Safe-, s**U**stainable- and **R**ecyclable-by design **P**olymeric systems
A guidance toward**S** next generation of plastic**S**

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Deliverable D1.1

Regulatory landscape

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WP Leader		CABRERA Géraldine - IPC
Lead beneficiary		IPC
Contributing beneficiaries		**IPC**, CEA, CID, IND, WFO
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DEC	Websites, patents filing, press & media actions, videos, etc.	☐
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List of acronyms and abbreviations

CLP	Classification, Labelling, Packaging
CMR	Carcinogenic, Mutagenic, Reprotoxic
CPR	Construction Products Regulation
CS	Case study
CSM	Common Safety Method
DPD	Dangerous Preparations Directive
Dx.x	Deliverable (D) + WP number and task number (x.x)
EAD	European Assessment Document
EAT	European Technical Assessment
EC	European Commission
ECHA	European Chemical Agency
EFTA	European Free Trade Association
EPBD	Energy Performance on Building Directive
ESPR	Ecodesign for Sustainable Products Regulations
ETA	European Technical Assessment
EU	European Union
EU-CSS	EU Chemical Strategy for Sustainability
FRP	Fiber reinforced polymer
GHS	Globally Harmonized System
HL	Hazard level
JRC	Joint Research Center
M	Month of the project
MSC	Member State Committee
PEF	Product Environmental Footprint
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
RoI	Registry of Intentions
SEAC	Socio-Economic Analysis Committee
SME	Small-medium enterprise
SoC	Substance of Concern
SPI	Sustainable Product Regulation
SSbD	Safe-and-sustainable-by-design
SSRbD	Safe-Sustainable-Recyclable-by-Design
SUP	Single-use Plastic
SVHC	Substance of Very High Concern
UI/UX	User interface/User experience
WFD	Waste Frame Directive
WP	Work package

Executive summary

The purpose of this deliverable (coordinated by **IPC**) is identifying and monitoring the regulation landscape. The document covers the three application domains of SURPASS:

- **Construction (IND):** paying special attention to the human health safety aspects and potential restrictions of the EU-Regulations. No 305/2011, i.e. harmonized conditions for the marketing of construction products,

- **Transport (CID):** use of thermoset composites in Railway sector, based on previous work performed in particular in Mat4Rail project. Additionally, SURPASS counts with representation of Talgo in the SAB, train manufacturer and member of the Europe's Rail Joint Undertaking (EU-Rail), European partnership on rail research and innovation established under Horizon Europe, which building on the achievements of the Shift2Rail Joint Undertaking (S2R), aims to accelerate research and development in innovative technologies and operational solutions supporting the fulfilment of European Union policies and objectives relevant for the railway sector and supporting the competitiveness of the rail sector and the European rail supply industry. Moreover Talgo will give guidance in the industrial requirements of carbod materias and share information in terms of lessons learned as partner of REFRESCO and PIVOT projects.

- Packaging (IPC): links will be made to ongoing initiatives such as the Circular Plastic Alliance, the Plastics Circularity Multiplier conference as abundant knowledge has already been produced.

In addition, EU regulations (REACH, EU Waste Framework Directive and CLP Regulation) have been also analyzed and monitored by **WFO** (benefiting from **CEA** expertise), especially since such regulations are under revision.

National regulations have been monitored as well, including: France, Germany, Spain and Hungary, since motivations and restrictions may differ from EU regulations. These countries were selected as an example, taking into account the origin of the case studies and Consortium Partners of SURPASS Project.

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Introduction

The main objective of SURPASS project is to lead by example in the transition towards more Safe, Sustainable, and Recyclable by Design (SSRbD) polymeric materials. Therefore, develop SSRbD alternatives with no potentially hazardous additives through industrially relevant case studies targeting the three sectors representing 70% of the European plastic demand:

- **Building sector _ Case Study CS#1**: New recyclable-by-design bio-sourced polyurethane (PU) to replace PVC as insulating material for window frames.
- **Transport sector _ Case Study CS#2**: Fire resistant, intrinsically recyclable epoxy-vitrimer materials for sustainable composites to replace metal for train body.
- **Packaging sector _ Case Study CS#3**: Recyclable MultiNanoLayered (MNL) films to replace multi-layer films for packaging with drastically reduced concentrations of compatibilizers.

In particular, WP1 (Landscape analysis for the development of SSRbD polymers and guiding tool) will help building foundation of the main activities scheduled in the project, providing:

- A deep and dynamic analysis of current policy and regulation landscape
- Technical specification definition and strict compilation of data related to foreseen benchmark for each case study
- End-user requirements for the digital infrastructure set up (bottom-up approach to design UI/UX to make it user-friendly.

This deliverable D1.1 is associated with the Task 1.1 within WP1, which is focused on the analysis and monitoring of EU and National regulatory Landscape and ongoing revisions. This deliverable covers three application domains: Construction, Transport and Packaging. Additionally, EU regulations (REACH, EU Waste Framework Directive and CLP Regulation) have been analyzed and monitored. Same analysis was made for National regulations of four different countries, namely France, Germany, Spain, and Hungary, since restrictions and applications may differ from EU regulations. Besides, these four countries were selected as they are the country of origin of the three CSs of the project.

The first version of the Regulatory Landscape Analysis will serve as a guideline. However, since the regulations and restrictions are in constant revision, the SURPASS Project's Consortium will be responsible for the monitoring and updates of this report during the four years duration of the Project (2022-2025).

1 SSRbD (Safe, Sustainable, Recyclable by Design) Materials and Concept

Plastic derives predominantly from fossil feedstock and has reached a global annual production of almost 370 Mtons in 2019 - a substantial portion of it is quickly discarded as waste. Almost 70% of the collected plastic waste in the EU (29.1 Mtons) is currently incinerated, landfilled or exported to other countries causing harm to the economy, wildlife, and eventually to human health. Increasing the recycling percentage is vital to limit global heating to 1.5°C. [1]

Societal urgency dictated by those health and environmental impacts motivates innovators to develop new solutions that are safer, more sustainable and more recyclable by design. However, lack of targeted guidance, holistic vision and the existence of multiple definitions, regulations and standards result in ambiguity and multiplication of criteria.

“The European Union (EU) CSS (Chemical Strategy for Sustainability) action plan anticipates the development of a framework to define safe and sustainable by design (SSbD) criteria for chemicals and materials that should contribute to achieve the Green Deal ambitions, and going beyond current regulatory compliance”. The JRC (Joint Research Centre’s) report aims at proposing such a framework, presenting the dimensions, aspects, methods, and indicators that can be used to assess chemicals and materials and how criteria can be defined in order to identify those that are SSbD. [2]

The aim of SURPASS is to overcome this global challenge by contributing to the safe-, sustainable-, recyclable-by-design (SSRbD) Assessment and guidance dedicated to polymeric materials. [3]

Safe-and-sustainable-by-design (SSbD)

The EC Joint Research Center (JRC) describe the main objectives of the SSbD framework as:

- Promoting the application of the Safe and Sustainable by Design approach to chemicals and materials and steering innovation towards the green industrial transition, resulting in the EU becoming a global reference for safety and sustainability targets;
- Providing guidance on criteria development for the design of ‘safe’ and ‘sustainable’ chemicals/materials;
- Driving innovation towards the substitution or minimisation of the production and use of substances of concern, in line with and beyond upcoming regulatory obligations;
- Minimising or, as far as possible, eliminating the impact on human health, climate and the environment (air, water, soil) along the entire chemical’s and material’s life cycle;

- Enabling comparative assessment of chemicals and materials based on safety and sustainability performance for a given function or application context. [2]

For human and environmental safety dimensions, the EC Joint Research Center (JRC) recommends a two-phase approach in a draft report for the SSbD criteria framework:

- a (re)-design phase in which guiding principles are proposed to support the design of chemicals and materials;
- a step-wise hierarchical approach to address chemical safety, direct toxicological/ecotoxicological impact, and aspects of environmental sustainability [4].

The overall safety and sustainability assessment comprises five steps: The first three steps assess safety aspects such as the hazard properties (**Step 1**), the human health and safety aspects in the chemical/material production and processing phase (**Step 2**), and the human health and environmental effects in the final application phase (**Step 3**). Further, **Step 4** assesses impacts along the entire chemical/ material life cycle, and **Step 5** explores socio-economic aspects, focusing on the available approaches and suggesting potential streamlined assessment methods. [2]

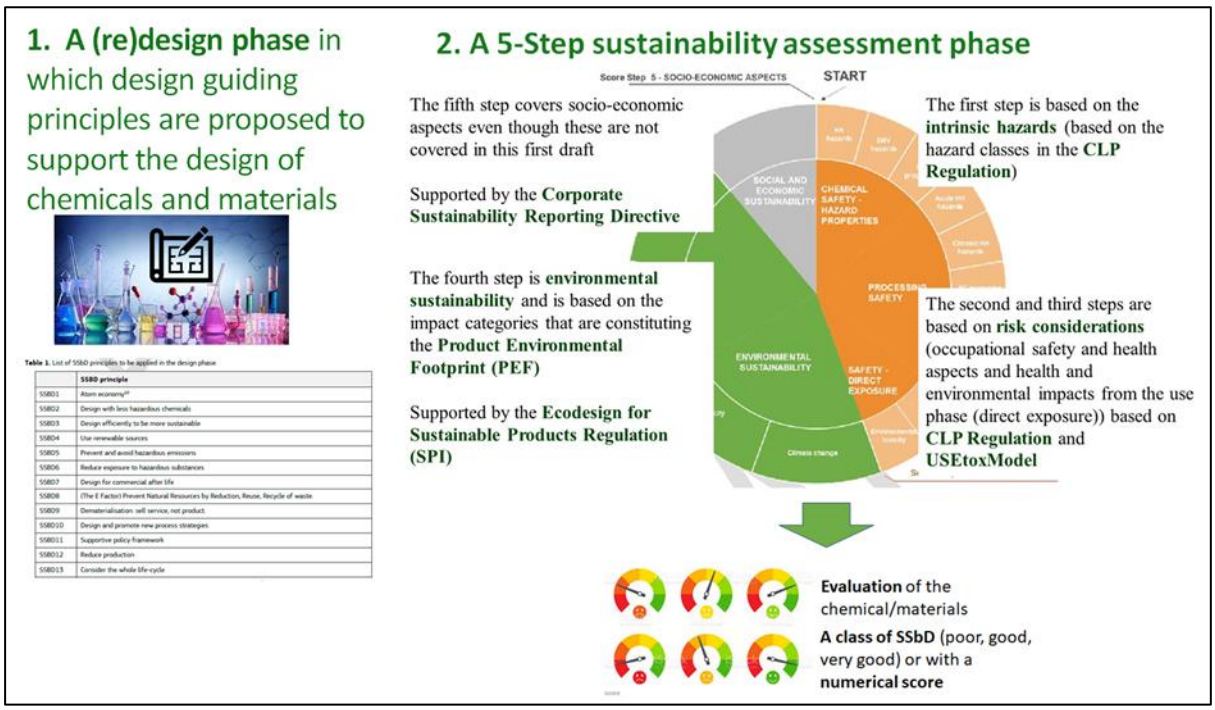


Figure 1 Two-phase process in the JRC framework for the definition of criteria and evaluation procedure for chemicals and materials (adapted from Draft Report for Consultation [4])

The safety concept is related to the absence of unacceptable risk for humans and the environment by avoiding the use of hazardous chemicals [4]. In the EU-CSS, the ambitions towards a toxic-free environment and protection against the most harmful chemicals are evident. An important development is the extension of the generic approach to risk management to ensure that CMR compounds, endocrine system disruptors, or persistent and bio-accumulative chemical species are not present in consumer products. This generic approach will be extended to other harmful chemicals including those affecting the immune, neurological or respiratory systems and chemicals toxic to specific organs [5]. The scope of the EU-CSS is also to protect vulnerable groups which typically include pregnant and nursing women, the unborn, infants and children, the elderly as well as workers and residents subject to high and/or long term chemical exposure [5].

Group definition	Human health hazards	Environmental hazards	Physical hazards
Includes the most harmful substances (according to CSS (EC, 2020a)), including the substances of very high concern (SVHC) according to REACH Art. 57(a-f)[13,14] (EU, 2006). These hazard properties will form Criterion S1.	• Carcinogenicity Cat. 1A and 1B • Germ cell mutagenicity Cat. 1A and 1B • Reproductive / developmental toxicity Cat. 1A and 1B • Endocrine disruption Cat. 1 (human health) • Respiratory sensitisation Cat 1 • Specific target organ toxicity - repeated exposure (STOT-RE) Cat. 1, including immunotoxicity and neurotoxicity	• Persistent, bioaccumulative and toxic / very persistent and very bioaccumulative (PBT/vPvB) • Persistent, mobile and toxic / very persistent and mobile (PMT/vPvM) • Endocrine disruption Cat. 1 (environment)	
Includes hazardous substances with chronic effect, which are part of the substances of concern, described in CSS (EC, 2020a) and are not included already in Criterion S1. These hazard properties will form Criterion S2.	• Skin sensitisation Cat 1 • Carcinogenicity Cat. 2 • Germ cell mutagenicity Cat. 2 • Reproductive / developmental toxicity Cat. 2 • Specific target organ toxicity - repeated exposure (STOT-RE) Cat. 2 • Specific target organ toxicity - single exposure (STOT-SE) Cat. 1 and 2 • Endocrine disruption Cat. 2 (human health)	• Hazardous for the ozone layer • Chronic environmental toxicity (chronic aquatic toxicity) • Endocrine disruption Cat. 2 (environment)	
Includes the other hazard classes not part already in Criteria S1 and S2. These hazard properties will form Criterion S3.	• Acute toxicity • Skin corrosion • Skin irritation • Serious eye damage/eye irritation • Aspiration hazard (Cat. 1) • Specific target organ toxicity - single exposure (STOT-SE) Cat. 3	• Acute environmental toxicity (acute aquatic toxicity)	• Explosives • Flammable gases, liquids and solids • Aerosols • Oxidising gases, liquids, solids • Gases under pressure • Self-reactive • Pyrophoric liquids, solid • Self-heating • In contact with water emits flammable gas • Organic peroxides • Corrosivity • Desensitised explosives

Figure 2 List of aspects and indicators (hazard properties) relevant for Step 1 [4])

Table 1 Overview of dimensions and aspects covered in the assessment phase from the EC JRC draft report for defining criteria for SSbD chemicals and materials (adapted from [4])

Dimension	*Aspect*
Safety of chemical and material – hazard-based approach	Human health hazards
	Environmental hazards
	Physical hazards
Chemical or material processing safety – occupational safety and health aspects	Acute human hazards
	Chronic human hazards
	Physical properties
	Hazards from release behavior
	Process-related hazards
Safety – direct exposure	Human health
	Ecotoxicity
Environmental sustainability – Life cycle assessment	Climate change
	Human toxicity - cancer
	Human toxicity – non-cancer
	Ecotoxicity
	Particulate matter
	Ionizing radiation
	Ozone depletion
	Eutrophication terrestrial
	Eutrophication fresh water
	Eutrophication marine
	Ozone formation
	Acidification
	Fossil resources
	Mineral and metal resources
	Soil quality index
	User deprivation potential (deprivation weighted water consumption)

Sustainability

Sustainability covers and integrates safety, economic, environmental, and social aspects to avoid harm to humans and the environment [4]. Sustainability also supports the EU Green Deal [6] whose ambitions include becoming climate neutral; protecting human life, animals and plants by cutting pollution; helping companies become world leaders in clean products and technologies; and being inclusive helping ensure a just and inclusive transition [7].

Global consumption of materials such as biomass, fossil fuels, metals and minerals is expected to double in the next forty years, while annual waste generation is projected to increase by 70% by 2050. Applying the circular economy from front-runners to the mainstream economic players will make a decisive contribution to achieving climate neutrality by 2050, decoupling economic growth from resource use. In order to achieve this ambition, the EU needs to accelerate the transition towards a regenerative growth model to reduce our consumption footprint and double the circular material use rate in the coming decade [8].

Additionally, sustainability also includes Biodiversity Strategy. The latter suggests to minimize or, eliminate if possible, the impact on human health, climate and the environment (air, water, soil) along the chemical's and material's entire life cycle, ensuring sustainable circularity, and Chemicals release during the life cycle. [2]

The Circular Economy Action Plan aims to accelerate the changes required by the European Green Deal, while building on circular economy actions implemented since 2015.This plan will ensure that the regulatory framework is respected and adapted for a sustainable future. It will contribute to establish a strong and coherent product policy framework that will make sustainable products, services and business models the norm. The main focus is to transform consumption patterns in a way that no waste is produced in the first place [8].

'In the context of chemicals, sustainability can be seen as the ability of a chemical, material, product or service to deliver its function without exceeding environmental and ecological boundaries along its entire life cycle, while providing welfare and socio-economic benefits [4], [9]'.

2 Standard European Regulations landscape and ongoing revisions

European law takes precedence over national law. The following five categories of legal acts can be published on the Official Journal of the European Union. Some apply to all EU countries, others to just a few:

- **Regulations:** a "regulation" is a binding legislative act. It must be applied in its entirety across the whole European Union.
- **Directives:** a "directive" is a legislative act that sets out a goal that all EU countries must achieve. However, it is up to the individual countries to devise their own laws on how to reach these goals.
- **Decisions:** a "decision" is binding on those to whom it is addressed – e.g., an EU country or an individual company – and is directly applicable.
- **Recommendations:** a "recommendation" is not binding. A recommendation allows the institutions to make their views known and to suggest a line of action without imposing any legal obligation on those to whom it is addressed.
- **Opinions:** an "opinion" is an instrument that allows the institutions to make a statement in a non-binding fashion, in other words without imposing any legal obligation on those to whom it is addressed. An opinion is not binding. It can be issued by the main EU institutions (Commission, Council, Parliament), the Committee of the Regions and the European Economic and Social Committee. While laws are being made, the committees give opinions from their specific regional or economic and social viewpoint.

2.1 REACH Regulation (Regulation EC 1907/2006)

The Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation is a piece of legislation that aims to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. It also promotes alternative methods for the hazard assessment of substances in order to reduce the number of tests on animals. REACH also aims to enhance innovation and competitiveness of the EU chemicals industry.

- **Registration:** Companies are responsible for collecting information on the properties and uses of the substances they manufacture or import above one ton a year. They also have to assess

the hazards and potential risks presented by the substance. This information is communicated to ECHA through a registration dossier containing the hazard information and, where relevant, an assessment of the risks that the use of the substance may pose and how these risks should be controlled. Registration is based on the "one substance, one registration" principle. This means that manufacturers and importers of the same substance have to submit their registration jointly.

- **Evaluation:** Registered substances are allowed to freely circulate on the European market. Companies must ensure that the information contained in their dossiers is correct and changes are reported without delay. This stems from the principle of REACH that the registrants must ensure the substances used and placed on the market do not adversely affect human health or the environment. The REACH evaluation provisions give ECHA the responsibility to check whether registrations comply with the requirements of this Regulation.
- **Authorisation:** It aims to ensure that Substances of Very High Concern (SVHCs) are progressively replaced by less dangerous substances or technologies whenever technically and economically feasible alternatives are available. The route to authorisation starts when the European Chemical Agency (ECHA) – at the request of the European Commission – or a Member State proposes a substance to be identified as a SVHC by preparing a dossier in line with the requirements set out in Annex XV to REACH. The process take place in three phases:
    - ✓ Substances of very high concern (SVHC) Registration, Preparation of the SVHC dossier, Consultation and Addition to the Candidate List.
    - ✓ Recommendation for inclusion in the Authorisation List. Prioratisation, Draft Recommendation, Consultation, MSC opinion, and Recommendation and Inclusion in the Autorisation List.
    - ✓ Application for Authorisation. Application for Authorisation, Consultation, Risk Assessment Committee (RAC) and Socio-economic Analysis (SEAC) opinion, Commission decision, Implementation, Review period.

  Substances with hazardous properties may be identified as SVHCs and included in the Candidate List. The inclusion into the Candidate List already brings obligations for the suppliers of the substance
    - ✓ supplying a safety data sheet
    - ✓ communicating on safe use
    - ✓ responding to consumer requests within 45 days and

- ✓ notifying ECHA if the article they produce contains an SVHC in quantities above one tonne per producer/importer per year and if the substance is present in those articles above a concentration of 0.1% (w/w).

All SVHCs are included in the Candidate List, which is updated by ECHA twice a year. Substances with priority are: Persistent, Bioaccumulative and Toxic substances (PBT) or Very Persistent, Very Bioaccumulative (vPvB) or Wide-dispersive use or High Volumes. Also, endocrine disruptors and substances that are carcinogenic, toxic to reproduction or very persistent are included.

Based on the prioritisation, a number of substances are proposed in the draft recommendation. The draft has to include the sunset date from which the placing on the market and use of a substance is prohibited (unless an authorisation is granted or the use is exempt from authorisation), the latest application date by which applications must be received, review periods if any, and exemptions from the authorisation requirement.

The European Commission decides on the substances to be included in the Authorisation List and on the final entries (sunset date, latest application date, review period, exemptions).This decision is published in the Official Journal and the Authorisation List is updated by ECHA's website. Companies that want to continue using a substance included in the Authorisation List after the sunset date need to prepare an application for authorisation and submit it before the latest application date. The latest application date and the sunset date are specified in the Authorisation List.

- **Restriction:** Restrictions are an instrument to protect human health and the environment from unacceptable risks posed by chemicals. Restrictions are normally used to limit or ban the manufacture, placing on the market (including imports) or use of a substance, but can impose any relevant condition, such as requiring technical measures or specific labels.

  A restriction may apply to any substance on its own, in a mixture or in an article, including those that do not require registration, for example, substances manufactured or imported below one tonne per year or certain polymers. On-site isolated intermediates are exempted from those substances to which REACH restriction applies.

  Once the restriction has been adopted, the industry must comply, including manufacturers, importers, distributors, downstream users and retailers. The REACH Regulation places responsibility on industry to manage the risks from chemicals and to

provide safety information on the substances. Manufacturers and importers are required to gather information on the properties of their chemical substances, which will allow their safe handling, and to register the information in a central database in the European Chemicals Agency (ECHA).The Agency is the central point in the REACH system, including a braod database in which consumers and professionals can find hazard information.

The Regulation also calls for the progressive substitution of SVHCs when suitable alternatives exist.

2.2 CLP Regulation (Regulation EC 1272/2008)

The Classification, Labelling and Packaging (CLP) Regulation (EC) 1272/2008 is based on the United Nations' Globally Harmonised System (GHS) and its purpose is to ensure a high level of protection of health and the environment, as well as the free movement of substances, mixtures and articles.

CLP is legally binding across the Member States and directly applicable to all industrial sectors. It requires manufacturers, importers or downstream users of substances or mixtures to classify, label and package their hazardous chemicals appropriately before placing them on the market.

One of the main aims of CLP is to determine whether a substance or mixture displays properties that lead to a hazardous classification. In this context, classification is the starting point for hazard communication.

When relevant information on a substance or mixture meets the classification criteria in CLP, the hazards of a substance or mixture are identified by assigning a certain hazard class and category. The hazard classes in CLP cover physical, health, environmental and additional hazards.

Once a substance or mixture is classified, the identified hazards must be communicated to other actors in the supply chain, including consumers. Hazard labelling allows the hazard classification, with labels and safety data sheets, to be communicated to the user of a substance or mixture, to alert them about the presence of a hazard and the need to manage the associated risks.

CLP sets detailed criteria for the labelling elements: pictograms, signal words and standard statements for hazard, prevention, response, storage and disposal, for every hazard class and category. It also sets general packaging standards to ensure the safe supply of hazardous substances and mixtures. In

addition to the communication of hazards through labelling requirements, CLP is also the basis for many legislative provisions on the risk management of chemicals.

The current list of regulated chemicals and their categories can be found on the ECHA website (https://echa.europa.eu/information-on-chemicals/annex-vi-to-clp).

2.3 Waste Framework Directive (Directive 2018/851 of the European Parliament and the Council on amending Directive 2008/98/EC on waste)

It sets the basic concepts and definitions related to waste management, such as the definitions of waste and recycling. It introduces the waste hierarchy, the Polluter Pays Principle, and the Extended Producer Responsibility and sets out separate collection targets.The Waste Framework Directive sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery; and lays down some basic waste management principles. It requires that waste is managed:

- without endangering human health and harming the environment;
- without risk to water, air, soil, plants or animals;
- without causing a nuisance through noise or odours; and
- without adversely affecting the countryside or places of special interest

It explains when waste ceases to be waste and becomes a secondary raw material, and how to distinguish between waste and by-products. The Directive also introduces the "polluter pays principle" and the "extended producer responsibility".

The foundation of EU waste management is the five-step “waste hierarchy”, established in the Waste Framework Directive. It sets an order of preference for managing and disposing of waste.

Figure 3 Schema of the "waste hierarchy" established in the Waste Framework Directive.

To comply with the objectives of this Directive, EU countries shall take the necessary measures to ensure that the preparation for re-use and recycling of municipal waste will increase to a minimum of 55%, 60% and 65% by weight by 2025, 2030 and 2035, respectively.

Hazardous waste

Hazardous wastes pose a greater risk to the environment and human health than non-hazardous waste and therefore require a stricter control regime.

The Waste Framework Directive provides additional labelling, record keeping, monitoring and control obligations from the "cradle to the grave", in other words from the waste production to the final disposal or recovery. It also bans the mixing of hazardous waste with other categories of hazardous waste, and with non-hazardous waste.

The classification into hazardous and non-hazardous waste is based on the system for the classification and labelling of dangerous substances and preparations. This ensures that similar principles are applied over the whole life cycle of materials.

By-products

The Waste Framework Directive defines by-products as a substance or object, resulting from a production process, the primary aim of which is not the production of that item. By-products can come from a wide range of business sectors, and can have very different environmental impacts. It is

important to classify by-products correctly to avoid environmental damage or unnecessary costs for business.

End-of-waste criteria

End-of-waste criteria specify when certain waste ceases to be waste and becomes a product, or a secondary raw material.

Certain specified waste ceases to be waste when it has undergone a recovery operation (including recycling) and complies with specific criteria, in particular when:

- the substance or object is commonly used for specific purposes;
- there is an existing market or demand for the substance or object;
- the use is endorsed (substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products);
- the use will not lead to overall adverse environmental or human health impacts.

2023 Waste Framework Directive revision

Despite political initiatives and existing legislation, the municipal waste generation in the EU has shown a slight increase in last decades, being registered in the range of 467-505 Kg/year/person during the period from 1995 to 2020 [10]. Low recycling rates, as well as lower quality of the recycled-material, are in part due to inefficient waste-collection systems. For some specific streams, such as waste oils and textile, evidence indicated that the polluter pays principle is not fully implemented and that some waste may be illegally disposed of, leading to pollution.

Therefore, the European Commission is currently working on a targeted revision of the Waste Framework Directive. This revision aims to improve the overall environmental outcome of waste management in line with the waste hierarchy and the implementation of the polluter pays principle, potentially via Extended Producer Responsiblity schemes. It will focus on the following policy areas: prevention, separate collection, waste oils and textiles.

The responses from the Call for Evidence reflected on the need to address consumption and promote direct re-use and design for circularity in order to avoid waste prevention. This call for evidence was opened for feedback until 22 February 2022. Additionally, a broader set of consultations was planned

in the first half of 2022 to ensure that, across a series of activities, all relevant participants are given an opportunity to express their views on the current performance of the WFD, including what may be working well or not, and how it could be improved [11].

The Waste Framework Directive provides for review clauses on prevention measures, food waste, and waste oils. The European Green Deal includes a political commitment to 'simplify waste management for citizens and ensure cleaner secondary materials for businesses'. Furthermore, the Circular Economy Action Plan commits to significantly reducing total waste generation: it aims to halve the amount of residual (non-recycled) municipal waste by 2030, promote safer and cleaner waste streams, and ensure high-quality recycling. This initiative will integrate the initiative for the reduction of food waste, as the latter constitutes a significant share of municipal waste.

The Waste Framework Directive expands significantly the reporting obligations from REACH; to establish a central database of products containing hazardous substances.

As a result, producers, assemblers, importers, and distributors of articles containing SVHCs above 0.1 %(w/w) threshold have to collect more information on these items in addition to the data required under the REACH Regulation.

2.4 Additional legislations within the interest of SURPASS Project

2.4.1 The European Green Deal (11/12/2020)

It provides the overall EU strategy to achieve the efficient use of resources by moving from a linear to a circular economy model. The agreement aims to reduce waste generation, foresee changes in the EU waste collection, restore biodiversity and cut pollution.

The European Commission adopted a set of proposals to make the EU's climate, energy, transport, and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

All the Member States of the European Union committed to turning the EU into the first climate-neutral continent [5].

2.4.2 Chemical Sustainability Strategy (CSS)

In 2020, The European Commission adopted the Chemicals Strategy for Sustainability. This strategy is in the context of the broader European Green Deal. Its main objective is to better protect citizens

and the environment from harmful chemicals, and boost innovation by promoting the use of safer and more sustainable chemicals [5].

Chemicals are the building blocks of the goods we use, and for new materials needed for a circular and climate neutral economy, the CSS fits particularly into the point of the EU's zero pollution ambition. Moreover, chemicals production is also an energy and CO_2-intense industrial sector. Shifting towards chemicals and production technologies that require less energy will limit emissions.

Parallelly, the European Chemical Agency (ECHA) contributes to the strategy with its scientific and expertise and databases [5].

2.4.3 Microplastics Restriction

Microplastics are solid plastic particles composed of mixtures of polymers and functional additives. They may also contain residual impurities. They can be unintentionally formed when larger pieces of plastic, like car tyres or synthetic textiles, wear and tear. But they are also deliberately manufactured and added to products for specific purposes, in a range of products including fertilisers, plant protection products, cosmetics, household and industrial detergents, cleaning products, paints and products used in the oil and gas industry.

Within the framework of the European Green Deal and the New Circular Economy Action Plan, the Commission announced a new initiative to tackle the unintentional release of microplastics into the environment [12].

The objectives are:

- Develop labelling, standardization, certification, and regulatory measures on the unintentional release of microplastics, including measures to increase microplastic capture at all relevant stages of the product life cycle;
- Continue developing and harmonizing the measurement methods of microplastics released unintentionally;
- Develop scientific knowledge related to the risk and presence of microplastics in the environment, drinking water and food;
- The European Chemical Agency, has proposed to the European Commission restrictions on microplastics that are intentionally added to products and are inevitably released into the environment. According to the proposal, the concentration of microplastic in a mixture should not exceed 0.01%. This would be almost equal to a ban in the European Union. The proposition

may be adopted in the year 2022. It is expected that the restriction would prevent the release of 500,000 tonnes of microplastics in a period of 20 years.

2.4.4 REACH Revision under the Chemicals Sustainability Strategy

The overall objective of the initiative is to ensure that the provisions of the REACH Regulation reflect the ambitions of the European Commission on innovation and a high level of protection of health and the environment, while preserving the internal market, as provided for in the Chemicals Strategy for Sustainability.

To address the problems identified, a range of measures will be considered, including:

- **Reforming the authorisation process:** Options include clarifications and simplifications of the current provisions, national authorisation for smaller applications, removing the authorisation title from REACH, integrating the REACH authorisation and restriction systems into one and improving the interface with other pieces of legislation. As well, complementing actions under the one-substance one-assessment action under the Chemicals Strategy.
- **Reforming the restriction process:** Options include extending the “Generic Risk Management Approach” (GRA) to restrictions to Endocrine Disruptors (ED), PBT (Polybutylene Terephthalate) and vPvB (very Persistent and very Bioaccumulative) substances, immunotoxicants, neurotoxicants, respiratory sensitisers and substances that affect specific organs ; extending the generic risk approach to products marketed for professional use; and operationalising the concept of “Essential Use” in restrictions, including the criteria for granting derogations.
- **Essential Uses:** There are hazardous chemicals, which are nevertheless needed for the society functioning, and hence should not be easily banned. To solve this dilemma, the European Commission is planning to introduce the essential use concept, "to ensure that the most harmful chemicals are only allowed if their use is necessary for health, safety or is critical for the functioning of society and if there are no alternatives that are acceptable from the standpoint of environment and health." In this way, an essential use is basically a bypass to the generic approach to risk management. If a chemical is banned by the generic approach, it may still be used, if the use is essential.

By the end of 2022, the European Commission is expected to present the proposal for the REACH revision.

All the directives dealing with safety at work are also applicable in the frame of SURPASS Project. These directives should be transposed in national legislations that the project partners must ensure compliance with. Council Directive of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work (89/391/EEC) highlights the employers and workers responsibility and introduces the nine prevention principles to be followed:

a. avoiding risks;
b. evaluating the risks which cannot be avoided:
c. combating the risks at source;
d. adapting the work to the individual, especially as regards the design of work places, the choice of work equipment and the choice of working and production methods, with a view, in particular, to alleviating monotonous work and work at a predetermined work-rate and to reducing their effect on health.
e. adapting to technical progress;
f. replacing the dangerous by the non-dangerous or the less dangerous;
g. developing a coherent overall prevention policy which covers technology, organization of work, working conditions, social relationships and the influence of factors related to the working environment;
h. giving collective protective measures priority over individual protective measures;
i. giving appropriate instructions to the workers.

In the 16th article, the adoption on individual directives is forecasted. Two of them are listed below:

1. ***Directive 2004/37/EC of the European Parliament and of the Council of 29 April 2004*** on the protection of workers from the risks related to exposure to carcinogens or mutagens at work (Sixth individual Directive within the meaning of Article 16(1) of Council Directive 89/391/EEC) sets the definition of carcinogen and mutagen. This directive detailed the employers responsibilities:
    - Reduction of the use of carcinogen and mutagen by replacing them
    - Reduction of exposure (closed system, level of exposure as low as technically possible, limit value respect, etc.)
    - Information of the competent authority
    - Unforeseen exposure anticipation (information of workers, limitation of workers)
    - Appropriate measure for the foreseeable exposure (maintenance, cleaning, etc.)

- Access limitation
- Appropriate measures for hygiene and industrial protection
- Information, training and consultation of workers

2. ***Council Directive 98/24/EC of 7 April 1998*** on the protection of the health and safety of workers from the risks related to chemical agents at work (fourteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) lays down minimum requirements. Definitions (hazardous chemical agents, occupational exposure limit values …) are first settled in the general provision, then the requirements for limits (occupational exposure or biological) are presented. The employer's obligations are then detailed. Annexes list the binding occupational exposure limit values, the binding biological limit values and the chemical agents prohibited.

The following lists of substances will be a consistent support to be monitored during the project:

- ***Candidate List of substances of very high concern for Authorisation*** (published in accordance with Article 59(10) of the REACH Regulation) : *https://echa.europa.eu/candidate-list-table*
- ***List of substances included in Annex XIV of REACH ("Authorisation List") :*** *https://echa.europa.eu/fr/authorisation-list*
- ***Annex XVII to REACH includes all the restrictions adopted in the framework of REACH and the previous legislation:***
  https://echa.europa.eu/fr/substances-restricted-under-reach
- ***Community rolling action plan (CoRAP):*** If a substance is on this list, it means that a Member State has evaluated or will evaluate it over the coming years.
  https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table
- ***Public Activities Coordination Tool (PACT):*** *it provides an overview of the substance-specific activities that authorities are working on under REACH and the CLP Regulation:*
  https://echa.europa.eu/fr/pact
- ***CLP:*** the only official and legally-binding harmonised classification and labelling is available in Table 3 to Annex VI of CLP and its subsequent ATPs published in the Official Journal of the European Union. ECHA has prepared this unofficial excel table only for convenience and ease of use:
  https://echa.europa.eu/fr/information-on-chemicals/annex-vi-to-clp

2.5 National regulation landscape and ongoing revisions

2.5.1 France

This section lists in Table 2 the French legislation associated to the European directives before mentioned.

Table 2 French transposition to the generic European directives to be monitored during the project

Directive n° (known as …)	French transposition
2012/18/EU - Seveso	***LOI*** n° 2013-619 du 16 juillet 2013 ; ***Décret*** n°2014-284 du 3 mars 2014 ; ***Décret*** n°2014-285 du 3 mars 2014 ; ***Décret*** n°2015-1652 du 11 décembre 2015
2018/851 – Waste Framework	***Décret*** n°2019-190 du 14 mars 2019 ; ***LOI*** n° 2019-1479 du 28 décembre 2019 ; ***LOI*** n° 2020-105 du 10 février 2020 ; ***Ordonnance*** n°2020-920 du 29 juillet 2020 ; ***Décret*** n°2021-321 du 25 mars 2021 ; ***Décret*** n°2021-380 du 1er avril 2021 ; ***Décret*** n°2021-950 du 16 juillet 2021
89/391/EEC – Safety and health at work	***Décret*** n°60-72 du 15 janvier 1960 ; ***Décret*** n°60-965 du 9 septembre 1960 ; **Arrêté** du 10 avril 1972 **Arrêté** du 10 avril 1972. ; **Décret** n° 82-453 du 28 mai 1982 ; **LOI** n°82-1153 du 30 décembre 1982 ; **Décret** n°84-1029 du 23 novembre 1984 ; **Décret** n°85-603 du 10 juin 1985 ; **Décret** n°85-755 du 19 juillet 1985 ; **Décret** n°85-946 du 16 août 1985 ; **Décret** n°85-947 du 16 août 1985 ; **LOI** n° 91-1414 du 31 décembre 1991 ; **Décret** n°92-158 du 20 février 1992 ; **Décret** n°92-332 du 31 mars 1992 **Décret** n°92-333 du 31 mars 1992 ; **DECRET**95-694 & **DECRET**95-696 ; **Arrêté** du 26 décembre 1995 **DECRET96-859** ; **Arrêté** du 30 octobre 1996 ; **DECRET9**7-451 & **DECRET**97-452 ; **LOI** n° 97-1051 du 18 novembre 1997 ; **Décret** n°98-588 du 9 juillet 1998 ; **DECRET**99-116 ; **Décret** n° 2000-542 du 16 juin 2000 ; **Ordonnance** n° 2001-175 du 22 février 2001 ; **Décret**2001-232 ; **Arrêté** du 15 mars 2001 ; **Décret** n°2001-1016 du 5 novembre 2001 ; **Décret**2001-1381 ; **LOI** n° 2002-73 du 17 janvier 2002 ; **Décret**2002-146 & **Décret**2002-155 & **Décret**2002-670 ; **Arrêté** du 3 mai 2002 ; **Décret**2003-546 & **Décret**2003-1118 ; **Arrêté** du 24 décembre 2003 ; **Décret** n°2004-760 du 28 juillet 2004 ; **Décret**2007-164 ; **Décret** n°2007-1288 du 29 août 2007 ; **LOI** n°2008-67 du 21 janvier 2008 ; **Décret** n°2008-1347 du 17 décembre 2008 ; **Décret** n°2009-289 du 13 mars 2009 ; **LOI** n° 2009-526 du 12 mai 2009
2004/37/EC – Carcinogenic or mutagens at work	**Arrêté** du 13 juillet 2006
98/24/EC – Chemical agents at work	**Décret** n°2003-1254 du 23 décembre 2003

2.5.2 Germany

This section lists in **Table** 3 the German legislation associated to the European directives aforementioned.

Table 3 German transposition to the generic European directives to be monitored during the project

Directive n° (known as …)	German transposition
2018/851 – Waste Framework	Management Act (KrWG) on September 17, 2020 [13]
89/391/EEC – Safety and health at work	Act on the Implementation of Measures of Occupational Safety and Health to Encourage Improvements in the Safety and Health Protection of Workers at Work (Arbeitsschutzgesetz, ArbSchG) [14]
2004/37/EC – Carcinogenic or mutagens at work	Hazardous Substances Ordinance of 26 November 2010 (Federal Law Gazette (Bundesgesetzblatt) I, p. 1643, 1644), last amended by Article 2 of the Ordinance of 21 July 2021 (Federal Law Gazette I, p. 3115)"[15]
98/24/EC – Chemical agents at work	

2.5.3 Spain

This section lists in Table 4 the Spanish legislation associated to the European directives aforementioned.

Table 4 Spanish transposition to the generic European directives to be monitored during the project

Directive n° (known as …)	Spanish transposition
2018/851 – Waste Framework	Real Decreto 553/2020, Real Decreto 293/2018, Real Decreto 110/2015, Ley 22/2011, Orden APM/1007/2017, de 10 of October Ley 7/2022 [16]
89/391/EEC – Safety and health at work	Ley 31/1995, de 8 de noviembre, de prevención de Riesgos Laborales. [17]
2004/37/EC – Carcinogenic or mutagens at work	Real Decreto 1154/2020, de 22 de diciembre, por el que se modifica el Real Decreto 665/1997 [18]
98/24/EC – Chemical agents at work	Real Decreto 374/2001, de 6 de abril, [19]

2.5.4 Hungary

This section lists in Table 5Table 4 the Hungarian legislation associated to the European directives aforementioned.

Table 5 Hungarian transposition to the generic European directives to be monitored during the project

Directive n° (known as …)	Hungarian transposition
2018/851 – Waste Framework	**Hungarian Waste Management Framework Act: 2012. CLXXXV**. (modified 25.02.2021) ; **Mandatory separate collection of biowaste** (31.12.2023), **Hazardous waste** (01.01.2025), **Textile waste** (01.01.2025).
89/391/EEC – Safety and health at work	**Act LXXV of 2000** on the proclamation of Convention No 155**; Directive** 89/654/EEC of 30 November 1989; **Directive** 90/270/EEC of 29 May 1990 ; **Directive** 92/58/EEC of 24 June 1992; **Directive** 92/85/EEC of 19 October; **Directive** 94/33/EC of 22 June 1994 ; **Directive** 89/656/EEC of 30 November 1989
2004/37/EC – Carcinogenic or mutagens at work	**Directive** 2004/37/EC of 29 April 2004; **Directives** 2000/39/EC and 2009/161/EC; **Directive** (EU) 2017/2398/EC of 12 December 2017 amending **Directive** 2004/37/EC
98/24/EC – Chemical agents at work	**Act XXV** of 2000; **ITM Decree** 5/2020 (II. 6.) ; **Directive** 98/24/EC; **Regulation** (EC) No 1907/2006, amending **Directive** 1999/45/EC, repealing Council **Regulation** (EEC) No 793/93 and **Commission Regulation** (EC) No 1488/94; **Council Directive** 76/769/EEC ; **Commission Directives** 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

3 Building sector regulation landscape and ongoing revisions

This chapter concerns the first case study named: “New recyclable-by-design bio-sourced polyurethane (PU) to replace PVC as an insulating material for window frames.”

Building regulations set minimum quality requirements to ensure that buildings are safe, healthy, and energy-efficient to everyone who lives and works in and around them. European and national regulations aim to guarantee the application and enforcement of these minimum requirements.

The purpose of this chapter is to investigate the building sector regulation landscape and ongoing revisions in both Europe, and the countries concerned by the project: Spain, France, Germany, and Hungary.

In this part, ***the human health safety aspects, and potential restrictions of the EU-Regulation N° 305/2011 will be the main topic to be analyzed*** along with the harmonized conditions for the marketing of construction products.

3.1 European regulation landscape and ongoing revisions

The building environment has a significant impact on many sectors of the economy, on local jobs and quality of life. It requires vast amounts of resources and accounts for about 50% of all extracted material. The construction sector is responsible for over 35% of the EU’s total waste generation.

Greenhouse gas emissions from material extraction, manufacturing of construction products, construction and renovation of buildings are estimated at 5-12% of total national GHG emissions. Greater material efficiency could save 80% of those emissions [20].

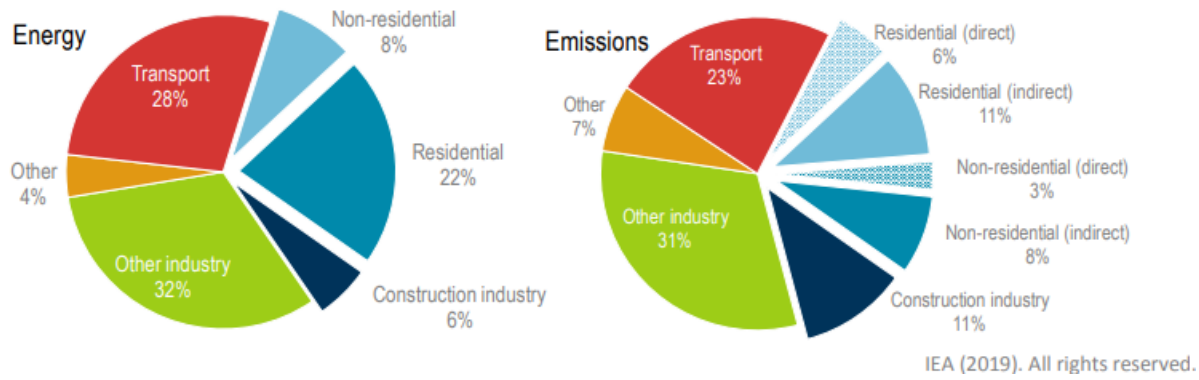


Figure 4 Global share of buildings and construction final energy and emissions, 2018 [21]

To exploit the potential for increasing material efficiency and reducing climate impacts, the Commission will launch a new comprehensive Strategy for a Sustainable Built Environment. This Strategy will ensure coherence across the relevant policy areas such as climate, energy and resource efficiency, management of construction and demolition waste, accessibility, digitalization, and skills.

Furthermore, the 'Renovation Wave' initiative announced in the **European Green Deal** to lead to significant improvements in **energy efficiency** in the EU will be implemented in line with circular economy principles, notably optimized lifecycle performance, and longer life expectancy of build assets. As part of the revision of the recovery targets for construction and demolition waste, the Commission will pay special attention to insulation materials, which generate a growing waste stream"[22]. Therefore, the Commission will enforce the legislation related to the energy performance of buildings. This will start with an assessment in 2020 of Member States' national long-term renovation strategies. In addition, The Commission will start to work on the possibility of including emissions from buildings in European emissions trading, as part of broader efforts to ensure that the relative prices of different energy sources provide the right signals for energy efficiency [23].

Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

The Regulation (EU) No 305/2011 (annex 1) aims to make the single market work better and improve the free movement of construction products in the EU, by laying down uniform rules for the marketing of these products and by providing a common technical language to assess the performance of construction products.

3.1.1.1 Key points of EU regulation No 305/2011

- The regulation sets out the conditions for the marketing of construction products.
- It sets out methods and criteria for assessing and expressing the performance of construction products, and the conditions for the use of CE marking.
- EU countries, on the other hand, are responsible for fire safety, mechanical resistance and stability, environmental, energy and other requirements applicable to construction works [24].

3.1.1.2 Harmonized technical specifications

"Harmonized technical specifications" include harmonized standards and European Assessment Documents. Harmonized standards are drawn up by European standardization bodies (European Committee for Standardization or European Committee for Electrotechnical Standardization) on the

basis of requests issued by the European Commission. Harmonized standards define the methods and the criteria for assessing the performance of construction products.

Harmonized European standards create a common technical language used by all actors in the construction sector to:

- Define requirements (regulatory authorities in EU countries);
- Declare the product's performance (manufacturers);
- Verify compliance with requirements and demands (design engineers, contractors).

Supporting testing standards relevant to construction products cover:

- Resistance to fire, reaction to fire, external fire performance, noise absorption;
- Construction products in contact with drinking water;
- Release of dangerous substances into indoor air, soil and (ground)water; " [6]

In the case of rigid polyurethane foam windows in phase of development, the matter of fire safety and air quality is most important due to its chemical formulation.

Harmonized standards that can concern bio-polyurethane window frames:

- EN 16034:2014 Pedestrian doorsets, industrial, commercial, garage doors and openable windows - Product standard, performance characteristics - Fire resisting and/or smoke control characteristics
- EN 14351-1:2006+A2:2016 Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian doorsets
- EN 13165:2012+A2:2016 Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products – Specification

3.1.1.3 Provisions in for issuing ETA (for products not covered by harmonised standards)

For products which are not covered or not fully covered by harmonised standards the manufacturer may in line with Article 19 (annex 1) of the CPR submit a request to obtain a European Technical Assessment (ETA). The ETA is issued by one of the Technical Assessment Bodies designated for this purpose by the Member States.

In order to determine the assessments necessary for products not covered by harmonized standards, EOTA (the organization of the TABs) has collected national provisions related to the content of

dangerous substances and has used also the relevant information available in CEN. This resulted in the elaboration of a checklist which the EOTA bodies apply for assessing the product to issue a European Technical Assessment. [25]

3.1.1.4 Air quality and release of dangerous substances in construction sector

In order to elaborate European assessment methods concerning dangerous substances the Commission has issued in 2005 Mandate M/366 to CEN/CENELEC (based on Directive 89/106/EEC), requesting the development of horizontal assessment methods for dangerous substances.

The Commission has thus requested CEN/CENELEC to develop assessment methods for dangerous substances regulated either through national or through European legislation. CEN Technical Committee TC/351 has undertaken the work requested by Mandate M/366. In January 2014 the Technical Committee finalized the following documents:

CEN/TS 16516:2013: Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air

CEN/TR 16496:2013: Construction Products - Assessment of release of dangerous substances - Use of harmonised horizontal assessment methods

CEN/TR 16410:2012: Construction products - Assessment of release of dangerous substances - Barriers to use - Extension to CEN/TR 15855 Barriers to trade.

CEN/TR 16220:2011: Construction products - Assessment of release of dangerous substances - Complement to sampling.

CEN/TR 16098:2010: Construction products: Assessment of release of dangerous substances - Concept of horizontal testing procedures in support of requirements under the CPD.

CEN/TR 16045:2010: Construction Products - Assessment of release of dangerous substances - Content of regulated dangerous substances – Selection of analytical methods.

CEN/TR 15858:2009: Construction products - Assessment of the release of regulated dangerous substances from construction products based on the WT/WFT procedures.

CEN/TR 15855:2009: Construction products - Assessment of release of dangerous substances - Barriers to trade.

When the intended use of a construction product is such that the product may contribute to the generation and spread of fire and smoke within the room or area of origin or beyond, the performance of the product in relation to its reaction to fire shall be classified in accordance with the classification system set out in the ***Annex 3***. [26]

REACH & its consequences for the construction products

REACH imposes several obligations on the construction sector as it is directly applicable to manufacturing of construction materials or their chemical components, but also to downstream construction companies who use chemicals during construction processes.

In addition, health and environmental information provided by REACH should be used in the risk assessment of construction products. Complying with REACH by the registrant thus addresses risks to health and environmental damage that might be posed by exposure to his registered volume of the substance and during the registered uses, e.g. during manufacturing of construction materials, use of construction materials containing chemicals at construction sites, release during service life of buildings and release during decommissioning. REACH is not the only regulation addressing these risks. Risks of failure of materials or risks resulting from improper use are not, in general, addressed by compliance with REACH, but through other legislation. Compliance with REACH registration obligation also does not cover issues related to the aggregated exposure or end of life issues, addressed for certain pollutants through further REACH risk management measures such as restrictions and authorization, sectoral EU legislation (e.g., regulation of VOC in solvents and paints), environmental standards, labelling provisions, waste legislation etc. [25]

Directive 2010/31/EU on the Energy Performance of Buildings (EPBD): Sustainable polyurethane window frames

Following a review of its implementation, Directive 2010/31/EU (Annex 4) was amended in 2018 by Directive (EU) 2018/844. The principal aim was to accelerate the cost-effective renovation of existing buildings and to promote smart technologies in buildings. As part of the Clean Energy package, the amending directive complements legislation on energy efficiency. Content of the directive is described hereafter.

3.1.1.5 Directive 2010/31/EU EPBD key points

EU countries must set optimal minimum energy performance requirements. These should be reviewed every 5 years.

- The European Commission has established a comparative methodology framework to calculate the optimal cost levels for the energy performance requirements.

- New buildings must meet the minimum standards. Buildings owned and occupied by public authorities should have achieved nearly zero-energy status* by 31 December 2018 and other new buildings by 31 December 2020.

- Existing buildings, when undergoing a major renovation, must upgrade their energy performance to meet the applicable requirements.

- EU countries must operate an energy performance certification system.

- EU countries' national authorities must ensure schemes are in place to inspect heating and air-conditioning systems.

3.1.1.6 Amendments to the original directive

Amending **Directive (EU) 2018/844** requires EU countries to draw up long-term renovation strategies to support the renovation of both residential and non-residential buildings into a highly energy-efficient and decarbonized building stock by 2050. The strategies should set out a roadmap with measures and measurable progress indicators, with a view to the EU's long-term 2050 goal to reduce greenhouse gas emissions by 80-95% compared to 1990. The roadmap must include indicative milestones for 2030, 2040 and 2050, and specify how they contribute to achieving the EU's energy efficiency targets in accordance with Directive 2012/27/EU on energy efficiency.

3.1.1.7 A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives

"Delivering the depth and volume of renovation Europe needs, ultimately requires a strong and competitive construction sector, embracing innovation and sustainability to increase quality and reduce costs." [27]

The Renovation Wave is not only about looking into existing building stock. It is the start of a forward-looking process to match sustainability with style. As announced by President von der Leyen in her State of the Union speech on 16 September 2020, the Commission will launch the New European Bauhaus to nurture a new European aesthetic that combines performance with inventiveness [27]

European companies lead in innovation, manufacture, distribution, and installation of a variety of energy-saving and renewables-related goods and services in buildings. Consolidating this lead role requires uptake of industrialized technological solutions to limit the cost and duration of works, faster

digitalization, and the full integration of circularity principles across the value chain: sourcing safe, sustainable, and secondary raw materials, reuse and recycling and waste management. Industrialization can trigger a virtuous circle between higher demand for deeper renovation and falling costs for smarter and more sustainable products.

The Commission promotes environmental sustainability of building solutions and materials, including wood and bio-based materials, nature-based solutions, and recycled materials based on a comprehensive life-cycle assessment approach. It will address the sustainability performance of construction products in the context of its revision of the Construction Product Regulation and it will develop by 2023 a roadmap leading up to 2050 for reducing whole life-cycle carbon emissions in buildings. The Commission will also accelerate work with standardization organizations on climate resilience standards for buildings.

By the end of 2024, the Commission will review the material recovery targets set in EU legislation for construction and demolition waste. The Commission will put in place measures to increase reuse and recycling platforms and support a well-functioning internal market for secondary raw materials. Level(s), the Circular Economy principles for buildings design and the EU Construction and Demolition Waste management protocol guide the user to apply these principles in renovation projects. [28]

3.2 National regulation landscape and ongoing revisions

The division of powers between the EU and EU countries: the EU deals only with the single market access rules and not with requirements for product's performance itself. ***The EU countries are those who are responsible for fire safety, environmental, energy and other requirements applicable to construction works***.

However, there are many differences between countries regarding who sets the building regulations, how the technical building regulations are organized and formulated, what is the role of national standards and how building regulations apply to existing buildings.

The product itself (rigid polyurethane foams for window frames) does not have a reference product standard and, in general, the regulation does not refer to window profiles either, but refers to, and establishes regulatory requirements, at the window level.

The reference standard for windows is:

- ***EN 14351-1:2006+A2:2016*** Windows and doors - Product standard, performance characteristics - Part 1: Windows and external pedestrian door sets

An assessment and verification of performance reliability (AVCP) of construction products needs to be carried out in the context of the CE marking of construction products under the Construction Products Regulation. The use of independent testing laboratories and certification bodies, called notified bodies, is required for certain AVCP systems.

3.2.1 France

France has construction and housing code, called: "***Code de la construction et de l'habitation*".** In Table 6 **Erreur ! Source du renvoi introuvable.**, the synthesis of French transposition of the directives is displayed.

It is important to mention that France also have: "*Réglementation environnementale RE2020*". This French regulation is linked with EU Green Deal. It states mandatory LCA for certain building during construction, as well as energy and carbon emissions threshold, which it is more restrictive than the EU Directives. [29]

Table 6 Synthesis if the French transposition of the EU directives related to the building sector

Directive N°(know as..)	French transposition
Directive 2010/31/EU on the Energy Performance of Buildings (EPBD): Sustainable polyurethane window frames	**Loi** n° 2015-992 du 17 août 2015 relative à la transition énergétique pour la croissance verte [30] **Décret** n° 2021-1941 du 31 décembre 2021 relatif à la responsabilité élargie des producteurs pour les produits et les matériaux de construction du secteur du bâtiment [31] **Décret** n° 2012-1489 du 27 décembre 2012 pris pour l'exécution du règlement (UE) n° 305/2011 du Parlement européen et du Conseil du 9 mars 2011 établissant des conditions harmonisées de commercialisation pour les produits de construction et abrogeant la directive 89/106/CEE du Conseil [32] **Décret** n° 2011-321 du 23 mars 2011 relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils [33] **Décret** n° 2021-1674 du 16 décembre 2021 relatif à la déclaration environnementale de produits de construction et de décoration ainsi que des équipements électriques, électroniques et de génie climatique [34]

3.2.2 Germany

In Germany, there are 16 State Building Codes, which are based on a common model – the Model Building Code.

During the 2016 revision of the Model Building Code, the technical rules for design and execution of structural works, construction techniques and construction products were thoroughly amended and merged into one document, the Model Administrative Provisions – Technical Building Rules (MVV TB)

- Parts A and B of the MVV TB essentially contain provisions for the design and execution of structural works.
- Part C comprises provisions for the use of construction products that do not bear the CE marking in accordance with the Construction Products Regulation (Regulation (EU) No 305/2011). This part also includes provisions on construction products and construction techniques for which a national technical test certificate is required.
- Part D provides information on construction products for which no verification of fitness for use is required. In addition, this part contains rules for handling voluntary manufacturer information regarding essential characteristics of harmonized construction products which are not covered by the CE marking of the underlying technical specification.

For the time being, the Model Administrative Provisions – Technical Building Rules are available in German language only. Bellow, the link to access this model:

-*Link*: **https://www.bmj.de/DE/Startseite/Startseite_node.html**

In Table 10**Erreur ! Source du renvoi introuvable.**, the synthesis of German transposition of the directives is displayed.

Table 7 Synthesis if the German transposition of the EU directives related to the building sector

Directive N°	German transposition
Directive 2010/31/EU on the Energy Performance of Buildings (EPBD): Sustainable polyurethane window frames	**Gesetz zur Durchführung der Verordnung** (EU) Nr. 305/2011 zur Festlegung harmonisierter Bedingungen für die Vermarktung von Bauprodukten und zur Umsetzung und Durchführung anderer Rechtsakte der Europäischen Union in Bezug auf Bauprodukte *Act implementing Regulation (EU) No. 305/2011 to establish harmonized conditions for the marketing of construction products and to implement and implement other legal acts of the European Union regarding construction products (Construction Products Act - BauPG)* [35]
	Verordnung über das Inverkehrbringen von Heizkesseln und Geräten nach dem Bauproduktengesetz (Artikel 1 der Verordnung zur Umsetzung der Heizkesselwirkungsgradrichtlinie) *Ordinance on the placing on the market of boilers and devices according to the Construction Products Act (Article 1 of the Ordinance on the Implementation of the Boiler Efficiency Directive)* [36]
	Verordnung über die Anerkennung als Prüf-, Überwachungs- und Zertifizierungsstelle nach dem Bauproduktengesetz Ordinance on recognition as a testing, monitoring, and certification body under the Construction Products Act [37]

3.2.3 Spain

As far as regulations are concerned, each European member state has its own building code and can require different levels of performance from windows; In Spain, the CTE (Código Técnico de la Edificación) applies, which requires thermal, watertight, permeability, wind resistance, etc... benefits to windows.

Therefore, it would be necessary to carry out a regulatory development process at European level, which is:

- Preparation of an EAD

- Preparation of an ETA

- Certification tasks for CE marking

Bellow, the link to access the regulatory development process:

-*Link***: www.Boe.es**

In Table 8**Erreur ! Source du renvoi introuvable.**, the synthesis of Spanish transposition of the directives is displayed.

Table 8 Synthesis if the Spanish transposition of the EU directives related to the building sector

Regulatory provisions	Directives/decrees in Spain
Directive 2010/31/EU on the energy performance of buildings	**Directiva 2010/31/UE** del Parlamento Europeo y del Consejo, de 19 de mayo de 2010, relativa a la eficiencia energética de los edificios [38]
COMMISSION DECISION of 3 May 2000 implementing Council Directive 89106EEC as regards the classification of the resistance to fire performance of construction products, construction works and parts thereof	**Royal Decree 842/2013**, of October 31, which approves the classification of construction products and construction elements based on their reaction properties and resistance to fire **Real Decreto 842/2013**, de 31 de octubre, por el que se aprueba la clasificación de los productos de construcción y de los elementos constructivos en función de sus propiedades de reacción y de resistencia frente al fuego [39]

3.2.4 Hungary

There is no harmonized standard or European Technical Assessment for rigid polyurethane windows as a construction product. That is why Hungarian Government Decree 275/2013 (VII. 16.) should be considered.

The Second paragraph in Section 5 of the Government Decree 275/2013 states that a declaration of performance issued based on a:

- non-harmonized European standard;
- international standard;
- Hungarian standard may be considered.

The third paragraph in Section 5 of the Government Decree 275/2013 states that if one (or more) of the documents referred to the second paragraph does not provide sufficient information, the manufacturer may - at his option - using the available documents, for domestic design and installation, or for use in accordance with the procedure laid down in Regulation (EU) No 305/2011 of the European Parliament and of the Council.

Thus, it is important to emphasize that declarations of performance issued by a non-harmonized European standard and an international standard are only acceptable if they include a system for assessment and verification of constancy of performance in accordance *with Annex V of the Regulation (EU) No 305/2011* of the European Parliament and of the Council (AVCP system) system.

The CPR Regulation and Hungarian government decree 275/2013, both stipulates that the condition for the placing on the market and distribution of construction products is that the products have a declaration of performance issued by the manufacturer. ***Distribution declarations in Hungarian are required for distribution in Hungary.*** Bellow, the link to access the regulatory development process:

-*Link:* **https://net.jogtar.hu/**

In Table 12, the synthesis of Hungarian transposition of the directives is displayed.

Table 9 Synthesis if the Hungarian transposition of the EU directives related to the building sector

Directive N°	Hungarian transposition
Directive 2010/31/EU on the Energy Performance of Buildings (EPBD): Sustainable polyurethane window frames	Government decree 275/2013. (VII. 16.) on the detailed rules for the design and installation of the construction product in the building, and the certification of performance in the process. [40]
	Decree 15/2003. (XI. 7.) KvVM on regional waste management plans. [41]
	Decree 26/2014. (III. 25.) VM on limiting the emission of volatile organic compounds from certain activities. [42]
	Government decree 492/2017. (XII. 29.) on the designation of organizations that examine, control, and certify the fire safety compliance of individual technical products. [43]
	Government decree 65/2011. (IV. 15.) on the requirement of environmentally friendly design obligations for energy-related products, as well as on the general conditions for their placing on the market and conformity assessment. [44]
	Act LXXXVIII of 2012 on market surveillance of products. [45]

3.3 Summary of the Building sector regulations

	Regulation ref & database links	Status to date	Comments
Europe	Regulation (EU) No 305/2011	On going	Laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
	Directive 2010/31/EU		On the energy performance of buildings
France	Decree n° 2021-1941		Producer responsibility for construction products and materials in the building sector
	Decree n° 2012-1489		Execution of Regulation 305/2011 EU
	Decree n° 2011-321		Packaging of construction products
	Decree n° 2021-1674		Environmental declaration of construction products
Germany	Construction Products Act - BauPG		
	Ordinance (Article 1 of the Ordinance on the Implementation of the Boiler Efficiency Directive)		on the placing on the market of boilers and devices according to the Construction Products Act
	Ordinance under the Construction Products Act		on recognition as a testing, monitoring, and certification body
Spain	Directive 2010/31/EU		on the energy performance of buildings
	Royal Decree 842/2013, of October 31		Classification of construction products and construction elements based on their reaction properties and resistance to fire
Hungary	Government decree 275/2013. (VII. 16.)		on the detailed rules for the design and installation of the construction product in the building, and the certification of performance in the process
	Decree 15/2003. (XI. 7.) KvVM		on regional waste management plans
	Decree 26/2014. (III. 25.) VM		on limiting the emission of volatile organic compounds from certain activities
	Government decree 492/2017. (XII. 29.)		on the designation of organizations that examine, control, and certify the fire safety compliance of individual technical products
	Act LXXXVIII of 2012		on market surveillance of products
	Government decree 65/2011. (IV. 15.)		on the requirement of environmentally friendly design obligations for energy-related products, as well as on the general conditions for their placing on the market and conformity assessment

4 Transport regulation landscape and ongoing revisions: railway

The reason behind the emerging trend for introducing fibre reinforced polymer (FRP) composites in the rolling stock of new trains is focused on **weight reduction** of the structures of components together with the aim of simplifying the manufacturing and integration process cost-effectiveness, aligned with the action plan proposed by European Commission entitled “A European Green Deal” [5].

The European Green Deal objective is to reach climate neutrality by 2050. The railway sector will contribute to those objectives by increasing its capacity for passenger, goods transport batteries or tanks enabling an increase in the use of rail transport, and by reducing further the greenhouse gas emissions of the railway sector itself. And indeed, increase of capacity and reduction of greenhouse gas require necessarily weight reduction of the structures of the car-body.

The next section will gather the current regulations applicable to materials for rolling stock, and therefore extensible to the new sustainable by design thermoset materials to be developed within SURPASS.

Thermoset, composite materials are a great candidate due to their mechanical performance. However, their fire performance need still improvements and it is delaying some of the applications. Additionally, new manufacturing and certifications are needed for each new material.

The Common Safety Method (CSM), based on the European Regulation 402/2013, can be used as a supporting tool to identify relevant standards. The CSM is a mandatory, risk-based method applicable when a new technology is introduced in the railway industry. The CSM is a structured way of performing a comprehensive analysis without pre-set limits and biases. The purpose of this method is to make the broadest possible reflection on the impact on the railway system when introducing composite materials for rolling stock bodies.

4.1 European regulation landscape and ongoing revisions

4.1.1 EU regulations in relation to rolling stock

Starting from REACH (No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals, entered into force on 1 June 2007), it is applicable for product development in European railways. The Railway Industry Substance List provides a comprehensive and accurate list of prohibited and declarable chemicals used specifically by the railway industry. The list defines and categorises substances while providing the locales of where restrictions must be considered. First initiated as a result of the European REACH regulation, the list helps users comply with the regulation's legal provisions for manufacturers, downstream users and importers of substances. The UNIFE Topical Group has extended the legal scope beyond Europe to include Canada, China, and the USA. The complete list can be found on the link bellow:

-**Link:** https://www.unife.org/activities/environment-and-sustainability/rail-industry-substance-list/

As for CLP (No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures), it is not applicable for product development itself, but all the products used for the production on railways based on Europe fulfil the requirement defined on the regulations.

In relation to regulations related to the treatment of end-of-life rail vehicles, End of Life of car body materials, there is a lack of them as such, but there are numerous initiatives aimed at reducing negative environmental impact of this type of waste are carried out leading to a development of a railway specific recovery infrastructure and to a design of railway products in a recycling-friendly way [46]. So far, recycling was carried out because of the economic benefits that could be derived from the recovery of parts and components used as spare parts and from the recovery of some secondary raw materials. However, the implementation of the concept of sustainable development and the EU policy on waste management, requiring EU member states to properly manage waste so that the economic development does not entail deterioration of natural environment and depletion of natural earth resources, will mean that in the future, all end-of-life rolling stock and scrap trains are subject to appropriate treatment and guarantee high recycling and recovery rates. Reorganization and change of

strategies of the railway transport operation is related to the modification of the approach from quantitative to qualitative and effective asset management.

Rolling stock is a precious source of materials, whose recycling brings measurable economic benefits. Similarly, to other means of transport, rail vehicles are built from many types of materials such as: ferrous and non-ferrous metals, elastomers, polymers (excluding rubber), glass, fluids, modified organic natural materials (e.g. leather, wood, cardboard and cotton fleece) and other materials (e.g. compounds, electronics, and electrics). On one hand the recovery of these materials facilitates the reduction of the demand for primary raw materials and on the other hand it reduces the environmental perils of improper management (contamination of ground and ground waters with hazardous substances used for their production.)

As for the scarce regulations related to waste management in railway, the issues of recycling of the modes of transport have been legally regulated only for passenger vehicles and light duty trucks of the gross vehicle weight not exceeding 3.5 tons. [47]. Perhaps because the amount of end-of life rolling stock is much smaller than the end-of-life vehicles, both international authorities (e.g. European Commission) and national governments have not yet implemented any specific legislation for recycling of rail vehicles. In terms of environment protection in railway transport only such areas as noise emission, exhaust emissions, electromagnetic fields or ban on the use of certain materials have been legislated. Aside from the latter aspect, the actions related to recycling of rolling stock result from voluntary regulations of the organizations associating the rolling stock manufacturers and operators as well as individual strategies realized by key stakeholders.

Also at the European level, stakeholders decided to develop rolling stock recycling standards. Association of the European Rail Industry (UNIFE), gathering manufacturers representing 80% of the railway market in Europe, created unified rolling stock recycling guidelines. Representatives of the different parts of the rail transport sector, system integrators, rolling stock manufacturers, sub-system suppliers and operators have been involved in the development process of product category rules (PCR) for rail vehicles (International EPD Consortium, “Product category rules (PCR) for preparing an environmental product declaration (EPD) for rail vehicles”, UNCPC Code: 495, 1.12.2009).

The basis for the developed guidelines is the ISO22628 standard for the automotive industry (document reviewed and confirmed in 2018 and therefore in effect) referring to the methods to manage the wastes from any road vehicles; thus, it supposes to apply with the end-of-life rolling stock. It aims at measures on the mass fraction of vehicles on reuse, recycle, and recovery processes. Such document has been adapted to the specificity of the rolling stock by UNIFE.

Other applicable standards have also been used such as ISO 14040 and ISO14044, both related to life cycle assessment. The PCR guidelines should serve the purpose of preparing the Environmental Product Declaration (EPD) according to the ISO 14025 standard and thus constitute a basis for the admission of the rolling stock to traffic in the EU. UNIFE issued also in January 2013 document on recyclability and recoverability calculation method for railway rolling stock [UNIFE Association of the European Rail Industry, Sustainable Transport Committee, "Recyclability and Recoverability Calculation Method - Railway Rolling Stock", Brussels, 1.03.2013.]. It specifies the methods of calculating the recovery and recycling rates of the rolling stock without indicating the rates to be achieved.

4.1.2 Fire safety regulations for rolling stock materials: European REACH and beyond

As the annex ZA of EN 45545 directive states [48], it was prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirement of the Directive 2008/57/EC, now amended by Directive 2016/797.

The following international standards are of particular relevance in the field of materials testing:

- EN 45545-2
- British Standard (BS)
- NFPA 130 (ASTM E162 / E662)
- GOST (Russian standard)

Once this standard is cited in the Official Journal of European Union under that Directive and has been implemented as a national standard in at least one Member State compliance with the clauses of this standard given in Table ZA.1 for HS Rolling Stock, Table ZA.2 for CR Locomotives, Passenger Rolling Stock and Table ZA.3 for the HS/CR TSI Safety in Rail Tunnel, confers within the limits of the scope of the standard. The latter is a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations. Since it is a harmonized standard according to European directive, it is the direct way to assess the conformity according to the regulations.

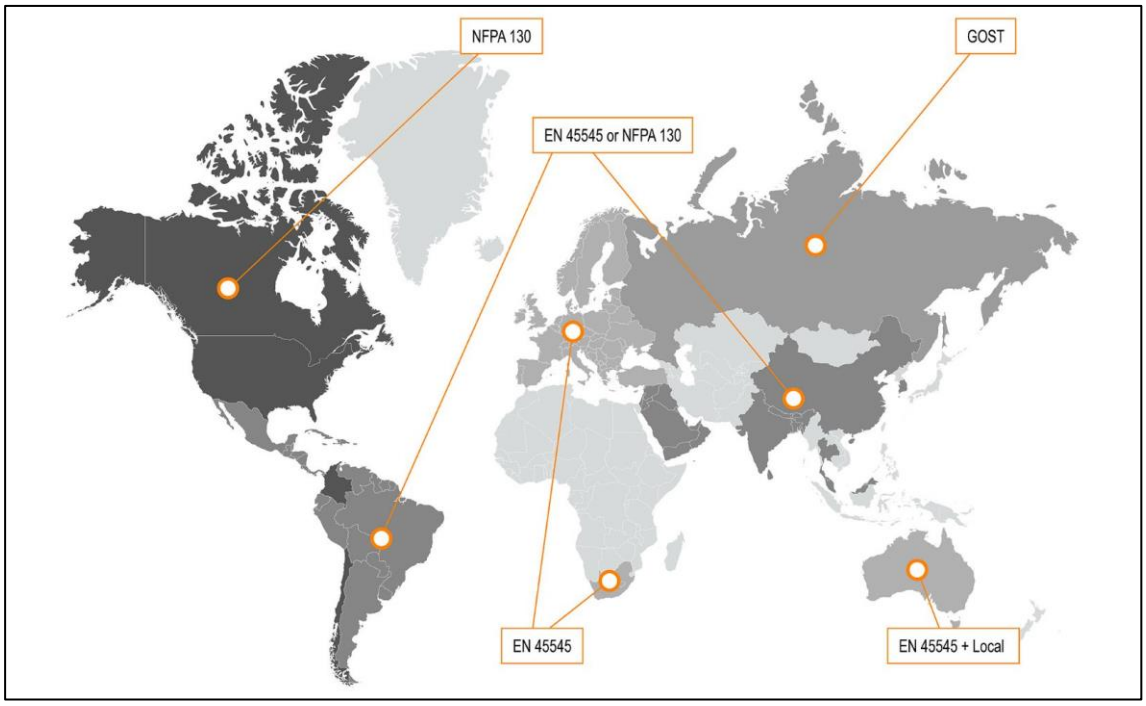


Figure 5 Schema of the international standards are of relevance in the field of materials testing

4.1.2.1 Materials classification to EN 45545-2

After having passed all individual tests, a material will be considered fit for assessment in light of the fire safety requirements applicable to rolling stock and then it will be classified for use based on its compliance with the pertinent limit values. These limit values are defined in standard EN 45545-2. Materials that by design meet the highest standards in terms of fire behaviour are exempted from the testing requirement as they are approved for use on rolling stock of any category, e. g. components classified as A1 (non-flammable) to EN 13501-1.

What does EN 45545-2 mean?

This European Standard has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the Directive 1303/2014, the current Technical Specifications for Interoperability (TSI).

The European standard EN 45545-2 is entitled “Rail applications – Fire protection on railway vehicles“. Part 2 deals with the “Requirements for fire behavior of materials and components “. This standard sets out the conditions and measures that are conducive to containing the spread of fire. It also includes a definition of the fire safety requirements for materials and components employed in the

construction of rolling stock. It aims to protect passengers and staff in railway vehicles in the event of a fire on board. The fire protection is achieved through prevention, detection, limiting the fire spread and the effects in terms of heat, smoke and toxicity, control and management of fire and fire suppression.

Different hazard levels (HL) are assigned depending on a railway vehicle's class of service (operation category) and class of design (design category).

4.1.2.2 Fire safety requirements on rolling stock products: the stringent standards to be met

There are some classified fire protection products, which comply with the requirements of the HL3 standard and are approved for use on rolling stock of any design category.

However, there is little information about composite materials for exterior applications since this is an emerging field. For example, the project Mat4Rail served to design and test many composites and chose the best 6 formulations for full EN 455545-2 testing, results of such test were presented in Deliverable 4.1 [49]. In any case none of the composites contained sustainable green fire additives, as it is the focus of SURPASS.

The picture below illustrates the assignment of hazard levels in terms of operation categories and design categories:

Operation category	Design category			
	N Standard vehicles	A Automated vehicles (unstaffed)	D Double-decked vehicles	S Sleeping and couchette cars
1	HL 1	HL 1	HL 1	HL 2
2	HL 2	HL 2	HL 2	HL 2
3	HL 2	HL 2	HL 2	HL 3
4	HL 3	HL 3	HL 3	HL 3

Figure 6 Hazard levels by operation category and design category [50]

Fire protection solutions are tested to EN 45545-2 depending on the size of the exposed surface and the area of use on the rolling stock in accordance with the requirements set out in the image below:

Exposed surface	(Intended) use	Requirement set
> 0,20 m²	Indoors	R1
> 0,20 m²	Outdoors	R7
⩽ 0,20 m²	Indoors	R22
⩽ 0,20 m²	Outdoors	R23

Figure 7 Requirements for the testing of the fire protection solutions [50]

4.1.3 Other Standards and ongoing revisions

Materials for different railway applications need to meet specific requirements to ensure the safety of the crew and passengers, e.g., a car-body should fulfill structural requirements, crashworthiness requirements, and protection provisions relating to electrical hazards or electromagnetic compatibility. In fact, these requirements are standardized in this case by:

- EN 12663: Structural requirements
- EN 15227: Crashworthiness requirements
- EN 50121: Electromagnetic compatibility (EMC)
- EN 50153: Electrical hazards

The aspects treated by these standards are briefly described in the following table:

Standard	Aspects treated
EN 12663	This European Standard specifies the loads to be carried by vehicle bodies, identifies how material data should be used and establishes the principles to be used for design validation through analysis and testing to ensure passenger safety
EN 15227	This standard specifies crashworthiness requirements applicable to locomotives, passenger vehicles, freight vehicles, streetcars, metros and intercity trains. This document identifies common methods that provide passive safety and can be adapted to meet individual vehicle requirements
EN 50121	The purpose of this standard is to define limits and test methods for electromagnetic emissions and requirements for immunity tests related to conducted and radiated disturbances. The emission requirements have been selected to ensure that disturbances generated by apparatus under normal operating conditions on board railway rolling stock do not exceed a level that could prevent other apparatus from operating as intended and jeopardize safety
EN 50153	This European Standard establishes a set of requirements to be applied in the design and manufacture of electrical installations and equipment to be used in rolling stock for the protection of persons against electric shock. Applies to rolling stock on rail transport systems, road transport systems powered by an external power supply (e.g. trolleybuses), magnetic levitation transport systems and to electrical equipment installed on these vehicles. However, it is not applicable to: - subway mine railroads; - crane installations, mobile platforms and similar transport systems on rails, - funicular railways, - temporary constructions

Additionally, the following page describes public standards on Railway rolling stock in general (ICS 45.060.01) including wheels, axles, ultrasonic acceptance testing, magnetic particle acceptance testing, methods for assessing vibration, method for elastomeric suspension parts, etc. However, there is not specific mention to composite materials for structural car body applications. [51]

Mainly the criteria used for thermoset materials is that they should meet the same performance than the metals they are replacing. But there are still gaps on regulations and standardization matters.

To gain confidence in new materials, demonstration cases must be developed and put on track (*in operando* demonstration). The gap existing in the standardisation regarding new materials in the

railway sector could be an impediment to tests on track. Different standards have been identified regarding this point mainly for car-body and running gear. The conceptual roadmap for the acceptance of new materials in the sector is currently being discussed, coming from design phase to standardization, and the organisations to be involved along the way. It is necessary to gain experience with the new material in the railway environment. Mat4Rail and PIVOT/PIVOT2 Shift2Rail projects collaborated with CEN, regarding the development of different steps to be completed in order to achieve such common goal, as it was explain in Mat4Rail-Presentations to standardisation bodies [52]. Both projects participated at a new group at CEN/TC 256, Implementation and Approval of New Materials group (named TC 256/SC 2/WG 54 – NEW MATERIALS). This WG defines a process to support the introduction of new materials to meet the minimum requirements in the railway sector. It identifies requirements of plans for design, manufacture, maintenance, and proof of compliance (e.g., test, etc.). This standard will be applicable to new materials for all Rolling Stock and its on-board equipment.

There are also recent actions being performed in terms of regulations or recommendations for the creation of new standards, which can affect composites materials. Here are some relevant recent actions:

- New standard for adhesive bonding currently under development: EN WI 000256799 “Adhesive bonding of rail vehicles and parts” (WG 52).
- CEN TC256 SC2 WG2, feedback in terms of load assumptions and fatigue assessment required by the CEN working group to implement the results in a new revision of EN 12663 (already some input provided from Roland Rennert, member of Mat4Rail [49].
- The ballot CEN/TC 256 N 6649 was followed and supported by the Mat4Rail project partners, also at the Swedish mirror committee (SIS) for CEN/TC 256.

If there are relevant actions related to this or any other actions, SURPASS consortium will follow them.

4.2 National regulation landscape and ongoing revisions

Governments and policy makers, as well as society, are demanding a significant reduction in transport emissions. Reducing the energy consumption of railway rolling stock is therefore an important objective.

New materials, such as composites, hold out the hope of building lighter rolling stock that consumes less energy, contributes to reducing rail transport emissions and reduces infrastructure maintenance costs.

EN 45545, published in 2013, has marked a turning point in the regulation of the fire performance of materials, fire barriers, electrical equipment, and installations for the railway sector in Europe. All national standards that could conflict with EN 45545 were annulled before March 2016. This standard is therefore the standard used at European level for the railway sector. France, Germany, Hungary and Spain apply EN 45545.

With the increasing demand for lightweight structures, composite materials with good mechanical properties and FST are expected to be great solutions to make the trains lighter.

Today, structural parts of a car-body are made of metals, there are currently only a few composite materials certified according to EN 45545 and although there is a clear trend to try to replace metals in these applications it is still an emerging area. In Asia some train models start to have some structural composite components (in particular, in China and Korea) but in Europe the few developments made to introduce them in the market are still under testing. Shift2Rail [53] projects such as Mat4Rail [49] and PIVOT/PIVOT2 have helped to make this a reality. Within Rail´s Europe, there will be also supported to continue further in that direction.

In what it concerns to semi-structural there are already some examples of composite materials in the market. It is the case of the front nose of high-speed trains AVE S-106, manufactured by TALGO and Aernnova (model AVRIL) which is made with semi-preg from Gurit. This component meets the EN 45545-2, and it is already in use.

4.3 Summary of the Transport sector regulations

	Regulation ref & database links	**Status to date**	**Associated standards**	**Comments**
Europe	Directive 2008/57/EC	Amended	EN 45545-2	Recast of previous directives regarding trans-European rail system
	Directive 96/48/EC	Amended	EN 45545-2	Interoperability of the trans-European high speed rail system
	Directive 2001/16/EC	Amended	EN 45545-2	Interoperability of the trans-European conventional rail system
	2004/50/EC	Amended	EN 45545-2	Corrigendum to Directives 96/48/EC and 2001/16/EC
	Regulation (EU) No. 1303/2014	On going	EN 45545-2	Technical specification for interoperability (TSI) to "Safety in Railway Tunnels" of the rail system of the EU
	Directive 2016/797/EC	On going	EN 45545-2	Correcting Regulation (EU) 2008/57/EC concerning the interoperability (TSI) of the rail system within the EU

5 Packaging regulation landscape and ongoing revisions

Pressure to reduce packaging waste and more particularly plastic waste has been increasing all over the world for several years. The European Commission aim to address the general awakening on this issue by proposing new regulations applying safe and sustainable by design approach.

In all countries, the new regulations intend to enforce new requirements to reduce negative impact of plastic packaging on the environment and on the human health. Moreover, most of these regulations also include the following topics:

- Packaging specifications such as weight, size or composition;
- Packaging attributes such as recyclability or biodegradability;
- Packaging main use
- Packaging value chain, from raw material to waste management, including re-use and recycling (collection, sorting)

Another important element is that most countries worldwide are focusing the start and the end of the packaging value chain i.e.:

- At the beginning of the value chain: the restriction of the use of any materials or chemical substances;
- At the end of the value chain: a structured waste management with extended producer responsibility (EPR) systems.

Furthermore, some advanced countries have set up funding and infrastructures to support new regulatory obligations in design, recycling and recycled material uses.

Finally yet importantly, it is possible to identify different packaging segment or areas targeted worldwide by the new regulatory measures:

- Primary packaging (consumer) : The principal function of primary packaging is to protect the product
- Secondary and Tertiary packaging (non-consumer) : The main purpose is to group together different primary packages for easy and safe transportation

5.1 European regulation landscape and ongoing revisions

The European regulation regarding packaging is carried out within the Circular economy Action Plan and within the current European « Green Deal » growth strategy which aims to make Europe the first climate-neutral continent in 2050. To meet its ambitious targets, European Union and the member states have to quickly adapt regulation and to set binding objectives in many areas, including packaging.

Context of the packaging regulatory developments in EU

The first European « Action Plan for a Circular Economy » that was adopted by the European Commission (EC) in December 2015 already identified plastic as a key priority. That forecasted a specific strategy for this material in order to take into consideration the entire plastic value chain and life cycle and to fight its negative effects on the environment and human health.

The "European Strategy for Plastics in a Circular Economy" (2018)

The EC adopted the **Plastics Strategy**, i.e. the « *European Strategy for Plastics in a Circular Economy* » in January 2018 [54].

The main objectives of this Plastics Strategy are:

- To protect our environment and reduce marine litter, greenhouse gas emissions and dependence on imported fossil fuels;
- To support more sustainable and safer consumption and production patterns for plastics;
- To transform the way plastic products are designed, produced, used and recycled in the EU.

In May 2018, Directive (EU) 2018/851 was passed (the Revised Waste Framework Directive). This amended the Waste Framework Directive by, for example, introducing general minimum requirements for EPR schemes and outlining the measures that Member States are required to take to prevent waste generation. More generally, the Revised Waste Framework Directive updated the rules for waste management in the EU.

The Commission has set out that new rules on packaging will be developed to improve the recyclability of plastics used on the market and increase the demand for recycled plastic content. It is noted that with more plastic being collected, improved and scaled up recycling facilities should be set up, alongside a better and standardised system for the separate collection and sorting of waste across the EU.

The EU Plastic Strategy integrates 4 action areas and a list of measures to implement them [55].

The 4 action areas are:

- Making recycling profitable for business by:
  - ✓ Establishing new rules on packaging to improve the recyclability of plastics and increase the demand for recycled plastic content;
  - ✓ Improving the separate collection of plastic waste;
  - ✓ Launching an EU wide pledging campaign, targeting industry and public authorities
- Curbing plastic waste thanks to:
  - ✓ Directive on single use plastic products and fishing gear
  - ✓ Measures to restrict the use of microplastics in products and address and reduce the unintentional release of microplastics into the environment
  - ✓ Measures on bio-based, biodegradable and compostable plastics
  - ✓ New rules on port reception facilities to tackle sea-based marine litter
- Driving innovation and investment in order to:
  - ✓ Develop smarter and more recyclable plastics materials,
  - ✓ Make recycling processes more efficient,
  - ✓ Trace and remove hazardous substances and contaminants from recycled plastics
- Spurring global change with international partners to devise global solutions and develop international standards on plastics

The different measures to implement each action areas of the plastics strategy and their timeline were detailed in the Annex 1 of the plastics Strategy [55].

For more information on the EU plastic strategy, see the following link:
https://environment.ec.europa.eu/strategy/plastics-strategy_en#policy-areas

The European Green Deal (2019)

In December 2019, the European Commission unveiled **The European Green Deal** [12]**,** a roadmap for making the EU's economy sustainable and reaching climate neutrality by 2050. This roadmap which covers all sectors of the economy (such as transport, energy, buildings, chemicals, and so on), provides actions to increase the efficient use of resource and raw materials by moving to a clean, circular economy and stop climate change, revert biodiversity loss and cut pollution. It embraces different key

actions and policy areas (including a « new circular economy action plan »), listed with an indicative timeline in Annex [12].

It is also explained that the European Commission:

- Follows up on the 2018 plastics strategy focusing on measures to tackle intentionally added micro plastics and unintentional releases of plastics, for example from textiles and tire abrasion,
- develops requirements to ensure that all packaging in the EU market will be reusable or recyclable in an economically viable manner by 2030,
- develops a regulatory framework for biodegradable and bio-based plastics,
- implements measures on single use plastics,
- develops a "sustainable products" policy to support the circular design of all products
- strengthens the extended producer responsibility.

For more information on the EU Green Deal roadmap, see the following links:
https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

The new Circular economy action plan: CEAP (2020)

The European Commission adopted one of the main building blocks of the European Green Deal i.e. the new Circular economy action plan (CEAP) in March 2020. This EC communication is entitled "A new Circular Economy Action Plan For a cleaner and more competitive Europe" [56]

This new action plan announces initiatives along the entire life cycle of products. It targets how products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible.

It also introduces legislative and non-legislative measures targeting areas where action at the EU level brings real added value.

Thus the main measures introduced in the new Circular economy action plan (CEAP) are:

- make sustainable products the norm in the EU
- empower consumers and public buyers
- focus on the sectors that use most resources and where the potential for circularity is high
- guarantee less waste production

- make circularity work for people, regions and cities
- lead global efforts on circular economy

The different sectors or value chains of products targeted by the European Commission, including packaging (paragraph 3.3) and plastics (paragraph 3.4), are specified.

For more information on the EU Circular Economy Action Plan, bellow the link to access the document: https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

Furthermore, the CEAP foresees the development of a policy framework on:

- sourcing, labelling and use of bio-based plastics, based on assessing where the use of bio-based feedstock results in genuine environmental benefits, going beyond reduction in using fossil resources;
- using biodegradable or compostable plastics, based on an assessment of the applications where such use can be beneficial to the environment, and of the criteria for such applications. It will aim to ensure that labelling a product as 'biodegradable' or 'compostable' does not mislead consumers to dispose of it in a way that causes plastic littering or pollution due to unsuitable environmental conditions or insufficient time for degradation.

Last, but not least, the Circular economy action plan quotes the Directive on Single Use Plastic Products and fishing gear: the European Commission planned to ensure the implementation of this directive in particular *with regard to:*

- *"harmonized interpretation of the products covered by the Directive;*
- *labelling of products such as beverage cups and wet wipes and ensuring the introduction of tethered caps for bottles to prevent littering;*
- *developing for the first time rules on measuring recycled content in products."*

These measures are reflected by 35 actions listed with an indicative timeline in Annex at the end of CEAP [8].

It's important to notice that despite the Covid-19 pandemic and the ensuing economic and social crisis, the European Union's political stayed "on track" with the objectives of the European Green Deal. The timelime has been (overall) respected, which has allowed important policy developments, especially in the fields of plastics as well as packaging.

The different topics regarding plastics regulations can be seen on the European Commission website via the link below:

https://environment.ec.europa.eu/topics/plastics_en

Packaging and plastic regulations and ongoing revisions

The main in force regulations regarding plastic packaging are:

- Directive (EU) 94/62/EC: the Packaging and packaging waste
- Directive (EU) 2015/720: the Plastic bags Directive (amendment to Directive 94/62/EC)
- Directive (EU) 2019/904: the Single-Use plastics (SUP) Directive

EU regulations as REACH, EU Waste Framework directive and CLP regulation are described in Chapter 2 (Page 16) of this document.

Directive (EU) 94/62/EC: the Packaging and packaging waste Directive

The *European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste* defines the essential requirements for packaging design and composition and sets out packaging collection and recycling targets. It is applied since 31 December 1994 and had to become law in the EU countries by 30 June 1996. It covers all packaging placed on the European market and all packaging waste, whether it is used or released at industrial, commercial, office, shop, service, household or any other level, regardless of the material used [57].

The last amendment of the Directive 94/62/EC is the Directive (EU) 2018/852, which contains updated measures regarding the prevention of packaging waste production and the promotion of the reuse, recycling and other forms of recovering of packaging waste in order to contribute to the transition towards a circular economy [58]. This amending Directive (EU) 2018/852 is applied since 4 July 2018 and became law in the EU countries by 5 July 2020.

Overview

The directive as amended requires EU countries to

- Improve the environmental performance of packaging;
- Reduce packaging waste and their impacts on the environment;
- Harmonize national measures concerning the management of packaging and packaging waste;

- Encourage the increase in the share of reusable packaging put on the market and of systems to reuse packaging in an environmentally sound manner without compromising food safety or the safety of consumers
- Protect the free circulation of packaging in the EU Single Market.
- Prevent the generation of packaging waste by taking measures, such as national programmes, deposit-return schemes, economic incentives, targets, etc.

Summary & Key points

The different measures of the consolidated Directive (EU) 94/62/EC are listed and summarized below in Table 10.

Table 10 Summary of the different measures of the consolidated Directive (EU) 94/62/EC

Recycling targets for plastic packaging	• A minimum of 50 % by weight of all plastic packaging waste (and 65 % by weight for all packaging waste) will have to be recycled by 31 December 2025 • A minimum of 55 % by weight of all plastic packaging waste (and 70 % by weight for all packaging waste) will have to be recycled by 31 December 2030
Requirements specific to the manufacturing and composition of packaging	• To limit the weight and volume of packaging to a minimum adequate amount in order to maintain the required level of safety, hygiene and acceptance for the packed product and for the consumers • To design reusable, recoverable or recyclable packaging in order to minimise its impact on the environment. • To minimise the content of noxious and other hazardous substances and materials in the packaging material and its components (and also in waste packaging, residues, emissions, etc.)
Requirements specific to the reusable nature of packaging	The 3 following requirements must be simultaneously satisfied: The physical properties and characteristics of the packaging shall allow a number of reuses in normally predictable conditions of use; The packaging at end of life has to be processed without heathly or safety problem for the workforce; The packaging has to fulfil the requirements specific to recoverable packaging when it is no longer reused and becomes waste
Requirements specific to the recoverable nature of packaging	• Recyclable packaging: it must be produced in a way allowing the use of recycled material in new marketable products • Packaging recycling in the form of energy recovery • Compostable packaging • Biodegradable packaging. *Oxo-degradable plastic packaging shall not be considered as biodegradable.*
Return, collection and recovery systems	• Mandatory setting up systems to provide for the return and/or collection of used packaging and/or packaging waste, as well as the reuse or recovery including recycling of the packaging and/or packaging waste collected • Producer responsibility schemes (PRS), which should comply with minimum requirements established under Waste Framework Directive 2008/98/EC, have to be established for all packaging by end of 2024.

Directive (EU) 2015/720: the Plastic bags Directive

Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 is an amendment to Directive 94/62/EC (Packaging and Packaging Waste Directive) as regards reducing the consumption of lightweight plastic carrier bags [59].

Overview

The Directive (EU) 2015/720 which modifies Directive 94/62/EC requires Member States to take measures such as national reduction targets and/or economic instruments (e.g. fees, taxes) and marketing restrictions (bans) for plastic carrier bags with a wall thickness below 50 microns in order to reduce the impact of packaging and packaging waste on the environment. It completes the Directive 94/62/EC that does not contain specific measures on the consumption of such bags.

This directive has been published on May 6, 2015, entered into force on May 26, 2015 and should have been implemented in national regulation on November 27, 2016 at the latest.

Summary & Key points

The Directive (EU) 2015/720 is summarised below:

The measures taken by Member States had to permit that:

Lightweight plastic carrier bag (with a wall thickness below 50 microns)	• The annual consumption level does not exceed:
	  ○ 90 lightweight plastic carrier bags per person by 31 December 2019
	  ○ 40 lightweight plastic carrier bags per person by 31 December 2025, or an equivalent targets set in weight;
	And/or
	• Lightweight plastic carrier bags are not provided free of charge by 31 December 2018 at the point of sale of goods or products, unless equally effective instruments are implemented.
	A progress report to the Commission is mandatory.

Plastic carrier bags (with a wall thickness above 50 microns)	Member States are not allowed to adopt marketing restrictions (bans) for these carrier bags i.e. reusable bags but they are free to adopt measures to reduce their consumption. The report to the Commission on their consumption is not obliged but strongly recommended
Very lightweight Plastic carrier bags (with a wall thickness below 15 microns)	These very lightweight carrier bags, which are required for hygiene purposes or provided as primary packaging for bulk food when this helps to prevent food wastages, may be excluded from these objectives but Member States have to report on their consumption to the Commission.

Directive (EU) 2019/904: the Single-Use plastics (SUP) Directive

The Directive (EU) 2019/904 of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment is also called Directive on Single-Use plastics (SUP) [60].

Overview

This directive was adopted on June, 5th, 2019 and aims to prevent and reduce the impact on the environment of certain plastic products and to promote a transition to a circular economy by introducing a mix of measures tailored to the products covered by the directive, including an EU-wide ban on single-use plastic products whenever alternatives are available.

Disposable plastic products need to carry a label to inform consumers about appropriate waste management options.

EU Member States had to transpose the directive into national directives by July 3, 2021 and both the market restrictions and marking of products applied as of this date.

Summary & Key points

The different measures of the Directive (EU) 2019/904 are listed and summarized in Table 11 and Table 12.

Table 11 Summary of the different meaures listed in Directive (EU) 2019/904. Part I

Market restrictions (bans) from 3 July 2021	• Cutlery (forks, knives, spoons, chopsticks); • Plates; • Straws; • Cotton bud sticks; • Beverage stirrers; • Sticks to be attached to and to support balloons; • Food containers made of expanded polystyrene; • Products made from oxo-degradable plastic.
Consumption reductions from 3 July 2021	For other single-use plastic products i.e. single-use plastics for which there is no alternative, EU Member States are required to: • Take measures to reduce drastically the consumption (by 2026 compared to a 2022 baseline) • Monitor consumption of these single-use products as well as the measures taken • Report the progress made to the UE
Extended Producer responsibility (EPR) from 31 December 2024	The 'polluter pays' principe is included in the directive for: • Food and beverage containers, • Bottles, • Cups, • Packets and wrappers, • Light-weight carrier bags, • Tobacco products with filters • Wet wipes and balloons Fishing gear containing plastic

Table 12 Summary of the different meaures listed in Directive (EU) 2019/904. Part II

Compulsory marking from 3 July 2021	Certain disposable plastic products placed on the market must carry a visible, clearly legible and indelible marking affixed to its packaging or to the product itself: • sanitary items; • wet wipes; • tobacco products with filters; • drinking cups.
Specific targets for plastic bottles for separate collection and design requirements from 3 July 2024	• A 77% separate collection target for plastic bottles by 2025, increasing to 90% by 2030 • Incorporating 25% of recycled plastic in PET beverage bottles from 2025, and 30% in all plastic beverage bottles from 2030
Awareness raising	EU countries must also take measures to: • inform consumers and to encourage responsible consumer behavior in order to reduce litter from such products; • make consumers aware of reusable alternative products and the impact of inappropriate disposal of single-use plastic waste on the sewage system

What are the next European regulatory changes?

As of today, the work program of the European Commission includes at least two subjects that will have upcoming consequences on the current regulation regarding plastic packaging:

- the regulation review regarding eco-design for sustainable products,
- the regulation review regarding chemical substances.

Regulation regarding Ecodesign for sustainable products

As part of the Green Deal roadmap and the 2020 Circular Economy Action Plan, the European Commission is notably examining how to reinforce the essential requirements regarding packaging design in order to improve their reuse and their recycling. Thus, the new regulation will have to improve European products' circularity, energy performance and other environmental sustainability aspects.The European Commission has published on 30th march 2022 a Circular Economy Package that integrates different proposals in order to boost Circular Economy and "*make sustainable products the* norm in Europe*"* [61].

These proposals are:

- a proposal for a Regulation on Ecodesign for Sustainable Products [62]
- a review of the Construction Products Regulation (CPR)
- new rules to empower consumers in the green transition and fight greenwashing
- a new EU Strategy for Sustainable Textiles

As regards the **new regulation on Ecodesign for Sustainable Products (march 2022)**, it is aiming to replace the current ***Ecodesign Directive 2009/125/EC*** [63]that covers 31 energy-related product groups. It will have to involve almost all categories of physical goods placed on the EU market (including packaging but with the exception of food and feed).

This new regulation on Ecodesign for sustainable products will have to define the rules to products design (i.e. not only packaging) regarding the following requirements:

- product durability, reusability, upgradability and reparability
- presence of substances that inhibit circularity
- energy and resource efficiency
- recycled content
- remanufacturing and recycling

- carbon and environmental footprints
- information requirements, including a “Digital Product Passport” (information included in this DPP will be determined by product).

The new regulation will establishes in a first stage, a framework that will enable product-level rules to be laid down. Then, some delegated acts will be established product by product or for groups of products, such as packaging, in a second stage. The European Commission plans to launch a public consultation on the categories of products that have to be selected under the first Ecodesign for Sustainable Products Regulation working plan by the end of 2022. Then the Regulation on Ecodesign for Sustainable Products is expected to be ready by mid-2023.

5.2 National regulation landscape and ongoing revisions

5.2.1 France

The summary of French transpositions from the EU directives is displayed on Table 13. Additional information about these french transpositions are described in Appendix 7.3 Additional information about the French transposition from EU Directives regarding the packaging sector.

About the French roadmap for circular economy (FREC)

French government has equipped itself with a roadmap for circular economy in April 2018. The roadmap "*feuille de route pour l'économie circulaire*" is the operational translation *of Law n°2015-992 of 17 August 2015 on energy transition for green growth.*

It is important to mention that not all of the content of this French roadmap is transcript in a French law. (Table 13)

The French roadmap*, feuille de route pour l'économie circulaire,* includes four key priority areas (Better production, Better consumption, Better waste management, Engaging all stakeholders) and 50 measures described in the following link :
https://www.ecologie.gouv.fr/feuille-route-economie-circulaire-frec

Table 13 Summary of French transposition of EU Directives related to the packaging sector

Directive N°(know as..)	**French transposition**
94/62/EC- European Packaging Directive	Décret no 96-1008 (1996) relatif aux plans d'élimination des déchets ménagers et assimilés [64] Décret n°2005-1472 (2005) modifiant le décret n° 96-1008 [65] .
(EU) 2015/720-The Plastic bags Directive	Loi n° 2015-992 (2015) relative à la transition énergétique pour la croissance verte[30]; Décret n° 2016-379 (2016) relatif aux modalités de mise en œuvre de la limitation des sacs en matières plastiques à usage unique [66] Décret n° 2021-763 (2021) définissant la catégorie des sacs en plastique très légers[67]
Directive (EU) 2019/904:on the reduction of the impact of certain plastic products on the environment (also namely SUP directive)	Loi n° 2020-105 (2020) relative à la lutte contre le gaspillage et à l'économie circulaire[68]Ordonnance n° 2020-920 du 29 juillet 2020 relative à la prévention et à la gestion des déchets [69] Décret n° 2021-1279 (2021) relatif au marquage de certains produits en plastique à usage unique [70] Arrêté du 24 septembre 2021 relatif à la teneur en plastique maximale autorisée dans les gobelets en plastique à usage unique [71] Décret n° 2021-1610 (2021) relatif à l'incorporation de plastique recyclé dans les bouteilles pour boissons [72]

5.2.2 Germany

The German transposition from the EU directives is displayed in Table 14

Table 14 Summary of Germany transposition of EU Directives related to the packaging sector

Directive N°(know as..)	German transposition
94/62/EC European Packaging directive	German Packaging Act, i.e., on 1 January 2019 [73]

In order to bring the Packaging Act into line with the current EU directives and to improve its enforcement, the Germany's Federal Cabinet approved on 20 January 2021 a new Draft Law transposing the Single Use Plastics Directive (EU-Plastics Directive 2019) and the Waste Framework Directive into the Packaging Act (VerpackG). **This law came into force as of 3 July 2021.** The summary in Appendix 7.4 Additional information about the German transposition from EU Directives regarding the packaging sectorexhibits the most important changes and their timelines.

5.2.3 Spain

The summary of the Spain transposition from the EU directives is displayed on **Table 15**. Additional information about these spanish transpositions are described in Appendix 7.5 Additional information about the Spanish transposition from EU Directives regarding the packaging sector

Table 15 Summary of Spanish transpositions from EU directives related to the packaging sector

Directive N°(know as..)	Spanish transpositions
94/62/EC European Packaging directive	Ley 11/1997, de 24 de abril, de evases y residuos de envases [74]
(EU) 2015/720 of 29 April 2015 (that amends Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags).	Real Decreto 293/2018, de 18 de mayo, sobre reducción del consumo de bolsas de plástico y por el que se crea el Registro de Productores [75]

(EU) 2019/904 European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (Single-Use Plastics (SUP) Directive).	Ley 7/2022, de 8 de abril, de residuos y suelos contaminados para una economía circular. (10 April 2022) [16]

5.2.4 Hungary

The summary of the Hungarian transposition from the EU directives is displayed on Table 16. Additional information about certain Hugarian transpositions are described in Appendix 7.6 Additional information about the Hungarian transposition from EU Directives regarding the packaging sector.

Table 16 Summary of Hugarian transpositions from EU directives related to the packaging sector

Directive N°(know as..)	Hungarian transposition
(UE) 94/62.EC European Packaging directive	A Kormány 442/2012. (XII. 29.) Korm. rendelete a csomagolásról és a csomagolási hulladékkal kapcsolatos hulladékgazdálkodási tevékenységekről, related to packaging waste. [76] It is entried into force on 2 January 2013
(EU) 2019/904 on the reduction of the impact of certain plastic products on the environment	A Kormány 301/2021. (VI. 1.) Korm. rendelete az egyes egyszer használatos, valamint egyes egyéb műanyagtermékek forgalomba hozatalának korlátozásáról.: on restricting the placing on the market of certain single-use and certain other plastic products [77] Published in the Hungary's Official Gazette on 1 June 2021.
	349/2021. (VI. 22.) Korm. Rendelet az egyes műanyagtermékek környezetre gyakorolt hatásának csökkentéséről [78] Decree is on force since 3 July 2021.

5.3 Summary of the Plastic Packaging regulations

	Regulation ref & database links	Status to date	Comments
Europe	Directive (EU) 94/62/EC	Amended	on packaging and packaging waste (PPWD)
	Directive (EU) 2015/720	Ongoing	as regards reducing the consumption of lightweight plastic carrier bags
	Directive (EU) 2018/852	Ongoing	on packaging and packaging waste
	Directive (EU) 2019/904	Ongoing	on the reduction of the impact of certain plastic products on the environment (SUP)
	COM(2022) 140 Final	New Up coming regulatory	On ecodesign for sustainable producs
	COM (2020) 667 Final	Regulatory Reviews	On the reduction of chemical substances of concern
France	Law n°2015-992 of 17 August 2015	Ongoing	on energy transition for green growth
	Decree n°2016-379 of 30 Marchs 2016		regarding the conditions for the implementation of the limitation of single-use plastic bags
	Decree n°2016-379 of 30 Marchs 2016		regarding the conditions for the implementation of the limitation of single-use plastic bags
	Law n°2020-105 of 10 February 2020		on the Circular economy and against waste
	Ordonnance n°2020-920 of 29 July 2020		regarding to the prevention and management of waste
	Decree n°2021-763 of 14 June 2021		regarding definitions of very lightweight plastic bags
	Decree n° 2022-549 of 14 April 2022		on the National strategy for the reduction, re-use and recycling of single use plastic packaging
Germany	Packaging Act (VerpackG)		Packaging law (VerpackG)
Spain	Law 11/1997		on Packaging and Packaging Waste
	Royal decree n°293/2018		on the reduction of the consumption of plastic bags and by which the Registry of Producers is created
	Law 7/2022		on waste and contaminated soil for a circular economy
Hungary	Act n° LIII of 1995		on the General Rules of Environmental Protection
	Act CLXXXV of 2012		on Waste
	442/2012 (XII. 29) Government Decree		on packaging and packaging waste management activities
	Government Decree No. 301/2021 (VI. 1.)		on restricting the placing on the market of certain single-use and certain other plastic products
	Government Decree n°349/2021 (VI. 22.)		on reducing the impact of individual plastic products on the environment

6 Conclusions

Develop SSRbD alternatives with no potentially hazardous additives through industrially relevant case studies is the main objective of SURPASS Project. The three sectors targeted (Building, Transport and Packaging) represent around 70% of the European plastic demand.

This Regulatory Landscape analysis for the development of SSRbD polymers will help the end-users to have an access to a compilation of the current policy and regulations of each industrial sector, which will serve as a guiding tool to make the search of information more user-friendly.

The focus of this report covers an exhaustive analysis of the EU regulations as REACH, EU Waste Framework Directive and CLP Regulation, which are aligned with the Safe and Sustainable approach. Besides, some others legislations as The European Green Deal, the Chemical Sustainability Strategy and Microplastics Restrictions were also mentioned and described, since they play an important role on the development of SSRbD polymers for all three sector of study. Since the EU Regulations are in constant revision, some of the ongoing corrections were also presented, as the example of REACH which is under current revision through the Chemicals Sustainability Strategy. Therefore, same analysis was made for National regulations of four different countries: France, Germany, Spain, and Hungary, since restrictions and applications may differ from EU regulations. These specific four countries were selected as an example, since they represent the country of origin of the three case studies and of the Consortium of SURPASS Project.

As observed along this report, there are specific regulations for each one of the three sectors targeted. However, the Packaging sector is the one presenting most restrictions and ongoing revisions at the European level but also for the National (France, Germany, Spain and Hungary).

It is important to mention that currently, this first version of the Regulatory Landscape Analysis will serve as a guideline. However, since the regulations and restrictions are in constant revision, the SURPASS Project's Consortium will be responsible for the monitoring and updates of this report during the four years duration of the Project (2022-2025).

7. Appendix

7.1 European and national law databases

	Law database	Description
Europe	https://eur-lex.europa.eu	European regulation datdbase
France	http://www.legifrance.gouv.	French law
Germany	http://www.gesetze-im-internet.de	German federal law database
	https://justiz.de/onlinedienste/bundesundlandesrecht/index.php	Access to Lander legislation
Spain	https://www.boe.es	Spanish law database
Hungary	https://njt.hu	Hungarian law

7.2 List of organizations monitoring regulatory developments

Country	Professional organization	Website
Hungary	Hungarian association of packaging and materials handling	http://en.csaosz.hu/
	Hungarian Plastics Industry Association	https://huplast.hu/
	Hungarian Waste Management Federation	https://www.hosz.org/en/welcome
	Hungarian Chemical Industry Association	http://www.mavesz.hu/
	ÖKO-Pannon	https://www.okopannon.hu/en/home/
Germany	IK Industrievereinigung Kunststoffverpackungen e.V.	https://kunststoffverpackungen.de/en/
	Deutsches Verpackungs Institut	https://www.verpackung.org/en
	German Association of the Plastics Converters	https://www.gkv.de/en/
	Arbeitsgemeinschaft Verpackung + Umwelt e. V.	https://www.agvu.de/en/
Spain	ANAIP ASOCIACION ESPAÑOLA DE INDUSTRIALES DE PLÁSTICOS	https://www.anaip.es/
	Asociación Española de Packaging	https://aespackaging.graphispack.org/
	AIMPLAS Instituto Tecnológico del Plástico	https://www.aimplas.es/
	Asociación de Industriales de Plásticos de Catalunya	https://aipc.cat/
	Asociación Española de Fabricantes de Tubos y Accesorios Plásticos	http://asetub.es/
	Asociación Nacional Recicladores Plástico	https://anarpla.com/
	Centro Español del Plásticos	https://www.cep-plasticos.com/
France	Polyvia	https://www.polyvia.fr/en
	Elipso	https://www.elipso.org/en/home/
	Conseil national de l'emballage	https://conseil-emballage.org/en/
Europe	European Plastics Converters	https://www.plasticsconverters.eu/
	Plastics Europe	https://plasticseurope.org
	Europen	https://www.europen-packaging.eu/

7.3 Additional information about the French transposition from EU Directives regarding the packaging sector

7.3.1 National Pact on Plastic Packaging

On 21 February 2019, a National Pact on Plastic Packaging was also signed between the Secretary of State to the Minister for the Ecological and Inclusive Transition Brune Poirson, and 2 NGO and several companies with the support of the Ellen MacArthur Fundation.
This National Pact on Plastic Packaging refers to Safe and Sustainability aspects.

Law n° 2020-105 of 10 February 2020 on the Circular economy and against waste and its application decrees

In France, the prevention and the management of waste, whose packaging waste, is regulated by the French Environmental Code (FEC) tha was modified by the Law n°2020-105 of 10 February 2020 on the Circular economy and against waste (Loi n°2020-105 du 10 février 2020 relative à la lutte contre le gaspillage et à l'économie circulaire or loi AGEC, publiée au JORF n°0035 du 11 février 2020).

The main aim of this law is to help change the French society model from a linear economy (produce, consume, throw away) to a circular economy, **more resource-efficient;** that means waste is minimized and resources are reused as much as possible. This new economic model includes:

- a low consumption of nonrenewable resources,
- the reuse of waste as a resource,
- products that have a longer useful life,
- the recycling of 100% of plastics,
- less wastefulness.

The Law n°2020-105 of 10 February 2020 on the Circular economy contains:

- **new obligations** with the creation of new producer responsibility sectors to include new product families in the circular economy (toys, sports and do-it-yourself equipment, building materials, cigarette butts, sanitary textiles);
- **new prohibitions** on single-use plastics and to fight waste of food and non-food unsold products;

- **new tools** to better control and sanction offences against the environment (greater power for mayors to combat littering and illegal dumping), to support companies in their eco-design initiatives (bonus/malus-type incentives) and to assist citizens in new consumption practices (repairability index, information on environment and health impacts of products, harmonisation of info on sorting, etc.).

All these measures are divided into 5 great objectives:

- Phasing out of disposable plastic;
- Better informing consumers;
- Fighting against waste and for solidarity reuse;
- Acting against planned obsolescence;
- Better production

Since the anti-waste law for a circular economy has been enacted on 10 February 2020, different application decrees were published (A list of these application decrees can be found on this web page on the Ministère de la Transition écologique et de la Cohésion des territoires website). Among these decrees, several focus on plastics, recycled plastics as well as plastic packaging:

- Regarding single-use plastics:
  - Décret n° 2020-1828 du 31 décembre 2020 relatif à l'interdiction de certains produits en plastique à usage unique (the targets defined in the decree are given in the table above)
  - Décret n° 2021-517 du 29 avril 2021 relatif aux objectifs de réduction, de réutilisation et de réemploi, et de recyclage des emballages en plastique à usage unique pour la période 2021-2025
  - The targets definied in this decree are:
    - Reduction target of 20% (whose at least 50% achieved through the reuse of packaging) by 31 December 2025 and taking into account the potential specific to the product categories for which this packaging is intended
    - Recycling target of 100% of single use plastic packaging by 1st January 2025
  - Décret n° 2022-549 du 14 avril 2022 relatif à la stratégie nationale pour la réduction, la réutilisation, le réemploi et le recyclage des emballages en plastique à usage unique (ie Decree 3Rs , which is detailed on bellow)
- Regarding packaging:

- Décret n° 2021-1318 du 8 octobre 2021 relatif à l'obligation de présentation à la vente des fruits et légumes frais non transformés sans conditionnement composé pour tout ou partie de matière plastique
- Décret n° 2021-1610 du 9 décembre 2021 relatif à l'incorporation de plastique recyclé dans les bouteilles pour boissons
- The objectives set by this decree are stemming from the Directive 2019/904 i.e.: At least 25% recycled plastic in beverage PET bottle from 1 January 2025 and at least 30% from 1 January 2030
- Décret n° 2022-2 du 4 janvier 2022 relatif aux situations permettant de déroger à l'interdiction d'acquisition par l'Etat de produits en plastique à usage unique
- Décret n° 2022-507 du 8 avril 2022 relatif à la proportion minimale d'emballages réemployés à mettre sur le marché annuellement
- This decree defines for the years 2023 to 2027 the minimum proportion of reused packaging to be placed on the market annually in France in order to achieve the reuse targets set by Article L. 541-1 of the Environmental Code, i.e. 5% in 2023 and 10% in 2027

- Regarding recycled plastics:
  - Décret n° 2021-254 du 9 mars 2021 relatif à l'obligation d'acquisition par la commande publique de biens issus du réemploi ou de la réutilisation ou intégrant des matières recyclées

For more information on the French law n°2020-105, see the following link:
https://www.ecologie.gouv.fr/loi-anti-gaspillage-economie-circulaire

7.3.2 The « 3R Decree »: Decree n° 2022-549 of 14 April 2022 on the National strategy for the reduction, re-use and recycling of single use plastic packaging

France has also enacted the 3R National Strategy for single-use plastic packaging i.e. « Stratégie 3R (Réduction, Réemploi, Recyclage) pour les Emballages en plastique à usage unique » in April 2022 in order to "achieve the end of single-use plastic packaging on the market by 2040".This perspective is broken down into five-year reduction, reuse and recycling targets.

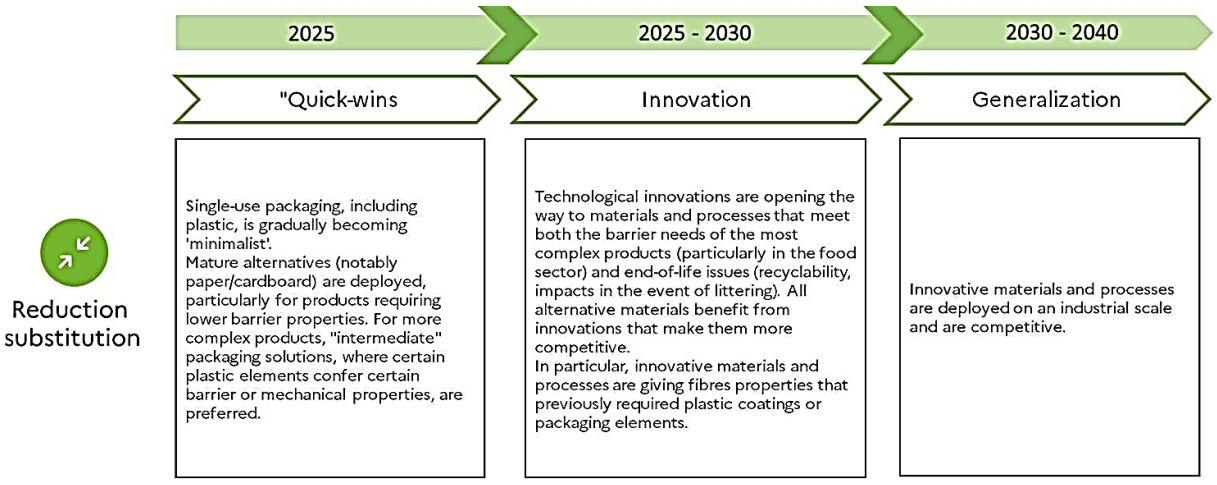
The first five-year decree known as the « 3R decree » i.e. **Decree n° 2022-549 of 14 April 2022 on the National strategy for the reduction, re-use and recycling of single use plastic packaging** (Décret n°2022-549 du 14 avril 2022 relatif à la stratégie nationale pour la réduction, la réutilisation, le réemploi et le recyclage des emballages en plastique à usage unique) introduced the following targets for the period 2021 -2025:

- 20% reduction in single-use plastic packaging by the end of 2025, at least 50% of which should be achieved through reuse.
- A 100% reduction of unnecessary single-use plastic packaging by the end of 2025.
- A 100% recycling of single-use plastic packaging by 1st January 2025 and, to achieve this, an objective that all single-use plastic packaging placed on the market should have an operational recycling channel by 1st January 2025.

The 3Rs Strategy for reduction, reuse and recycling of single-use plastic packaging is the France roadmap designed to achieve these targets. The 3R strategy report is organizedin 3 parts:

- Part 1, devoted to a summary of the environmental, economic and social issues associated with single-use plastic packaging, a description of the regulatory tools, support systems and existing initiatives, as well as an introduction to the framework and key definitions.
- Part 2, which provides a summary of the current situation regarding the use of single-use plastic packaging in France, describes the alternatives that contribute to the objectives of the decree and the main issues associated with their broader adoption, proposes potential 2025 trajectories and 2040 perspectives broken down by sector, and addresses a number of specific issues such as the assessment of the environmental impacts of alternatives, investment and the needs, articulation of the 2025 objectives and the 2040 ambition.
- Part 3, proposing a cross-cutting and sectoral action plan to achieve the 2025 objectives and the 2040 perspective.

Main key milestones definited into the 3Rs Strategy are illlustrated below:



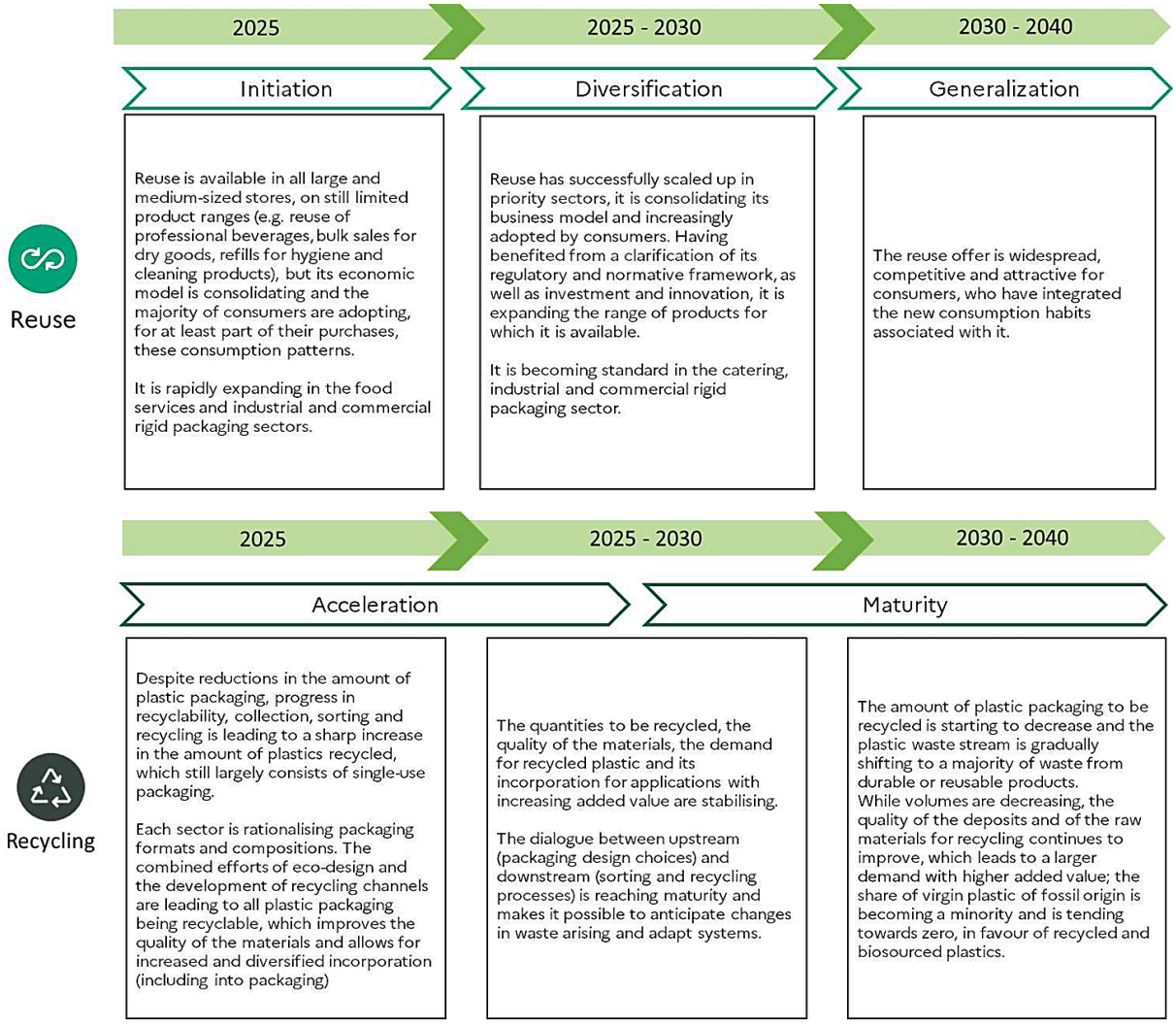


Figure 8 Executive summary of the 3R Strategy for reduction, reuse and recycling of single-use plastic packaging [79]

For more information on the 3R National Strategy for single-use plastic packaging, **see the following link:**

https://www.ecologie.gouv.fr/lutte-contre-pollution-plastique#scroll-nav__1

7.3.3 Ongoing revisions

Law n° 202-105 of 10 February 2020 on Circular Economy and wastes:

Main measures of the Law n°2020-105

Phasing out of disposable plastic	Ban on all single-use plastics by 2040 by a progressive and reasoned method for phasing out by defining five-year plans providing targets for plastic reduction, reuse and recycling This includes a fast-track ban on single-use plastic for a first series of uses and products which predominantly end up in the environment and in the ocean, in accordance with the european SUP Directive.
Better informing consumers	The change in the consumers' behaviour requires better informations while providing informations allow companies to be more accountable for the environmental quality and the durability of their products and services.
Fighting against waste and for solidarity reuse	The law strictly prohibits the destruction of unsold non-food products while strengthening the fight against food wastage. It also contains a large number of measures aiming at promoting reuse.
Acting against planned obsolescence	Products having to able be repaired or reused, the law provides an easier access to square parts and sets up a reparability index for products.
Better production	The law creates new polluter pays schemes created in the areas of toys, cigarette butts, sports equipment, pre- soaked wipes and nappies. Companies have to better design their products and to put in place reuse and recycling channels. Other measures aim to simplify sorting habits, such as the harmonization of the colour of waste bins or the possible implementation of a deposit-system which aims to make this sorting more efficient to promote packaging recycling and reuse

Targets planned on the anti-waste law-Part I

Measures regarding packaging and packaging waste	
Overall targets	• 15% decrease in household trash per inhabitant by 2030; • 5% decrease in waste from economic activity; • Recycling 100% of plastics by 2025; • Zero disposable plastic by 2040 thanks to 4 stages (2020-2025, 2025-2030, 2030-2035, 2035-2040)
Plastic product ban (whose single-use plastics)	From 1st January 2020: • Cotton buds; Disposable tableware in sets (glass, cups, plates) From 1st January 2021: • straws, spoons; • take-out cup lids, • expanded polystyrene boxes (e.g. kebab boxes) for on-site or on-the-go consumption, • steak spades, • balloon rods, • plastic confetti • all oxodegradable plastic objects • The importation and manufacture of singe-use plastic bags for the purpose of supply on the national territory From 1st January 2022: • Plastic tea bags; • Plastic toys distributed free of charge at fast-food restaurants; • Plastic packaging used for shipping newspaper or magazines; • Plastic packaging around fruit and vegetables under 1.5 kg; • Labels onf fruits and vegetables From 1st January 2023

	• Disposable dishes in fast food restaurants for meals served on site From 1st January 2023: • Shipping under plastic wrap of advertising From 1st January 2025: • Shipping under plastic wrap of newspapers and magazines • Plastic containers for reheating or cooking baby food in paediatric, obstetric, maternity wards, and perinatal centres

Targets planned on the anti-waste law-Part II

Plastic Bottle	From 1st January 2021 • The free of charge distribution of plastic bottles in enterprises is prohibited From 1st January 2022 • Public establishments have to be equipped with drinking water fountains From 2023 • Setting up of a mixed deposit system for recycling and reuse, following a progress report on the simplification of sorting rules, to be prepared in 2023 on the results of 2022.
Reusable containers	From 1st January 2021: • Drinks served in a reusable container presented by the consumer will be sold at a lower price • Large areas over 400 m2 provide reusable containers (free or for a fee); • Bulk traders will have to accept containers brought by the consumer From 1st July 2021: it is possible to bring his own reusable containers in restaurant

Targets planned on the anti-waste law-Part III

Measures for other market products:	
Fight against microplastic pollution	From 1st January 2025: Household or professional washing machine have to be equipped with a plastic microfiber filter
Fight against planned obsolescence	From 1st January 2021: • Creation of a repairability index for electric and electronic products • Extension of the legal guarantee of conformity • Creation of repair funds for EPR schemes. From 1st January 2022:Enable the use of additive manufacturing processes for the product repair
Obligation to inform consumers	From 1st January 2021 ▪ Sellers have to inform consumers about availability of spare parts for electric and electronic equipment and furniture From 1st January 2022 • Triman Logo: the obligation to mark products with the symbol is implemented in the French environment law (Code de l'environnement Art. L541-9-3). The logo which is already mandatory on all (household-) packaging, textiles and shoes, furniture, tires, and paper products, is also applied to electronic goods, batteries and similar. • Any person marketing products containing substances with endocrine disruptor properties according to ANSES, must publish in an open format the list of these products and the substances contained in each of them • Internet service providers and mobile operators will have to display information on the amount of data consumed, as well as the equivalent in greenhouse gas emissions (GES). From 1st January 2023: The colours of waste bins have to be harmonized throughout the national territory.
Waste reduction	• Increase of sanctions in case of non-compliance with the ban on food wastage • Prohibition of the destruction of non-food unsold products: • Unit dispensing of medications From 1st January 2022: End of distribution of printed advertising matter containing mineral oils From 1st January 2023: End of printing of cash-till and credit card receipts

7.4 Additional information about the German transposition from EU Directives regarding the packaging sector

Germany Packaging Act, replaced the "Packaging Ordinance", which was in force until the 31st December 2018, and is aiming to reduce the negative impacts of packaging waste on the environment and to bring about a significant increase in recycling rates for waste packaging materials.

As the Packaging Ordinance, the German Packaging Act specifies the product responsibility for packaging materials. Anyone or any company that markets packaging materials for the first time in Germany for the purpose of protecting a product, marketing it better or sending it by post (shipment packaging), must ensure beforehand that these packaging materials are disposed of correctly by participating to a dual system. This dual system is a nationwide take-back system for packaging that reflects the principle of manufacturer product responsibility.

All packaging that ultimately end up with and have to be disposed of by German end-users, whatever the material and whatever the packaging volume, are concerned i.e. both product packaging and shipping packaging including filling and padding materials.

Each initial distributor of packaging has to register with the packaging register LUCID and license their sales packaging there.

To oversee that the dual system is working efficiently, the German Packaging Law includes the creation of the Foundation Central Agency Packaging Register (namely Central Agency) as a federal authority.

As a result, the Packaging Act has allowed Germany to reinforce obligations and definitions for companies and to increase significantly targets for material recycling.

- Companies have to contribute as "initial distributor" to the costs of collecting, sorting and recycling the packaging waste that is created by paying a "licence fee" whose amount is based on the volume and materials contained in packaging placed on the market. The fee is payed to one of the "dual systems" – accredited private companies that ensure that packaging waste goes through waste management and recycling processes.
- A national authority (Stiftung Zentrale Stelle Verpackungsregister or ZSVR) has been established to set an overall system for the national packaging waste disposal that is

sustainable and eliminating competitive distortion. This agency is financed by systems and operators of sector-specific solutions, based on their respective market share. It has regulatory powers and, as an independent body, aims to increase enforcement efficiency and bolster competition.

  - Before placing packaged goods on the market, companies must register with the ZSVR.
  - Companies also have to submit information relating to packaging subject to system participation to the ZSVR (registration number, material type and volume, name of the packaging system participated in, duration of the system participation contract)

- Licence fees are defined by the Central Agency and modulated i.e. set with ecological criteria in order to encourage companies to use packaging that consists (partially) of recycled materials or that contains a high percentage of recyclable materials.
- Recycling & reuse targets: The packaging schemes are required to reach the following minimum annual average rates for their contracted packaging volumes in terms of preparation for recycling and reuse.
  - Recycling targets

MATERIAL	PREVIOUSLY	FROM 2019	FROM 2022
Glass	75%	80%	90%
Paper, paperboard, cardboard	70%	85%	90%
Ferrous metals	70%	80%	90%
Aluminium	60%	80%	90%
Beverage carton packaging	60%	75%	80%
Other composite packaging	60%	55%	70%
Plastics (mechanical recycling)	36%	58,5%	63%

  - Reuse targets: the VerpackG includes a target reusability rate of 70% for beverage packaging.
  - Additionally the obligation to charge a deposit has been expanded to beverage packaging that includes carbonated fruit and vegetable nectars as well as drinks with

In order to bring the Packaging Act into line with the current EU directives and to improve its enforcement, the Germany's Federal Cabinet approved on 20 January 2021 a new Draft Law transposing the Single Use Plastics Directive (EU-Plastics Directive 2019) and the Waste Framework Directive into the Packaging Act (VerpackG). This law cames into force as of 3 July 2021.

The summary in Table 17**Erreur ! Source du renvoi introuvable.** exhibits the most important changes and their timelines.

Table 17 Summary of the most relevant changes on the German Packaging Act (VerpackG) and their timeline

3 july 2021	Entry into force of the amendment with the following changes • New Producer‘s obligations for packaging not subject to system participation (e.g.: transport or reusable packaging) • Service packaging: Delegation of companies obligations to upstream distributors is still possible • Assignment of an Authorised Representative (voluntary) in order to facilitate companies without branch or registered office in Germany to fulfil their obligations
1 January 2022	• Extension of deposit and return obligations: Mandatory deposit for all one-way beverage bottles and drink cans (except for one-way beverage bottles filled with dairy products until 1 January 2024) • Obligations to offer and promote to customers reusable alternatives (and their take-back) to single-use plastic food packaging and single-use beverage cups
1 July 2022	• Changes to the registration requirements for Producers: Registration of all packaging (e.g. also transport and reusable packaging) with the Central Agency (ZSVU) • Implementation of obligations for Digital Marketplaces and fulfilment service providers
1 January 2025	Obligation of a minimum recycled content: Sales ban on PET bottles containing less than 25% recycled plastics
1 January 2030	Obligation of a minimum recycled content: Sales ban on all one-way beverage bottles containing less than 30% recycled plastics

In February 2021, Germany has again amended its Packaging Act to introduce a ban on the distribution of lightweight plastic carrier bags with a wall thickness between 15 and 50 microns as of 1 January 2022.

According to the amendment, this ban has been introduced because it is notably unlikely that the previous voluntary agreement would have continued to decrease consumption of plastic carrier bags and because not all retailers participated to the voluntary agreement.

Moreover, Germany feared that overall consumption rising again due to an increase in consumption among retailers not party to the agreement.

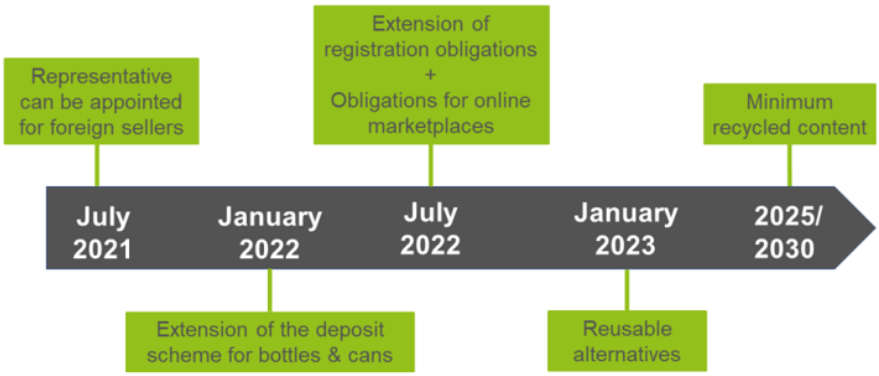


Figure 9 Timeline and evolutions of the German packaging Law

For more information on the VerpackG see the following links:

https://verpackungsgesetz-info.de

https://www.gesetze-im-internet.de/verpackg/

7.5 Additional information about the Spanish transposition from EU Directives regarding the packaging sector

7.5.1 Law 11/1997 on Packaging and Packaging Waste

The Law 11/1997 of April 24 on Packaging and Packaging Waste aims to prevent and to reduce the impact of packaging on the environment as well as to manage packaging waste. It includes within its scope of applications all the containers put on the European market and prioritize the different waste management options. The priority is given to measures that tend to prevent waste generation followed by those whose purpose is to promote the reuse, the recycling or recovery to avoid or reduce the elimination of this waste.

Moreover, law 11/1997 on Packaging and Packaging waste sets recycling and recovery objectives that have to be meet within a period of five years. To achieve these objectives, the law provides that:

- Packaging manufacturers have the obligation to use material from packaging waste in their manufacturing processes;
- Companies that place a packaged product on the market for the first time have to manage the environmental impact and contamination caused by the waste they generate: it is the concept of Extended Producer Responsibility (EPR),
- The different agents that participate in the commercialization chain of a packaged product (packagers, importers, wholesalers and retailers) must charge their clients, up to the final consumer, an amount for each product that is the object of the transaction and return the same sum of money for the return of the empty container. It is the concept of deposit system.

All in all, the Law 11/1997 of April 24 on Packaging and Packaging Waste includes 7 chapters respectively dedicated to:

- (1) the provisions of general application
- (2) setting certain principles of action of the Public Administrations to promote the prevention and reuse of packaging

- (3) to establish the objectives of recycling and recovery provided for in the aforementioned Directive, while establishing intermediate recycling targets that must be met within a period of 36 months
- (4) the requirements for packaging;
- (5) the information to be supplied to the Autonomous Communities;
- (6) the economic instruments
- (7) the sanctioning regime

7.5.2 Royal decree n°293/2018

In 2018, Spain has adopts Royal Decree N° 293/2018in order to reduce the consumption of single-use plastic bags and to create the Registry of Producers. This decree that was published in the Spanish "Boletin Oficial del Estado" on May 19, 2018, established measures to prevent and reduce the adverse impacts that the waste generated by these plastic bags produce in the environment", with **special attention to the damage caused to aquatic ecosystems, and on certain economic activities, such as fishing or tourism, among others**. It also has to "avoid the loss of material and economic resources that involves the abandonment of plastic bags and their dispersion in the environment.

Under this decree, the free distribution of lightweight single use plastic carrier bags is prohibited, effective 1 July 2018. Retailers could continue to distribute such bags after that date but have to affix a bag fee (Recycling Laws International, 4 June 2018).

7.5.3 Law 7/2022 on waste and contaminated soil for a circular economy

On March 31, 2022, Spanish Parliament passed the Law 7/2022 on waste and contaminated soil for a circular economy (ref.: BOE-A-2022-5809).

the,

This law, which entered into force on 10 April 2022aims to promote the implementation of measures to prevent the generation of waste and to reduce their adverse impacts on the environment and on human health by improving efficiency in the use of resources.

It directs competent authorities to adopt measures to prevent the generation of waste. Among the specified measures are:

- To promote and support sustainable and circular production and consumption models
- To promote the reduction of hazardous substances in materials and products in accordance with established harmonized EU legislation, especially substances under Annex XIV of REACH 'Authorization List,' restricted substances under Annex XVII of REACH and endocrine disruptors, as well as the prohibition of bisphenol A (BPA) and phthalates in packaging (Article 18(i))

It introduces a special tax on non-reusable plastic containers (including non-reusable containers that contain plastic) with certain derogations (effective January 1, 2023)

Thus, the law 7/2022 aims to:

- reduce the generation of waste, especially single-use plastics;
- manage the negative impact of packaging waste on human health and the environment
- promote the development of a circular economy.
- ban of the use of phthalates and bisphenol A in food packaging
- take restrictions of certain types of plastic products on the market, including plastic products mentioned in Section IVB of the Annex to the Regulation; any plastic product made from oxidatively degradable plastic; plastic products with intentionally added.
- support to the reusability of food packaging

7.5.4 Ongoing revisions

Law 7/2022 -Summary of the measures concerning food packaging included in article 55 to article 60. Part I:

Law article	Plastic products	Measure
Plastic products subject to reduction (Title V, Article 55)	• Drinking glasses, including their lids and plugs. • Food containers, such as boxes, with or without lids, used for the purpose of containing food that are intended for immediate consumption in the container itself and on the spot or to take away	The marketing reduction targets • A reduction of 50% by weight must be achieved in 2026 compared to 2022 • A reduction of 70% by weight must be achieved in 2030 compared to 2022 These objectives have to be carried out through: • the promotion of reusable alternatives or other non-plastic material • the payment of a price for each plastic products delivered to a customer
Plastic products subject to restrictions on placing on the market (Article 56)	**The introduction on the market of these products is prohibited** • Cotton swabs (except those which are matters of the Royal Decree 1591/2009 regarding medical devices; • Cutlery (forks, knives, spoons, chopsticks); Plates. • Straws (except those which are matters of the Royal Decree 1591/2009);Drink stirrers. • Sticks intended to hold and be attached to balloons, with the exception of balloons for professional uses • Food and beverage containers made of expanded polystyrene, including their lids and plugs • Any plastic product manufactured with oxodegradable plastic; • Intentionally added plastic microspheres less than 5 millimeters.	

Law 7/2022- Summary of the measures concerning food packaging included in article 55 to article 60. Part II:

Law article	• Plastic products	Measure
Design requirements for plastic beverage containers (Article 57)	• Beverage containers up to three liters in capacity , i.e. containers used to contain liquids, such as beverage bottles, including their caps and caps. • Containers for beverages intended for and used for food for special medical uses	Only single-use plastic products whose lids and caps remain attached to the container during the intended use phase of said container (if they are manufactured in accordance with the EU harmonized standards) may be placed on the market As of July 3, 2024
	PET bottles could be placed on the market if they contain:	• at least 25% recycled plastic as of January 1, 2025. • at least 30% recycled plastic as of January 1, 2030
	Measures to ensure compliance with these objectives have to be established by the extended responsibility of the producer (ERP) systems regarding packaging and packaging waste. They also have to facilitate the material availability in sufficient quality and quantity. For instance part of the recovered PET must be allocated to the manufacture of recycled PET.	
	A Coordination Commission on waste have to manage the establishment of the measures required to achieve the objectives and to value the promotion of a secondary market for recycled PET in Spain	
Marking requirements for certain single-use plastic products (Article 58)	• Wet wipes for personal hygiene and household use. • Pads, hygienic tampons and tampon applicators; • Tobacco products with filters and filters for use with tobacco products • Glasses for drinks	These products have to be marked in a highly visible, clearly legible and indelible manner, in accordance with the Implementing Regulation 2020/2151 of the Commission, of December 17, 2020. The marking should inform consumers about the appropriate product waste management options

Law 7/2022 -Summary of the measures concerning food packaging included in article 55 to article 60. Part III

Law article	Plastic products	Measure
Separate collection of plastic bottles (Article 59)	Beverage bottles of up to 3 liters capacity, including their caps and stoppers (except glass or metal beverage bottle and beverage bottel for food for special medical purposes)	Separate collection targets are definited for these plastic products. Their recycling rate • 70% by weight of that introduced on the market by 2023 at the latest, • 77% by weight By 2025 at the latest, • 85% by weight By 2027 at the latest, • 90% by weight By 2029 at the latest. A deposit, return and return system for these containers will be implemented throughout Spain within 2 years to guarantee compliance of the objectives in 2025 and 2029 in the case that targets set in 2023 or 2027 are not met at the national level.
Creation of taxes	• Tax excise on non-reusable plastic packaging Tax on waste sent to landfill, incineration and co-incineration	These taxes have to be come into force on January 1, 2023

Law 7/2022 Summary of the measures concerning food packaging included in article 55 to article 60. Part IV

Regimes of extended responsibility of the producer (Article 60)	• Food containers, such as boxes, that are intended for immediate consumption, directly in them or to take away, except beverage containers, plates and containers and food-containing wrappers. • Containers and wrappers made of a flexible material that contain food • Beverage containers or bottles with a capacity of up to 3 litres, including their caps and lids, except glass or metal beverages containers with stoppers and lids made of plastic. • Drinking glasses, including their lids and plugs. • Light plastic bags, as defined in Royal Decree 293/2018, of May 18. • Wet wipes for personal hygiene and for household uses. • Balloons, except balloons for professional uses • Filter tobacco products.	Spanish Government has to establish by regulation extended producer responsibility schemes for these single-use plastic products: • Before January 1, 2025 for single-use non-packaging plastic products, wet wipes for personal hygiene and for household uses and balloons (except balloons for industrial and professional uses and applications); • Before January 6, 2023 for food containers intended for immediate consumption , directly in them and without any further preparation, on the spot or to take away, except beverage containers, plates and containers and food-containing wrappers, including those made of flexible material as well as filter for tobacco products

7.6 Additional information about the Hungarian transposition from EU Directives regarding the packaging sector

7.6.1 Act n° LIII of 1995 on the General Rules of Environmental Protection

The Act No. LIII of 1995 on the General Rules of Environmental Protection (i.e. 1995. évi LIII. törvény a környezet védelmének általános szabályairól) is aiming to promotes:

- the reduced use, burdening and contamination of the environment,
- the protection of human health,
- the improvement of quality of life,
- the conservation of natural resources as well as their sustainable management and renewal.

Another purpose of the law is to harmonize State activities with the requirements of environmental protection, at the international cooperation in the field of environmental protection, public participation, integrating social and economic development into environmental protection, the establishment and development of institutions for environmental protection and the creation of a specialized public administration.

A list of special regulations regarding specified matters is integrated in article 3.

Last but not least, it defines the three fundamental principles of environmental protection i.e.: precaution, prevention and restoration.

7.6.2 Act CLXXXV of 2012 on Waste

The Act CLXXXV/2012 on Waste which has been several times amended since it was voted by the Hungarian Parliament, is aiming to protect environment and human health, to manage efficiently the natural resources and their uses, to prevent waste, to increase the re-use of materials and waste recycling and so on.

This law includes 11 chapters:

- Chapter I lays down general provisions;
- Chapter II provides general rules on waste;
- Chapter III regulates waste management;
- Chapter IV contains the obligation of actors in the waste management sector,

- Chapter V lays down general rules of public waste management service;
- Chapter VI contains general rules regarding each type of waste, among which hazardous waste and waste oil;
- Chapter VII sets out the rules concerning illegal waste disposal or abandonment;
- Chapter VIII provides for obligations (such as duty of reporting and registration, payment of waste disposal fee, reserves and insurance) linked to waste management activities;
- Chapter IX rules planning of waste management at national and territorial level;
- Chapter X contains rules on certain activities of the authorities concerning waste management, among which authorization, registration and control, and foresees sanctions for offenders;
- Chapter XI contains final provisions.

In fact, the CLXXXV Act of 2012 on Waste establishes the general rules and principles of waste management in Hungary. It notably integrates the principle of waste prevention, the principle of extended producer responsibility (EPR), and the principe of “polluter pays”.

As a result, the main purposes of this Act are:

- the protection of the environment and human health, including the mitigation of environmental impact,
- the efficient management of natural resources, i.e. the reduction of the impact and the improvement of efficiency of the use of resources,
- the prevention of waste and its harmful effects, which includes the reduction of its quantity and hazardousness, the re-use of materials, the increase of waste recycling rates;
- the environmentally waste disposal of non-reusable and non-recyclable waste.

7.6.3 442/2012 (XII. 29) Government Decree on packaging and packaging waste management activities

The Decree n°442 of 2012 (XII. 29.)integrates the obligations for producers and distributors to:

- take back, collect and reuse packaging materials,
- keep a register
- report on their related activities.

The Government Decree also provides the requisites of production, labelling and distribution of packaging materials (in Articles 3-5).

The consolidated version of the Decree entered into force on 1 April 2015.

This Decree defines producers two ways to comply with their obligations of collection, recovery and recycling:

- By individual compliance;
- By paying a product charge to the National Waste Management Directorate (NHI), a unit within the National Inspectorate for Environment and Nature

The missions of the National Waste Management Directorate (NHI) are to:

- arrange for waste collection and recovery;
- implement the annual National Collection and Recovery Plan;
- support the development of a state fund to ensure sustainable resource management and eco-innovation in the waste management sector;
- improve the public's environmental awareness;
- participate in international fora such as the International Solid Waste Association.

To carry out its missions, NHI has contracts with local waste management companies and with recyclers.

The Decree includes the same recovery and recycling targets than the European Packaging and Packaging Waste Directive.

7.6.4 Government Decree No. 301/2021 (VI. 1.)

The decree N° 301/2021 has notably introduced new definitions concerning certain single-use product, i.e. « plastic shopping bags ». It distinguishes « light plastic shopping bag » (with wall thicknesses of less than 50 microns) and « very light plastic shopping bag » (bags with wall thicknesses of less than 15 micron and used for hygienic purposes and for the primary packaging of bulk food and that helps to prevent food waste). It establishes the ban on certain single-use plastic products and products made from oxo-degradable plastic from 1 July 2021. As a result, only "light plastic shopping bags" if made of biodegradable plastic can be placed on the market beginning 1 July 2021 according to the Government Decree 301/2021. (VI.1).

As the list of single-use plastics banned shows, Hungary added other products in the Government Decree 301/2021 (VI.I) than required by the SUP directive:

- Cups of beverages made of plastic, including plastic coated paper cups;
- Lightweight plastic carrier bags with a wall thickness of between 15 and 50 microns (except those made of biodegradable plastic)

Furthermore Hungary has significantly increased the environmental product fee rate for by 1 July 2021 to encourage the economical use of non-banned plastic carrier bags as displayed in Table 18.

Table 18 Government encouragement for the economical use of non-banned plastic carrier bags

Type of plastic carrier bags	Product fee rate evolution by 1 July 2021
Very lightweight plastic carrier bags (with wall thickness under 15 µm	From 57 Forint/kg to 1900 Forint/kg
Lightweight plastic carrier bags (with wall thickness between 15 and 50 µm	From 0 Forint/kg to 500 Forint/kg
Lightweight plastic carrier bags (with wallthickness above 50 µm	Unchanged - 1900 Forint/kg

7.6.5 Ongoing revisions

Hungarian Government Decree No. 301/2021 (VI. 1.):

<table>
<tr><td>Prohibition to put on the market of these plastic products from 1 July 2021</td><td colspan="2">• Cotton swabs;
• Cutlery (forks, knives, spoons, chopsticks);Plates; Straws; Drink stirring sticks,
• Sticks to be attached to and to support balloons, except for balloons used for professional purposes
• Food containers made of expanded polystyrene
• Beverage containers made of expanded polystyrene (EPS), including their caps and lids;
• Lightweight plastic carrier bags with a wall thickness of between 15 and 50 microns, except those made of biodegradable plastic.</td></tr>
<tr><td>Prohibition to put on the market of these plastic products from 1 January 2023</td><td colspan="2">• Cups for beverages not made of expanded polystyrene, including their caps and lids</td></tr>
<tr><td>Exceptions to prohibition</td><td colspan="2">• Plastics products such as cups intended and used for containing food for special medical purposes as well as straws and sticks qualifying as medical devices.</td></tr>
<tr><td rowspan="4">Increase of environmental produc fee rate «(« Green Tax ») for plastic products (whose non-banned plastic bags</td><td>Plastic product</td><td>Green tax (Forint/kg)</td></tr>
<tr><td>Plastic products (except plastic bags)</td><td>57 Ft/kg</td></tr>
<tr><td>Plastic bags under 15 µm and over 50 µm</td><td>1900 Ft/kg</td></tr>
<tr><td>Non-banned Plastic bag (i.e. made of biodegradable plastic)</td><td>500 Ft/kg</td></tr>
<tr><td>Sanctions</td><td colspan="2">The government decree being qualified as legislation connected to waste prevention, any violation has to be sanctioned according to waste-prevention regulations.</td></tr>
</table>

Decree No 349/2021most important measures-Part I :

Consumption reduction	The free-of-charge provision of certain single-use plastic products, including certain food packaging to consumers upon sale are prohibited

Product requirements	• Only single-use (beverage) containers whose caps and lids remain attached to the packaging;
	• Beverage bottles made of PET have to contain recycled plastic:
	  ○ At least 25% recycled plastic from 2025
	  ○ At least 30% recycled plastic from 2030

Marking requirements	As of 3 July 2021, certain single-use plastic products (e.g. tampons, tobacco products) have to bear a conspicuous, clearly legible and indelible marking in accordance with Commission Implementing Regulation (EU) 2020/2151.
Separate collection	A separate collection for recycling has to be ensured as part of the framework of extended producer responsibility in order to achieve the follow targets: • *77%* of bottles *put* on the *market* by *2025* must be recycled • 90% of bottles *put* on the *market* by 2029 must be recycled
Awareness raising measures	Manufacturers have to inform consumers and incentivise responsible consumer behaviour in order to reduce litter from products specified in the Government Decree, and must take measures to inform consumers of certain single-use plastic products
Registration of manufacturers	Manufacturers of certain single-use plastic products specified in the Government Decree had to initiate their registration with the competent authority as of 1 January 2022 until 15 January 2022.

Decree No 349/2021most important measures-Part II :

Record-keeping and reporting obligations for manufacturers	The Government Decree also specifies record-keeping and reporting obligations for manufacturers
Sanctions	The Government Decree qualifies as legislation connected to waste prevention. Hence, any violation will be sanctioned according to waste-prevention regulations

7.7 Packaging regulation landscape and ongoing revisions

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