polynSPIRE

Innovative technologies for plastic recycling

WP9 - Market analysis, Exploitation and Business plan

Task 9.3 Overcoming legislative barriers for the recycling of fossil-based plastics for high added value applications (M12-M48).

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EXECUTIVE SUMMARY

This research is the development of Task 9.3 which is part of WP9 Market analysis, Exploitation and Business plan that aims to ensure the exploitation and commercialization of all the knowledge and technical results obtained from the execution of the previous WPs to pave the way for market uptake of POLYNSPIRE solutions for the targeted polymers along the value chain stakeholders and around Europe.

Research done on legislation relating to the reuse and recycling of plastics aims to identify the most widely used and relevant directives in the field. Through this document, it is possible to detect what the objectives of the regulations are, possible conflicts between them, gaps, undefinitions and missing points. The idea is to detect legislative barriers that may hinder the circular economy or recycling processes in addition to the use of the technologies developed in the project.

Due to the widespread use of plastic and the difficulties that, at an international level, arise for its reuse and recycling, the specific regulations in relation to this issue have been mentioned in the first place. Specifically, some example industries in which regulations are not sufficient to contribute to the reduction of the environmental impact have been identified: vehicles, electronic equipment, and shipment.

On the other hand, research has been done on regulations related to waste and the EU position with respect to its hierarchy and its recovery. The idea followed by present and future standards is to reduce waste generation as much as possible, for reuse, recycling, and recovery to take place.

To get a clearer idea of the context in which the previous regulations are developed, relevant European Commission's communications have also been mentioned, which have a strong link with the circular economy and waste treatment policies. In addition, the information obtained in webinars related to the new waste laws and those of single-use plastics has been very useful for the development of some of the points discussed below.

Within the development of the deliverable, there are examples of Belgian, Spanish, French, Portuguese, Italian, and Turkish regulations, representing the countries where the partners of the consortium are most affected, that emphasize the prohibitions for the use of certain products or materials, the importance of waste recovery and the necessary steps to achieve a more sustainable industry.

Recommendations and proposals for improvement are included in the deliverable with the aim of overcoming some of the possible barriers or legislative gaps previously identified. The objective is to create a series of systems that contribute to the motivation of companies to incorporate recycled plastics in their production processes and reduce their negative impact.

Once the first version of the document was finalized, policy makers and associations from different sectors focused on plastic and waste management were contacted and approached with the draft deliverable. They were asked for feedback and opinions, so this document shows the contributions that have been achieved after this work of dissemination and collaboration.

Finally, the path to global acceptance is identified, so that the developed technologies are incorporated into the industry and regulations are oriented to facilitate this implementation. It is a challenging task, but these

changes and incentives will be sought through the acceptance and dissemination of the benefits provided by new technologies.

One of the main goals of the deliverable is that all partners could enrich the document by adding the regulations of their countries and sectors with which they work daily. In addition, it means an opportunity to provide ideas on legislative improvements that could be made to better develop a circular economy and reduce environmental impact.

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- **Main Objective**: Legislative barriers will be addressed, for implementing the chemical and mechanical recycling methods analysed in POLYNSPIRE. The idea is to identify the most widely used and relevant directives and regulations in the plastic waste field to detect barriers to the implementation of technologies.

Specific Objectives:

- Identify and describe the regulatory framework for the reuse and recycling of plastic waste in the European Union.
- Analyze the impact that regulations can have for the implementation of polynSPIRE solutions.
- Receive contribution from partners who will identify the most relevant regulations in the countries where they operate. Then, analyze the impact in each case.
- Provide proposals for improvement to encourage awareness on this issue, the reuse of plastic waste and the creation of standards that favor it.
- Identify the path to achieve global acceptance of the technologies and developments proposed in the project.
- Bring this deliverable to relevant personalities and organizations in the sector so that they can give their comments about current legislation and the possibility of involving policy makers to achieve improvements in current regulations.

LIST OF ABBREVIATIONS AND ACRONYMS

CA – Consortium Agreement
D – Deliverable
DoA – Description of Action
EC – European Commission
EUPC – European Plastics Converters
FP – Framework Programme
GA – General Assembly
H2020 – Horizon 2020 The EU Framework Programme for Research and Innovation
PA – Polyamide
PC – Project Coordinator
PolynSPIRE - Demonstration of Innovative Technologies towards a more Efficient and Sustainable Plastic Recycling
PU - Polyurethane
SC – Steering Committee
WP - Work package

1 INTRODUCTION

Task 9.3 Overcoming legislative barriers for the recycling of fossil-based plastics for high added value applications (M12-M42) is part of WP9 Market analysis, Exploitation and Business plan. The analysis carried out in these deliverable results from the research and data collection sent by the partners involved in the task.

The scope of 9.3 is to identify the barriers to the implementation of the polynSPIRE solutions. As mentioned in the Task Definition, an attempt will be made to detect lack of definitions and the occurrence of gaps in legislation, unclear definition of targets in legislation, definition of hard numerical limits on regulations, incomplete implementation or enforcement of legislation, conflicting national implementations of a legislation and legislations that conflict each other.

In addition, proposals for improvement will be passed on to relevant people and organizations in the sector so that they get insight into these ideas and, if possible, take them into consideration when finding ways to address the challenges that hinder a more efficient circular economy.

The idea of the deliverable is to achieve a collaborative work in which all those involved or interested can contribute with ideas and seek the best implementation of the technologies. This is a difficult objective to achieve, but communication actions have been carried out with the most relevant entities in the sector who were open to maintaining a collaborative relationship and fluid conversation.

The aim of polynSPIRE is to develop innovative and sustainable technologies to improve energy and resources efficiency of recycling processes of plastics containing PA and PU materials through different methods and delivering them to the market for its exploitation.

Although the developments are innovative and contribute to the reduction of the environmental impact of the industry, legislative barriers can mean a serious limit to their exploitation. It is for this reason that it must be considered that the lack of regulation or the difficulty in imposing obligations or prohibitions is such a negative factor that it can even nullify the success of inventions or developments of the project.

The main objective of T9.3 is to contribute by providing solutions to regulatory conflicts and to promote the creation of standards that regulate and facilitate the implementation of technologies that are relevant and coordinated with the European objectives of reduction of plastics. It is noticed that many existing regulations are linear in focus but in order to make a sustainable future, regulations and directives should be aligned with a circular focus. e.g., in the waste frame directive.

2 EUROPEAN REGULATION

2.1 PLASTIC

This section mentions the main European regulations referring to plastic, types of plastic and their different ways of use. The intention is to understand the current legislative context and detect possible difficulties, regulatory gaps, or normative conflicts.

Any plastics waste management and plastics recycling activity that takes place in EU Member States occurs under the European legal framework because the EU sets the rules, criteria of action, and main objectives.

- REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) Regulation

Regulation (EC) 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

This is the main piece of legislation in the European Union governing restrictions over chemical substances. Plastics are mostly composed of a polymer, to which functional additives are added. All these substances need to be registered and comply with the REACH regulation. The latter means that the substances under used must be allowed and, therefore, their use not restricted. The REACH Regulation contains a list of restricted substances under its Annex XVII (Restriction List). This restriction may present – or not – derogations for certain uses or aplications. Moreover, the regulation includes an Annex XIV (Authorisation List), that are substances which use is not restricted yet, but it requires the approval of a temporary authorisation.

- Opinion of the European Economic and Social Committee on the 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Towards a job-rich recovery'.

This document is very interesting as it clearly explains the negative impact of plastic waste today. On the other hand, it emphasizes the importance and value of plastics recycling to improve the circular economy. This regulation is very useful for the objectives of PolynSPIRE as it helps to rethink and improve the functioning of a complex and strongly installed value chain in the market.

- COMMISSION IMPLEMENTING DECISION (EU) 2022/162 of 4 February 2022 laying down rules for the application of **Directive (EU) 2019/904** of the European Parliament and of the Council as regards the calculation, verification, and reporting on the reduction in the consumption of certain single-use plastic products and the measures taken by Member States to achieve such reduction.

This decision has an impact on the objectives of the project because states will have to calculate the consumption of plastic and demonstrate that they are taking measures to reduce its use.

- DIRECTIVE (EU) 2019/904 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on the reduction of the impact of certain plastic products on the environment.

Types of plastic:

- Single-use (examples exhaustively listed in Annex 1). Some are restricted others must be marked or it is recommended to reduce consumption.
- Oxodegradable plastic (microplastic).
- Fishing gear containing plastic.

This directive is the newest and most relevant as far as polluting plastics are concerned. It lists exhaustively the contaminant elements and explain the treatment that must be done with each one. It intends to reduce the consumption of this type of plastics and calls the Member States to ensure separate collection.

This categorization is very useful to identify the different types of plastic and their negative impact on the environment. Knowing the different types of plastics and its particular impact, it's easier to understand the importance of separation for the subsequent recycling.

- COMMISSION REGULATION (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food.

It differentiates between allowed plastics, prohibited plastics and special exceptions. In addition, it establishes which plastics can be placed on the market if they meet certain conditions.

The plastics that form the part of food containers are, due to their indiscriminate use, one of the most polluting wastes. This regulation determines the conditions of insertion in the market and the subsequent treatment of the waste generated.

2.1.1 EXAMPLES OF INDUSTRIES THAT USE PLASTICS WITHIN THEIR MAIN ACTIVITIES:

2.1.1.1 VEHICLES

European regulations that make the use of recyclable plastics mandatory in the manufacture of vehicles were not found.

However, there are some provisions concerning the classification of plastic materials and the separation of components when the vehicle is out of operation (end-of life vehicles).

- 2003/138/EC: Commission Decision of 27 February 2003 establishing component and material coding standards for vehicles pursuant to Directive 2000/53/EC of the European Parliament and of the Council on end-of-life vehicles

The Commission is to establish component and material coding standards to be used by producers and material and equipment manufacturers, to facilitate the identification of those components and materials which are suitable for reuse and recovery.

- Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles - Commission Statements

ANNEX I. 4. Treatment operations to promote recycling: removal of tires and large plastic components (bumpers, dashboard, fluid containers, etc.), if these materials are not segregated in the shredding process in such a way that they can be effectively recycled as materials.

These regulations are advantageous for the purposes of the project because they favor the separation of materials, an imperative preliminary step to achieve the recycling of plastics.

2.1.1.2 ELECTRONIC EQUIPMENT

- DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND THE COUNCIL on waste electrical and electronic equipment (WEEE) (recast 2018/849/EC).

The WEEE Directive establishes an obligation to collect waste electrical and electronic equipment (WEEE) separately for sorting and recycling. It sets a detailed framework for Extended Producer Responsibility and aims to provide incentives to improve the design of electrical and electronic equipment to facilitate recycling. It was introduced to prevent the generation of WEEE and to promote reuse, recycling, and other forms of recovery.

The ideal way to overcome the general regulatory gaps is that the different sectors have legislation that promotes the circular economy from the design and manufacture of products. Electronic equipment manufacturers are a key industry that generates large amounts of waste and that is why it is relevant to reinforce the importance of its regulations and incentives.

2.1.1.3 SHIPMENT

- REGULATION (EC) 1013/2006 OF THE EUROPEAN PARLIAMENT AND THE COUNCIL on shipments of waste.

It specifies the procedures for controlling waste shipments to improve environmental protection and sets out a system of control for the movement of waste. It concerns almost all types of waste shipped. The European Commission is currently working on a proposal for revision.

The transfer of waste should be considered within this analysis because it is an important point in the reuse and recycling chain. A correct treatment must be provided so as not to mix materials and ensure that the movement from one side to the other is done without harming the process.

2.2 WASTE

The same legislative research that was done for the plastics sector has been done to investigate waste regulations. The following are the main results:

- DIRECTIVE 2018/851 OF THE EUROPEAN PARLIAMENT AND THE COUNCIL on amending Directive 2008/98/EC on waste (Waste Framework Directive).

It sets the basic concepts and definitions related to waste management, such as definitions of waste or recycling. It introduces the waste hierarchy, the Polluter Pays Principle, the Extended Producer Responsibility and sets out separate collection targets.

- DIRECTIVE (EU) 2018/852 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste.

It establishes that Member States should take measures to incentivize the take-up of reusable packaging and to achieve a reduction in consumption of packaging that is not recyclable.

- DIRECTIVE 2018/850 OF THE EUROPEAN PARLIAMENT AND THE COUNCIL amending Directive 1999/31/EC on the landfill of waste: Landfill Directive.

It aims to prevent or reduce the adverse effects of landfill waste on the environment. It defines the different categories of waste, classifies the types of landfills, and obliges the Member States to minimize biodegradable waste.

- DIRECTIVE (EU) 2015/720 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags.

This directive was adopted to prevent or reduce the impact of packaging and packaging waste on the environment.

- DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on waste and repealing certain Directives.

This directive puts in place the essential requirements for the management of waste and establishes major principles such as an obligation to handle waste in a way that does not have a negative impact on the environment or human health.

All these rules encourage the correct treatment of waste, promote the circular economy and are the European framework for the creation of more specific legislation both in the EU and in the member countries.

It is highlighted that these regulations taken together are a very good regulatory framework for the correct treatment and use of waste. On the other hand, many of these are mere recommendations that establish what states, companies or individuals should do but without imposing obligations or penalties on those who do not comply.

2.2.1 Waste treatment hierarchy

Due to the high generation of garbage, the European Union defined a hierarchy when it comes to waste treatment:

1) Efforts should be made to prevent waste generation as much as possible.
2) Waste reuse/ recovery: give materials a second chance.
3) Recycling.

4) Valorization: generate energy through a special treatment of waste.
5) Landfill disposal.

This hierarchy forces companies to exhaust all possible options before using garbage dumps.

2.2.2 Waste recovery

It is an instrument that allows most waste not to end up in the landfill. The idea is to examine objects and materials and determine how they can get a second chance.

According to DIRECTIVE 2008/98/EC on waste, 'recovery' means any operation in which the principal result is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function.

There are different types of waste recovery:

- Reuse: any operation by which products or components of products other than waste are reused for the same purpose for which they were conceived.
  Preparation for re-use is the recovery operation consisting of checking, cleaning, or repairing, wherein products or components of products that have become waste are prepared so that they can be reused without any further processing.
- Energy recovery: through the incineration of waste, energy from these materials is obtained. This energy is sometimes comparable to the functions of conventional fuels such as coal, gas and hydroelectricity.
- Valuation of solid materials: obtaining raw material through recycling. In this aspect, it is common to manage non-hazardous waste such as plastic containers, paper, cardboard, glass, among others.

- DIRECTIVE (EU) 2018/852 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 94/62/EC on packaging and packaging waste: it is necessary for Member States to take appropriate measures to encourage an increase in the proportion of reusable packaging placed on the market and the re-use of packaging.

  It introduces the concept of "reusable packaging" as any packaging that has been conceived, designed, and marketed to perform multiple circuits or rotations throughout its life cycle, being filled or reused for the same purpose for which it was conceived. This Directive encourages the reuse of packaging through incentives and the fixing of a minimum percentage of reusable packaging placed on the market.

  This directive proposes a very advantageous approach to the objectives of polynSPIRE since it promotes the reuse of plastics without compromising food hygiene or consumer safety. According to the rule, member states should take measures such as:

  - The use of deposit and return systems.

- The setting of qualitative or quantitative objectives.
- The use of economic incentives.
- The fixing of a minimum percentage of reusable containers marketed each year for each flow of containers.

2.3 FRAMEWORK REGULATIONS AND AGREEMENTS

Relevant European Commission's communications that are worthy of particular attention due to the strong link to the EU waste policy and circular economy:

- **The European Green Deal (11/12/2020)** 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 27 EU Member States committed to turning the EU into the first climate-neutral continent.

- **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.
  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.

- **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 – 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/vPvB substances, immunotoxins, neurotoxicants, respiratory sensitisers and substances that affect specific organs (STOT); 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.

- The Circular Economy Action Plan 2.0 (CEAP) (11/03/2020) announces specific strategies to move from a linear to a circular model on a wide range of materials (plastics, textiles, food, batteries, construction, etc.) and foresees waste reduction targets as well as actions to promote reuse, repair, and recycling.
  The 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 resources used are kept in the EU economy for as long as possible.
  This Plan is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth.

- Critical Raw Materials Strategy (03/09/2020) establishes 10 actions to boost research and innovation on critical raw materials and foster energy transition while reducing EU reliance on non-EU countries. In particular, the strategy foresees research on second life (re-use and re-purposing), collection rates, recycling efficiency and recovery of materials.

- EU Renovation Wave (14/10/2020) intends to improve the energy performance of buildings by at least doubling renovation rates in the next ten years and make sure renovations lead to higher energy and resource efficiency. The main idea is promoting the development of standardized sustainable industrial solutions, the reuse of waste material, and the revision of the material recovery targets set in EU legislation for construction and demolition waste by the end of 2024.

- European Sustainable Investment Plan (14/01/2020) is the investment pillar of the European Green Deal and will mobilize at least €1 trillion of sustainable investments over the next decade. It intends to facilitate and stimulate the public and private investments needed for the transition to a climate-neutral, "green" economy.

- **8Th Environment Action Programme (14/10/2020).** This is a proposal for a Decision of the European Parliament and the Council of the European Union that will guide the European environment policy until 2030. It establishes 6 priority objectives linked to the transition to a circular economy, zero-pollution, restoration of biodiversity, and more EU ambitions.

Certain categories of waste require specific approaches. Therefore, in addition to the general legal framework, the EU has many laws to treat different types of waste:

- Batteries and accumulators.
- Biodegradable waste.
- Waste from construction and demolition.
- End-of-life waste of vehicles.
- Landfill waste.
- Mines waste.
- Packaging waste.
- Transport waste.
- Oil residues.
- Residuos electrónicos y eléctricos con sustancias peligrosas.

On 17 November 2021, the Commission adopted a proposal for a new Regulation on shipments of waste. It aims to ensure that the EU does not export its waste problems to third countries and to support a clean and circular economy.

In addition, they are evaluating options for revising the Packaging and Packaging Waste Directive, with a view to improving design and encouraging reuse and recycling.

The review will contribute to achieving the objective of the European Green Deal and the New Circular Economy Action Plan to ensure that all existing packaging on the EU market is reusable or recyclable in an economically viable way by 2030.

- Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for the establishment of eco-design requirements applicable to sustainable products and repealing Directive 2009/125/EC

By applying the eco-design concept to a very wide range of products and allowing it to establish a wide range of specific requirements applicable to products, this Regulation aims to address the most detrimental environmental impacts of products.

The proposal also includes the creation of a digital product passport to electronically record, process and share information related to products between companies in the supply chain, authorities, and consumers. This measure is expected to increase transparency, both for supply chain companies and the general public.

The directive is the framework, which leaves to specific regulations of the Commission (Implementing Measures) the treatment of individual product categories. The framework directive, without the adoption

of other measures, does not imply any legal obligation for manufacturers. This is another example of legislative limitations that, as they only recommend or provide a legal context, are not mandatory or compulsive and therefore, often do not have the desired effects.

2.3.1 Microplastics

Microplastics are solid plastic particles composed of mixtures of polymers and functional additives. They may also contain residual impurities. Microplastics 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.

The objetives 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 tons of microplastics in a period of 20 years.

3 REGULATIONS PER COUNTRIES

After having received contributions from the partners, a compilation has been prepared of the main regulations in force in the countries where they carry out their activities. The intention is to understand the existing legal framework and detect possible legal gaps or barriers to the circular economy and the implementation of PolynSPIRE technologies.

3.1 BELGIUM[1]

Regionally, most of the population is located in the Dutch-speaking northern region of Flanders with around 57.3% of people living there, followed by Wallonie with 32.3%, and Brussels with 10.4% (https://worldpopulationreview.com/countries/belgium-population). For this reason, Flemish legislations are the most relevant, together with the Wallonian ones.

3.1.1 FLANDERS

For the northern region, the institution for waste management is the Openbare Vlaamse Afvalstoffenmaatschappij, OVAM (Public Waste Agency of Flanders).

Main Legislation

- 23 December 2011. — Decree on the sustainable management of material cycles and waste.
- 17 February 2012. Decree of the Flemish Government establishing the Flemish Regulation on the sustainable management of material cycles and waste.
- 4 May 2012. Decree of the Flemish Government amending Article 4.3.2, 4.5.3, 6.1.1.4, 6.1.3.1, 12.3, and Annex 5.2.4 of the Flemish Government Decree of 17 February 2012 establishing the Flemish Regulation on the sustainable management of material cycles and waste.
- Materials Decree
  The Materials Decree anchors sustainable materials management in Flanders. The legal text is based on an integrated view of the material chain, which is indispensable to find a lasting solution to the waste issue. The decree implements the European Framework Directive (EC) 2008/98 for waste management in Flanders and of the Council of 19 November 2008 on waste. It contains general provisions on the management of material cycles and waste, besides definitions on types of waste and environmental taxes and fees as well.
- VLAREMA
  The VLAREMA contains more detailed regulations on (special) waste materials, raw materials, selective collection, transport, the obligation to register, and extended producer responsibility.

The priorities correspond to the European framework directive but the Materials Decree and the VLAREMA also go further by establishing cycles and priorities related to recycling.

Firstly, the prevention of waste must be promoted towards sustainable production and consumption patterns. The second step encourages preparation for reuse. Thirdly, recycle as much waste as possible and close material cycles. Fourthly, other forms of waste recovery are encouraged, such as energy recovery and the use of materials as an energy source. In fifth place comes the disposal of waste, with landfills as the last option.

[1] Information obtained from the contribution made by EUPC.

- OVAM Plastics 2020-2025 implementation plan: reuse of plastic and invest in Flemish plastics recycling.
  The program contains actions that aim to close the technical plastic cycle. The core of the action plan has five objectives and is built on the general principles for a circular plastic chain:
  - Prevention measures: use of fewer plastics more efficiently.
  - Research and investments in a sustainable recycling market: creating a sustainable recycling market for plastics.
  - Recycled plastics fully converted into raw material.

  An important part of the plan is that the government will free up resources to invest in additional sorting and recycling.

3.1.2 WALLONIE

The responsable institution in Wallonie is Le Département des Sols et des Déchets (Soil and Waste Department).

Main Legislation

- 23 September 2010. Decree of the Walloon Government introducing an obligation to take back certain waste.

- 23 June 2016. — Decree amending the Environmental Code, the Water Code and various decrees on waste and environmental permits.

- Walloon Waste-Resources Plan (PWD-R)
  This plan is part of an European (Framework Directive 2008/98/EC in particular) and the Walloon waste decree. The PWD-R constitutes both the program for prevention/reuse and the waste management plan, and it is placed firmly in the perspective of a circular economy and sustainable development and considers waste management as a vector of economic restructuring for Wallonie.

3.1.3 BRUSSELS REGION

Bruxelles Environnemen / Leefmilieu Brussel is the institution that defines the rules and organizes waste management in Brussels Region.

Main Legislation

- 14 June 2012 — Ordinance on waste materials

- 01 December 2016 - Order of the Brussels Capital Regional Government

The Waste Framework Directive 2008/98/EC of 19 November 2008 imposes the observance of a waste hierarchy which gives priority to prevention aiming to guide Member States towards increased efficiency in the use of raw materials, water and energy.

Within this waste hierarchy, which was included in the Brussels Ordinance of 14 June 2012 on waste, the preparation of waste for reuse and recycling occupies the second and third places, respectively. In these two cases, **it is generally required that waste is sorted at the source, and then collected separately.**

The 2012 ordinance set a target of 50% of Brussels' waste being reused. These ordinances are beneficial to achieve good waste treatment and the approach to a more efficient circular economy.

3.2 SPAIN

It is considered relevant to mention the most important Spanish' regulations that establish prohibitions and recommendations for the consumption of plastic materials.

In the case of Spain, as it happens in most countries, the legislation might vary depending on the region. Some of them might have more specific regulations and others will be governed directly by national laws or directives.

- Ley 7/2022, of April 8th, on Waste and Contaminated Soils for a Circular Economy. The purpose of this Law is to prevent and reduce the generation of waste and the adverse impacts of its generation and management. In addition, special attention is given to the aquatic environment.

  The Law on Waste and Contaminated Soil defines a timetable of objectives:

  - By 2026 50% reduction in weight, compared to 2022.
  - In 2030, 70% by weight, compared to 2022.

  The tax on single-use plastics included in the bill establishes a surcharge of 0.45 euros per kilo of plastic from non-reusable containers. The moratorium on the application of the tax also affects the tax on landfilling and incineration of plastic waste, which will be applied by the autonomous communities.
  In addition, manufacturers are expected to create a new design of plastic beverage containers respecting the needs of reuse and recycling, as well as the development and promotion of more sustainable materials.

- Real Decreto 553/2020, 2nd of June, regulating the shipment of waste within the territory of the State.

  The purpose is to develop the legal regime for shipments of waste carried out within the territory of the State. This decree provides the regulatory framework for determining the state and place from which the waste is sent and where it is destined for treatment.

- Real Decreto 293/2018, 18th of May, on reducing the consumption of plastic bags and creating the Register of Producers.

  This decree aims to adopt measures to reduce the consumption of plastic bags, in order to prevent and reduce the adverse impacts that the waste generated by such plastic bags produce on the environment, with special attention to the damage caused to aquatic ecosystems.
  In addition, the Register of Product Producers is created.

- Real Decreto 110/2015, 20th of February, on waste electrical and electronic equipment.

  The idea is to regulate the prevention and reduction of adverse impacts caused by the generation and management of waste electrical and electronic equipment on human health and the environment, determine the objectives of collection and treatment of this waste.

- Ley 22/2011, 28th of July, on contaminated waste and soil: this law incorporates the principle of hierarchy in waste production and management which should focus on prevention, preparation for re-use, recycling, or other forms of recovery (including energy recovery) and aims to transform the European Union into a 'recycling society' and contribute to the fight against climate change.

- Orden APM/1007/2017, de 10 of October, on general rules for the recovery of excavated natural materials: it contributes to savings and efficiency in the use of natural resources, facilitating their valorization when they are destined to a filling operation or to a different work from those in which they were generated.

- REAL DECRETO 252/2006, reviewing the recycling and recovery targets established in Law 11/1997, of 24 April, on Packaging and Packaging Waste, and amending the Regulation for its execution, approved by Royal Decree 782/1998, of 30 April

3.2.1 Regulations in the process of being approved

- Although directive (EU) 2019/904 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 (Single-use and Oxodegradable plastic) has already entered into force, Spain is still in the legislative process and forecasts its implementation by 2023.

- In order to transpose into law, the latest amendment to the Packaging and Packaging Waste Directive, Directive (EU) 2018/852, the Government has published a Draft Royal Decree on Packaging and Packaging Waste that will regulate:
  - Reducing the impact of certain plastic products on the environment.
  - The extended producer responsibility regime for all packaging and packaging waste, including single-use plastic cups.

- Specific prevention objectives, both to reduce in weight the packaging waste generated, or the number of bottles for single-use plastic beverages that are marketed, and to ensure that all packaging placed on the market in 2030 is 100% recyclable by 2030, and whenever possible, reusable.

3.3 FRANCE

- Law 2020-105 of February 10, 2020 deals with different aspects for waste reduction including a program for the elimination of single-use plastic waste by 2040. New rules for re-employment and reuse are established and other important steps to raise awareness and inform the consumer.

  From 2022 companies are required to place a label on compostable plastic products and the advertence of “do not throw in nature”. In addition, it prohibits the use of "biodegradable" or "environmentally friendly" labels if it does not meet the required conditions.

  New non-food products will have to be reused, donated, or recycled. It emphasizes that recycling is prohibited for products of necessity and the donation of them will be mandatory.

- Code de l'environnement, Replier Partie législative (Articles L110-1 à L713-9) (Environmental Code)

  France is adopting a national trajectory aimed at increasing the distribution of reused packaging placed on the market compared to single-use packaging. They want to reach a proportion of 5% of reused packaging marketed in 2023 and 10% of reused packaging marketed in 2027.

3.4 PORTUGAL

- Decreto-Lei n.º 78/2021, de 24 de setembro on reducing the impact of certain plastic products on the environment, and amending the rules on plastic products at points of sale of bread, fruit and vegetables.
  This decree determines the prohibition of placing on the market certain single-use plastic products for which adequate and more sustainable alternatives are available.

- Decreto-Lei n.º 102-D/2020, de 10 de dezembro 2020.

  It is intended to promote and place special emphasis on circular approaches that give priority to reusable products and sustainable systems instead of single-use products, mainly in order to reduce the waste generated.

The new law integrates the new European objectives on preparation for the reuse and recycling of waste, the new obligations on separate collection, as well as the new requirements relating to extended producer responsibility included in the European Directives.

- Lei 69/2018, de 26 de dezembro, which makes the first alteration of the "Decreto–Lei" 152-D/2017, on the Unified Regime for Two Specific Waste Streams.

  It is proposed to create an incentive for the return of beverage containers made of non-reusable plastic and to create deposits of plastic, glass, metals, and aluminum beverage containers. This law, which is similarly implemented in other countries, is beneficial in promoting the circular economy and waste separation.

- The Portuguese Environmental Agency (APA) is the entity responsible for implementing environmental policies in Portugal. It aims to contribute to a high level of protection and improvement of the environment through the provision of quality services to citizens.
  The APA, as the National Waste Authority, oversees and monitors the implementation of the national waste strategy and is responsible for licensing, monitoring waste management activities and issuing technical standards. The APA also carries out the operational and administrative control of waste shipments in national territory.

3.5 ITALY[2]

- Decreto legislativo 3 aprile 2006, n. 152, Norme in materia ambientale

  This Legislative Decree approves the Code on the Environment and outlines the legislative framework concerning environmental protection, including waste management. Article 184b is of particular importance because it lays down the requirements and provisions regarding End of Waste.

- DECRETO LEGISLATIVO 3 settembre 2020, n. 116

  This legislative decree implements the EU Directives 2018/851 (which amends Directive 2008/98/EC on waste) and 2018/852 (which amends Directive 1994/62/EC on packaging and packaging waste). It transposes a few important definitions into the Italian Law, such as:

  > *"9. Article 183 of the Legislative decree 03/04/2006 n. 152 is amended as follows:*
  >
  > *t-bis) "material recovery": any recovery operation other than energy recovery and the reprocessing into materials to be used as fuels or other means to generate energy. It includes, inter alia, preparing for re-use, recycling, and backfilling.*

[2] Information obtained from the contribution made by I.BLU.

> *u) "**recycling**": any recovery operation through which waste is treated to obtain products, materials or substances to be used with their original purpose or other purposes. It includes the treatment of organic material but not energy recovery nor the reprocessing into materials to be used as fuels or in backfilling operations."*

3.5.1 The Recycled Product R-PMIX-SRA

Among the activities falling under the definition of Recycling "*with other purposes",* there is the production of the R-PMIX-SRA product, a Secondary Reducing Agent (S.R.A.) deriving from post-consumer plastic and complying with the relevant technical standard UNI 10667-17:2021. This product (EoW) is developed and mechanically recycled by I.BLU and supplied to FENO in the framework of WP6, for its employment in the steel industry as a reducing agent. The S.R.A. production activity by I.BLU was duly authorised by the competent Authorities as a recycling operation (R3) according to article 184-ter of the Italian Legislative Decree n. 152/2006 as amended and supplemented.

This S.R.A. production process is inherently encompassed by the EU and National legal definition of Recycling, given that it does not constitute any of the operations excluded by the same definitions (such as energy recovery, R1) and it is used for the specific purposes foreseen by the relevant technical standard.

Consequently, according to Directive 2018/851/EC, point (47), the quantities produced are accountable for the attainment of the European recycling targets:

> *"[…] Materials that cease to be waste through a recovery or recycling operation are to be counted for the attainment of the respective recovery or recycling targets set in those Directives in line with the applicable calculation methods […]"*

Likewise, Directive 2018/852/EC amending Directive 94/62/EC on packaging and packaging waste, at point (15), confirms that:

> *"(15) The calculation of the recycling targets should be based on the weight of packaging waste which enters recycling. As a rule, the actual measurement of the weight of packaging waste counted as recycled should be at the point where packaging waste enters the recycling operation […]"*

In particular, with regard to Municipal and Municipal Waste, the document "*Guidance for the compilation and reporting of data on municipal waste according to Commission Implementing Decisions 2019/1004/EC and 2019/1885/EC, and the Joint Questionnaire of Eurostat and OECD*" specifies that for Mechanical Recycling the calculation point should be identified as shown in Figure 1.

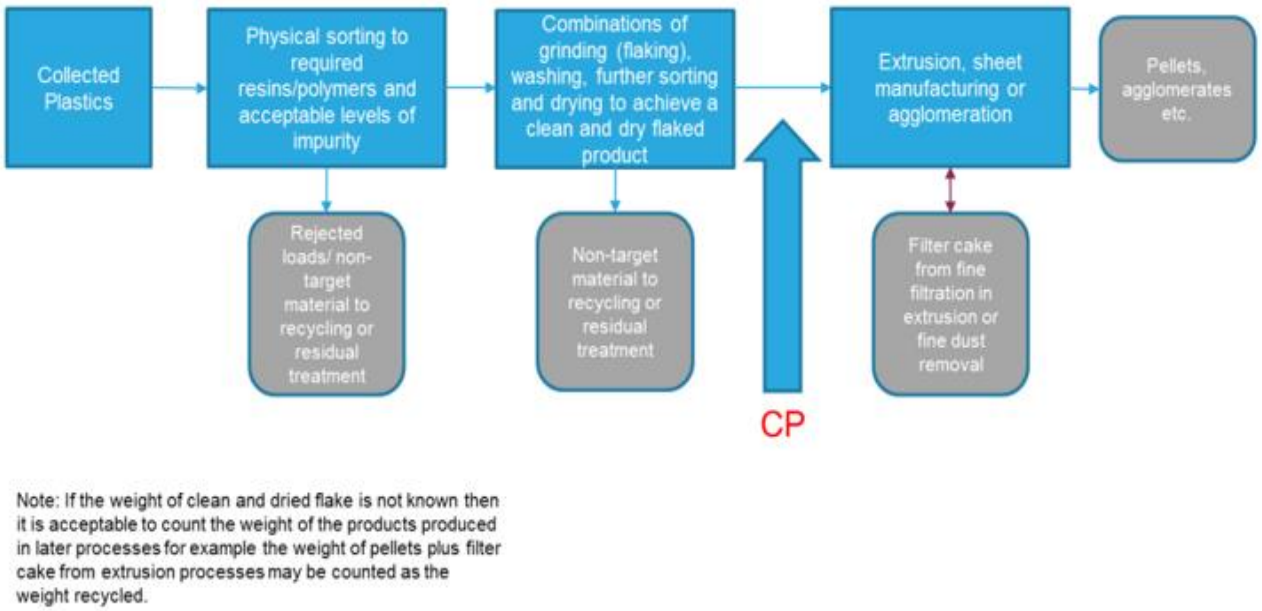

Figure 1: calculation point for Mechanical Recycling[3].

3.5.2 Legislative Barriers and Possible Improvements

To improve the current normative framework regarding the production of R-PMIX-SRA, a recycled Plastic Secondary Raw Material to be used as a reducing agent in the steel industry, the following is proposed:

1) The publication of a European Technical Standard for the production of R-PMIX-SRA based on the already existing Italian Standard UNI 10667-17:2021

ITALIAN STANDARD	**Plastic raw-secondary materials - Part 17: Mixtures of heterogeneous plastics from industrial residue and/or from post-consumer materials, to be used in metallurgical and steel processes - Requirements and test methods**	**UNI 10667-17** **JUNE 2021**

Figure 2: Standard UNI 10667-17:2021

2) The document "*Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy*

[3] Source: Guidance for the compilation and reporting of data on municipal waste according to Commission Implementing Decisions 2019/1004/EC and 2019/1885/EC, and the Joint Questionnaire of Eurostat and OECD. Page 39, figure A-3.

from renewable sources, and repealing Council Directive (EU) 2015/652" mentions multiple times the concept of Recycled Carbon for fuels, as a way to tackle climate change.

In particular, at point (22) of the premises, it is stated that:

"*Renewable fuels of non-biological origin can be used for energy purposes, but also for non-energy purposes as feedstock or raw material in industries such as steel or chemicals*."

The proposed legislative improvement is to acknowledge on a European level that there can also be Recycled Carbon sources that are not fuels, but Secondary Raw Materials. This proposal has the aim to decarbonize Industrial Sectors by reducing the consumption of traditional fossil sources.

As an EoW Product deriving from recycled plastic post-consumer waste and supplying Carbon to the steel process, R-PMIX-SRA should also be considered as Recycled Carbon, and therefore Carbon Neutral.

3) As previously outlined, the Product R-PMIX-SRA already falls under the definition of Recycling according to European and Italian legal definitions, as it is a product deriving from a material recovery operation (R3) to be used for its "*other purposes*" defined in the relevant technical standard, and as it does not constitute "*energy recovery nor the reprocessing into materials to be used as fuels or in backfilling operations".*
However, the explicit inclusion of such innovative application in the definitions of Recycling would represent a legislative improvement since it would enhance clarity.

3.6 TURKEY[4]

In recent years, different policies and practices have been developed in Turkey regarding the management of plastic waste. The most basic approach among these is "zero waste". The concept of "zero waste" is defined as "a strategy and a set of practices" that include approaches related to preventing waste, using resources more efficiently, preventing or minimizing waste generation, and collecting and recycling waste separately at the source. Hence, there are several regulations in line with these strategies & approaches. These regulations are published by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change.

3.6.1 Waste Management Regulation

- Official Gazette 02.04.2015-29314, aim that:
  - Ensuring the management of wastes from generation to disposal without harming the environment and human health.

[4] Information obtained from the contribution made by IKMIB.

- Reducing the use of natural resources and ensuring waste management through ways such as reducing waste generation, reuse, recycling and recovery of wastes.
- Production and market surveillance and inspection of products within the scope of this Regulation, which have certain criteria, basic conditions and characteristics in terms of environment and human health.

This Regulation has been prepared in accordance with the framework of Directive 2008/98/EC of the European Parliament and Council of 19 November 2008.

3.6.2 Zero Waste Regulation

- OG: 12.07.2019-30829

Its purpose is to determine the general principles and fundamentals regarding the establishment, dissemination, development, monitoring, financing and documentation of the zero waste system. The regulation also covers plastic waste. According to the Regulation, reusable paper, glass, metal and plastic wastes in local administrations, buildings and campuses with certain characteristics must be collected separately from other wastes, at least in duplicate. Local administrations and buildings/premises mentioned in the regulation must gradually switch to a zero waste system until 31 December 2022. After establishing the zero waste approach, it is obligatory to obtain a zero waste certificate at the basic level. It is also possible to obtain a silver, gold, and platinum zero waste certificate voluntarily after the system installation.

3.6.3 Control of Packaging Waste

- OG: 26.06.2021-31523

According to the Regulation, current implementation is included on packaging waste. In order to manage the resources efficiently and to prevent environmental pollution caused by plastic bags, a pricing system is applied to reduce the use of plastic bags. In this way, it is aimed to reduce the use of plastic bags throughout the country until 31/12/2025, not exceeding 40 per person per year.

The Ministry has included to the arrangements regarding the production, supply, placing on the market and increasing the use of reusable packaging by reducing their use, especially for plastic bags.

In addition, it is planned to introduce an obligation to participate in the deposit management system as of 1/1/2022 for single-use packages made of plastic material such as glass, polyethylene terephthalate (PET).

4 REUSE: DEFINITION AND CHALLENGES

AIMPLAS, Technological Institute of Plastic located in Spain, has been contacted and they shared relevant information related to a work they carried out on the reuse of plastics at European level. It is important to highlight this vision because there is a varied bibliography on this term, its meaning and implementation in different countries. Below, the contributions that have been sent from the entity will be exposed.

As mentioned in point 3.2 of this document, Law 7/2022 is already in force in Spain. This regulation of waste and contaminated soil establishes that a container is reusable if it is conceived, designed, and introduced into the market to make multiple circuits or rotations to use them for the same purpose for which they were designed.

In addition, at European level, the Commission Communication "Commission Guidelines on single-use plastic products under Directive (EU) 2019/904" establishes a check list that helps to understand whether the above definition is met. In this sense, a container is reusable if it complies with:

Conceived, designed, and introduced to the market to meet multiple circuits or rotations for the same purpose for which they were designed	✓
Allow core components to perform several rotations or circuits	✓
Ability to be refilled/recharged and emptied/unloaded without significant damage	✓
Ability to be reconditioned (cleaned, washed, repaired) and fulfill its intended function	✓
That there is a reuse system and that it works in practice	✓
Be perceived by the consumer as reusable	✓

Table 1: Directive (EU) 2019/904 reusable materials characteristics check list.

At Spanish level, there is also the draft of the Royal Decree on Packaging and Packaging Waste in which article 12.2 indicates that the packaging must comply with the composition requirements of Annex III, these requirements are:

Its volume and weight are the minimum.	✓
Allow their reuse or recovery, including recycling, in line with the waste hierarchy. Comply with the specific requirements for recoverable packaging when it is no longer reused.	✓
The use of harmful or hazardous substances and materials shall be minimized. Comply with the provisions of the REACH Regulation.	✓
Have properties and physical characteristics that allow several circuits or rotations.	✓
Be susceptible to treatments that allow compliance with health and safety requirements.	✓

Table 2: packaging characteristics check list in the draft of the Royal Decree on Packaging and Packaging Waste.

4.1 HOW TO PROVE THAT A PRODUCT MEETS THE REQUIREMENTS

For the aspects contemplated in Directive (EU) 2019/904, it is essential to have a concept of reuse that works in practice, either through a deposit and return system (DRS) in the case of packaging or because it is reused in the case of products of repeated use by consumers. The criteria to be reviewed to meet these aspects have not yet been established, but we have to think that, if there is no effective reuse in practice, packaging will not be considered as reusable.

Regarding compliance with ANNEX III, the Real Decreto itself establishes as a reference the fulfillment of the packaging standards UNE EN 13427, UNE EN 13428, UNE EN 13429, UNE EN 13430, UNE EN 13431 and UNE EN 13432, being the UNE EN 13429:2005 specific for reuse.

In order to help companies demonstrate the suitability of their plastic materials intended to come into contact with food repeatedly, AIMPLAS has developed the certification DESIGNED TO BE REUSABLE – AIMPLAS that guarantees both the food safety and the functionality of these products after successive uses after washing in a dishwasher.

With this certification, companies can guarantee the following aspects contemplated in the legislation and that are the cornerstone for compliance with reuse:

The use of harmful or hazardous substances and materials shall be minimized. In accordance with the provisions of the REACH Regulation.	
Have properties and physical characteristics that allow several circuits or rotations.	
Be susceptible to treatments that allow compliance with health and safety requirements.	

Table 3: certification DESIGNED TO BE REUSABLE – AIMPLAS guarantees.

5 PROPOSALS FOR IMPROVEMENT

A compilation of the most relevant and influential regulations related to plastics and waste management in the industry has been made. In the process it has been identified that legislation is not complete or binding enough to discourage the use of new monomers and plastics in the sectors where Polyamides and Polyurethane are use in great scale.

In this section, the proposals for improvement will be presented with the aim of overcoming the possible barriers to the viability of the project and its technologies.

5.1 TAX OR COMPETITIVE ADVANTAGES

Day by day large amounts of plastics are introduced into the planet generating a negative impact on the environment. This is due to its slow degradability and the chemical composition of this type of products.

The raw material used to create plastic products has relatively low costs and this means a disadvantage since the economic factor does not contribute to the development of a circular economy but motivates the incorporation of plastics into the environment.

One of the proposals for improvement is related to this point:

*To **provide tax or competitive advantages** to companies that, instead of incorporating virgin plastics into their production process, manufacture their products with entirely reused plastics. The justification for this advantage is that the amount of plastic that is reintroduced into the development of a product is not increased by adding new raw materials and, therefore, does not increase the negative impact on the environment additionally.*

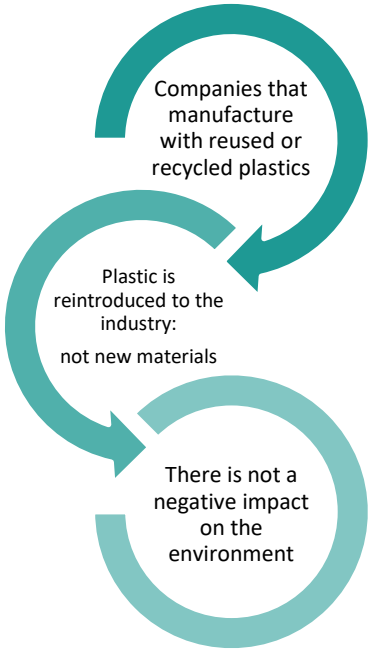

Figure 3: justification of tax or competitive advantages for the companies[5]

This reduction in the carbon footprint could be offset by a reduction in taxes or production rates in favor of companies that bet on this type of valuation.

This proposal could mean an important impact on the developments of polynSPIRE since, companies will be interested in buying recycled plastics to use as raw material in their production processes. In addition,

[5] Source: CIRCE's creation.

it will be more beneficial for them to be able to reuse their own plastics for the manufacture of new products.

In the case of Spain, for example, the new law on Waste and Contaminated Soils for a Circular Economy establishes fiscal measures to encourage circular economy. It is a special, indirect, and environmental imposition that taxes the consumption in Spanish territory of non-reusable plastic containers. In addition, penalties are established for tax infractions.

5.2 CREDITS AND COMPESATION TO PRODUCERS AND USERS

Taking the example of credits and compensations for CO2 emissions, it is proposed to create a similar system for the plastics production.

Carbon dioxide registries exist to collect the efforts of companies and organizations in the calculation, reduction and compensation of greenhouse gas emissions generated by their activity. This system facilitates the possibility of neutralizing all or part of the carbon footprint produced through financing and economic investment in environmental projects.

The emissions system allows that when a company wants to offset the CO2 generated by its production, it can acquire an amount of carbon credits corresponding to the volume of its emissions. In Spain, a carbon credit is equivalent to one ton of CO2 avoided. In addition, to ensure the transparency of these offset projects, carbon offset certifications have been created at the national level.

For polynSPIRE, two possible scenarios could be proposed:

1. Create a system of records like the existing one for CO2 emissions in which companies can voluntarily calculate their production of virgin plastics and compensate part of their environmental impact by buying credits that collaborate in the development of projects aimed at recycling and the recovery of plastic waste.

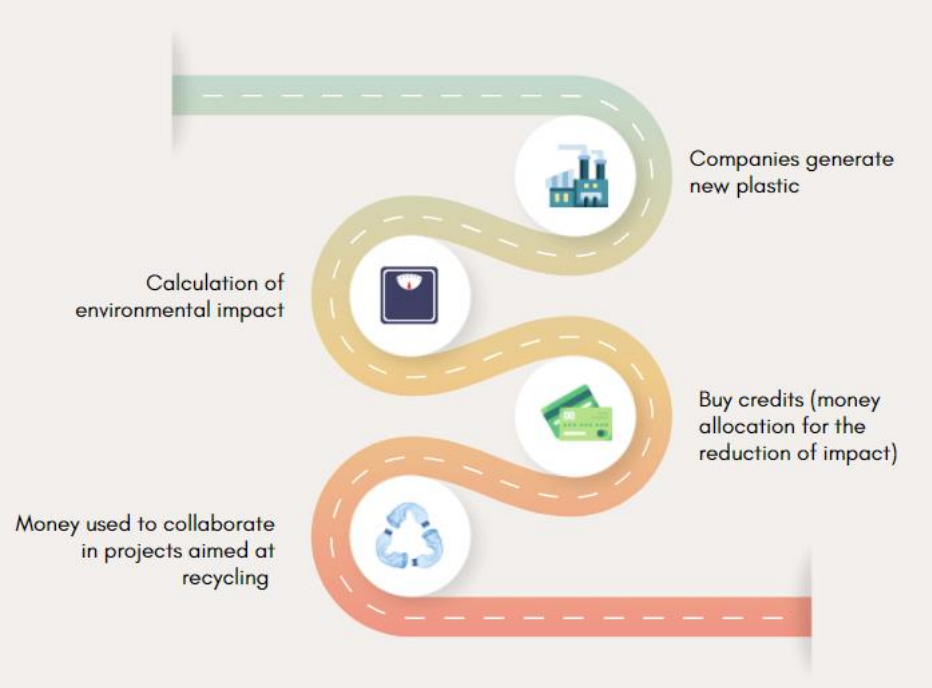

Figure 4: credits and compensation system for companies[6]

2. Establish rules that impose a maximum amount of virgin plastic that can be incorporated into the environment. Once that number is exceeded, the industries will have to pay a fine or buy plastic production credits to invest in recycling, reuse or valorization projects that contribute to the circular economy and the reduction of plastics on the planet.
On the other hand, manufacturers that do not reach that amount of production could be favored with tax or competitive advantages related to their activity.
This proposal requires a series of measures and regulations that impose obligations and prohibitions that, considering the current regulation, may seem very ambitious. However, with its nuances, a system of fines and rewards could be implemented according to the current situation of the industry.

[6] Source: CIRCE's creation.

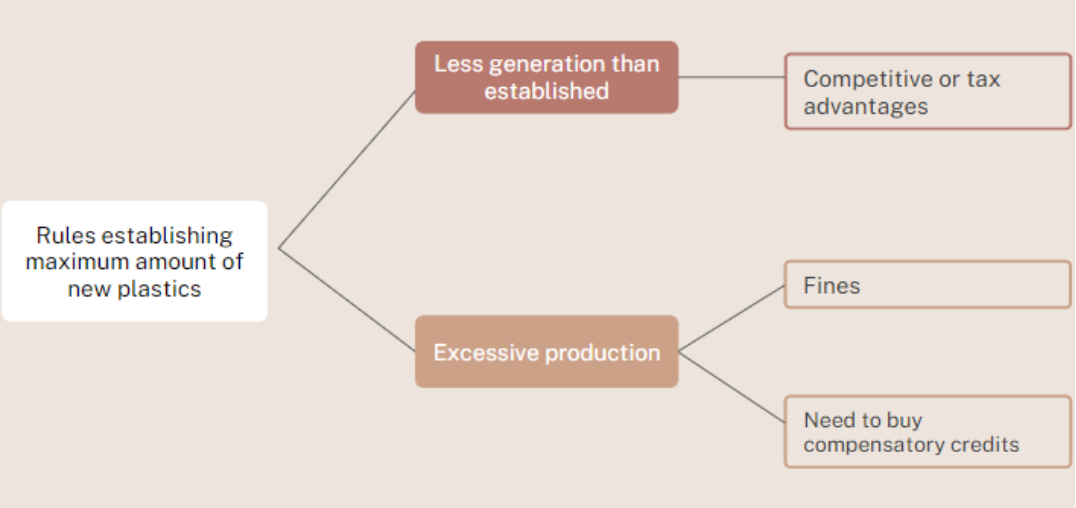

Figure 5: fines, credits, and rewards system.[7]

A practical example that can be taken as a reference is the Plastic Credit Exchange program, a non-profit organization that partners with sustainability-conscious companies to offset their plastic footprint and reduce the flow of plastic waste in landfills and oceans.

The scope of the plastic footprint calculator covers all plastic generated along the value chain from the ownership and reception of raw materials to the use of the product/service by consumers in its intended purpose. The plastic footprint represents an inventory, in unit mass, of plastic leaks into the environment.

5.3 PLASTIC NEUTRAL CERTIFICATION

Plastic Neutral Certified is a global standard for companies, brands and products that have taken steps to offset the plastic they generate across their operations. The certificate communicates the commitment to recover, recycle and reduce your plastic waste in accordance with the Plastic Neutral Pact.

A proposal for improvements could be the creation of regulations that boost interest in obtaining this type of certification. For example, companies that manage to become certified could be given **competitive advantages**. On the other hand, if a stricter alternative could be implemented, a deadline could be set for plastic manufacturing companies or those that involve plastic in their production processes, to have to obtain a certificate.

Types of certificates:

- Low environmental impact related to the use of plastics in production processes.
- Reduction in the use of plastics with respect to a previous calculation (a follow-up of the evolution in the calculation of plastic waste would be proposed).

[7] Source: CIRCE's creation.

- Growth in the use of recycled plastics to replace new materials.

5.4 FACILITATION OF INVESTMENT MECHANISMS

Set up and facilitate investment mechanisms that pool public and private resorurces to consolidate and accelerate the transition towards a circular economy for plastics. Bundle the many scattered efforts into thematic projects to accelerate progress and implementation of business models, products, and materials that support the transition. (European Commission, 2019)

6 PATH TO GLOBAL ACCEPTANCE: STRATEGY

It is considered that the first who will be interested in incorporating reused plastics as raw material would be those that will be beneficiated by it. These companies could be specialized in polyamide and polyurethane production and would be willing to pay a little more if they made a profit for it.

The focus is on the quality and the proportional impact of "other costs based on quality" (quality costs are the costs associated with preventing, detecting, and remediating product issues related to quality) which will be greater than the impact of raw material costs.

Focusing on product quality and collaboration with the circular economy is consistent with the European industrialization strategy.

To achieve greater impact, policy makers or associations that have direct contact with lawmakers will be sought to have access to the deliverable and the information contained. In addition, dissemination tasks will be carried out such as presenting the legislative barriers of PolynSPIRE at events and conferences attended by policy makers or people who participate in decision-making related to recycling and waste treatment regulations.

Throughout this research and development of the deliverable different entities and people specialized in the plastic and recycling sector have been contacted. They had access to the document and gave us their point of view on the impact of regulations and the main challenges they face in their daily work.

The biggest coincidence is that the regulations are going in the right direction and that, at a European level, is getting closer to a correct management of plastic. In addition, it is considered that the European Union is setting the course to achieve a circular economy where the reduction in the use and reuse of the most polluting plastics is prioritized.

However, all comment on the difficulty in standardizing regulations in different countries and the great challenges in establishing mandatory legislation.

7 CONCLUSIONS

The aim of the polynSPIRE project is to develop, validate and demonstrate integrated solutions for new ways of chemical and mechanical recycling of Polyurethane and Polyamide plastics and the revalorisation of its waste for a better circular economy.

This deliverable 9.3 attempts to identify possible legislative barriers to the implementation of project solutions, legal gaps or contradictory rules that hinder or do not collaborate with the reuse or recycling of plastics. To achieve this, the most important regulations regarding the manufacture, use and treatment of plastic waste have been raised with the aim of detecting the regulatory problems that arise at European level and in each country where the partners carry out activities.

No regulations have been found that prevent the implementation of polynSPIRE technologies, that is, there are no legal prohibitions for the development of the results. However, it has been identified that, although there are European and regional standards that collaborate with the separation, reuse and recycling of plastics, most are simply recommendations.

The legislative wave shows that measures are being taken to a more efficient circular economy and that the new directives seek to solve the problems related to the excessive use of plastic and the poor waste management. The question is whether it will really be possible to force companies to take action especially when this has an economic impact on their production processes.

By conducting research on European standards and receiving input from partners on their countries' framework laws, some ideas for improvement have been created:

- Tax or competitive advantages: provide tax or competitive advantages to companies that, instead of incorporating virgin plastics into their production process, manufacture their products with entirely reused plastics.
- Compensation and credits for plastic production: create a system of records in which companies can voluntarily calculate their production and compensate part of their environmental impact by buying credits or establish a maximum amount of virgin plastic that companies can incorporate and when they exceed it, they must invest in recycling and reuse projects.
- Plastic neutral certification: creation of regulations that boost interest in obtaining this type of certification.
- Facilitation of investment mechanisms: Set up investment mechanisms that pool public and private money to consolidate and accelerate the transition towards a circular economy for plastics.

As for the acceptance strategy, it is considered that the most interested sectors will be specialists in polyamide and polyurethane and those that do not have their main cost in raw material. The idea is to target companies that look for quality in their products and really want to collaborate to achieve an industry with less negative impact from plastic. It is expected that, given the existence of more obligations and incentives, many industries will be more interested in changing their raw materials for ones that ensure less negative impact on the environment.

The aims of polynSPIRE are noble: finding the possibility of recycling plastic materials that until now could not be reused is an innovative development that collaborates directly with the circular economy and the environment. In addition, as stated before, it is sought that recycling is achieved while maintaining the properties of the products, which makes these technologies much more attractive and with more value than the recycling models known so far.

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