice, any modification to the label set—such as adding a new material category—entails high implementation costs and coordination requirements. Comparable experience from the EU energy label framework (Regulation (EU) 2017/1369,[69] Article 14(2)) shows that, when preparing delegated acts, the Commission tests label design and content with representative consumer groups to ensure comprehension before introducing changes. This underscores the importance of evidence-based testing and stakeholder involvement prior to any update.

Expert stakeholder insights: Stakeholders expressed strong opposition to frequent changes, emphasising the high costs associated with adapting packaging artwork, printing systems, and waste receptacle signage. They agreed that any future updates should be coordinated centrally by the European Commission to maintain harmonisation and prevent market fragmentation. Most respondents stressed that changes should be introduced only when strictly necessary, supported by clear justification, scientific evidence, and prior consultation with affected actors. Stakeholders highlighted that digital solutions—such as QR codes or central databases—could help communicate or phase in updates more efficiently.

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[69] REGULATION (EU) 2017/1369 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU (Text with EEA relevance).

Furthermore, respondents recommended the establishment of structured mechanisms for stakeholder engagement and monitoring, including expert groups or observatories to track emerging materials, technologies, and sorting practices. Periodic reporting from MS or sectoral organisations could inform evidence-based revisions of the label set. Implementation timelines should also reflect the long investment cycles of packaging and receptacle systems—often extending beyond ten years—requiring a forward-looking approach that anticipates material innovations (e.g. algae-based or other bio-derived materials) and evolving waste collection infrastructures.

Citizen insights: Citizen workshop participants noted that any change to familiar labels would require clear, early communication and public education to ensure recognition and continued correct use (see also Section 4.2.8 on awareness, education and information campaigns).

JRC assessment of insights: The flexibility of the proposed harmonised system provides only limited practical advantage when considering the downstream consequences of label changes. Introducing, modifying, or removing labels could impose substantial financial and logistical burdens on both packaging producers and waste management operators. Consequently, updates should follow a cautious and transparent process, ensuring that revisions are justified by evidence of necessity, feasibility, and measurable benefit.

JRC proposal: Future updates to the harmonised waste-sorting labelling system should be coordinated by the European Commission in consultation with MS and relevant stakeholders. Any proposed change—whether to introduce, modify, or remove a label—should:

- be justified by robust evidence (e.g. new materials, technological or regulatory developments);
- undergo stakeholder consultation and, where appropriate, consumer testing;
- include IAs covering costs, implementation feasibility, and communication needs; and
- follow an adequate transition period allowing the use of existing stocks.

The sustainability of the harmonised system will depend on continuous monitoring of packaging innovation, collection practices, and consumption trends, as well as emerging reuse and DRS. A transparent governance framework for periodic review, informed by scientific and stakeholder input, will be essential to ensure that the labelling system remains stable yet adaptable over time.

4.2.8. Awareness, education and information campaigns

Issue description: This section outlines how the EU harmonised waste-sorting labels should be communicated to citizens and stakeholders, by whom, and through which means. Effective awareness, education, and information campaigns will be essential to ensure comprehension, acceptance, and correct use of the new labelling system.

Desk research insights: Behavioural research on waste-sorting labels (Beaumais et al., 2024) highlights that information campaigns play a decisive role in supporting the adoption of new visual systems. Familiarisation, trust, and repeated exposure are key behavioural drivers of correct sorting behaviour. Campaigns should focus on explaining the purpose of the harmonised labels, their benefits for recycling and the circular economy, and the practical use of the “matching system” between packaging and receptacles.

Expert stakeholder insights: During the expert workshops, stakeholders jointly designed a prototype citizen flyer to promote the new EU labelling scheme. They proposed that communication materials should:

— explain the matching principle clearly and visually;

— compare the new system with previous national schemes;

— illustrate how the labels appear on packaging and receptacles;

— provide concrete sorting examples, including multi-component packaging;

— clarify situations in which text or colour may be absent (e.g. achromatic versions);

— integrate local waste-collection timetables and preparation guidance (e.g. rinsing, emptying);

— feature visual scenarios, QR codes for supplementary information, and a dedicated website; and

— offer simple tools such as household stickers to reinforce correct sorting at home.

Stakeholders emphasised that communication should be continuous, multilingual, and age-inclusive, with particular focus on schools and younger audiences. For countries where colour associations differ from the EU scheme, complementary campaigns should introduce the new colours and explain the function of achromatic versions. Materials should be adaptable to national and local contexts, indicate implementation timelines, and, where feasible, be supported by temporary financial incentives to facilitate early adoption by producers and municipalities.

Concerns about education and awareness costs were raised repeatedly in both consultations. Stakeholders stressed the need for clear and practical guidance, especially for complex packaging types such as composites, compostables, and bioplastics. Campaigns should also explain that labels apply only to empty packaging and do not modify existing local collection rules.

In the second stakeholder consultation, 96 % of respondents confirmed the need for complementary information campaigns. They suggested that these should:

— clarify the scope of the harmonised labels and their relationship to previous national systems;

— emphasise that collection rules remain unchanged despite visual redesigns;

— explain that the system applies only to packaging waste;

— present and describe each label and its meaning;

— provide examples for sorting multi-component packaging;

— show where to find additional digital information;

— distribute reference labels for household receptacles;

— highlight the importance of emptying and cleaning packaging, particularly contaminated, hazardous, and pharmaceutical waste (see sections 4.2.6.3 and 4.2.1.13); and

— link correct sorting to its environmental and circular-economy benefits.

Citizen insights: Participants in the citizen workshops expressed widespread dissatisfaction with existing waste-sorting information and communication campaigns. They reported frequent uncertainty about how to dispose of specific items, limited access to information about recycling stations and system operations, and a perceived lack of transparency or political commitment to improving recycling outcomes. This was seen as a key factor undermining motivation and trust in the system. Many participants noted that they lacked knowledge of what happens to waste after

collection, including how recycled and non-recycled materials are processed and why certain materials are treated differently.

Citizens called for transparent and honest communication that clearly explains both individual and institutional responsibilities and limitations within the waste-sorting system. They recommended that future awareness campaigns should:

1. Empower citizens without overwhelming them through simple, actionable guidance;
2. Debunk myths about waste sorting, recycling, and processing;
3. Illustrate the consequences of correct and incorrect sorting in terms of resource use, climate impact, and environmental degradation;
4. Introduce waste education early, particularly in schools, to foster long-term behavioural habits;
5. Leverage digital and innovative tools (e.g. artificial intelligence and mobile applications) to support engagement, correct misconceptions, and simplify sorting;
6. Ensure accessibility and inclusiveness, using clear language, visual aids, and multiple communication channels; and
7. Prioritise the most complex and frequently misunderstood issues, such as composite and compostable packaging.

JRC proposal: The JRC supports the need for complementary and continuous awareness, education, and information campaigns accompanying the implementation of the harmonised waste-sorting labels. The draft user manuals (accessible upon request from the authors) already include general consumer-oriented information, but comprehensive communication efforts will be essential to ensure correct understanding and sustained behavioural change. Given the diversity of local waste collection systems, national and regional authorities are best positioned to develop and adapt these campaigns in coordination with the European Commission, ensuring alignment with the harmonised labelling scheme.

Education and awareness materials should be grounded in behavioural science and design principles (Beaumais et al., 2024) and should aim to foster long-term engagement by combining clarity, transparency, and empowerment. Continuous institutional support will be required for all stakeholder groups—including citizens, producers, and waste-management operators—throughout and beyond the initial implementation phase of the EU harmonised labelling system.

5. Conclusions

The objective of this report was to present a technical proposal for EU harmonised packaging waste sorting labels, developed through behavioural and design research involving citizens and stakeholders from the packaging and waste sectors. The proposal addresses both conceptual and visual design aspects, ensuring compliance with the PPWR and practical feasibility across MS.

The proposed system is grounded in extensive evidence from desk research, expert stakeholder consultations, citizen surveys, behavioural experiments, and participatory design workshops. It provides a coherent framework for harmonised, material-based labels that enhance consumer comprehension and sorting accuracy under diverse national collection systems.

At its core, the proposed labelling system emphasises material-specific communication through intuitive pictograms, consistent colour use, modular design, and limited text. Drawing inspiration from the Nordic pictogram system, it applies the matching principle between packaging and receptacles, enabling users to intuitively identify the correct disposal option. This evidence-based approach balances harmonisation across MS with the flexibility needed to accommodate local waste management practices.

The system's granularity has been calibrated to ensure usability and compatibility with current and evolving infrastructures, distinguishing between key material subcategories such as rigid and flexible plastics, coloured and uncoloured glass, fibre-based composites, and compostable packaging. Optional meta-labels and digital data carriers (e.g. QR codes) complement the physical labels, allowing for the provision of additional sorting guidance where necessary.

Despite its strengths, several implementation challenges require careful consideration during the upcoming regulatory phase. These include:

1. Multi-component packaging: Ensuring consistent and clear application of labels across different components, while maintaining visual clarity and space efficiency.
2. Deposit Refund Schemes (DRS): Integrating national DRS indicators without creating confusion or contradictory sorting instructions.
3. Composite packaging: Achieving a simple yet comprehensive solution for complex materials while maintaining user-friendliness.
4. Colour and text harmonisation: Balancing the need for cross-EU consistency with diverse national practices and stakeholder preferences.
5. Evidence limitations: Acknowledging that, for certain aspects, recommendations rely on best available evidence and expert judgment rather than definitive empirical proof.

Stakeholders highlighted potential implementation burdens—particularly for SMEs—including costs related to packaging redesign, printing, and adaptation of existing labelling and receptacle systems. These concerns underline the importance of transitional periods, clear user guidelines, and targeted support measures to facilitate compliance.

From a consumer perspective, sustained communication and education efforts are essential to maximise the impact of harmonised labels. Public information campaigns should explain the meaning, purpose, and benefits of the labels, and address variations in national sorting systems. Transparent, accessible communication will help build consumer trust and engagement, thereby supporting the PPWR's overarching goal of improving recycling performance.

Finally, the proposal identifies several areas requiring continued research and monitoring, including evolving waste management technologies, packaging innovations, and behavioural responses to the new labels. Regular assessment and iterative updates will be necessary to maintain the system's effectiveness and ensure its alignment with technological and policy developments.

In conclusion, the proposal provides an evidence-based and practical foundation for harmonised EU waste sorting labels. It combines scientific rigour with participatory insights to deliver a user-centred system capable of improving sorting accuracy, reducing market fragmentation, and advancing the EU's circular economy objectives. Policymakers are encouraged to use these findings to guide the implementing acts and ensure a coordinated, inclusive, and effective transition towards a harmonised waste-sorting labelling framework across the EU.

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List of abbreviations and definitions

Abbreviations	Definitions
CAS	Civic amenity site
CMYK	Cyan, Magenta, Yellow, and Key
DNTIN	Do Not Throw In Nature
DPP	Digital Product Passport
DRS	Deposit and return system
EBU	European Blind Union
EEA	European Environment Agency
EPR	Extended Producer Responsibility
EPS	Expanded Polystyrene
ESPR	Ecodesign for Sustainable Products Regulation
EU	European Union
FBCP	Fibre-based composite packaging
HDPE	High-Density Polyethylene
IA	Impact Assessment
LWP	Lightweight Packaging
MS	Member State(s)
NFC	Near Field Communication
PC	Polycarbonate
PE	Polyethylene
PET	Polyethylene Terephthalate
PHB	Polyhydroxybutyrate

Abbreviations	Definitions
PLA	Polylactic Acid
PP	Polypropylene
PPWR	Packaging and Packaging Waste Regulation
PRO	Producer Responsibility Organisations
PS	Polystyrene
PVC	Polyvinyl Chloride
SMEs	Small and medium-sized enterprises
SUP	Single Use Plastics
UBC	Used Beverage Cartons
WCAG	Web Content Accessibility Guidelines
WEEE	Waste Electrical and Electronic Equipment
XPS	Extruded Polystyrene

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Annexes

Annex I. Label prototypes and final label proposal

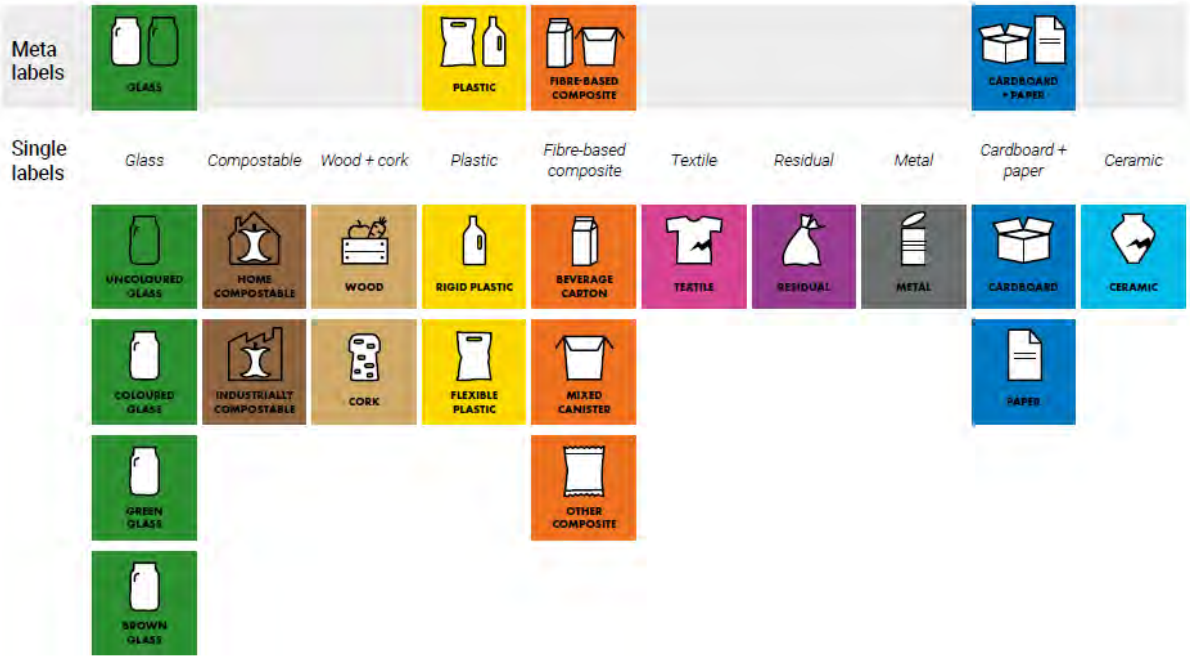
Prototype 1

Figure A- 1. Prototype 1.

Source: Author's elaboration.

Prototype 2 used in behavioural experiment (colour and text)

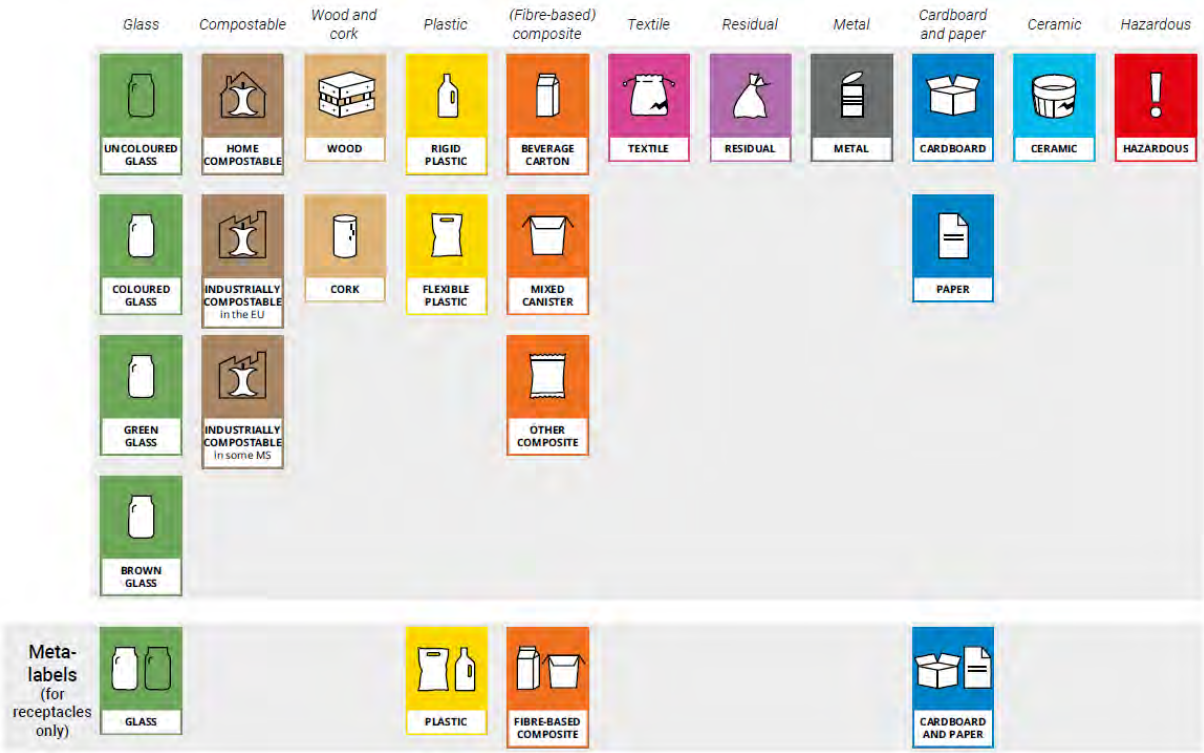
Figure A-2. Prototype used in behavioural experiment (colour and text).



Source: Author's elaboration.

Prototype 2 used in second stakeholder consultation (colour and text)

Figure A- 3. Prototype used in second stakeholder consultation (colour and text).



Source: Author's elaboration.

Final label proposal (colour and text)

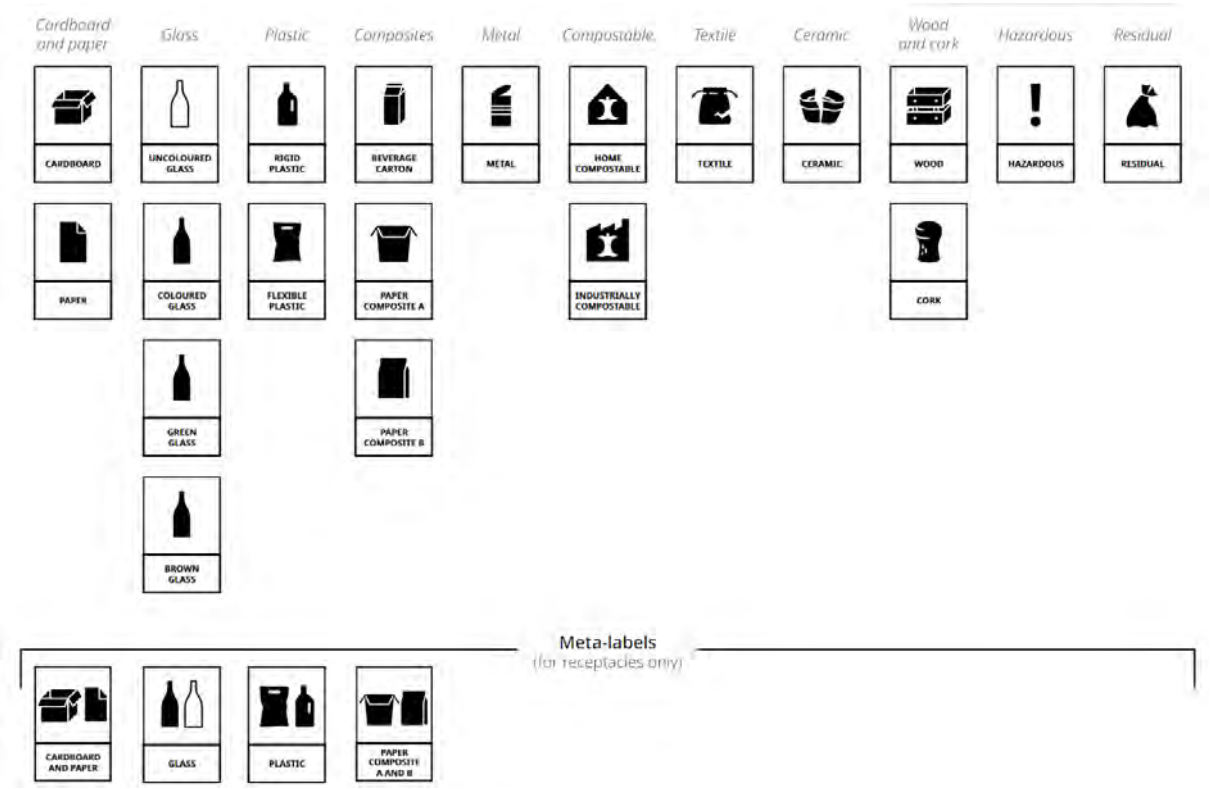
Figure A- 4. Final label proposal (colour and text).

Source: Author's elaboration.

Figure A- 5. Final label proposal (colour without text).

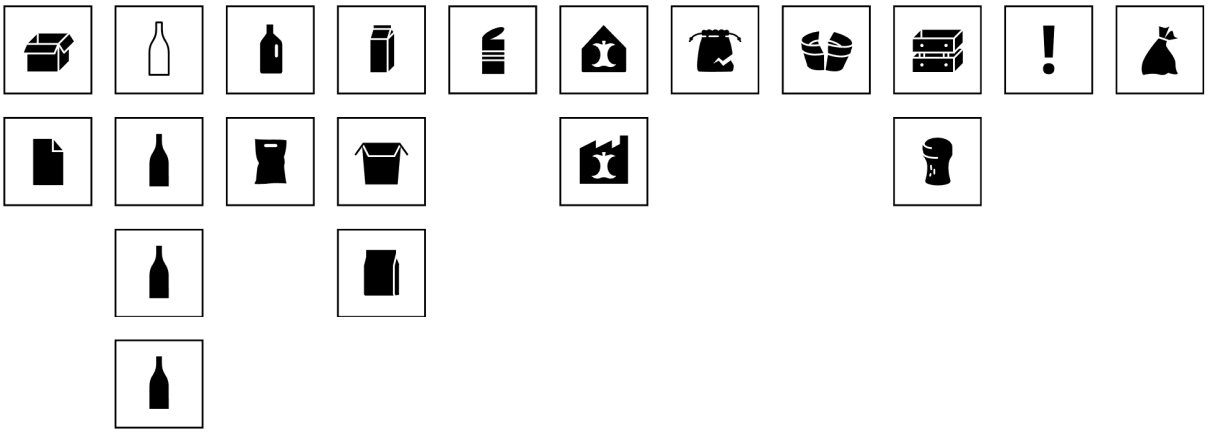
Source: Author's elaboration.

Figure A- 6. Final label proposal (opaque black and text).



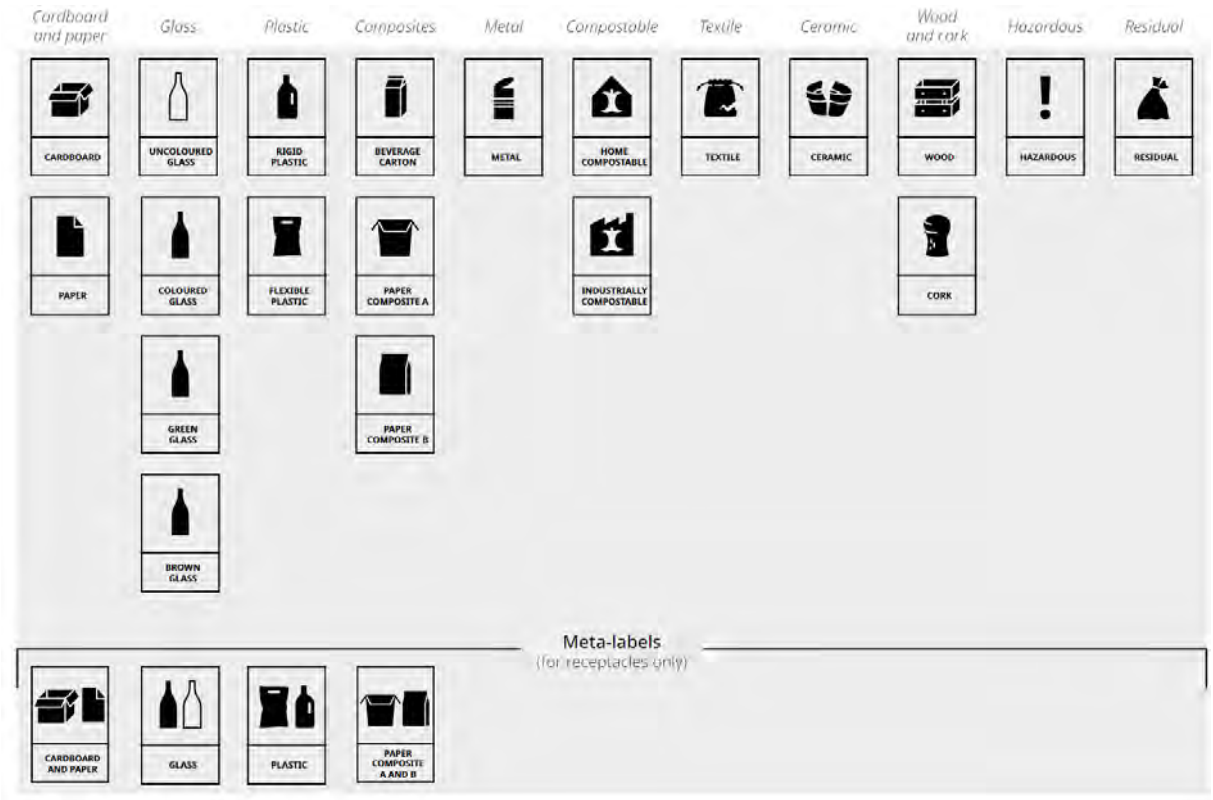
Source: Author's elaboration.

Figure A- 7. Final label proposal (opaque black without text).



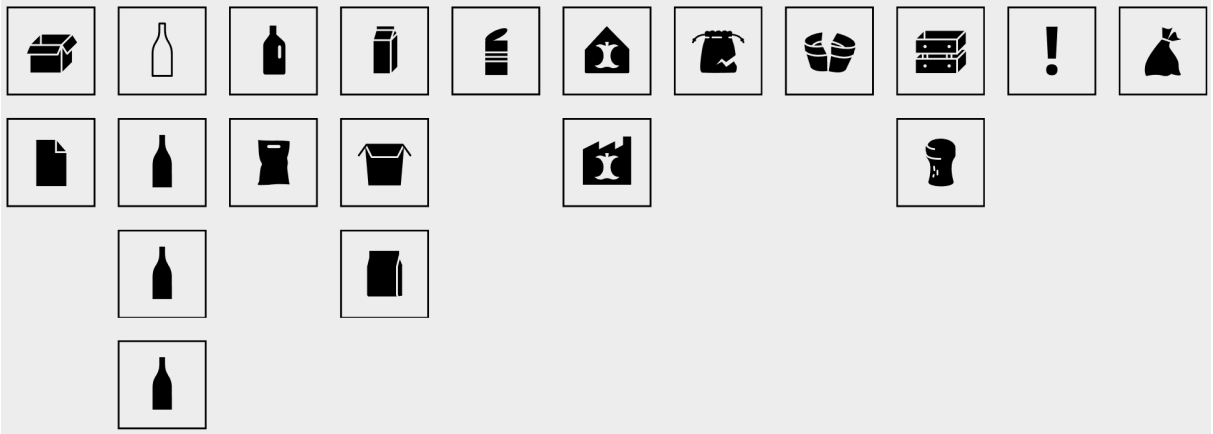
Source: Author's elaboration.

Figure A- 8. Final label proposal (transparent black and text).



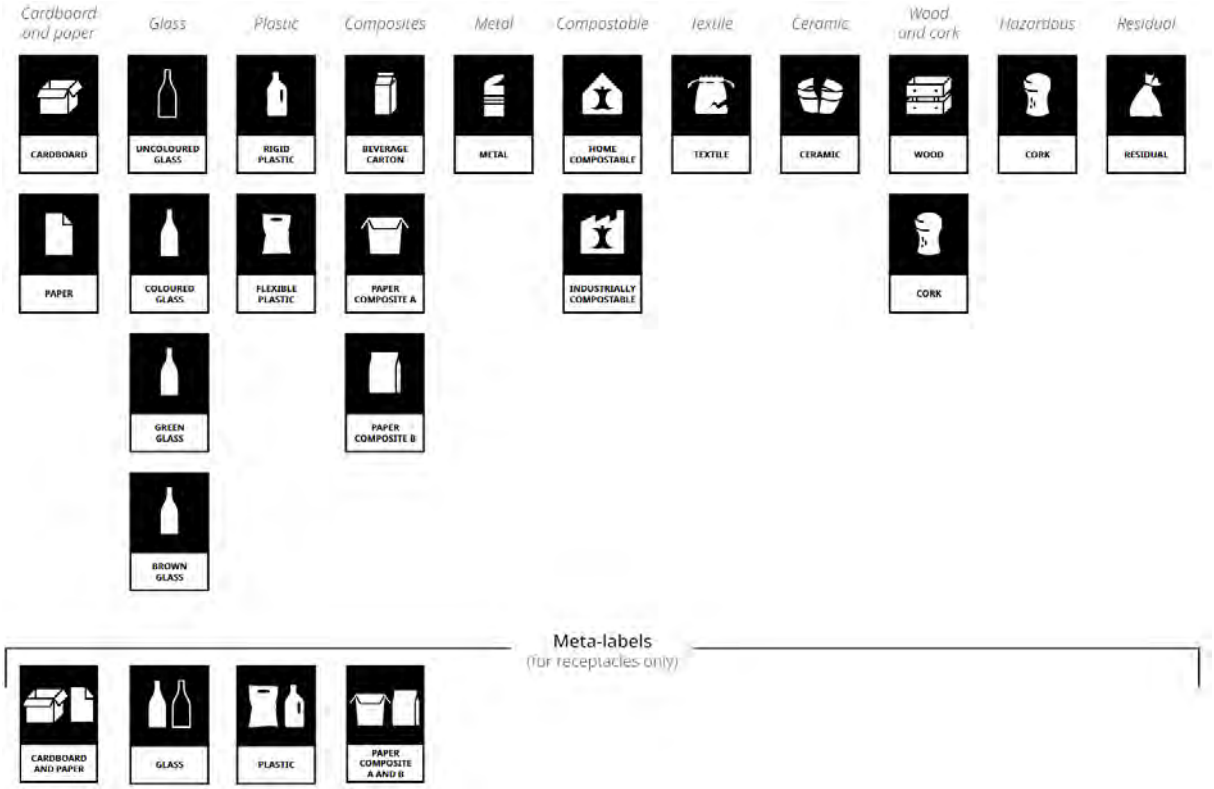
Source: Author's elaboration.

Figure A- 9. Final label proposal (transparent black without text).



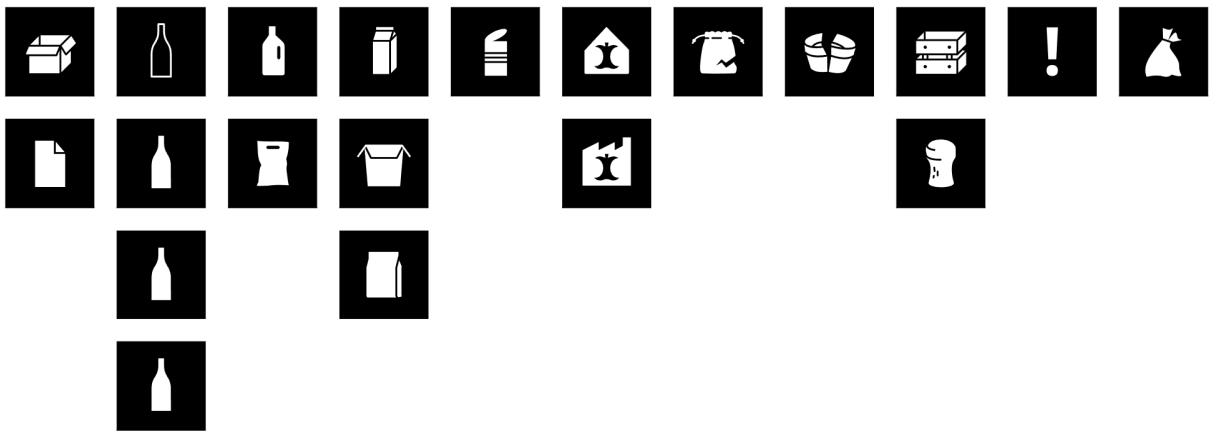
Source: Author's elaboration.

Figure A- 10. Final label proposal (opaque white and text).



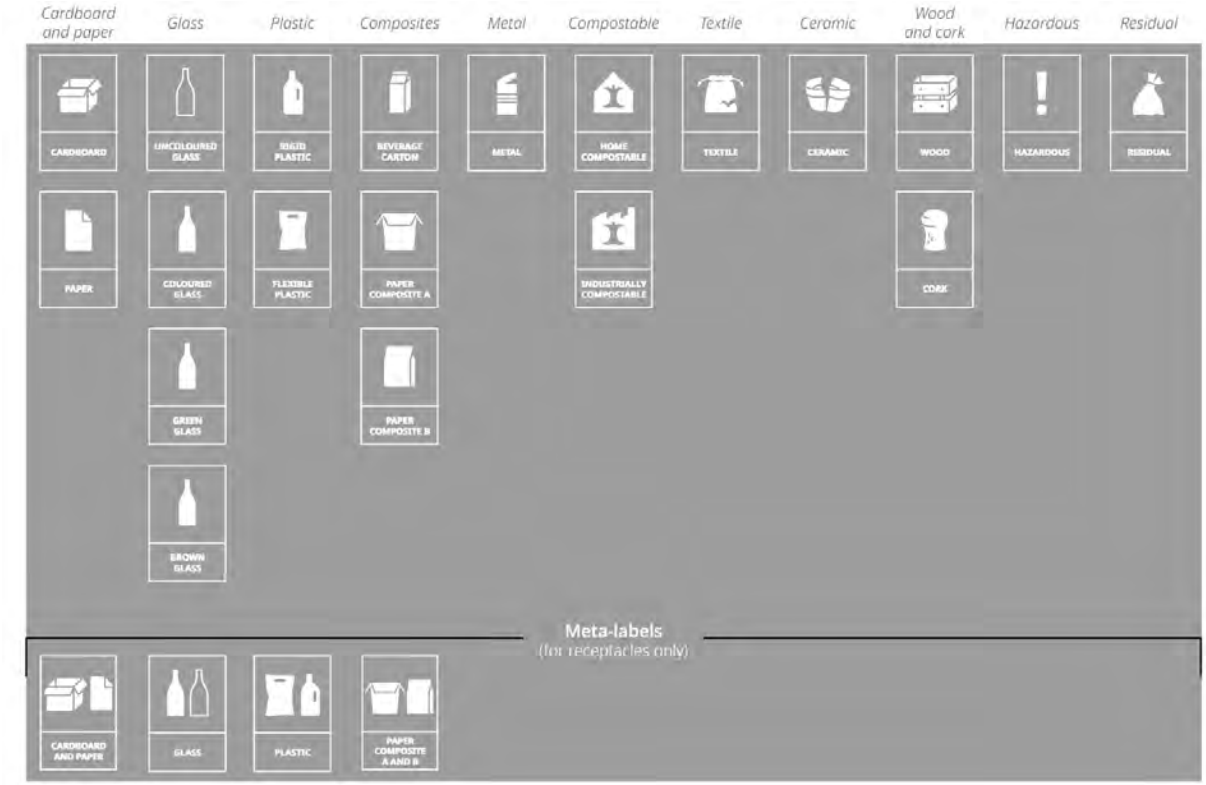
Source: Author's elaboration.

Figure A- 11. Final label proposal (opaque white without text).



Source: Author's elaboration.

Figure A- 12. Final label proposal (transparent white and text).



Source: Author's elaboration.

Figure A- 13. Final label proposal (transparent white without text).

Source: Author's elaboration.

Annex II. Selected insights from desk research on EU waste sorting practices

Evidence on the separate waste collection schemes and practices for consumers in EU Member States based on the European Environment Agency's early warning assessments for the 2024 packaging waste reduction targets

This document synthesises evidence on the separate waste collection schemes and practices for consumers in EU Member States based on the European Environment Agency's early warning assessments for the 2024 packaging waste reduction targets.

The goal of this synthesis is to provide an adequately (but not perfectly) accurate picture of separate waste practices in the EU Member States that provides us with an overview of the diversity of SWC practices and commonly commingled and separated waste materials. This will allow us to inform a suggested granularity for the planned harmonised waste sorting labels.

Source: https://www.eea.europa.eu/publications/many-eu-member-states/early-warning-assessment-related-to

The analysis was done as follows: First, the relevant parts from the complete files were extracted. Specifically, 2.1.4 Separate collection system, 2.1.5 Extended producer responsibility (EPR) and similar schemes, 2.2.4 Separate collection system, and 2.2.5 Extended producer responsibility (EPR)n and similar schemes.

Then, for each of these excerpts, we prompted ChatGPT 4o to create a summary using the following prompt: *"Based on the attached document about separate waste collection in Belgium, tell me exactly which materials are collected separately and which are collected together (commingled). Note exceptions explicitly."* The respective document was attached to this request.

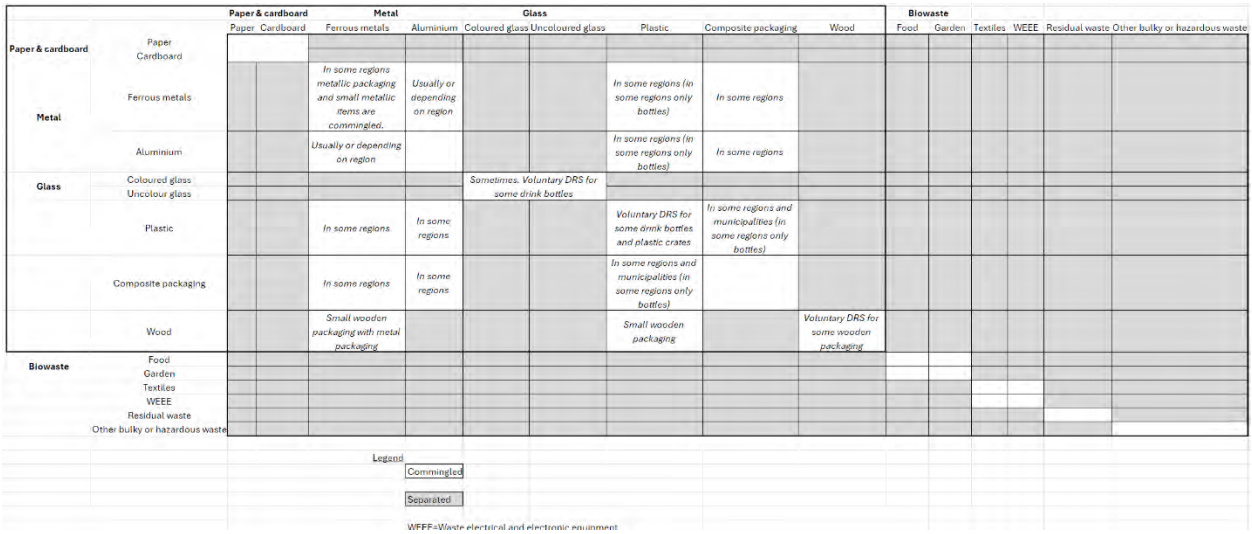
We included the table with characterisation of the collection system in the respective Member State in an excel file with one sheet per Member State. Then, based on the summary and the original excerpt, we created a visual representation of the separate waste collection scheme for consumers (see Figure A- 14 for the example from Austria).

The figure can be read as follows: The rows and columns depict the waste materials that are being differentiated in the country sheets. Categories are shown in bold. The cells are white and connected if there is no indication given in the text that these materials are collected separately. Cells are marked in grey if there are indications given in the text suggesting that they are collected separately. Text in the cells indicates specific cases, exceptions, or information regarding deposit refund schemes related to these materials.

For Austria, the figure indicates that, for example, paper and cardboard are commingled. Coloured and uncoloured glass are sometimes commingled, and there is a voluntary DRS for some glass drink bottles. In some regions, composite packaging is commingled with ferrous metals, and/or aluminium. Metals are also sometimes commingled with plastics and composite packaging. In cases of unclarities, it is advisable to refer to the respective original word file or full pdf file (all in this folder).

The figure is always based on rather qualitative and sometimes unclear data. Consequently, there is always an evaluative/subjective component and the data should not be interpreted as 100% correct. Some details and nuances cannot be depicted in this visualisation. Also, the data in the assessment reports is a couple of years old and things might have changed. Still, this data provides an overview of the separate waste collection schemes for consumers in the Member States. However, practices may of course deviate from the recommendations, and variations are often present.

Figure A- 14. Separate waste collection in Austria (example).



		Paper & cardboard		Metal		Glass				Biowaste					
		Paper	Cardboard	Ferrous metals	Aluminium	Coloured glass	Uncoloured glass	Plastic	Composite packaging	Wood	Food	Garden	Textiles	WEEE	Residual waste	Other bulky or hazardous waste
Paper & cardboard	Paper															
	Cardboard															
Metal	Ferrous metals			In some regions metallic packaging and small metallic items are commingled.	Usually or depending on region			In some regions (in some regions only bottles)	In some regions							
	Aluminium			Usually or depending on region				In some regions (in some regions only bottles)	In some regions							
Glass	Coloured glass					Sometimes. Voluntary DRS for some drink bottles										
	Uncolour glass															
	Plastic			In some regions	In some regions			Voluntary DRS for some drink bottles and plastic crates	In some regions and municipalities (in some regions only bottles)							
	Composite packaging			In some regions	In some regions			In some regions and municipalities (in some regions only bottles)								
	Wood			Small wooden packaging with metal packaging				Small wooden packaging		Voluntary DRS for some wooden packaging						
Biowaste	Food															
	Garden															
	Textiles															
	WEEE															
	Residual waste															
	Other bulky or hazardous waste															

Legend
Commingled
Separated
WEEE=Waste electrical and electronic equipment

Source: Author's elaboration.

Synthesis (insights)

- The EEA reports almost exclusively focus on the following materials and material categories. The materials that are sometimes differentiated with respect to packaging vs. no-packaging materials are indicated by the black frame.
    - Packaging materials
        - Paper & cardboard
            - Paper
            - Cardboard
        - Metal
            - Ferrous metals
            - Aluminium
        - Glass
            - Coloured glass
            - Uncoloured glass
        - Plastic
        - Composite packaging
        - Wood
    - Non-packaging materials
    - Biowaste
        - Food
        - Garden
    - Textiles
    - Waste electrical and electronic equipment (WEEE)
    - Residual waste
    - Other bulky or hazardous waste
- Sometimes, further specifications are provided, such as sub-categories of bulky or hazardous waste, batteries, oils, etc. but this is not done systematically.
- The above "granularity" can serve as a starting point for the harmonised waste labelling scheme.
- Insights for DRS systems: Overview of DRS systems for different materials in Member States: See DRS-overview sheet here.
    - Aluminium

        - Mandatory for nearly all: Croatia, Denmark, Estonia, Germany, Latvia (for some), Lithuania, Sweden
        - Voluntary for nearly all: Finland
        - Voluntary for some: Slovenia
        - None: Austria, Beligum, Bulgaria, Cyrpus, Czechia, France, Greece, Hungary, Ireland, Italy (or voluntary for some), Luxembourg, Malta, Netherlands, Poland, Portugal (or voluntary for some), Romania, Slovakia, Spain
    - Glass drink bottles
        - Mandatory for nearly all: Croatia, Denmark, Estonia (mandatory for some), Germany, Latvia (for some), Lithuania (for some), Romania (for some)
        - Voluntary for nearly all: Austria, Belgium, Bulgaria,
        - Voluntary for some: Hungary, Luexembourg, Slovenia
        - None: Cyprus, Czechia, France, Greece, Italy (voluntary for some), Malta, Netherlands, Poland, Portugal (or voluntary), Slovakia, Spain, Sweden
    - Plastic drink bottles
        - Mandatory for nearly all: Croatia, Denmark, Estonia, Germany, Latvia (for some), Lithuania (for some), Netherlands, Sweden
        - Voluntary for nearly all: Finland,
        - Voluntary for some: Austria, Luexembourg, Poland, Slovenia, Hungary
        - None: Belgium, Bulgaria, Cyprus, Czechia, France, Greece, Ireland, Italy (or voluntary), Malta, Portugal (or some), Romania, Slovakia, Spain
    - Plastic crates
        - Mandatory for nearly all: Netherlands
        - Voluntary for nearly all: Luxembourg
        - Voluntary for some: Austria, Belgium, Bulgaria, Czechia, Finland, Germany, Hungary, Lithuania, Slovenia
        - None: Croatia, Cyprus, Estonia, France, Greece, Hungary, Ireland, Italy (or some), Latvia, Malta, Poland, Portugal (or voluntary for some), Romania, Slovakia, Spain, Sweden
    - Wooden packaging
        - Mandatory for nearly all:
        - Voluntary for nearly all:
        - Voluntary for some: Austria, Belgium, Bulgaria, Czechia, Hungary, Lithuania, Netherlands, Slovenia
        - None: Croatia, Cyprus, Denmark, Estonia, Finland, France, Greece, Ireland, Italy (or voluntary for some), Latvia, Luxembourg, Malta, Poland, Portugal (or voluntary for some), Romania, Slovakia, Spain, Sweden
- Insights regarding materials
    - Paper & cardboard
        - Always commingled, with one exception: Separated sometimes in Latvia due to a planned DRS for cardboard packaging starting 2025
    - Metal (ferrous and aluminium)
        - Frequently commingled. Some countries have voluntary or mandatory DRS systems to collect aluminium cans separately. Some countries also explicitly differentiate between packaging and non-packaging metals (Germany, Latvia).
    - Glass
        - Frequently commingled (exceptions: sometimes in Luxembourg, Germany usually separates into green, brown, and flint) and given DRS.
    - Composite packaging
        - Often commingled with plastic and sometimes metal. In cases where DRS for plastic bottles exist (see above), this influences the extent of commingling of these two materials. Possibly with paper/cardbard in Italy.

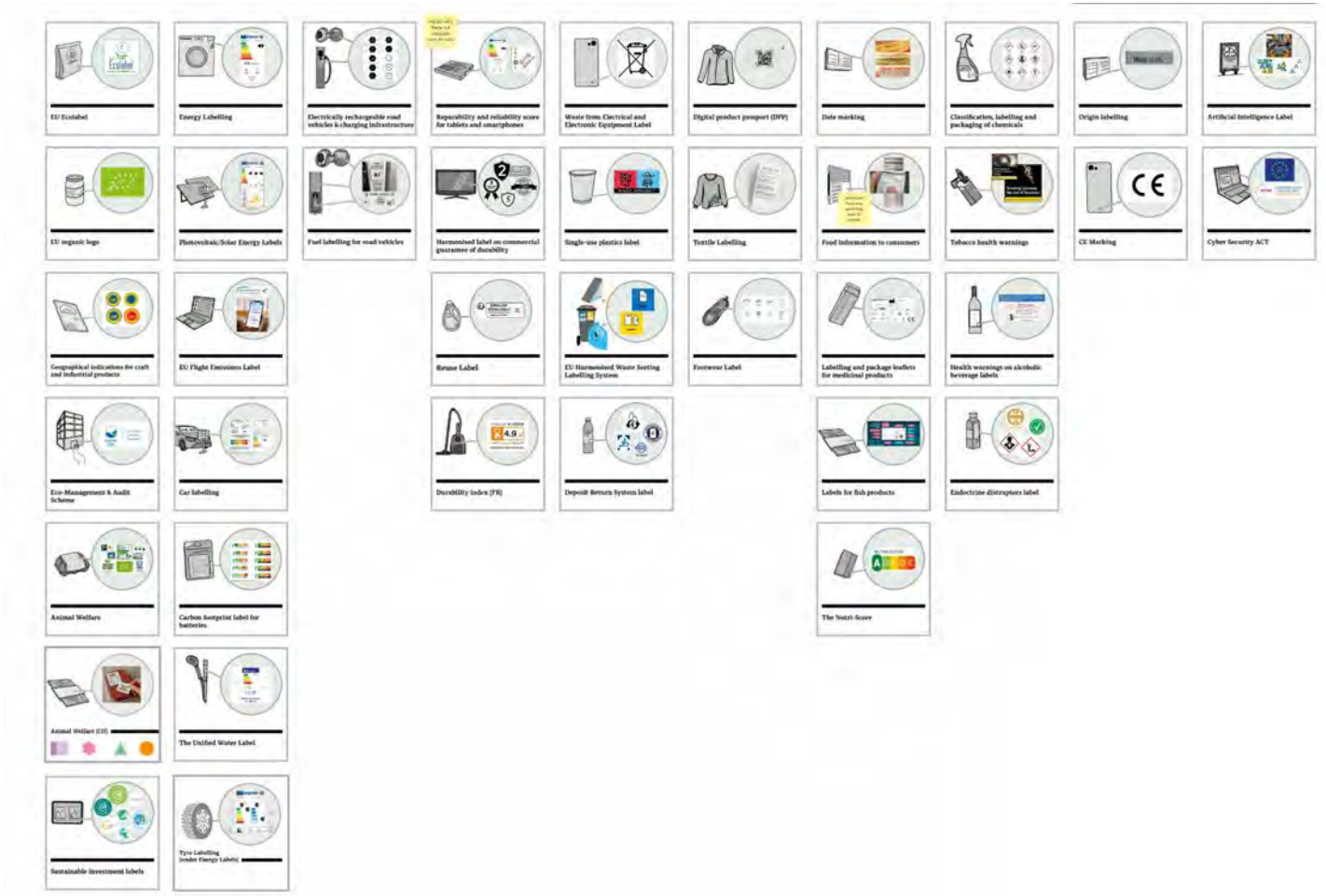
- Plastic
  - Often commingled with composite packaging
  - Often commingled with metal (see important cases of commingling)
- Wood
  - Mostly separately collected
  - Sometimes commingled with metal packaging (Austria) or sometimes others (Greece)
  - Some DRS exist
- Biowaste
  - Sometimes commingling between food waste and garden waste, sometimes separately collected
- Important cases of commingling
  - Metal and plastic are almost always commingled
  - Paper & cardboard and metal are sometimes commingled: Slovenia, Malta, Ireland, Greece, France, Bulgaria, Italy
  - Paper & cardboard, metal and plastic are occasionally commingled: Bulgaria, France, Greece, Ireland, Italy, Malta, Slovenia,
  - Commingling of glass with other materials is very rare: Italy, Greece, certain combinations of glass with metal in Denmark

Table A- 1. Distribution of collection types for different waste materials in the EU.

		Metal		Biowaste											
		Aluminium	Ferrous metals	Biowaste	Garden	Food	Composite packaging	Glass	Hazardous	Paper	Paper and cardboard	Plastic	Residual waste	Textile	Wood
DtD	Separate	23,08	28,21	50,00	38,46	30,77	29,49	60,26	7,69	2,56	66,67	32,05	76,92	19,23	17,95
DtD	Commingl	64,10	62,82	0,00	0,00	0,00	53,85	15,38	3,85	0,00	29,49	61,54	3,85	3,85	2,56
BP	>5km	66,67	65,38	26,92	26,92	21,79	57,69	78,21	7,69	3,85	75,64	71,79	28,21	48,72	8,97
BP	<5km	34,62	30,77	15,38	9,62	5,77	26,92	50,00	7,69	3,85	36,54	32,69	3,85	63,46	5,77
CAS		80,77	84,62	29,49	56,41	5,13	57,69	76,92	15,38	3,85	84,62	76,92	11,54	84,62	91,03

Source: Adapted based on European Environment Agency (2025).

Figure A- 15. Preliminary mapping of the European Commission's own labelling initiatives and related schemes.



Source: Author's elaboration.

Annex III. Other insights

Table A- 2. Mapping of materials according to 97/129/EC with EU harmonised waste sorting labels according to the proposed granularity – with each row corresponding to a distinct material according to 97/129/EC – and specification of criteria according to which selection of correct label is to be done.

Numbering	Material	Abbreviations	Level 1	Level 2	Level 3	Relevant criterion
1	Polyethylene terephthalate	PET	Plastic	Flexible plastic, rigid plastic		Material property
2	High density polyethylene	HDPE	Plastic	Flexible plastic, rigid plastic		Material property
3	Polyvinyl chloride	PVC	Plastic	Flexible plastic, rigid plastic		Material property
4	Low density polyethylene	LDPE	Plastic	Flexible plastic, rigid plastic		Material property
5	Polypropylene	PP	Plastic	Flexible plastic, rigid plastic		Material property
6	Polystyrene	PS	Plastic	Flexible plastic, rigid plastic		Material property
20	Corrugated fibreboard	PAP	Paper and cardboard	Cardboard		
21	Non-corrugated fibreboard	PAP	Paper and cardboard	Cardboard		
22	Paper	PAP	Paper and cardboard	Paper		
40	Steel	FE	Metal			
41	Aluminium	ALU	Metal			
50	Wood	FOR	Wood			
51	Cork	FOR	Cork			
60	Cotton	TEX	Textile			

61	Jute	TEX	Textile			
70	Colourless glass	GL	Glass	Colourless glass	Colourless glass	
71	Green glass	GL	Glass	Coloured glass	Green glass	
72	Brown glass	GL	Glass	Coloured glass	Brown glass	
80	Paper and fibreboard/miscellaneous metals				Fibre-based composite A: ≥85% - 95% fibre, Fibre-based composite B: 50% - <85% fibre, Beverage carton	Percentage of fibre, packaging type
81	Paper and fibreboard/plastic				Fibre-based composite A: ≥85% - 95% fibre, Fibre-based composite B: 50% - <85% fibre, Beverage carton	Percentage of fibre, packaging type
82	Paper and fibreboard/aluminium				Fibre-based composite A: ≥85% - 95% fibre, Fibre-based composite B: 50% - <85% fibre, Beverage carton	Percentage of fibre, packaging type
83	Paper and fibreboard/tinplate				Fibre-based composite A: ≥85% - 95% fibre, Fibre-based composite B: 50% - <85% fibre, Beverage carton	Percentage of fibre, packaging type
84	Paper and fibreboard/plastic/aluminium				Fibre-based composite A: ≥85% - 95% fibre, Fibre-based composite B: 50% - <85% fibre, Beverage carton	Percentage of fibre, packaging type
85	Paper and fibreboard/plastic/aluminium/tinplate				Fibre-based composite A: ≥85% - 95% fibre, Fibre-based composite B: 50% - <85% fibre, Beverage carton	Percentage of fibre, packaging type

90	Plastic/aluminium		Plastic	Flexible plastic, rigid plastic		Material property
91	Plastic/tinplate		Plastic	Flexible plastic, rigid plastic		Material property
92	Plastic/miscellaneous metals		Plastic	Flexible plastic, rigid plastic		Material property
95	Glass/plastic		Glass	Colourless glass, coloured glass	Green glass, brown glass	Colour
96	Glass/aluminium		Glass	Colourless glass, coloured glass	Green glass, brown glass	Colour
97	Glass/tinplate		Glass	Colourless glass, coloured glass	Green glass, brown glass	Colour
98	Glass/miscellaneous metals		Glass	Colourless glass, coloured glass	Green glass, brown glass	Colour

Source: Author's elaboration.

Table A- 3. Mapping of packaging materials, types and categories according to PPWR, Annex II, Table 1 with EU harmonised waste sorting labels according to the proposed granularity – with each row corresponding to a distinct packaging type according to PPWR, Annex II, Table 1 – and specification of criteria according to which selection of correct label is to be done.

Packaging type	**Level 1**	**Level 2**	**Level 3**	**Relevant criterion**
Glass and composite packaging, of which the majority is glass	Glass	Colourless glass, coloured glass	Green glass, brown glass	Colour
Paper/cardboard packaging	Paper and cardboard	Cardboard, paper		
Composite packaging of which the majority is paper/cardboard			Fibre-based composite A: ≥85% - 95% fibre, Fibre-based composite B: 50% - <85% fibre, Beverage carton	Percentage of fibre, packaging type
Steel and composite packaging of which the majority is steel	Metal			
Aluminium and composite packaging of which the majority is aluminium – rigid	Metal			
Aluminium and composite packaging of which the majority is aluminium – semi rigid and flexible	Metal			
PET - rigid	Plastic	Rigid plastic		
PET - rigid	Plastic	Rigid plastic		
PET - flexible	Plastic	Flexible plastic		
PE - rigid	Plastic	Rigid plastic		
PE - flexible	Plastic	Flexible plastic		
PP - rigid	Plastic	Rigid plastic		
PP - flexible	Plastic	Flexible plastic		
HDPE and PP – rigid	Plastic	Rigid plastic		
PS and XPS - rigid	Plastic	Rigid plastic		
EPS - rigid	Plastic	Rigid plastic		

Other rigid plastics (e.g. PVC, PC) including multimaterials– rigid	Plastic	Rigid plastic		
Other flexible plastics including multimaterials – flexible	Plastic	Flexible plastic		
Biodegradable plastics - rigid (e.g., PLA, PHB) and flexible (e.g., PLA)				
Wooden packaging, including cork	Wood, cork			Material
Natural and synthetic textile fibres	Textile			
Clay, stone	Ceramics			

Source: Author's elaboration.

Annex IV. List of contributing expert stakeholders

List of stakeholders in contact with the JRC outside of the two stakeholder consultations and/or that sent position papers

- AIM, European Brands Association
- APPLiA, Home Appliance Europe
- Avfall Sverige
- BEUC, Bureau Européen des Unions de Consommateurs
- Biorepack
- CEN, European Committee for Standardization
- Cepi, Confederation of European Paper Industries
- Circulaer Denmark
- Citeo
- CONAI, Consorzio Nazionale Imballaggi
- Cosmetics Europe
- Ecoembes
- EPTA, European Power Tool Association
- Eunomia
- EUPICTO
- European Bioplastics
- European Blind Union
- Europen, The European Organization for Packaging and the Environment
- EUWID, Europäischer Wirtschaftsdienst
- FBCA, Food and Beverage Carton Alliance
- FEAD, European Waste Management Association
- FEBEA, Fédération des Entreprises de la Beauté
- Federchimica Confindustria
- FEFCO, European Federation of Corrugated Board Manufacturers
- FERVER, European Federation of Glass Recyclers
- FEVE, The European Container Glass Federation
- FPE, Fibre-packaging Europe
- FUTU (Ann Thor)

— Graphic Packaging

— How2Recycle

— JDE Coffee, Jacobs Douwe Egberts Coffee

— Lidl

— Municipal Waste Europe

— Notpla

— OPRL, On-Pack Recycling Label Ltd

— PREP Design

— Sociedade Pontoverde

— Storaenso

— Trennhinweis e.V.

— UBA, Umweltbundesamt (German Environment Agency)

— Unilever

— Zero Waste Europe

First stakeholder consultation

— ACE IBERIA

— Activist Beauty

— Administration de l'environnement

— AESGP

— AIM, European Brands Association

— AMETIC

— Andros La Serna S.L:U.

— APPLiA Europe

— ARA

— Arge Österreichischer Abfallwirtschaftsverbände

— ARI - Affalds- og Ressourceindustrien

— AS AJ Power recycling/SIA 3R

— AVEC

— Avfall Norge

— AVU - Allianz Verpackung und Umwelt

— Bayer AG

— Bayer Consumer Care AG

— BDE Bundesverband der Deutschen Entsorgungs-, Wasser und Kreislaufwirtschaft e.V.

— BellandVision GmbH

— Biorepack

— Bloom Regulatory Limited

— Brewers of Romania

— Bruxelles Environnement

— Bureau National Interprofessionnel du Cognac

— BVMed | Bundesverband Medizintechnologie e.V.

— Carlsberg Breweries A/S

— CEEV Comité Européen Entreprises Vins

— Centre for Research and Technology HELLAS - CERTH

— Chamber of Labour

— Circular Denmark

— Citeo

— CITPA - International Confederation of Paper and Board Converters in Europe (CITPA)

— CLITRAVI

— Colruyt Group

— CONAI - CONSORZIO NAZIONALE IMBALLAGGI

— Confederation of European Paper Industries - Cepi

— Confindustria

— Cosmetics Europe

— Cosnova GmbH

— Croatian alliance of consumers

— Czech & Slovak Packaging Institut SYBA

— Danish Agriculture & Food Council

— Danish Industry

— Danish Ministry of Environment

— Dansk Retursystem A/S

— Digi-Cycle GmbH

— DIGITALEUROPE

— dm-drogerie markt GmbH + Co. KG

— Društvo Ekologi brez meja

— ECOEMBES - Ecoembes Entidad Administradora Sl.

— Ecopack Bulgaria

— ECOVIDRIO

— EDA - European Dairy Association

— EDANA

— Environment and Resources Authority

— EPS-branchen

— EPTA (European Power Tool Association)

— EuroCommerce

— European Bioeconomy Bureau

— European Bioplastics

— European Carton Makers Association

— European Federation of Corrugated Board Manufacturers (FEFCO)

— European Paper Packaging Alliance (EPPA)

— EUROPEN, the European Organisation for Packaging and the Environment

— Extended Producer Responsibility Alliance (EXPRA)

— Fassa srl

— Fazer Group/ Bakery, Mill, Confectionery, Biscuit, Plant based Drinks and Snacs

— FEAD

— FEBEA

— Federal Public Service Health, Food Chain safety, Environment

— Federchimica

— FERRERO

— FERVER

— FEVE - The European container glass federation

— Finnish Food and Drink Industries' Federation

— Finnish Forest Industries Federation

— Finnish Grocery Trade Association

— Finnish Packaging Producers Ltd (Suomen Pakkaustuottajat Oy)

— Flustix RETHINK PLASTICS

— FoodDrinkEurope

— Fost Plus

— GRANADO FRANCE

— Graphic Packaging International

— Green Dot (Cyprus) Public Co Ltd

— Greiner Packaging International GmbH

— Groent Punkt Norge (Green Dot Norway)

— Hager SE

— Hamburger Recycling Hungary Ltd

— HELLENIC RECYCLING AGENCY

— Hellenic Recycling Agency

— HKFoods Finland

— Hochland Deutschland GmbH

— IKSZ Italos Karton Egyesülés

— Independent Retail Europe

— Inter IKEA group

— Interregional Packaging Commission

— Interzero Recycling Alliance GmbH

— Irish Waste Management Association (IWMA)

— Jacobs Douwe Egberts Peets

— Julius Blum GmbH

— Lipor

— LOOP – The Foundation for Recycling and Waste Sorting

— MERCADONA S.A

— Merck Millipore

— Metal Packaging Europe

— MICRO-TECH Europe GmbH

— Ministry for Climate Action (BMK)

— Ministry of Climate and Environment

— Ministry of Ecological Transition, Energy, Climate, and Risk Prevention

— Ministry of Environmental Protection and Green Transition
— Ministry of the Environment
— Müller Service GmbH
— Municipal Waste Europe aisbl
— Murata Electronics Europe B.V. Germany Branch
— NATUR-PACK a.s.
— Neovita
— Nordic Council of Ministers' Office in Latvia
— NORSIRK AS
— Norwegian Environment Agency
— Notpla Limited
— NVRD
— OVAM - Public Wast Agency of Flanders
— Packaging Recovery Organisation Europe - PRO Europe srl
— Plastics Europe
— Plastics Recyclers Europe
— Polish Association of Cosmetic and Detergent Industry
— PREP Design
— Pro Duo NV
— Repak
— RWS namens ienw
— Schneider Electric
— Schwarz Unternehmenskommunikation international
— Slovak Environment Agency
— Slovenian Environment Agency
— Sociedade Ponto Verde
— spiritsEUROPE
— Stora Enso
— Styrenics Circular Solutions (SCS)
— Sulapac Ltd
— Suomen Kiertovoima ry KIVO Finland

— The Alliance for Beverage Cartons and the Environment (ACE)

— The Polish Union of the Cosmetics Industry

— TheNewSort ApS / Open Experience ApS

— Things Foundation

— Tobacco Europe

— TotalEnergies Corbion

— Toy Industries of Europe (TIE)

— Trennhinweis e.V.

— TU Vienna (technical University of Vienna)

— TÜV AUSTRIA Belgium

— Umweltbundesamt (German Environment Agency)

— UNIONS OF EMPLOYERS EKO-PAK

— UPM Specialty Papers

— Utilitalia

— VAATC, UAB (Vilnius region waste management centre)

— Vaillant Group

— Valorlux asbl

— Verbond van Belgische ondernemingen (VBO-FEB); Federations of Enterprises in Belgium

— Voice of irish concern for the environment

— VTT Technical Research Centre of Finland Ltd

— VVSG - Interafval

— Whyte and Mackay

— Zero Waste Europe

Second stakeholder consultation

— Activist Beauty

— AESGP - European Self-Care Association

— AIC - The Portuguese Trade Association of Cosmetics, Fragrance and Toiletries

— AIM, European Brands Association

— Allegro

— Altstoff Recycling Austria AG

— APPLiA - Home Appliance Europe

— ARGE Österreichischer Abfallwirtschaftsverbände

— Asmodee

— AVEC

— BALONEVI SAN VE TIC AS

— Bayer AG

— Bayer AG

— BellandVision GmbH

— Biorepack Consortium for organic recycling of compostable plastic (CONAI system)

— Brewers of Romania

— Bundesverband Glasindustrie e.V.

— CEEV - Comité Européen Entreprises Vins

— Cepi - Confederation of European Paper Industries

— CEPI Eurokraft

— Cerveceros de España

— Circular Denmark

— Citeo

— CONAI

— Confindustria

— Coop Italia soc coop

— Cosmetics Europe - The personal care association

— Cré - Composting and Anaerobic Digestion Association of Ireland

— Danish Agriculture & Food Council

— Danish Consumer Council

— Danish Environment Agency

— Dansk Retursystem A/S

— Digi-Cycle GmbH

— DIGITALEUROPE

— Društvo Ekologi brez meja

— Ecoembes

— ECOVIDRIO

— EDANA

— EDUQUEST

— EduQuest

— EKO-KOM, a.s.

— EURO TSA

— EuroCommerce

— EuromContact

— European Aerosol Federation (FEA)

— European Aluminium Foil Association

— European Bioplastics

— European Carton Makers Association

— European Compost Network (ECN) e.V.

— European Core and Tube Association e.V. (ECTA)

— European Federation of Pharmaceutical Industries and Associations

— European Paper Packaging Alliance (EPPA)

— European Power Tool Association

— EUROPEN - The European Organisation for Packaging and the Environment

— EUROSAC

— EXPRA

— Fabbrica Cooperativa Perfosfati Cerea

— Fazer

— Fazer Confectionery Ltd

— FEAD

— FEBEA

— FEDEMCO - Federación Española del Envase de Madera y sus Componentes.

— Federal Ministry of Agriculture and Forestry, Climate and Environmental Protection, Regions and Water Management

— Federal Public Service Health & Environment

— Federchimica

— Federdistribuzione

— FEFCO, The European Federation of Corrugated Cardboard Manufacturers

— FERVER - European Federation of Glass Recyclers

— FEV - Federación Española del Vino

— FEVE - The European Container Glass Federation

— Flexible Packaging Europe

— Food and Beverage Carton Alliance (FBCA)

— FoodDrinkEurope

— Fost Plus

— GEKA GmbH

— Graphic Packaging International

— Groent Punkt Norge

— Hager SE

— Hasbro Intl. Holding BV

— HELLENIC RECYCLING AGENCY

— Henkel AG

— HKFoods Finland- Packaging development

— Huhtamaki Oyj

— Independent Retail Europe

— International Confederation of Paper and Board Converters in Europe- CITPA

— Interregional Packaging Commission

— ITENE

— Johnson and Johnson

— Kesko Oyj

— Klosterfrau Healthcare Group

— Kraft Heinz

— Laboratoires Juva Santé

— LEANA TRADING AND INDEPENDANT GRAPHIC PACKAGING

— LOOP – The Foundation for Recycling and Waste Sorting

— Mars Inc.

— MASTER Odpady i Energia

— METAL PACKAGING EUROPE

— Mgr. Martin Lochovský

— MICRO-TECH Europe GmbH

— Ministry of Climate
— Ministry of Climate and Energy
— Ministry of Climate and Environment
— Ministry of Energy
— Ministry of Environment
— Ministry of Environment
— Ministry of Environment and Energy Security
— Ministry of the Environment
— MINISTRY OF THE ENVIRONMENT, CLIMATE AND ENERGY
— Müller Service GmbH
— Murrelektronik GmbH
— Natureef Association
— NATUR-PACK
— Notpla Limited
— NOVAMEX
— Novarroz
— Open Experience ApS (former TheNewSort ApS)
— Orkla Snacks
— OVAM - Flemish public Waste Agency
— Packaging Recovery Organisation Europe srl (PRO Europe)
— Plastics Recyclers Europe
— Polish Association of Cosmetic and Detergent Industry
— Portuguese Environment Agency
— Poznań City Hall
— PROPAK Austria
— Repak
— Samfunnsbedriftene
— Schwarz Corporate Affairs
— Seda International Packaging Group
— Selenis Portugal S.A.
— Smurfit Westrock

— Sociedade Ponto Verde

— spiritsEUROPE

— Steel for Packaging Europe

— Stichting Duurzaam Verpakkingsglas

— Stora Enso

— Suomen Pakkaustuottajat Oy / Finnish Packaging Producers Ltd

— The European Plastics Alliance PLASTALLIANCE

— The Polish Union of the Cosmetics Industry

— Tobacco Europe

— Toy Industries of Europe

— UAB "VAATC"

— Umweltbundesamt (German Environment Agency)

— UNESDA Soft Drinks Europe

— Unilever

— Urząd Miasta Płocka

— Verpact

— VTT Technical Research Centre of Finland Ltd

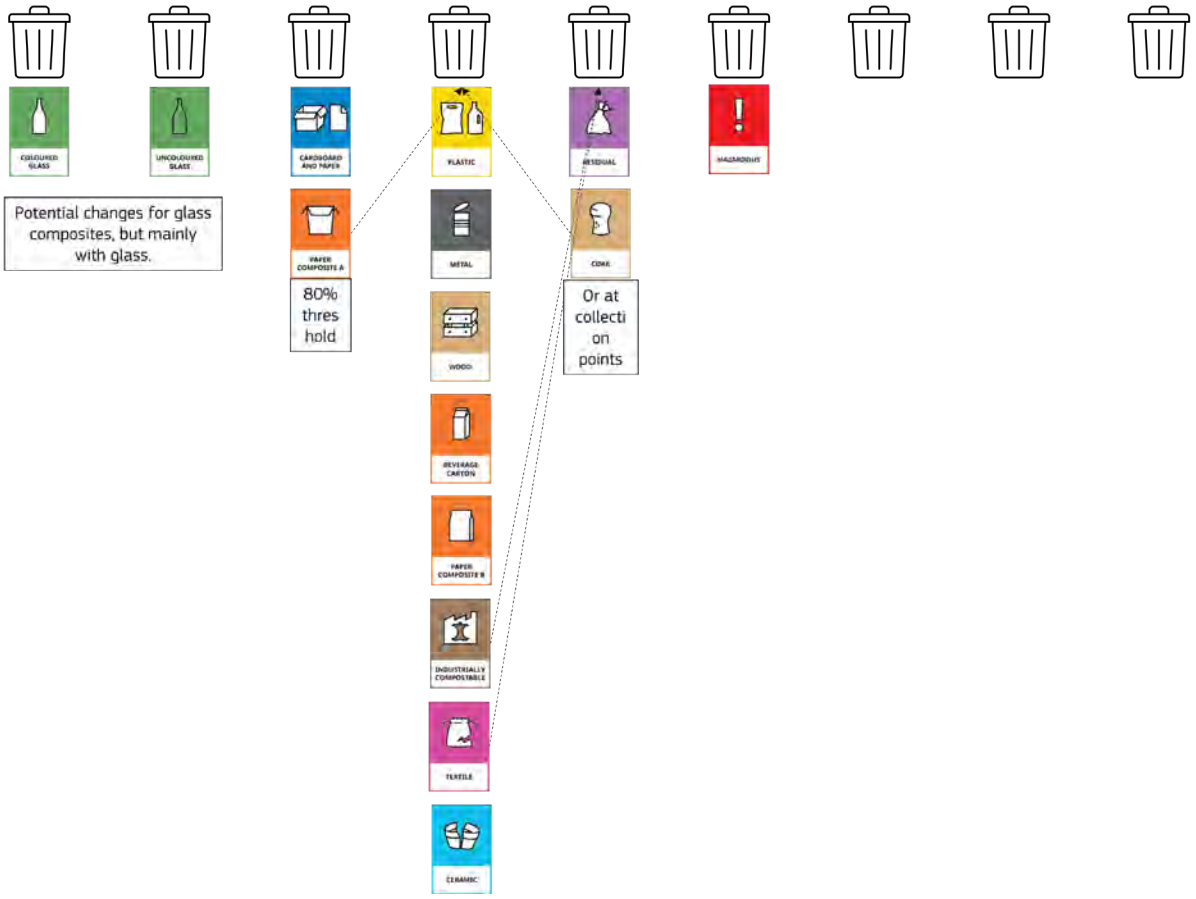
— ZVEI e.V.

Annex V. Draft label applications in Member States

The following images show draft possibilities of applying the labels on bins in EU Member States based on analysing country-specific sorting rules and practices using Large Language Model analyses (methodology as described in the main report).

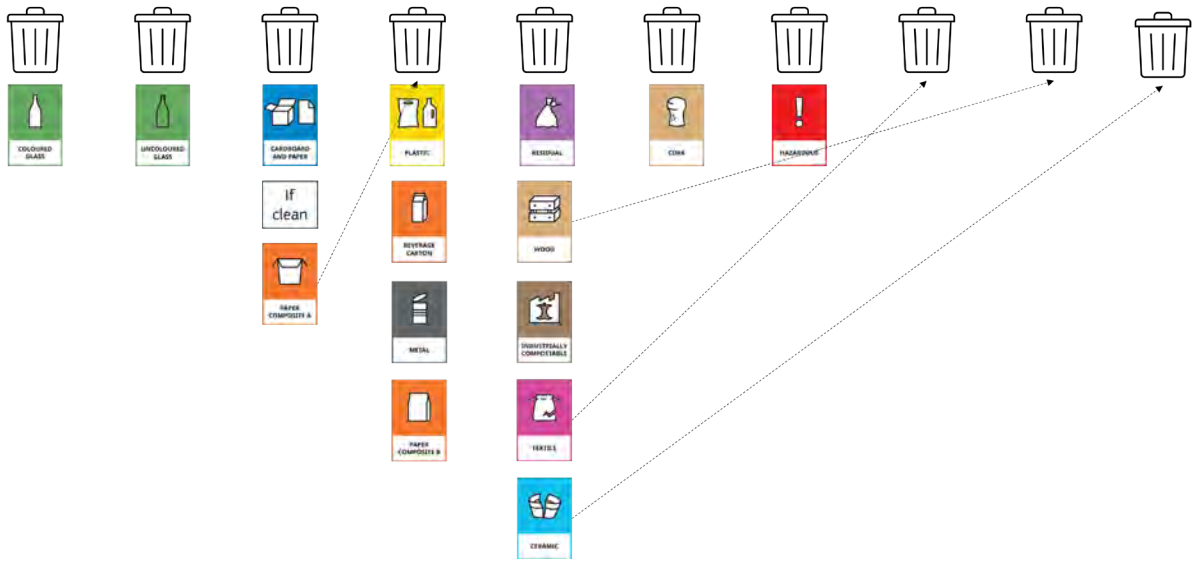
Important: These are only drafts and only consider evidence from the LLM data, not other methods that were used, such as surveys and EEA data. They mostly do not consider potential within-country variations. They should be treated carefully and not as final proposals, and only to visualise possible label combinations on receptacles according to sorting rules and practices.

Figure A- 16. Draft label application in Austria.



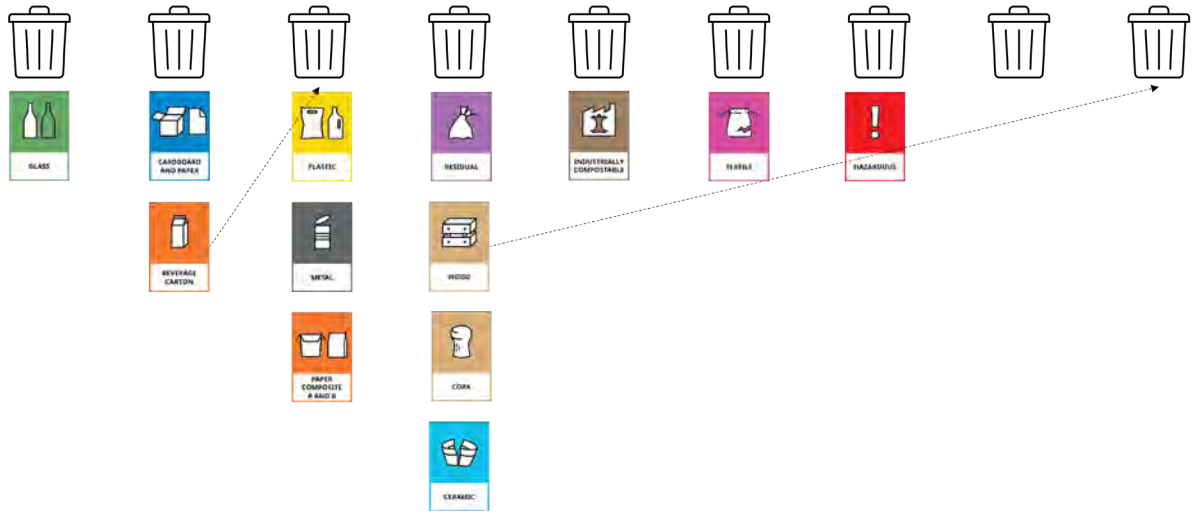
Source: Author's elaboration.

Figure A- 17. Draft label application in Belgium.



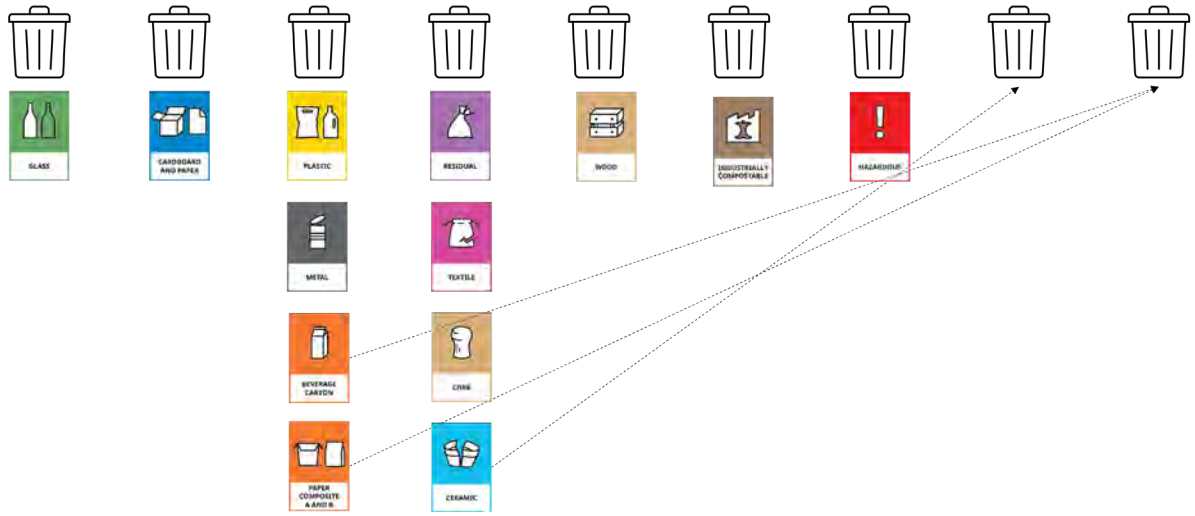
Source: Author's elaboration.

Figure A- 18. Draft label application in Bulgaria.



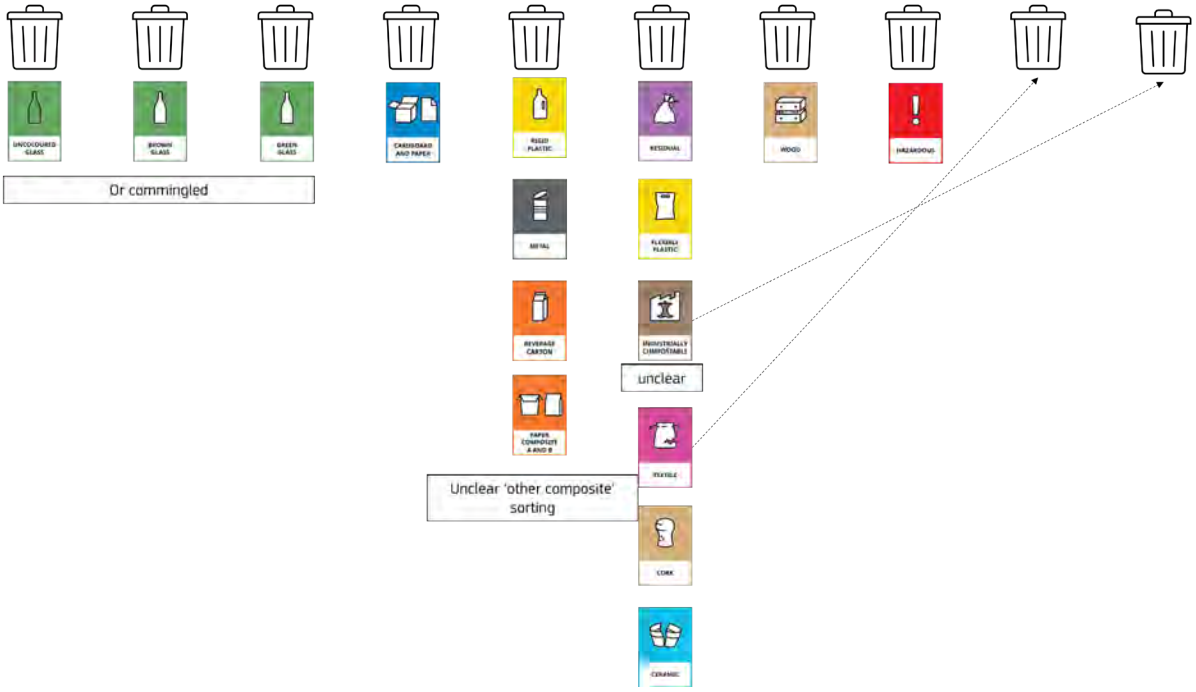
Source: Author's elaboration.

Figure A- 19. Draft label application in Croatia.



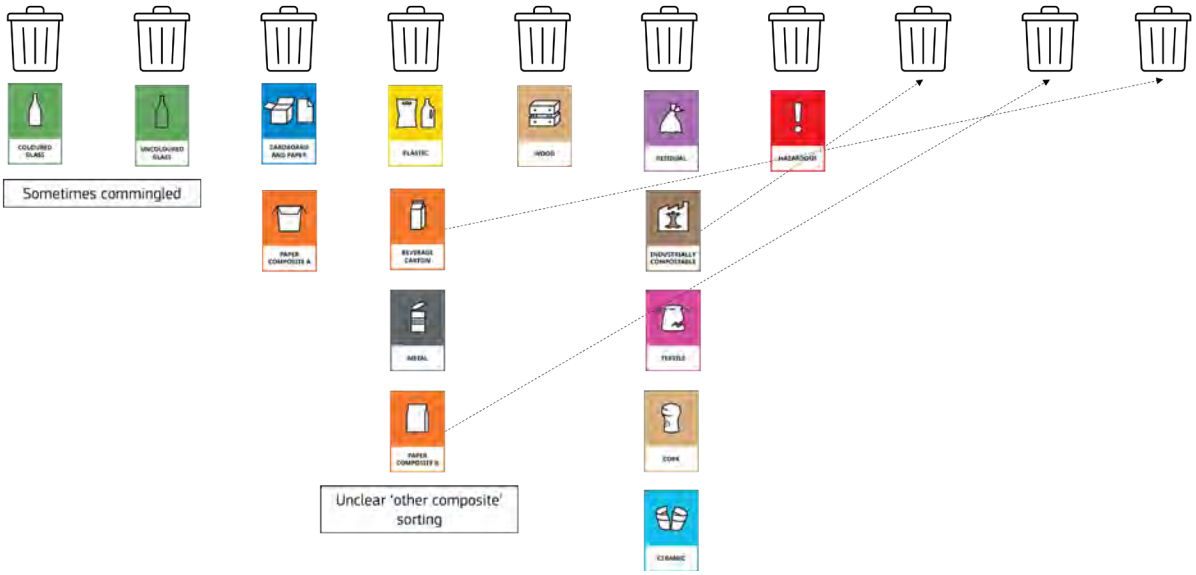
Source: Author's elaboration.

Figure A- 20. Draft label application in Cyprus.



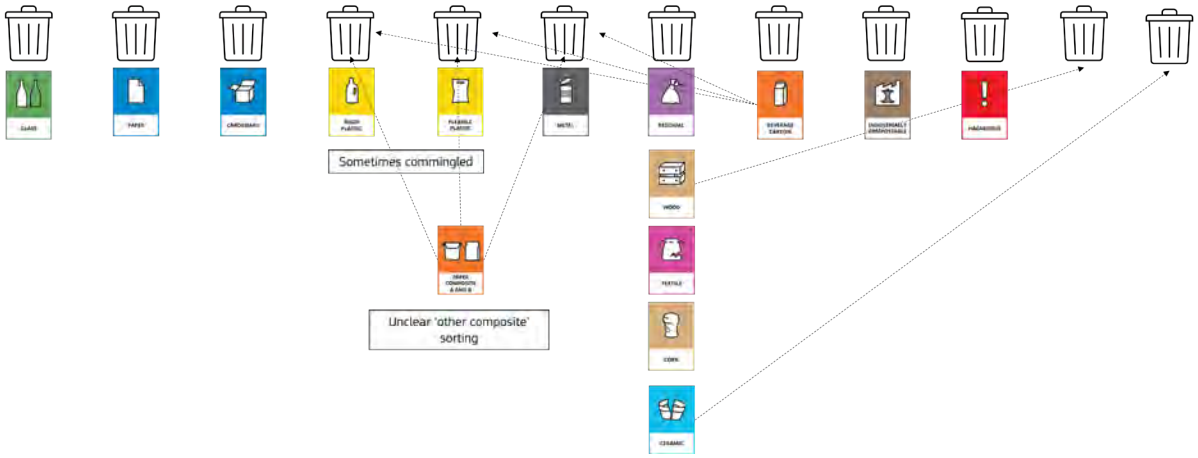
Source: Author's elaboration.

Figure A- 21. Draft label application in Czechia.



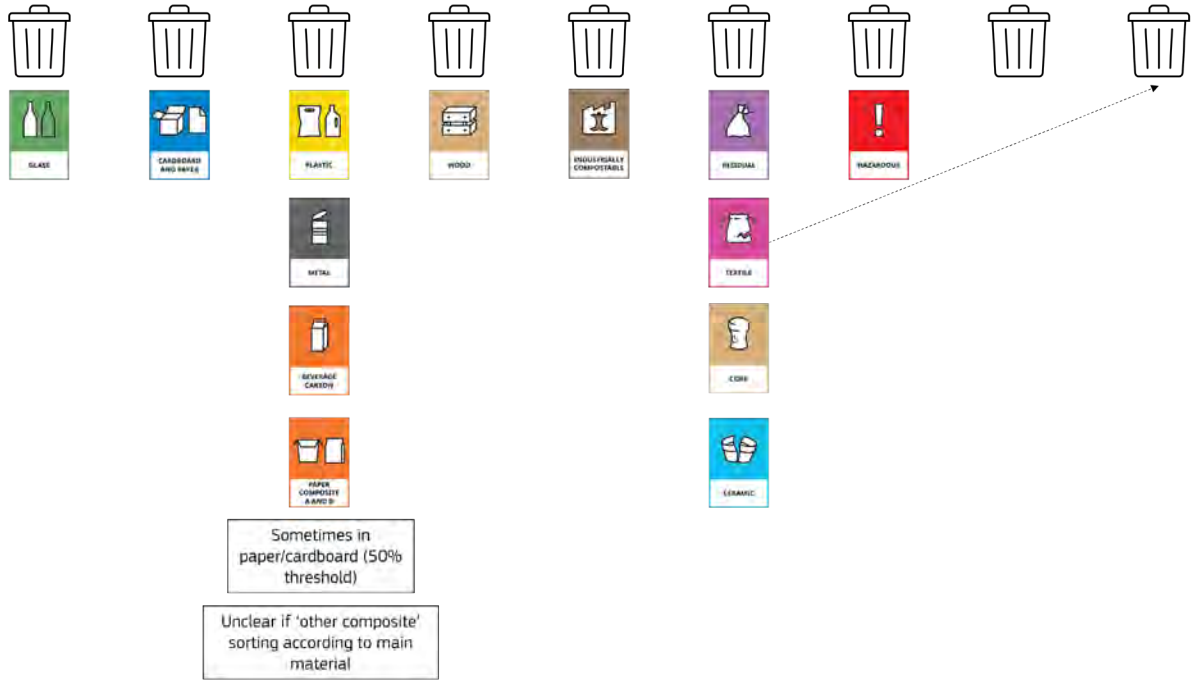
Source: Author's elaboration.

Figure A- 22. Draft label application in Denmark.



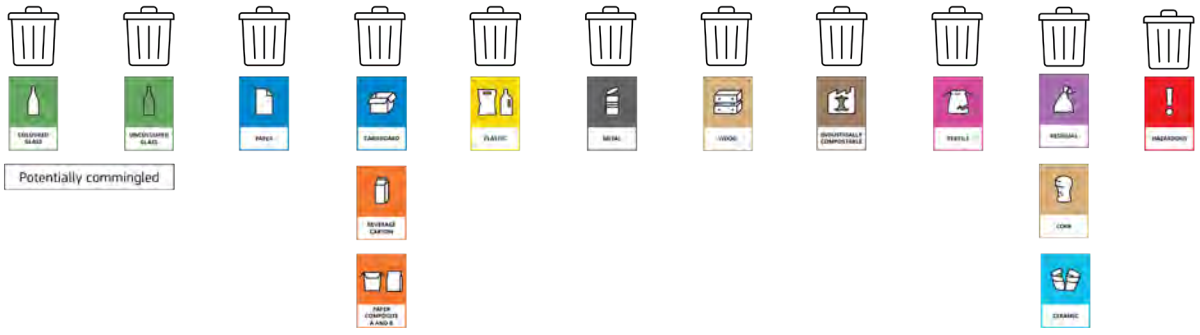
Source: Author's elaboration.

Figure A- 23. Draft label application in Estonia.



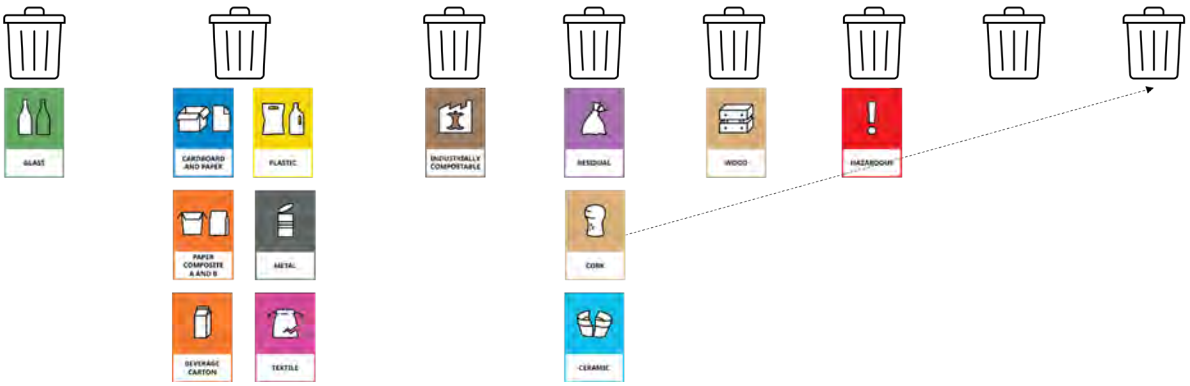
Source: Author's elaboration.

Figure A- 24. Draft label application in Finland.



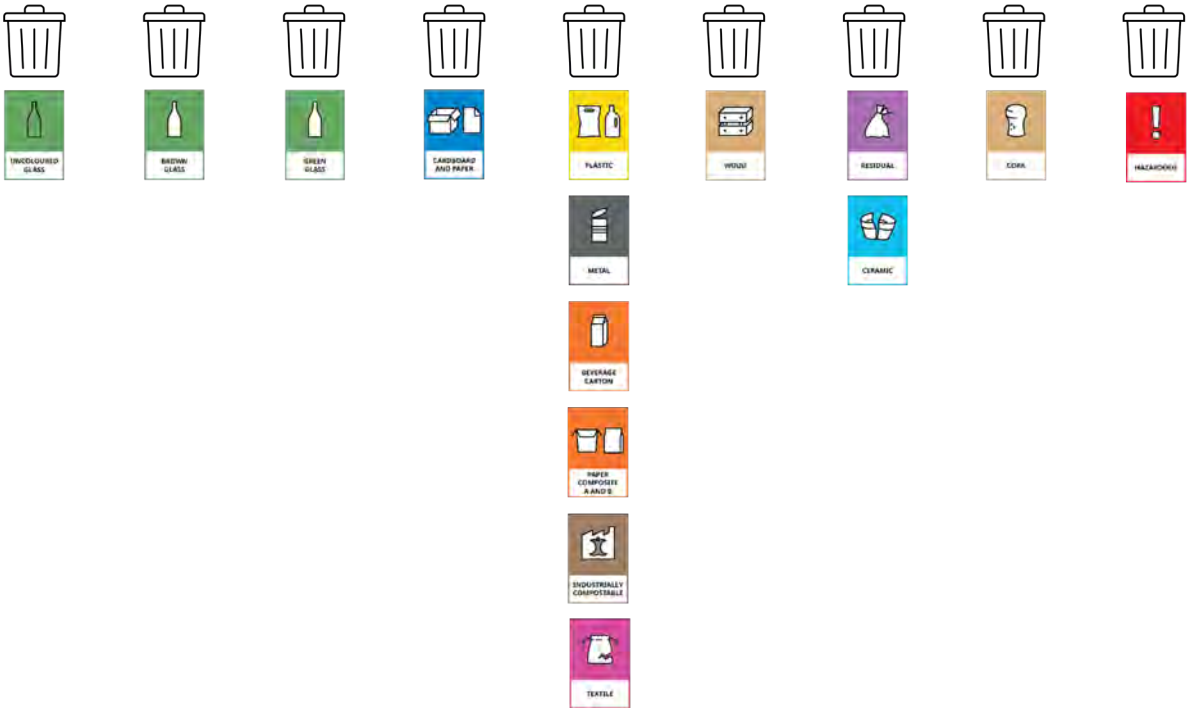
Source: Author's elaboration.

Figure A- 25. Draft label application in France.



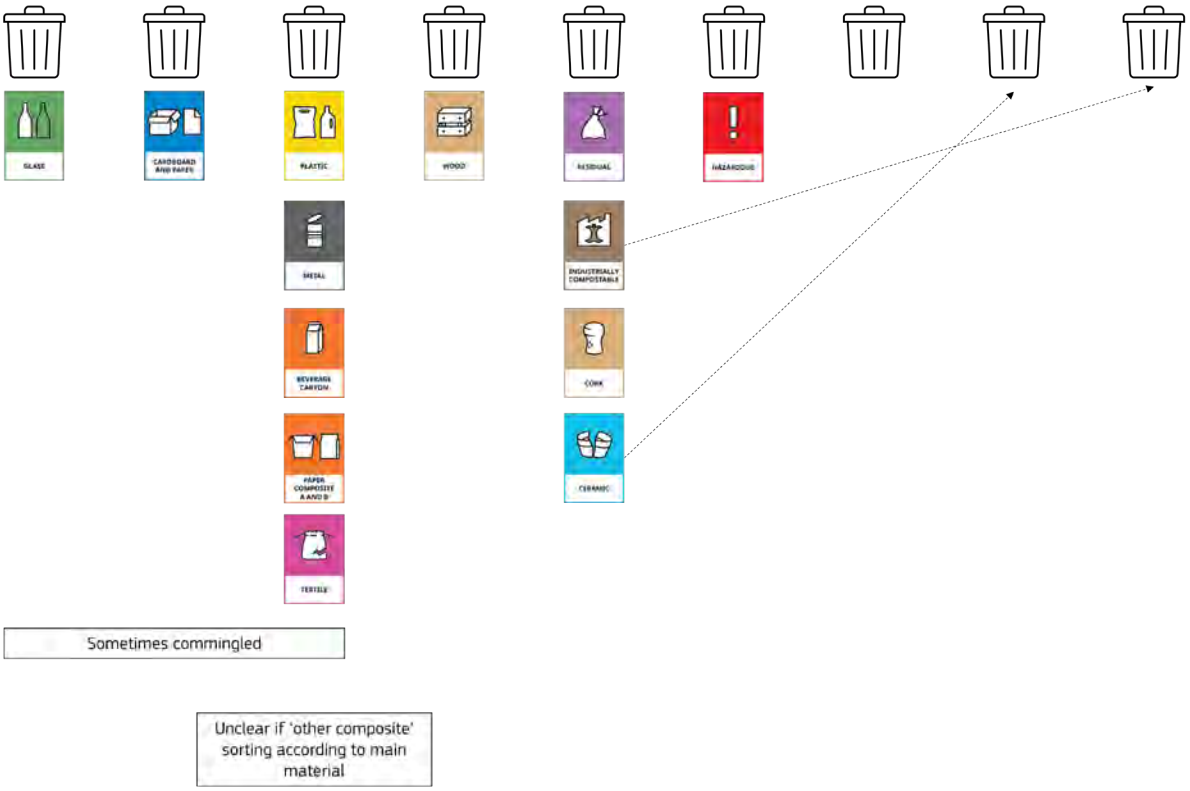
Source: Author's elaboration.

Figure A- 26. Draft label application in Germany.



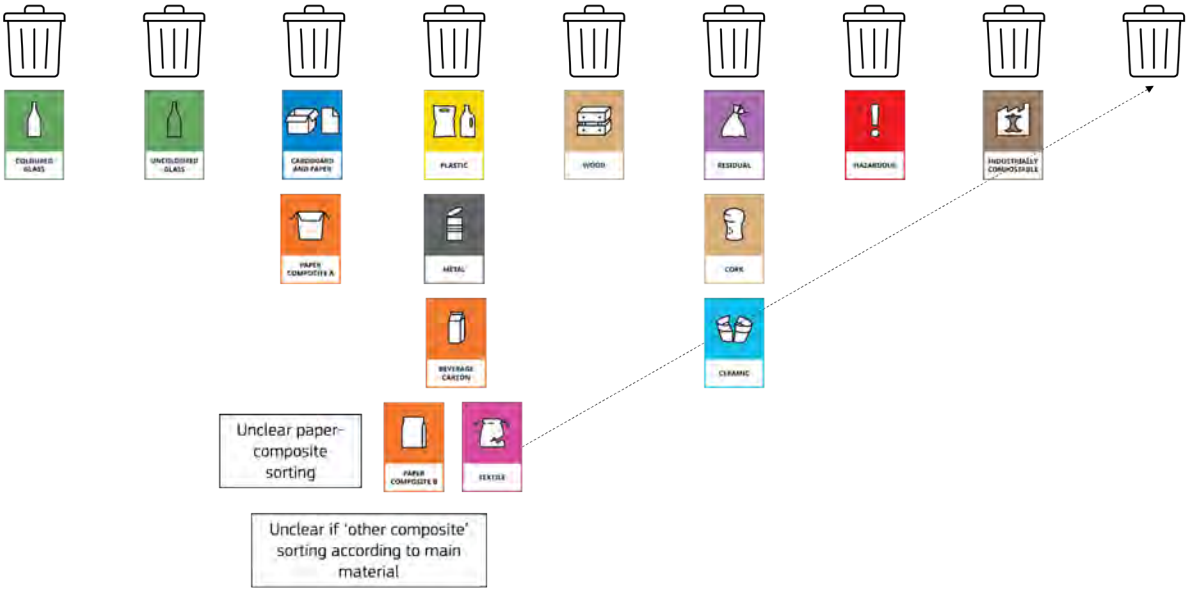
Source: Author's elaboration.

Figure A- 27. Draft label application in Greece.



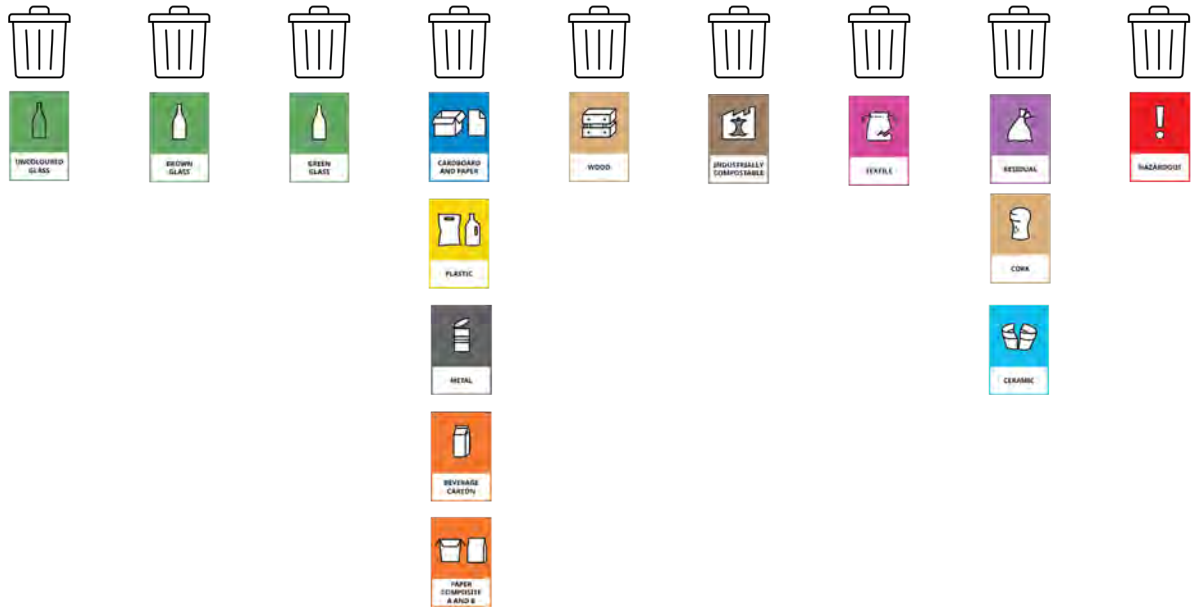
Source: Author's elaboration.

Figure A- 28. Draft label application in Hungary.



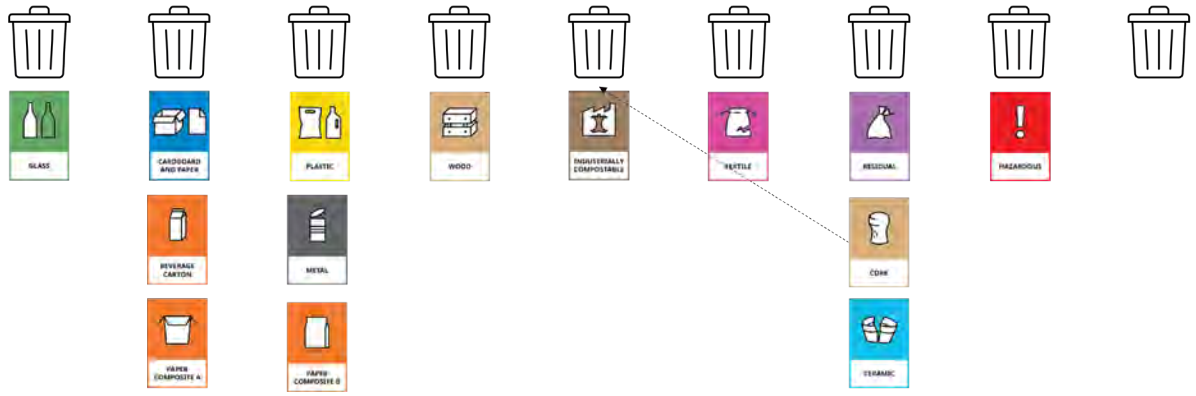
Source: Author's elaboration.

Figure A- 29. Draft label application in Ireland.



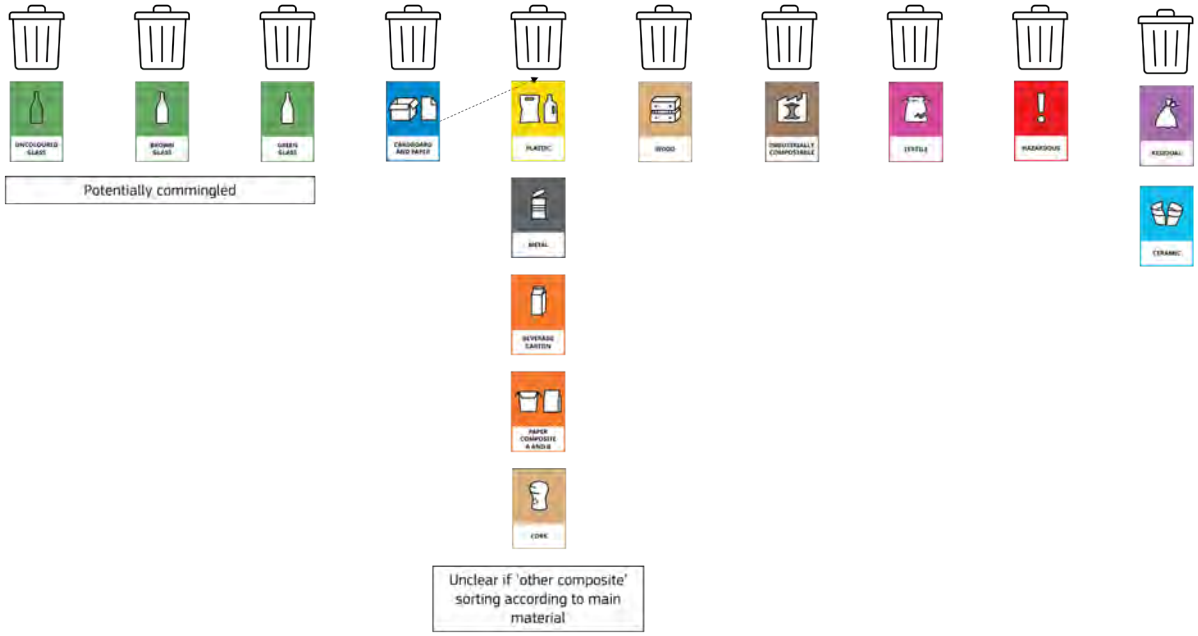
Source: Author's elaboration.

Figure A- 30. Draft label application in Italy.



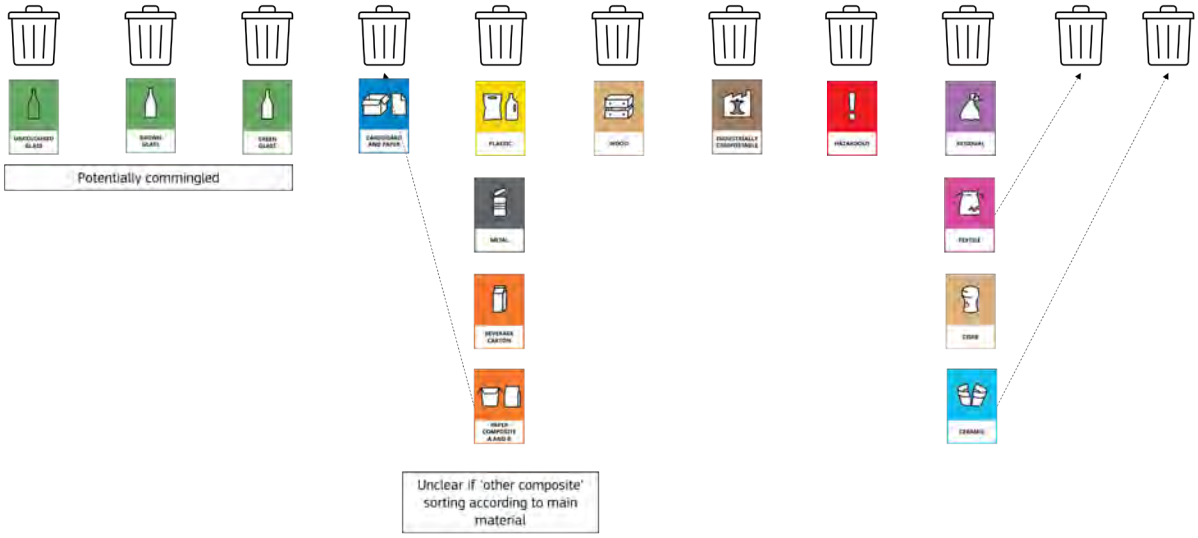
Source: Author's elaboration.

Figure A- 31. Draft label application in Latvia.



Source: Author's elaboration.

Figure A- 32. Draft label application in Lithuania.



Source: Author's elaboration.

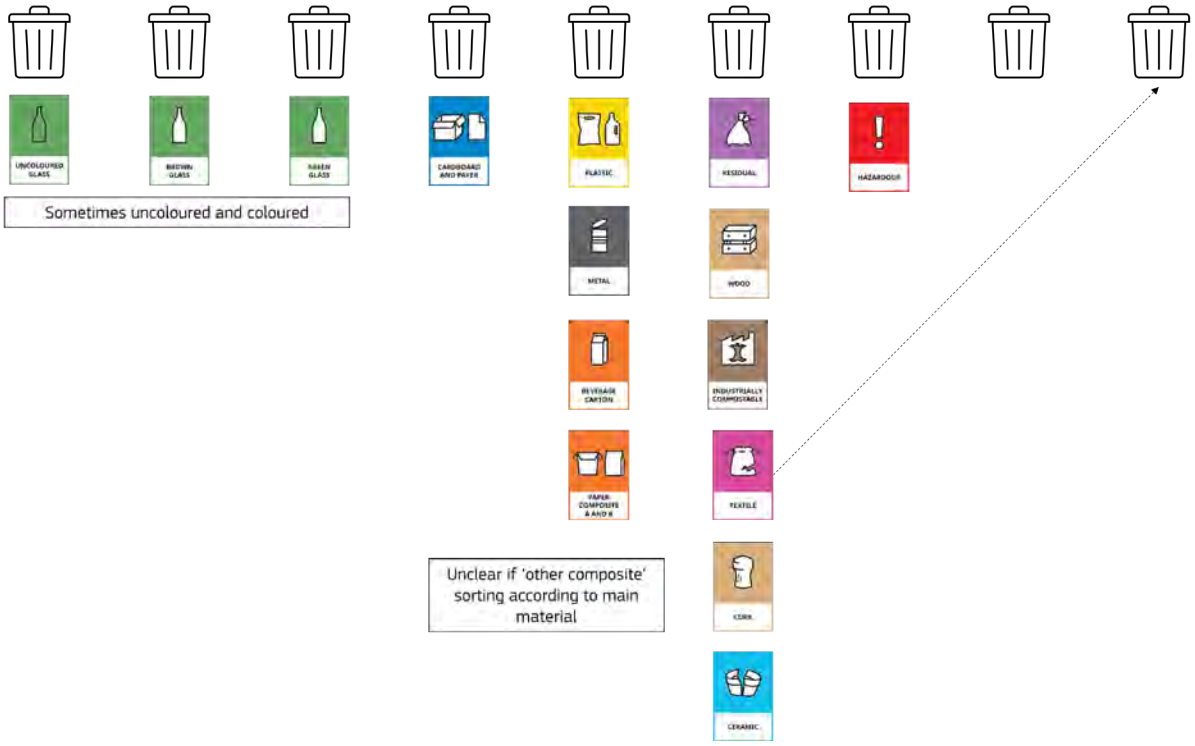
Figure A- 33. Draft label application in Luxembourg.

Source: Author's elaboration.

Figure A- 34. Draft label application in Malta.

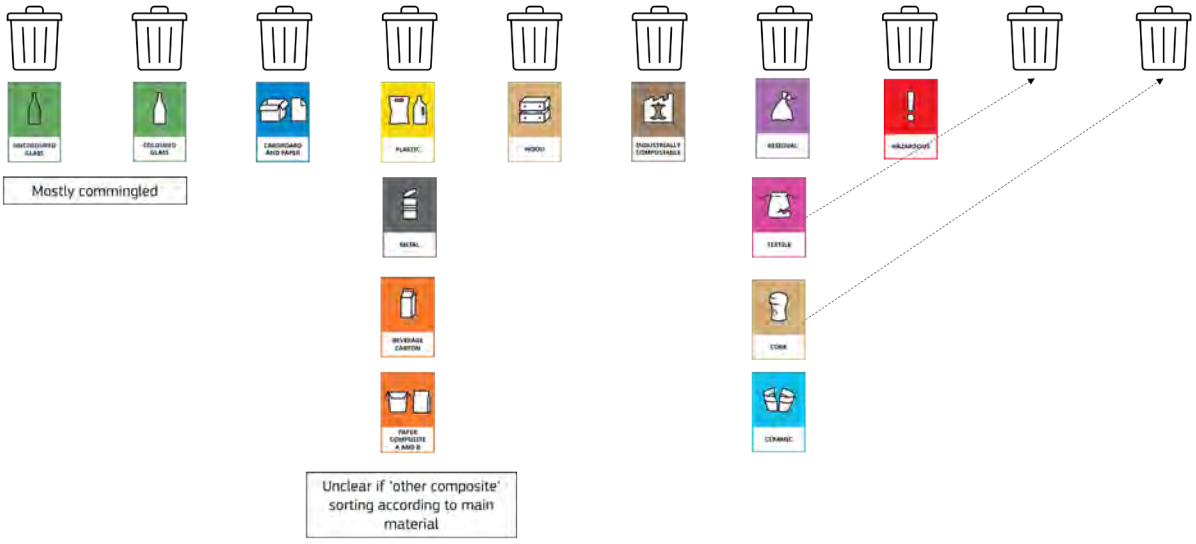
Source: Author's elaboration.

Figure A- 35. Draft label application in Netherlands.



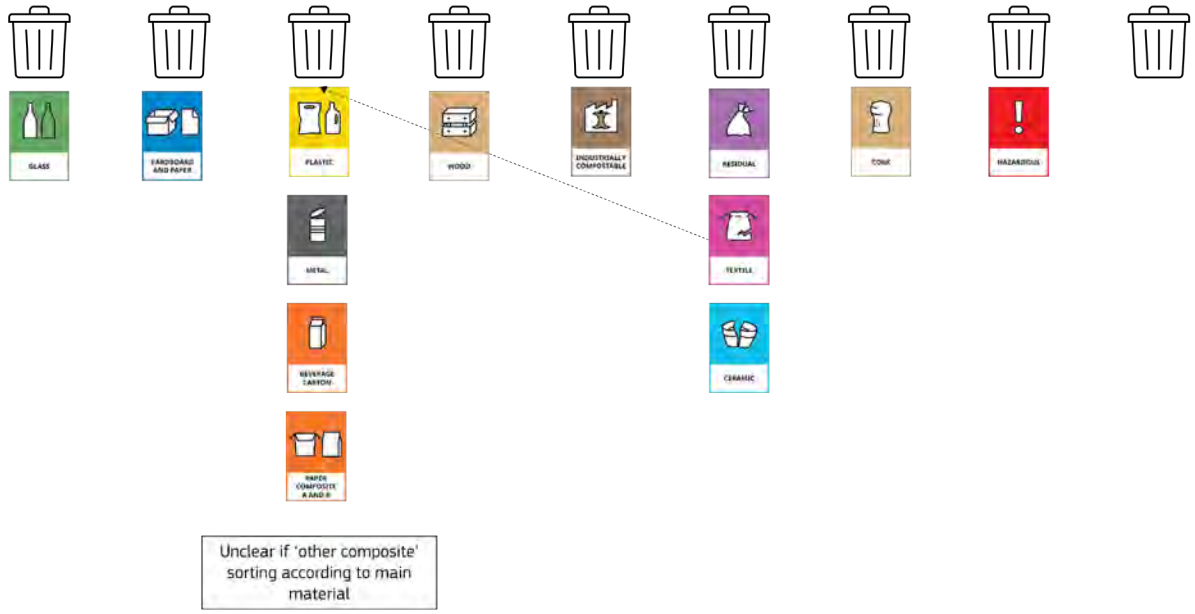
Source: Author's elaboration.

Figure A- 36. Draft label application in Poland.



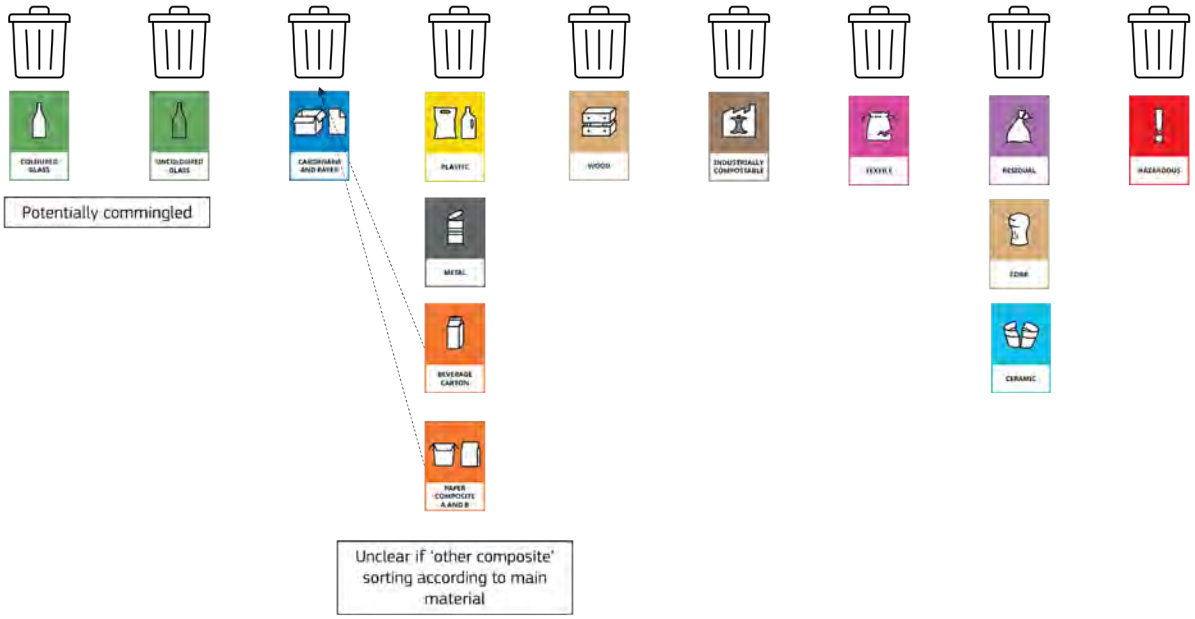
Source: Author's elaboration.

Figure A- 37. Draft label application in Portugal.



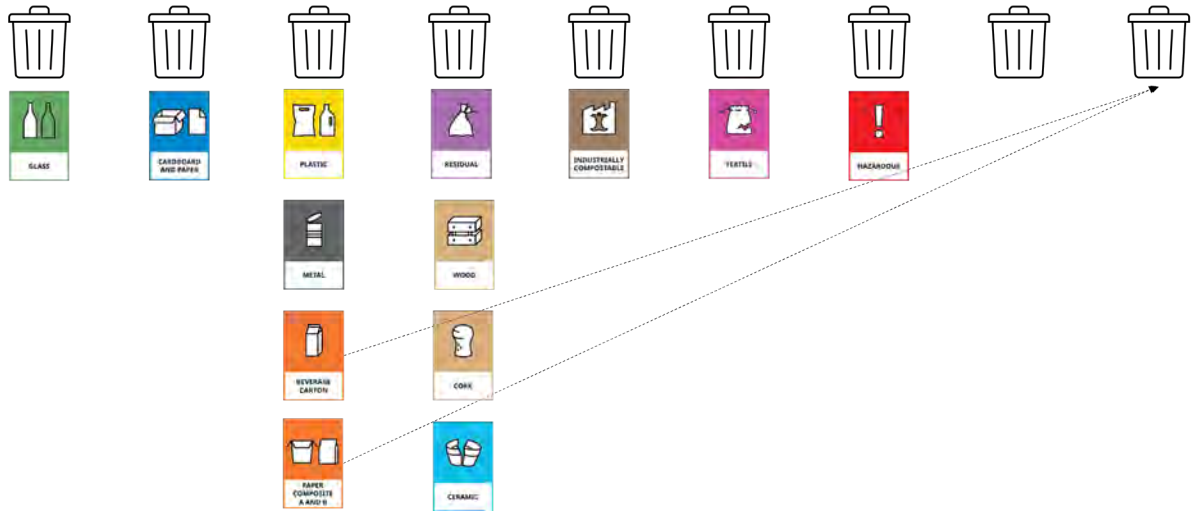
Source: Author's elaboration.

Figure A- 38. Draft label application in Romania.



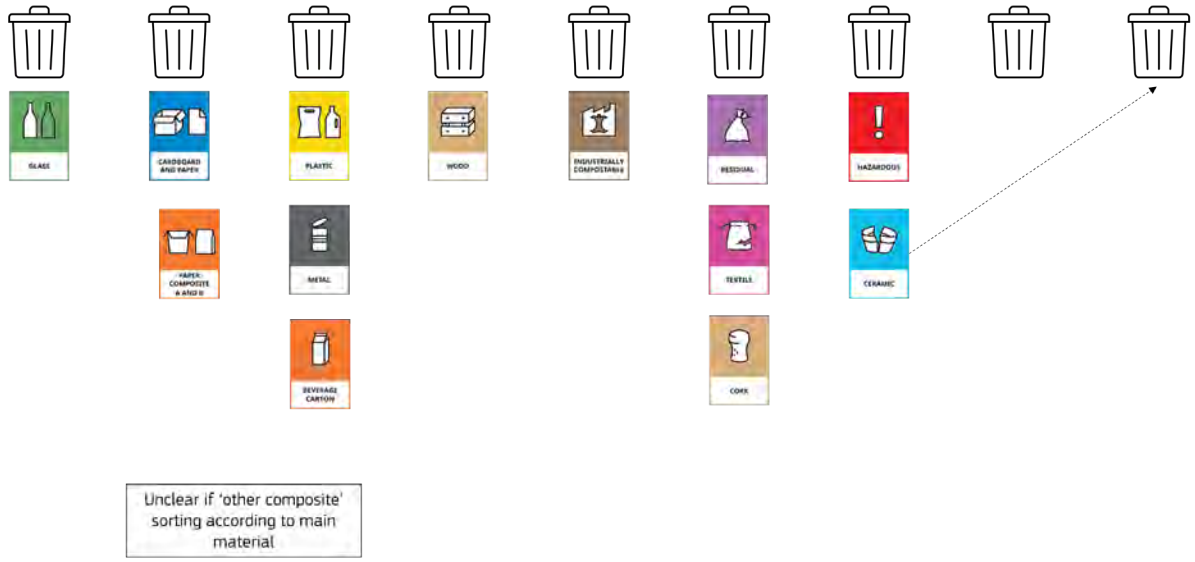
Source: Author's elaboration.

Figure A- 39. Draft label application in Slovakia.



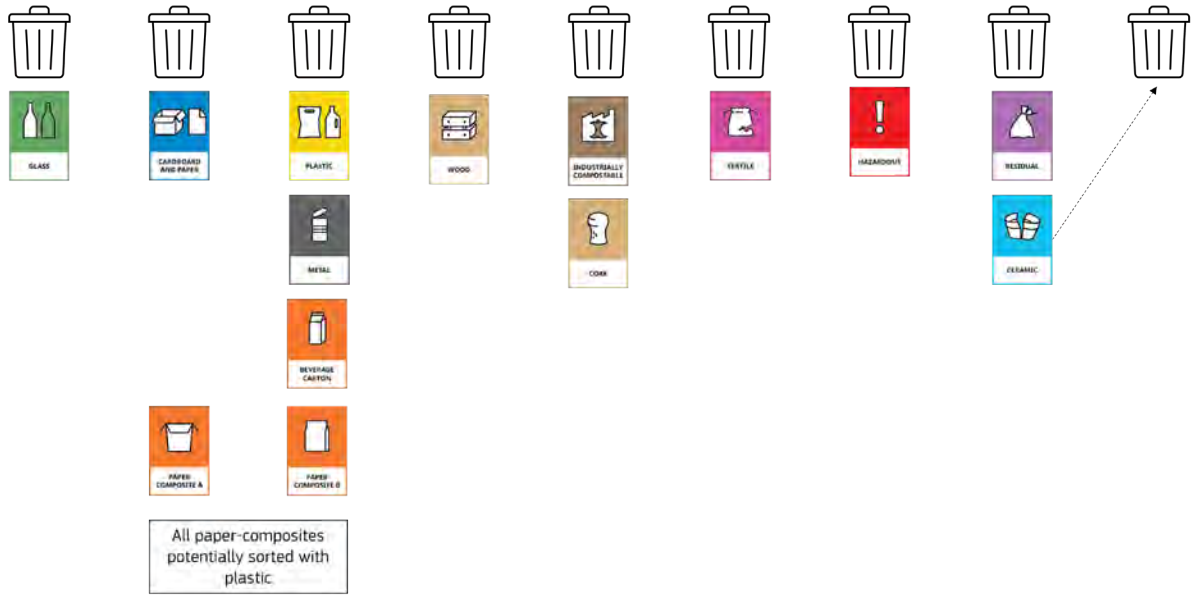
Source: Author's elaboration.

Figure A- 40. Draft label application in Slovenia.



Source: Author's elaboration.

Figure A- 41. Draft label application in Spain.



Source: Author's elaboration.

Figure A- 42. Draft label application in Sweden.

Source: Author's elaboration.

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