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PORTUGAL REGIONAL ROADMAP: NORTE REGION

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Abbreviations

AICEP - Portuguese Agency for Investment and Foreign Trade
ANI – Innovation National Agency
APA – Portuguese Environmental Agency
APIP - Portuguese Association of Plastics Industry
APICCAPS - Portuguese Footwear Industry Association Components Leather Substitutes
AREC - Regional Agenda for the Circular Economy
B2E – Collaborative Laboratory for the Blue Bioeconomy
CCDR-N – Norte Regional Coordination and Development Commission
CCRI - Circular Cities and Regions Initiative
CE – Circular Economy
CEAP - Circular Economy Action Plan
CEiiA - Engineering and Product Development Centre
CeNTI – Centre for Nanotechnology and Advanced Materials is a Centre for Technology and Innovation
CICECO - Aveiro Institute of Materials
CiTin - Industrial Technology and Innovation Center Industry Driven Applied R&D
CpEAP – CircuPuncture Economy Action Plan
CSS – Circular Systemic Solutions
CTC – Circular Territorial Cluster
CTCP - Portuguese Footwear Technology Center
CVR - Centre for Waste Valorisation
DGAV - General Directorate for Food and Veterinary
DRAP-N - Regional Directorate for Agriculture and Fisheries of the North Region
EGF - General Development Company
EU – European Commission
EWC - European Waste Code
FCT – Foundation for Science and Technology
Fibrenamics Association - Institute for Innovation in Fibrous and Composite Materials
GPD – Gross Domestic Product
GVA - Gross Value Added
ICT - Information and Communication Technologies
INE – National Institute of Statistics
INEGI - Institute of Science and Innovation in Mechanical and Industrial Engineering
INESC-TEC - Institute for Systems and Computer Engineering, Technology and Science
INL - International Iberian Nanotechnology Laboratory
IPB - Instituto Politécnico de Bragança
IPCA - Instituto Politécnico do Cávado e do Ave
IPP - Instituto Politécnico do Porto
IPVC - Instituto Politécnico de Viana do Castelo
ISQ – Interface and technology center
LAP – Local Activity Place
LR – Lodzkie Region
MORE CoLAB - Collaborative Laboratory
NGO – Non-Governmental Organisation
NUTS - Nomenclature of Territorial Units for Statistics
PAEC - Action Plan for the Circular Economy
PIEP - Centre for Innovation in Polymer Engineering
R&D - Research and Development
RCM - Resolution of the Council of Ministers
RCT - Regional Cluster Team
SDG - Sustainable Development Goals
SME – Small and Medium Enterprises
SAT – self-assessment tool
SGRU – Urban Waste Management Systems
SLOM – Stowarzyszenie Łódzki Obszar Metropolitalny (Lodz Metropolitan Area Association)
S2uL - Collaborative Laboratory for Urban Sustainability
TRL - technology readiness level
UCP - Universidade Católica Portuguesa
UM - Universidade do Minho
UP - Universidade do Porto
UTAD - Universidade de Trás-os-Montes e Alto Douro

1 Stage 1: Analysis of Condition

1.1 Characterization of the Norte Region

The Norte region (NUTS II) has around 3.7 million inhabitants, which represents 35% of the national population (INE, 2023a). It is the most export-oriented region, accounting for 35% of national exports (INE, 2023b). The region is divided into seven intermunicipal communities and one metropolitan area (NUTS III): Alto Minho, Cávado, Ave, Área Metropolitana do Porto, Alto Tâmega e Barroso, Tâmega e Sousa, Douro and Terras de Trás-os-Montes, and composed by eighty-six municipalities (Figure 1).

Figure 1– Map of the Norte Region (Source: CCDR-N, n.d.)

This region has the second highest number of enrolments in higher education, with almost 150,000 students in 2022/2023, surpassed only by the Lisbon metropolitan area. In terms of enrolment in higher education, there has been a significant increase over the last 20 years (from 23.9% in 2003/2004 to 42.9% in 2023/2024) and greater convergence with the national average, albeit slightly lower, which currently stands at 43.1% (INE, 2024). In terms of innovation, the Norte is the region with the highest number of institutions and companies with R&D (INE, 2022)

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and the region with the highest number of patent applications for inventions, mainly at company level (INE, 2023c).

The region's dynamism with regard to population, export capacity, and human capital appears to create a favourable context for technological development and innovation, both of which are essential for promoting the circular economy.

Circular Economy in Portugal and in the Norte Region

In Portugal, the EU's package of measures for the Circular Economy was essentially transposed into the document 'LEADING THE TRANSITION: Action Plan for the Circular Economy (PAEC)', approved by RCM no. 190-A/2017 of 11 December, which consolidated the proposals and measures, adopting three levels of operationalisation: national, sectoral, and regional. At the national level (macro level) the rationale is similar to the EU action plan for circular economy - product, consumption, waste/secondary raw materials, placing knowledge sharing as the central element for developing solutions. At the sectoral level (meso level), the focus is on the value chains associated with a given activity. At the micro level, the emphasis is given to acceleration strategies for the circular economy best suited to their socio-economic profile of each region. (CCDR-N, 2021).
As such, the Regional Coordination and Development Commissions in conjunction with the PAEC have begun to draw up Regional Agendas for the Circular Economy (AREC) (Figure 2).

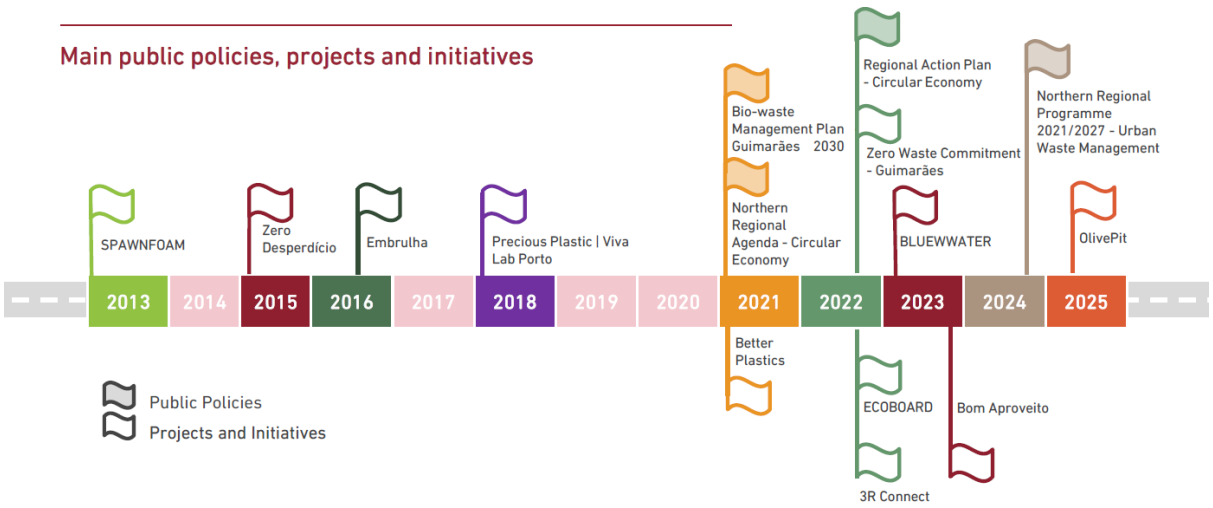

Figure 2 – Public policies, projects and initiatives in the Norte Region of Portugal

Encouraging the transition to a Circular Economy in the Norte of Portugal is the main objective of its Regional Agenda. Given Norte's business profile, the following areas have been prioritised:

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Cities and Circular Territories, Construction and Demolition Waste, Goods Transport and Logistics, Textiles and Agri-food. (CCDR-N, 2021).
Therefore, it is logical that **CSS2 – Food & Feed,** but also **CSS4 – Plastics & Rubber**, as it is a sector highly represented in the region and closely linked to the agrifood and feed industry, will be addressed by the Norte Region in the framework of the FRONTSH1P project.

Waste Management Situation

According to Eurostat, the detailed waste management parameters are only available for mainland Portugal, figure 3.

Waste Management

Waste Management		Portugal	Date
Overall recycling rates			
Landfill	percentage	57	2022
Recycling		16	
Composting		8	
Energy Recovery		15	
Other Recovery		2	
Recycling rates for specific waste streams			
Recycling rate of overall packaging	percentage	61.1	2022
Recycling rate of plastic packaging	percentage	38.1	2021
Recycling rate of WEEE separately collected	percentage	51.7	2021

Source: EUROSTAT (https://ec.europa.eu/eurostat/web/circular-economy/monitoring-framework)

Figure 3 - Waste management data in Portugal

1.2 Characterisation of sectors

Food and Feed

The boundaries between agriculture, food industry, food retail and feed industry are not always clearly defined. The term “agrifood” (or “agrofood”) may encompass all these subsectors (including feed), or it may refer more narrowly to agriculture and the food industry. In this report, the scope includes agriculture, fisheries and aquaculture, the food industry, the feed industry and food retail.

Agrifood sector in Portugal

The Portuguese agrifood sector is fundamental to the country’s growth strategy, directly contributing to increasing exports and guaranteeing food self-sufficiency (AICEP, 2025a). It comprises the production and processing of raw materials into food and drink – agriculture,

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fisheries, processing food and drink industries, extractive industries (salt) -, and distribution to the end consumer (AICEP, 2025b).

In recent years, there has been a significant increase in agrifood exports, demonstrating its growing international recognition (AICEP, 2025a) and the sector's relevance to the country's economy and competitiveness (AICEP, 2025b). Furthermore, the agrifood sector in Portugal corresponds to 12.9% of GDP and 7.9% of total exports (PORDATA, 2024a). The GVA in 2022 was similarly distributed between agriculture, silviculture and fisheries, and the food industries, each totalling 4.6 billion euros (PORDATA, 2024c).

Feed sector in Portugal

Portuguese animal feed sales are projected to reach approximately 1.7 billion euros by 2018, up from 1.6 billion euros in 2023, marking an annual growth rate of 0.7%. The country's animal feed imports are expected to decline slightly, reaching around 220 million kilograms by 2028 from 226 million kilograms in 2023. Conversely, Portuguese animal feed exports are anticipated to grow, reaching approximately 135 million kilograms by 2028, from 116 million kilograms in 2023. According to the country's feed manufacturers' association, the animal feed sector in Portugal feared being caught in the middle of two pressures: an increase in the price of raw materials and a lack of liquidity for livestock producers (IACA, 2021). An increase in the price of raw materials is a driving factor for the transition into a more circular economy.

Agrifood and feed in the Norte Region

Agriculture

In figures 4 reported the fodder maize is by far the most abundant crop in the Norte region, with a production of 1.5 million tons in 2023.

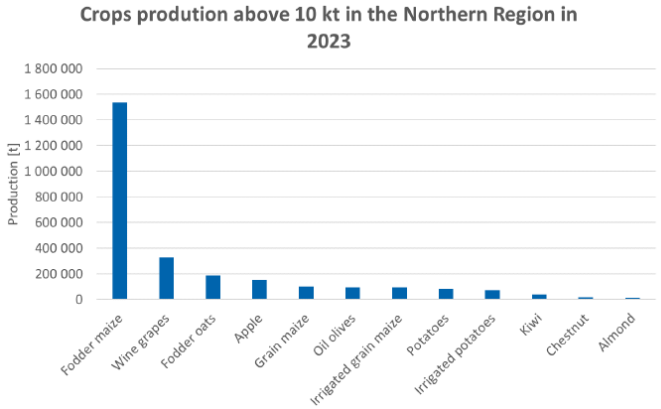

Figure 4 - Crops with annual production above 10 kt in the Northern Region. (Source: INE, 2024a)

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Wine grapes are the second most abundant crop in Norte, with 301 kt produced in 2023. Norte has 3 wine regions: Vinho Verde, Trás-os-Montes, and Porto e Douro.

Primary animal production

Direct production data is not available per region (NUTS II) but may be inferred from total effective heads for each animal species per region. Norte has 20% of cattle heads and 25% of goats (Table 2).

Table 1 – Total headcount in Portugal and in Norte, in 2023, per animal species. (INE, 2024a)

Species	Total headcount in Portugal (1 000 heads)	Headcount in Northern Region (1 000 heads)	% Northern Region/ Portugal
Cattle	1 528	300	20%
Pigs	2 181	63	3%
Sheep	2 217	267	12%
Goats	336	83	25%
Poultry – all species	239 458	15 296	6%
Chickens	224 007	15 296	7%

Cattle in this region is particularly important for milk production. Most milk cooperatives are in the Norte region. Agros is a union of cooperatives, representing 44 cooperatives and approximately 750 milk producers (Agros, 2025), all in the Norte region. Nonetheless meat production is also relevant, in particular in the context of native breeds: Arouquesa, Barrosã, Cachena, Maronesa, Mirandesa and Minhota are all bovine breeds from the Norte region (FERA, n.d.).
The four counties with the highest nominal number of intensively farmed cattle are located in the Northern Region (Table 2).

Table 2 – Municipalities with the highest nominal number of cattle in intensive farming (ENEAPAI 203).

County	Intensive cattle (nominal headcount)
Barcelos	32 797
Vila do Conde	30 055
Póvoa de Varzim	13 514
Vila Nova de Famalicão	9 557

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Fisheries and aquaculture

The Norte region is particularly prominent in sardines, blue whiting (verdinho), Atlantic mackerel (sarda), pout and seabass captures. The Norte region has 3 main fisheries discharge ports: Viana do Castelo, Póvoa de Varzim and Matosinhos.

With regards to aquaculture, Norte has a small significance with only 2.4% of total production, except for inland water production where it assumes the whole production (table 3). Although reduced, Portugal has shown a stable freshwater aquaculture production of trout (Portugal Global, 2024). The north coast of Portugal is, however, attracting interest from investors for large-scale salmon production (Portugal Global, 2024).

Table 3 - Aquaculture production in 2022 in Portugal, continental Portugal and Norte (INE, 2024b).

		Portugal [t]	Continental Portugal [t]	Norte [t]	% Norte/ Portugal
Total		16 116	14 126	394	2.4%
Inland waters	Total	264	264	263	99.9%
	Extensive production	0	0	0	-
	Intensive production	264	264	263	99.9%
	Semi-intensive production	0	0	0	-
Transition and marine waters	Total	15 852	13 862	131	0.8%
	Extensive production	7 140	7 140	25	0.4%
	Intensive production	5 563	3 573	106	1.9%
	Semi-intensive production	3 149	3 149	0	0.0%

Food and feed industries

Food and feed production quantities data is not directly available per NUTS II but may be inferred from number of enterprises and turnover per NUTS II.

The Norte region has 30% of the food companies in the country and 38% of the beverage companies. With respect to turnover, the Norte region represents 20% of the food industries turnover in the country and 43% of the beverage industries turnover.
From the analysis of data from INE (2024a), it can be observed that the most prevalent food, feed, and beverage subsectors in the Norte region are:

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- Dairy: only 15% of the dairy companies but 39% of the turnover.
- Beverages: 38% of the companies and 43% of the turnover.
- Cereals, pulses, starches: 27% of the companies and 46% of the turnover.
- Bakery and other flour products: 32% of the companies and 32% of the turnover

Furthermore, the Norte region detained almost one fourth of the enterprises and persons employed in 2023 in this subsector. (INE, 2024b)

The Norte region has around 10% of the number of feed producers and ≤12% of the countries' feed production turnover. The list of manufacturers of animal feedstuffs shows 204 plants with approval numbers (DGAV, 2024), classified as:

- Manufacturers of Animal Feed Additives
- Manufacturers of premixes of additives intended for animal feed
- Self-producers of compound feedstuffs
- Compound feed manufacturers

The number of companies is slightly lower, as some companies have two or more plants, and some plants produce more than one type of feed products. Of those feedstuffs' companies, only 15 seem locate in the Norte region. This data supports the relatively small representativity of feed producers in the Norte region when compared to other NUTS II.

Many feedstuffs' producers deal with animal byproducts. As per Regulation 183/2005, these operators are registered in an information system with DGAV (SIPACE). In addition to those operators accounted for in production of feedstuffs, there are other operators that deal with animal byproducts, but which do not produce feedstuffs. These players may be of importance in terms of circular economy, as they add value to food byproducts. Some of these players are different companies (12 to be precise) but belong to larger groups that have feedstuff production capacities.

Figure 5 presents an overview of the performance - turnover and number of companies - of the different regional sub-divisions, for the key economic activities.

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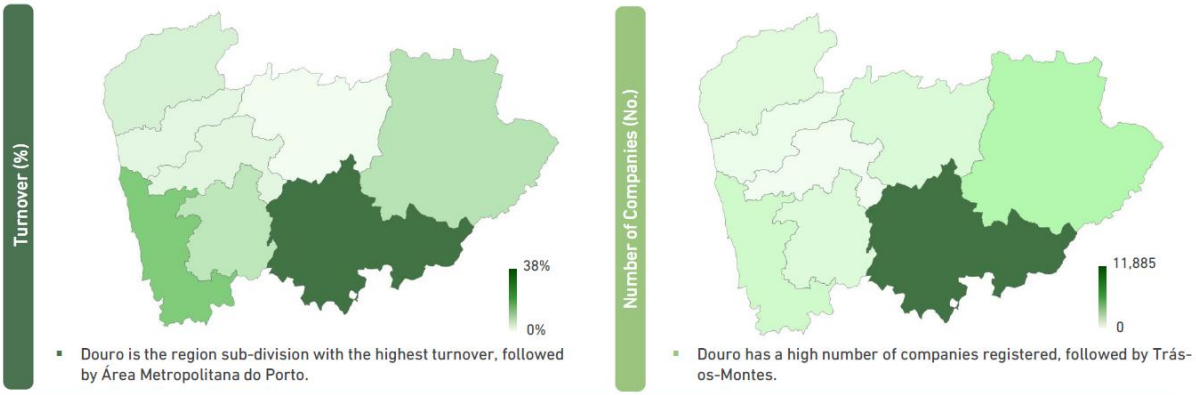
Farming



- Douro is the region sub-division with the highest turnover, followed by Área Metropolitana do Porto.
- Douro has a high number of companies registered, followed by Trás-os-Montes.

Sources:
INE | *Volume de negócios (€) dos estabelecimentos por Localização geográfica (NUTS - 2024) e Atividade económica (CAE Rev. 3); Anual* | Data relating to 2023
INE | *Empresas (N.º) por Localização geográfica (NUTS - 2013) e Atividade económica (Subclasse - CAE Rev. 3); Anual (2023)* | Data relating to 2023

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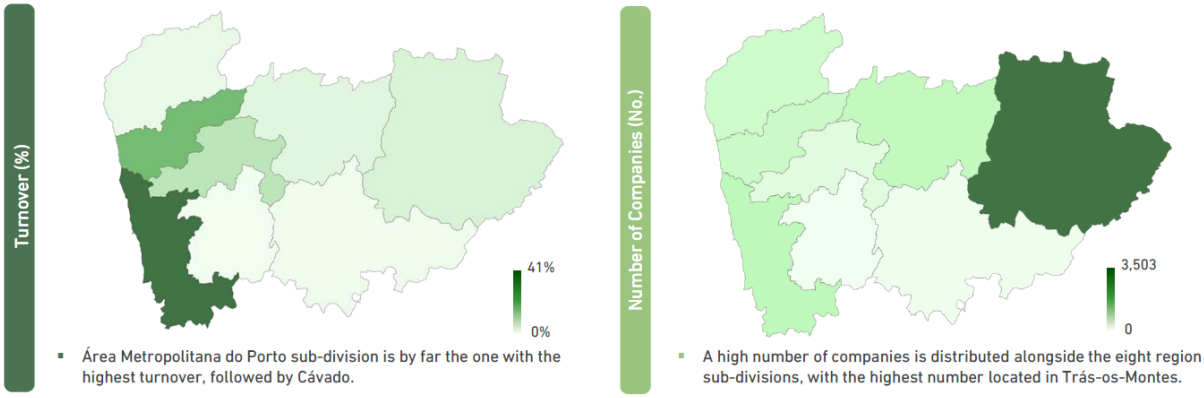
Animal Production



- Área Metropolitana do Porto sub-division is by far the one with the highest turnover, followed by Cávado.
- A high number of companies is distributed alongside the eight region sub-divisions, with the highest number located in Trás-os-Montes.

Sources:
INE | *Volume de negócios (€) dos estabelecimentos por Localização geográfica (NUTS - 2024) e Atividade económica (CAE Rev. 3); Anual* | Data relating to 2023
INE | *Empresas (N.º) por Localização geográfica (NUTS - 2013) e Atividade económica (Subclasse - CAE Rev. 3); Anual (2023)* | Data relating to 2023

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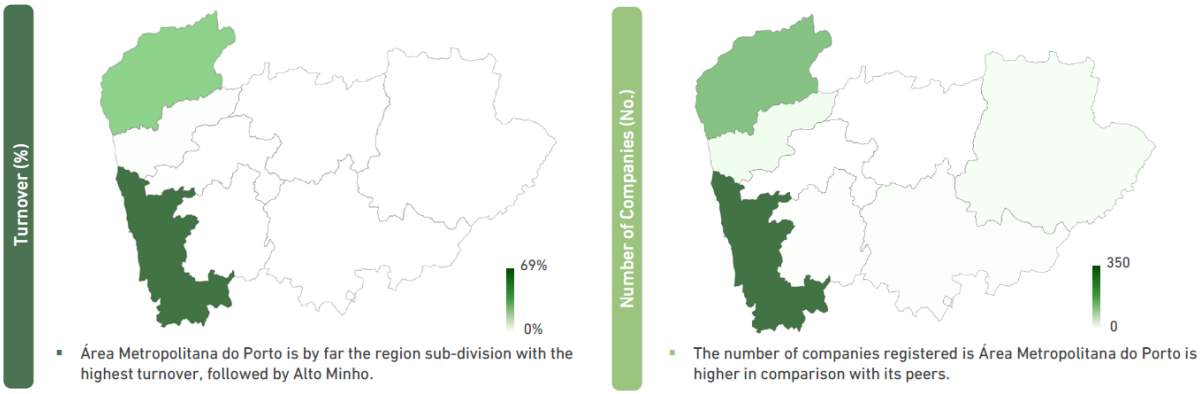
Fishing



- Área Metropolitana do Porto is by far the region sub-division with the highest turnover, followed by Alto Minho.
- The number of companies registered is Área Metropolitana do Porto is higher in comparison with its peers.

Sources:
INE | *Volume de negócios (€) dos estabelecimentos por Localização geográfica (NUTS - 2024) e Atividade económica (CAE Rev. 3); Anual* | Data relating to 2023
INE | *Empresas (N.º) por Localização geográfica (NUTS - 2013) e Atividade económica (Subclasse - CAE Rev. 3); Anual (2023)* | Data relating to 2023

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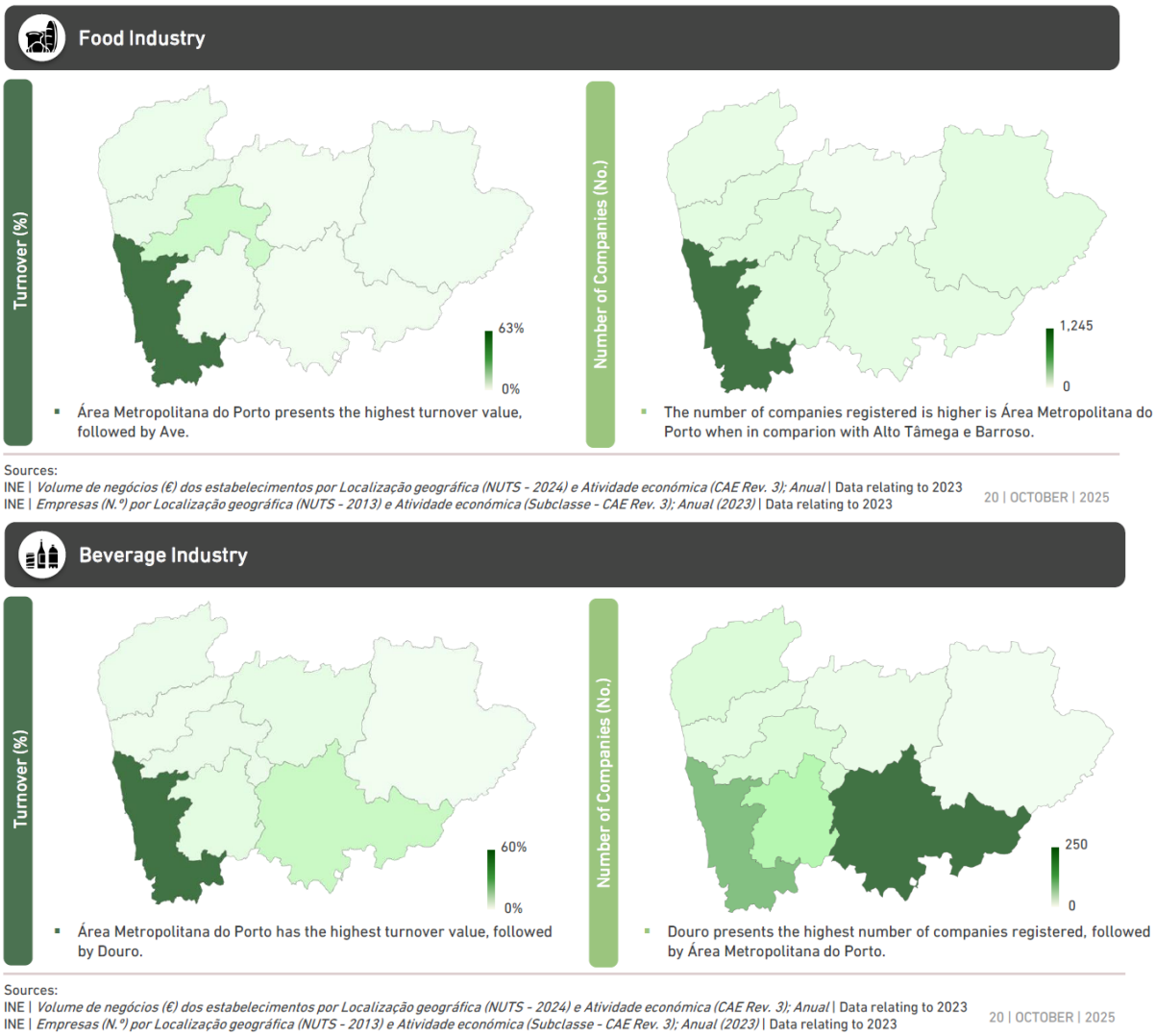

Figure 5 - Overview of the performance - turnover and number of companies - of the different regional sub-divisions to food and feed

Considering the Material and Waste Flow for Food and Feed final Value Chain (1.6 point) in the Norte Region, in the Production section, Animal feed emerges as the largest category by far – 51%, with a total production of 1,996,515.0 tons.

The Crops category represents 27% of total production. Although significantly lower than Feed, Crops still constitutes a substantial portion of the region's agricultural output, particularly in terms of food supply and export potential. This category includes Vegetables – 319,505.0 tons (comprising potatoes and horticultural crops), Vines – 318,673.0 tons, Fruits – 250,620.0 tons (comprising main fresh fruits, small berry fruits, main subtropical fruits, citrus fruits and main nuts), Cereals – 112,275.0 tons (comprising main dry legumes and cereals for grain) and Olival – 52,830.0 tons.

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Import

A large part of the imports from the Norte region are centered in the Crops, vegetables and fruits category, which accounts for 73% of the total. In this category stands out for the import of Cereals (78%) with 1,417,157.0 tons (including cereals, milling products, malt, starch, among others), followed by Fruits (13%) with 245,434.0 (including fruits, citrus peels and melons) and Vegetables (9%) with 162,105.0 tons (including edible vegetables, plants, roots and tubers).

The Animal category ranks second, representing 14% of total import. It includes the import of Meat (27%) – 98,652.0 tons, Dairy products and eggs (26%) – 94,040.0 Fish (22%) – 80,864.0 tons, Living animals (14%) – 52,107.0 tons and Animal fats and oil (11%) – 38,833.0 tons.

The Drinks category accounts for 7% of the total imports and includes a variety of beverages, alcoholic liquids and vinegars.

The Processed Food accounts for 6% of total imports. This category includes several subcategories: Processed meet and fish (20%) – 30,297.0 tons (encompasses preparations or preserves of meat, preserves, extracts and furrows of meat, mollusks and invertebrates, among others), Cereal-based products and flour (37%) – 55,411.0 tons, Processed vegetables and fruits (30%) – 44,314.0 and Various food preparations (13%) – 20,187.0 tons.

Although the Northern Region is highly productive in terms of local food production, both plant- and animal-based, it still maintains a strong level of food import activity.

Export

The Crops, vegetables and fruits category remains the most representative, accounting for 37% of total exports. Cereals are the leading product, making up 51% (214,477.0 tons) of crop exports (includes preparations of cereals, milling industry products, malt, starches, inulin and wheat gluten), followed by Fruits (30%) with 124,753.0 tons (comprising fruit, peels of citrus fruits and melons and others) and Vegetables (20%) with 83,470.0 tons (comprising edible vegetables, plants, roots and tubers). The Drinks category ranks second, representing 34% of the total exports and include a wide range of products such as beverages, alcoholic liquids and vinegars.

The Animals and animal-based products represents 20% of total exports. Within this category, the most significant subcategories are Dairy products and eggs (44%) with 104,399.0 tons, Fish (26%) with 62,188.0 tons and Meat (16%) with 37,392.0 tons. Follows Animal fats and oil (12%) with 27,318.0 tons and Living animals (2%) with 5,179.0 tons of exported products.

The Processed Food category accounts for 9% of total exports. This category includes several subcategories: Processed meet and fish (38%) – 37,909.0 tons (encompasses preparations or preserves of meat, preserves, extracts and furrows of meat, mollusks and invertebrates, among others) Cereal-based products and flour (38%) – 38,498.0 tons, processed Vegetables and fruits (14%) – 13,908.0 and Various food preparations (11%) with 10,763.0 tons.

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Food and Feed waste production

The total amounts of municipal waste and biowaste by waste management system (SGRU) in the Northern Region and the final destinations are also presented in nest Table.

Table 4 – Quantity of municipal waste produced in 2023, population, area, and infrastructure capacity for each SGRU. Estimated percentage and quantity of biowaste in the SGRUs of the Northern Region. (Source: APA, 2024), except for estimated biowaste, which was calculated based on the biowaste percentage and the total amount of municipal waste.

SGRU	Municipal waste quantity [t]	Population	Area [km²]	Capacity [kg/inhab/year)]	% Biowaste	Estimated biowaste [t]
AMBISOUSA	147 025	330 754	767	444.5	32.63%	47 974
BRAVAL	134 767	308 011	1 123	437.5	43.31%	58 368
LIPOR	520 753	1 016 143	646	512.5	34.01%	177 108
Resíduos do Nordeste	61 646	128 900	6 996	478.2	35.42%	21 835
RESINORTE	400 565	904 254	8 031	443.0	39.12%	156 701
RESULIMA	145 643	313 183	1 743	465.0	39.76%	57 908
SULDOURO	202 631	449 077	384	451.2	40.46%	81 985
VALORMINHO	40 008	73 902	950	541.4	40.40%	16 163
Total Northern Region	1 653 038	3 524 224	20 640	469.1		618 041

Considering data (figure 4) obtained from INE of industrial bio-waste (2022) it is possible to observe that from Primary Production, most waste comes from animal effluents (12,684tons), followed by animal waste from food preparation sand products (1,276tons) and finally plant waste (659tons).
In Food Industry, most of the bio-waste comes from plant-based products (8,235tons), followed by animal waste from food preparation sand products (5,351tons), andlastly, animal manure (1,356tons).

Economic activity	Type of residue	Waste managed (t) (2022) Norte Region
Primary Production (Agriculture, hunting, forestry and fishing)	Plant waste (non-hazardous)	659
	Animal waste from food preparations and products (non-hazardous)	1,276
	Animal faeces, urine and manure (non-hazardous)	12,684
Food Industry (Food, beverage and tobacco industries)	Animal waste from food preparations and products (non-hazardous)	5,351
	Plant waste (non-hazardous)	8,235
	Animal faeces, urine and manure (non-hazardous)	1,356

Figure 6 – Type of reside and waste managed in Norte region (2022).

When analysing the type of operation for waste management given to the waste from Primary Production and Food Industry, it was possible to observe that most bio-waste goes to operations of waste valorization, followed by landfill and energy recovery.

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Economic activity	Type of residue	Waste managed (t) (2022) Norte Region
Landfill	Bio-waste from Animal waste from food preparations and products (non-hazardous) and Plant waste (non-hazardous)	1,049
	Animal faeces, urine and manure (non-hazardous)	9
Energy recovery	Bio-waste from Animal waste from food preparations and products (non-hazardous) and Plant waste (non-hazardous)	857
Organic Valorization	Bio-waste from Animal waste from food preparations and products (non-hazardous) and Plant waste (non-hazardous)	13,615
Other types of valorization (excluding energy recovery)	Animal faeces, urine and manure (non-hazardous)	14,032

Figure 7 – Final destination for type of reside and waste managed in Norte region

Considering the available data from APA (2022), it is possible to conclude the inferred percentage of bio-waste that is collected selectively, undifferentiated but separated and undifferentiated.

Type of waste collection	Ambisousa	BRAVAL	Lipor	Resíduos do Nordeste	RESINORTE	RESULIMA	SULDOURO	VALORMINHO
Selective bio-waste	0,03%	0	27%	0%	2%	3%	2%	0%
Undifferentiated, separated bio-waste	0%	-	-	22%	2%	11%	2%	35%
Undifferentiated bio-waste	99,9%	100%	73%	78%	96%	86%	96%	65%

Figure 8 – % of bio-waste that is collected from SGRU of Norte region

BRAVAL, Ambisousa, Resinorte and Suldouro have a big percentage of undifferentiated bio-waste collected, showing a great opportunity for improvement.
Lipor, Valorminho and Resíduos do Nordeste show the best results regarding selective and separated collection of bio-waste. However, there is still a big opportunity for improvement.
Next map (Figure 10) uses different gradients of green – from dark to white - to indicate the amount of waste sent to the corresponding waste management strategy by organization. Darker colors represent a higher volume of waste sent to that specific treatment method, considering data from all organizations. Lighter areas correspond to the areas with the least amount (or nonexistence in white) of waste directed to the waste management strategy, considering data from all organizations.

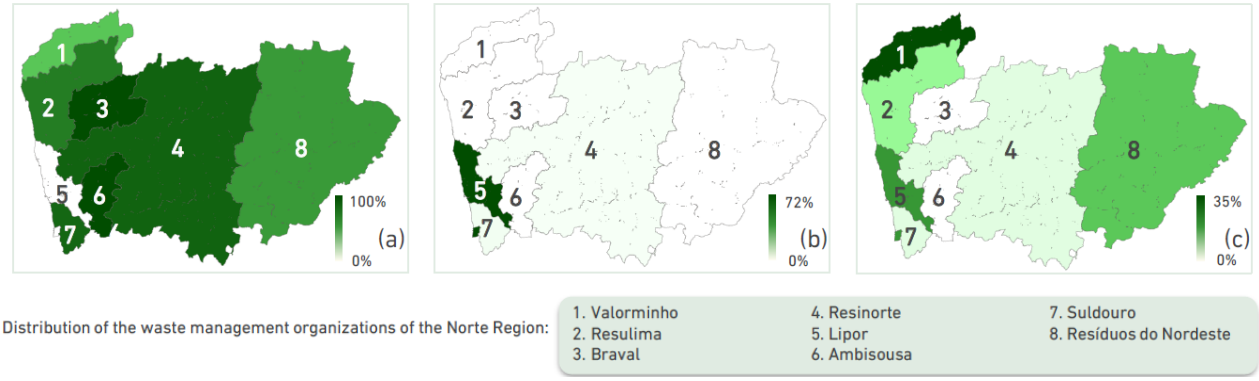

Figure 9 – Heat maps per waste management organization area of the Norte Region, comparing amount of waste that goes to landfill (a), energy valorization (b) and organic valorization (c)

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Lipor has residual % waste going to landfill and is the entity that sends the most to incineration. In paralel, only RESINORTE and SULDOURO send their waste for energy recovery. Ambisousa, BRAVAL and SULDOURO are the entities with the biggest rate of waste going to landfill. Valorminho has the biggest rate of organic valorization with a rate of 35%, followed by Lipor and Resíduos do Nordeste.

Conclusion

Production

- The dominant category in the production of food and feed in the North region is **animal feed**, which represents 51% of the total, with about 2 million tons. This shows the **strong emphasis on livestock feeding.**
- **Agricultural crops** occupy the second place, with 27% of total production. Although they are well below animal feed, they still represent a **significant part of production**. With emphasis on vegetables, fruits and cereals.
- The production of **milk and eggs** represents 20% of the total, with **milk being the main product**, with almost 790 thousand tons produced. This reinforces the importance of the dairy industry in the Norte Region.
- **Meat and fish** correspond to the products with lower production with 90 thousand tons produced.

Processing

- Drinks category has a substantial production volume, represented by the **production of beer, soft drinks and water and wine**, reinforcing the strength of this sector in the region.
- The region has a **high contribution to food processing** at the national level. Cereals occupies the first place representing 52% of the total. Next, the processing of dairy products stands out, followed by pastries and bakery and meat and fish and with lower representativeness, olive oil and vegetables and fruits.
- Besides its lower production volume, the processing of meat products (sausages, hamburgers, canned meat, among others) has high representativeness in the national economy, with the Norte Region representing 37.31% of the national turnover.

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Consumption

- **Plant products account for nearly 45% of total food consumption**, indicating their strong presence in food habits. Vegetables and fruits are the plant-based products more consumed, with 31% of the total consumption.
- The **drinks** category is quite representative, with **29% of the total**, which is mostly occupied by the consumption of non-alcoholic beverages.
- In the **animal** sector, 26% of total consumed products, it is possible to observe the **region's strong reliance on animal-derived products**, especially **meat and dairy**, which together make up over 75% of the animal-based consumption.
- In summary, the consumption pattern in the Norte Region reveals a **strong presence of vegetable products in the diet.**

Import

- A large part of the imports from the North region is concentrated in the categories of **Crops, vegetables and fruits**, which represent 73% of the total. Within this category, we can highlight **cereal imports**, which occupy **78% of this category**.
- The category of **animals** occupies **14% of total imports**, within this category the imports of meat, dairy products & eggs and fish stand out.
- Beverages and processed foods come next, accounting for 7% and 6% of imports respectively.
- Despite the strong local production of food of plant and animal origin, the Norte Region maintains a high level of imports, **especially in cereals and animal products.**

Export

- The category of **Crops, vegetables and fruits** continues to be the most representative, with **37% of total exports**. Again, **cereals lead the way** in this category, occupying a total of 51%, followed by fruits and vegetables.
- **Drinks** comes in second place, representing **34% of exports.**
- The **Animal category represents 20%** of total exports, with emphasis on the export of dairy products and eggs, fish and meat.
- **Processed food** category has less representativeness with 9% of total exports.
- Exports from the North region are diversified, with a strong presence of agricultural products, beverages and foods of animal origin, which demonstrates a broad and competitive production capacity in different segments of the agri-food sector.

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Waste Management

- Regarding **industrial bio-waste**, most of it goes to **operations of waste valorization**, followed by landfill and energy recovery. However, it is still generated a considerable amount of waste in primary production and food processing that should be avoided and valued.
- Considering the data from **municipal bio-waste** it was possible to observe that most of the municipal bio-waste in unsorted (91%) and only 9% is selected bio-waste. Furthermore, on average **65% of total bio-waste of the considered waste management entities goes to landfill**, followed by energy (21%) and organic valorization (14%). This results show a great opportunity for improvement in valorizing bio-waste in the Norte Region.
- The majority of **food donations** in the Norte Region comes from operational programs for deprived persons (41%) and the food industry (23%), consisting mainly of fruits and vegetables and products based on animal protein.
- National data from **food waste** show that most waste is associated to households (67%), highlighting the importance of raising awareness among the population to this topic.

Plastics and Rubber

The rubber and plastics industry accounts for about 8.3 % of the manufacturing industry in the Northern Region.

When comparing the rubber and plastics industries, the number of enterprises in the plastics industry is significantly higher (434 vs. 96), but in terms of gross value added (GVA) the difference is marginal (Figure 11).

Figure 10 – No. and % of national manufacturing industries, GVA in the Norte region in terms of the plastic and rubber industries (INE, 2023b)

The economic activity with the highest turnover in the northern region is 'Wholesale and retail trade; repair of motor vehicles and motorcycles', followed by manufacturing and construction. In terms of manufacturing, the industries with the highest turnover in the northern region are (Figure 11):

- Manufacture of basic metals, except machinery and equipment;

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- Food industries;
- Manufacture of wearing apparel;
- Manufacture of motor vehicles, trailers, semi-trailers and parts of motor vehicles;
- **Manufacture of rubber and plastic product.**

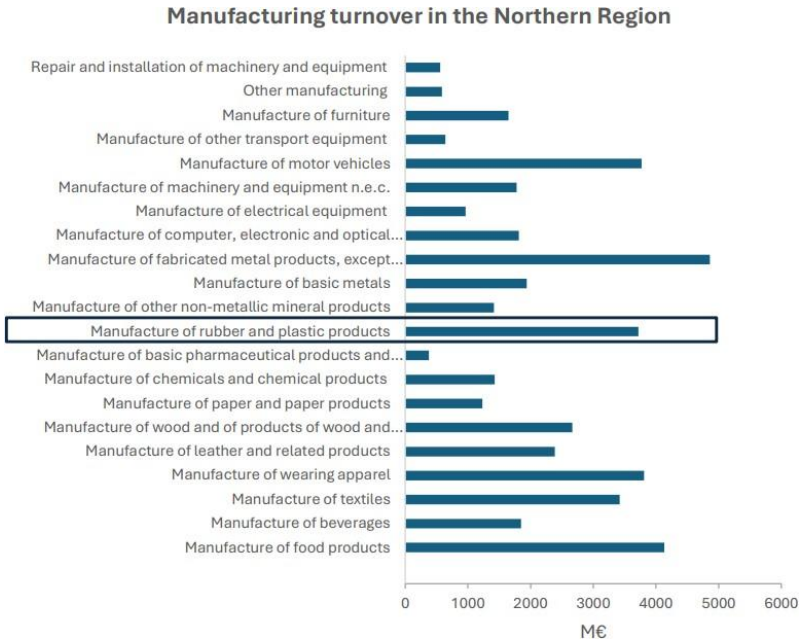

Figure 11 - Manufacturing turnover in the northern region (INE, 2023d)

Manufacture of rubber and plastic products

Most enterprises operating in this sector are in the Norte region, with a total of 533 enterprises, representing almost 50% of the national total, as shown in Figure 12.

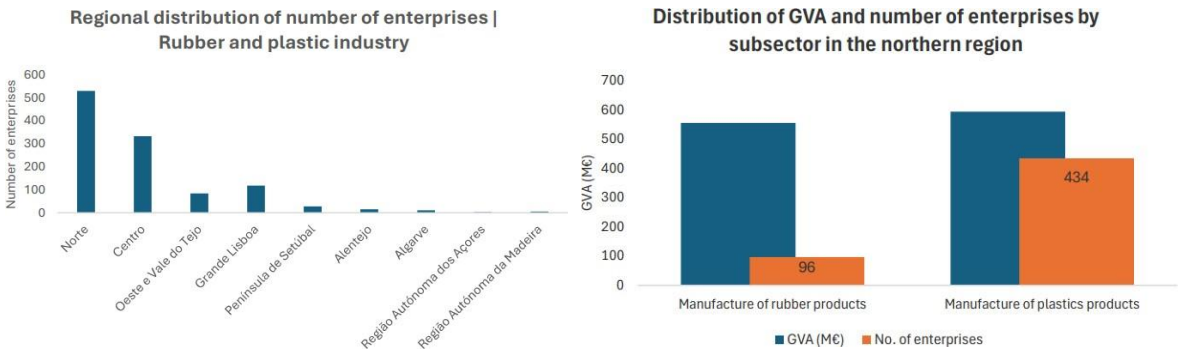

Figure 12 - Gross value added and number of enterprises in the rubber and plastics industry (INE, 2023e)

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In terms of sub-sectors, the plastics industry had the largest number of enterprises (434) compared with the rubber industry (96). In terms of gross value added (GVA), the difference is not very significant, although it is slightly higher in the case of plastics (around EUR 555 million GVA in the rubber sector and around EUR 594 million in the plastics sector) (Figure 12).

Manufacture of rubber products

An analysis of the rubber sector by intermunicipalities in the northern region shows that the largest number of enterprises is in the metropolitan area of Porto. However, in terms of GVA, the region of Ave has the most significant figure. Among the sub-sectors of the rubber industry, the largest number of enterprises operate in the 'Manufacture of other rubber products', mainly in the Oporto metropolitan area and the Ave region. In the Tâmega e Sousa region, a significant number of enterprises operate in the manufacture of rubber components for footwear (Figure 13).

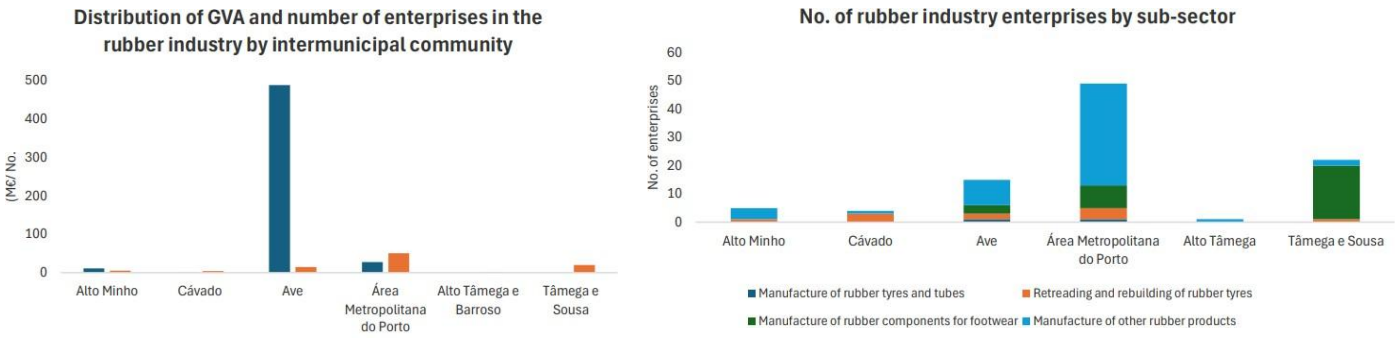

Figure 13 - Gross value added and number of enterprises by sub-sector in the rubber industry (INE, 2023e)

An analysis by municipality shows that, in terms of the number of enterprises, most are in Felgueiras, a municipality with a strong footwear industry in the Tâmega e Sousa region.
In terms of exports, Vila Nova de Famalicão, located in the intermunicipal municipality of Ave, is the municipality with the highest figure. This is due to the presence of Continental, a multinational tyre manufacturer (Figure 14).

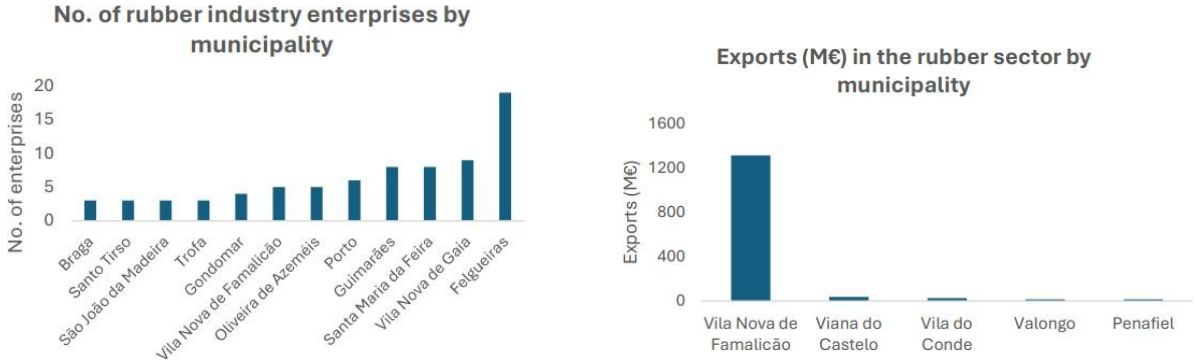

Figure 14 - Gross value added and number of enterprises in the rubber industry by intermunicipal community (INE, 2023e)

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Manufacture of plastics products

Regarding the plastics sector, it is in the Porto Metropolitan Area that GVA and the number of companies are significantly higher, followed by the Ave, Cávado and Alto Minho regions (Figure 15). In terms of sub-sectors, the largest number of enterprises were active in the manufacture of other and unspecified plastic products, mainly in the Porto Metropolitan Area (Figure 15).

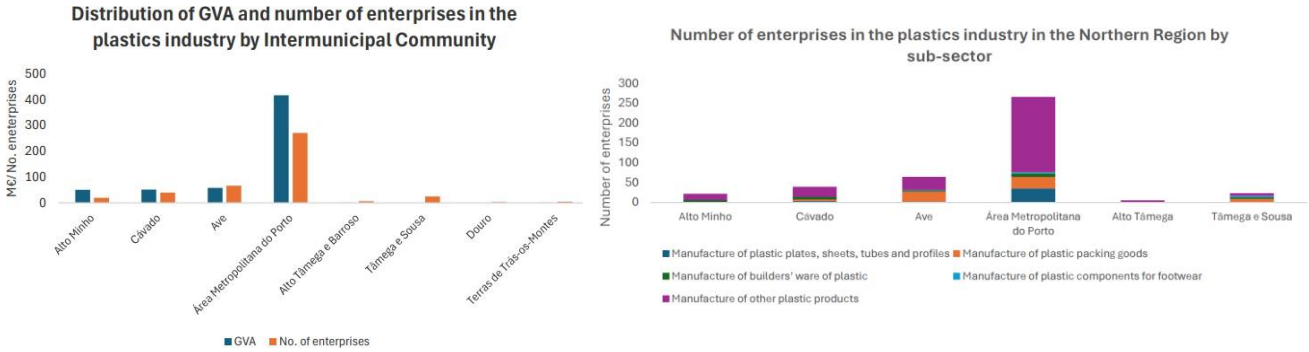

Figure 15 - Gross value added and number of enterprises in the plastics industry by intermunicipal community (INE, 2023e)

When analysing the number of enterprises by municipality, the highest number is found in Oliveira de Azeméis, followed by Guimarães and Vila Nova de Gaia. In terms of exports, Santo Tirso is the municipality with the highest export profile, followed by Vila Nova de Gaia, Porto and Maia, all in the Porto Metropolitan Area. Vila Nova de Famalicão also has a high level of exports (Ave region), as does Arcos de Valdevez in the Alto Minho region.

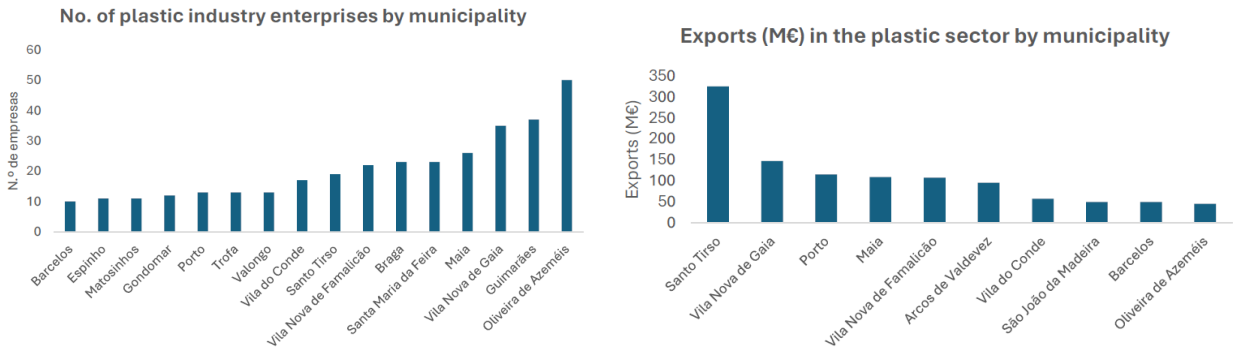

Figure 16 - No. of plastic industry and exports by municipality (INE, 2023b)

The following figures analyses the behaviour of the eight regional NUTSIII that compose the Norte Region with regards to several key economic activities identified in the region.

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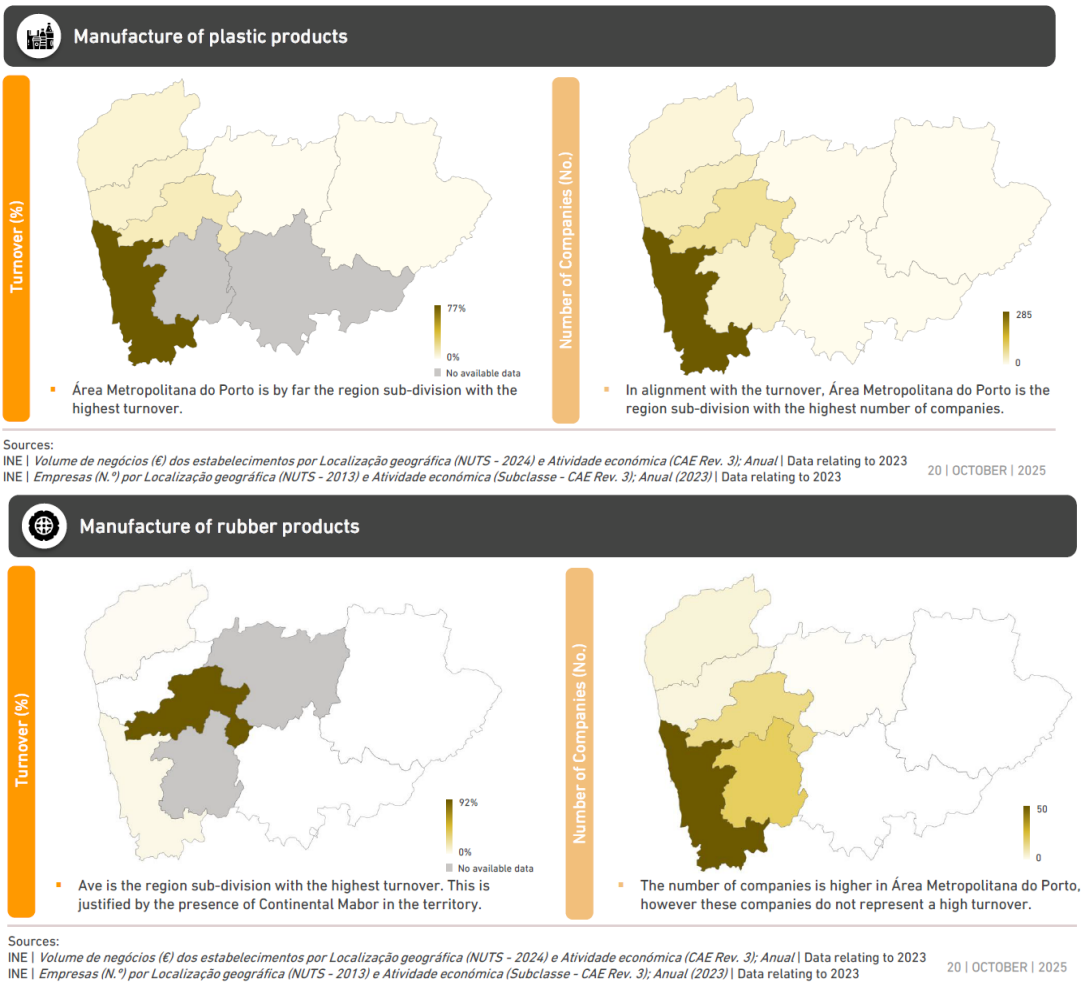

Figure 17 - Overview of the Norte region performance - turnover and number of companies

Plastic and rubber waste production

The Porto Metropolitan Area generated the largest quantity of plastic and rubber waste, accounting for around 46% of the total produced in the region. The Ave Intermunicipal Community (CIM) follows with 28,632 tonnes, representing around 28% of the total (Figure 18).

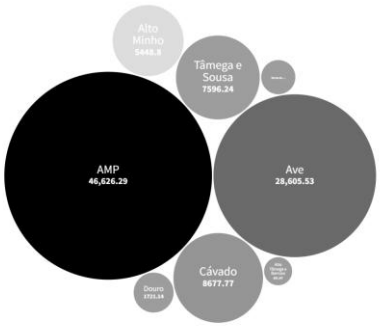

Figure 18 - Production of plastic and rubber waste by NUTSIII in the Norte region (Source: APA, 2023 based on MIRR)

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Final destination of plastic and rubber waste

Disposal and recovery operations of the plastic and rubber waste received, the most common operation is related to the exchange of waste for disposal (e.g., landfill), accounting for 54% of the total. Around 32.6% of waste, equivalent to 32,849 tons, is subjected to waste accumulation operations intended for one of the disposal operations, excluding temporary storage prior to collection at the site where it is carried out. This is followed by the recovery of waste through recycling/recovery of organic compounds not used as solvents, including composting and other biological transformations, representing 9.83% of the total.

Imports of Plastic and Rubber Waste

According to data provided by APA, around 50% of imported waste has the LOW code 191204 (Plastic and rubber waste from mechanical waste treatment). This is followed by plastic packaging waste, with 8,602 tonnes, corresponding to 40% of the plastic and rubber waste imported into the region.
Regarding waste with code 191204, it can be said that it originates mainly from the Dominican Republic, with 4,566 tonnes, followed by Lebanon and Spain, with 2,233 and 1,515 tonnes, respectively.
For plastic packaging waste, Spain stands out with 4,273 tonnes, representing 50% of imports of this type of waste.
Among the imported plastic and rubber waste in the Northern Region, its destination for intermediate operations is predominantly (95%) for the recycling/ of organic substances which are not used as solvents (including composting and other biological transformation processes) recovery operation. Within the 4.42% of waste sent to operations, waste with LOW code 020104 (Plastic waste - excluding packaging - from agriculture, horticulture, aquaculture, forestry, hunting, and fishing) is particularly notable.

Waste from the Manufacture of Rubber and Plastic Products

To provide a more detailed picture of plastic and rubber waste generated in the Northern Region, was analysed the situation of companies classified under NACE code 22, related to the manufacture of rubber and plastic products.
Regarding the NUTS III regions, the Porto Metropolitan Area registers the highest amount of waste generated by companies under NACE code 22, with approximately 20,102 tonnes. Of this total, 17,488 tonnes originate from the plastics industry.
Among the waste from NACE code 22 in the other territories of the Northern Region, plastics are more relevant in Alto Minho, Cávado and Terras de Trás-os-Montes, while rubber is more predominant in Tâmega e Sousa and in the municipalities of Alto Tâmega e Barroso.

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Conclusion

Processing

- The Norte Region plays a leading role in Portugal's rubber and plastic industries, processing around **36,373 tons of primary plastic forms**, mostly **polyethylene (47%)** and **PVC (40%).**
- Production is heavily concentrated in the **Área Metropolitana do Porto**.
- The region is responsible for **88% of the national rubber industry turnover**, with **98% of tire production** located in the **Ave sub-division**.
- With regards to plastics, the Norte Region contributes with **47% of national turnover**, with significant outputs in packaging, construction products and technical components, totaling **577,999 tons of plastic products**.
- This highlights a strong and diversified processing base, especially in high-demand sub-divisions.

Imports

- The Norte Region shows a **high dependency on external sources for raw materials**, importing around 838,164 tons of plastic and rubber products.
- **Imports of primary forms dominate**, particularly in plastics (508,413 tons) and rubber (48,288 tons), with only 7% of primary plastic forms produced locally and no domestic production of primary rubber.
- **Main imported polymers** include **PP, PE, and PET**, critical for packaging and industrial uses.
- In finished goods, rubber consumer products and semi-finished items show high import reliance, while plastic sheets and packaging demonstrate stronger domestic supply.
- The overall pattern reflects strong processing activity dependent on imported feedstock.

Exports

- **The Norte Region exported around 806,268 tons of plastic and rubber products**, with rubber (82%) and plastic (37%) showing strong national shares.
- Despite limited local production of primary forms, exports of primary plastic with 279,228 tons and primary rubber with 23,835 tons are significant, probably reflecting re-export or minor transformation.
- **Within rubber products**, **new tires** are the **main driver**, with 184,908 tons exported, confirming a highly competitive export sector.
- Regarding **plastics products**, the **region exported 293,832 tons**, surpassing imports and indicating a trade surplus.
- Key export categories include plastic profiles and construction materials, with some segments showing export volumes exceeding production, indicating contract manufacturing or transformation of imported goods.

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Consumption

- The **consumption** analysis in the **Norte Region** reveals that the **most consumed categories** are:
  - plastic materials in primary forms (28.35%)
  - plastic plates, sheets, tubes, and profiles (24.56%)
  - plastic packaging (21.42%)
- Within primary forms, **plastic materials dominate with 91.6% share,** with primary **synthetic rubber** contributing only **8.4%**.
- Regarding **rubber products**, **tires** are the most significant consumption category with a share of **63.8%**, followed by other rubber products with 36.2%.
- In the **plastic products** category, **plastic plates, sheets, tubes, and profiles** account for the **largest share** with **47.3%**, followed by **plastic packaging** with **41.2%**, plastic products for construction with 11.0%, and others with 0.5%.

Waste management | Industrial Waste

- The region generated approximately **7,579 tons of rubber waste** and **22,443 tons of plastic waste**.
- The **vast majority** of this waste was **managed through material valorization processes** - 97% for rubber and 89% for plastics - demonstrating a high level of recovery and reuse within industrial operations.
- Residual quantities of industrial waste were directed to:
  - landfill (0.1% for rubber and 7% for plastics)
  - energy recovery (3% for rubber and 4% for plastics)

Waste management | Municipal Waste

- **72% of municipal plastic waste** in the Norte Region **is collected unsorted**, with only 28% undergoing selective collection.
- Furthermore, rubber waste is not accounted for at the municipal level due to the lack of separate collection systems.
- This represents a critical gap in the waste management framework at the local level.
- **Most** of the **waste collected** was sent to **landfill with a share of 46%**, 28% was directed to material valorization and 26% to energy valorization.
- These findings highlight the need for substantial investment in selective sorting infrastructure and sustainable waste management strategies in the region.

It is important to stress that the plastics and rubber industry can produce materials for various segments: construction, automotive, food, agriculture, decoration, clothing, hospital equipment, household appliances.

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1.3 Indicators

The indicators for the monitoring framework of Circular Economy are not readily available at regional level in Portugal, except for one indicator ("Recycling rate of municipal waste"). Thus, the National Institute for Statistics was contacted to assess the possibility to collect the data at regional level. For progress monitoring and evaluation of circular measures for the region we used **EUROSTAT for socio-economic indicators**, the **CCRI Self-Assessment tool** and the ones proposed by **the Circular Benchmarking** tool which is inherently a CCRI tool. The lack of specific regional and sectoral data is one of the main challenged identified during roadmap development. For the **monitoring of circular measures for CSS2 and CSS4**, we propose specific indicators in **4.5 Progress and Monitoring section**. Regarding the Sustainable Development Goals (SDGs), the selected indicators of sustainable development relating mainly to economic growth and circular economy in Portugal are not available to the region. In the framework of the FRONTSH1P project, the Norte Region also took into consideration and contributed their **Tool Box.**

1.4 List of projects implemented in the circular economy area

In recent years, several projects have been and are being funded to promote circular economy in both the food and feed and the plastics and rubber sectors. Here is a non-exhaustive list of projects implemented in the Norte region or at national level by CSS.

List of projects in the food and feed sector:

- ANIMAL4AQUA | ERDF | 2016 - 2019
- BioTecNorte | ERDF | 2016 – 2020
- Bom Aproveito – Take-Away | 2023
- Café Circular | 2021
- Deposit Refund System | 2026
- DRECHEVALOR | COMPETE | 2009 – 2010
- EcoEconomy 4.0 | 2021
- Embrulha | 2016
- GOEFFLUENTS | PDR 2020 | 2017 – 2020
- Goodafter | 2016
- "Help the planet! Separate your biowaste!" | 2024
- INSEAFOOD | Portugal 2020
- MATTER- StartUp | 2021
- MICOBIOEXTRACT | ERDF | 2018 - 2022
- MOBFOOD | ERDF | 2017 -2021

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- MULTIBIOREFINERY | ERDF | 2017 – 2020
- National Circular Cities Initiative – 1nd Ed (2019-2023) 2nd Ed (2024-2028)
- OLIVEBLOEXTRACT | PT2020
- OlivePit | 2025
- REiNOVA_SI | Circular Economy in the Agri-Food Sector | 2019
- SPAWNFOAM | ERDF | 2013
- SPRAYSAFE | ERDF | 2019 – 2022
- "Ugly" or non-standard fruits and vegetables | 2016
- ValorNatural | PDR 2020
- ValorIntegrador | COMPETE | 2014 - 2015
- VIIAFOOD | 2022
- YPACK10 |
- Zero Waste (Zero Desperdício) | 2015
- Zero Waste Commitment of the Municipality of Guimarães | 2022

List of projects in the plastics and rubber sector:

- Sustainable Plastics – Green Agenda for Business Innovation under the Recovery and Resilience Plan | ongoing
- Embalagem do Futuro | Recovery and Resilience Plan | 01/01/2022 - 31/12/2025
- BluePoint - Blue Circular Economy of Marine Plastics | Interreg Atlantic Area | 01/11/2023 - 30/04/2026
- SMART PACK - Smart & Eco-efficient Flexible Films | Funding of AICEP | until 2027
- Strengthening the Integrated Approach of Holistic Impact Assessments for Safe and Sustainable by Design Plastic Value Chain | HORIZON-CL4-2023-RESILIENCE-01| 1 January 2024 – 30 June 2027
- Better Plastics: Plastics in a Circular Economy – Mobilising project co-financed by COMPETE 2020 | 2021 – 2023
- 3R Connect - Interconnected Innovation Ecosystems | HORIZON EUROPE| 2022-2024
- INOV.AM – Mobilising innovation in additive manufacturing
- Eco Sustainable Rail | COMPETE 2020 | POCI-01-0247-FEDER-017972 | 2019
- ECOBOARD | 2022
- Extruplás | 2000
- 2GLam - Development of 2nd generation laminates | COMPETE | 2013 –2015
- Global Coalition of Local and Subnational Governments (LSNG) to end Plastic Pollution (2022)
- MasterOpak - Development of a high opacity polyethylene masterbatch | COMPETE | Project no. POCI-01-0247-FEDER-017820 | 01/12/2016 - 30/11/2019

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- FWFI - New Food Packaging from Nature | COMPETE | Project no. POCI-01-0247-FEDER-048235 | 01/02/2021 - 30/06/2023
- AGRO TEE - Agro Tires Engineered for Efficiency | COMPETE 2020 | 2017-2019
- Portuguese Plastics Pact | 2020
- PreciousPlastic|VivaLabPorto | 2018
- R-Skin | Bolflex
- Re2win
- Rubberlink | 2013
- Sustainable Plastics | Mobilizing Agenda for Sustainable Plastics | 2022
- ZouriShoes | 2018

1.5 Analysis of barriers to implement a circular economy

CCDR-Norte and INL co-organized the first 4 workshops in 2024 (two per CSS) to gather insights from various stakeholders, particularly industry partners, and to identify the main perceived barriers that halt implementation of circular economy in their sectors.

These workshops were held in June and July 2024. Using the world café methodology and surveys, the stakeholders were asked to ponder on four categories of challenges: (**1) Legal Framework**; (**2) Innovation, product design and the value chain**; (**3) Infrastructure, investment, entrepreneurship; (4) Social inclusion, awareness and knowledge.** In the first round of workshops, the barriers to implementing a circular economy plan for both CSSs in the Norte region were identified for each category of challenges. In the second round of workshops, stakeholders were asked to rank the challenges identified previously in order of importance and priority for action. For some groups of thematic challenges, new challenges were also identified at the second workshop.

Methodology

Overall, the Norte Region employed the following methodologies to diagnose, identify stakeholders and barriers, validate challenges and brainstorm actions to accelerate circular economy and propose two action plans and a roadmap:

- Value chain analysis (material and waste flows, key actors) (stats data)
- Regional diagnosis (environmental, social, economic indicators) (stats data)
- Thematic workshops, seminars, interviews and surveys with stakeholders and some municipalities
- SWOT analysis.

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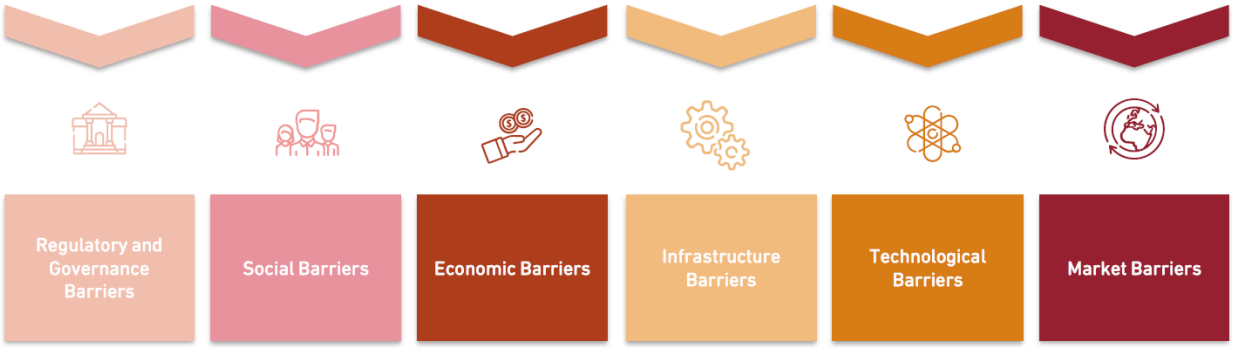
- Critical review of past initiatives.
- Barrier and solution identification (regulatory, technological, social).
- Definition of strategic pillars/axes, concrete measure and priority actions (short, medium, long term) and governance model.

Categories of barriers

- Therefore, the barriers to consider under the FRONTSH1P Project are:



Barriers for both CSS's are presented below by ranking within each challenge category.

Barriers identified for CSS2 Food&Feed + CSS4 Plastics&Rubber

1: Legal framework

CSS: Food and Feed	
Barrier	**Description**
Lack of advice on regulatory aspects	There is a need to create support infrastructures for regulatory advice. Introducing new foods incurs costs due to regulation, but the benefits are only realized in 2-3 years. Support from CCDR-N would be important to put pressure on the national government.
Misinformation about the declassification of waste	Many products may not be classified as waste, but there is widespread misinformation about what constitutes a product versus a by-product. Current legislation does not provide clarity in this area. For example, the use of animal by-products.
Barriers to the use of materials depending on their origin	Need for better synergies between the reuse of municipal and agricultural waste: there are barriers to the use of materials depending on their origin.
End of waste status for biomaterials/bio-waste	Increase and enable the introduction of methods to ensure end of waste status for biomaterials/bio-waste.
Lack of knowledge about tax incentives of donations	Tax incentives in the field of donations should be better disseminated.

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CSS: Plastics and Rubber	
Barrier	**Description**
Lack of incentives to transition to 100% recyclable packaging	Have a regulatory framework that supports the transition for production of 100% recyclable packaging.
Incorporate recycled materials into the production system	Consider obligation, through imposition, for the use of recycled materials, transversal to various types of products, whenever appropriate, and there should be supervision to avoid issues associated with greenwashing.
Lack of management in the non-packaging chain	Packaging plastics have associated management entities; however non-packaging plastics have greater difficulty in being organized throughout the life cycle.
Lack of awareness of recycling in society	There is little knowledge about the fate of the materials, institutions such as the The Portuguese Pact for Plastics (PPP) can unite different sectors, government entities, NGOs, associations and universities around this common vision – a circular economy for plastics in Portugal.
No compliance with regulations	Compliance with regulations prevents further recovery or reuse. Too much legislation. Need to raise government's awareness on these issues, so that the legislation developed has practical applicability.
Lack of metrics to measure circularity	There is a lack of region-level data and tools for circularity analysis that allow circularity to be measured.

2: Innovation, product design and the value chain

CSS: Food and Feed	
Barrier	**Description**
Lack of motivation on the part of companies in investing in local/sustainable products	Companies do not see a clear return or do not prioritize sustainability.
Price factor associated with innovations	Innovations are expensive and many traditional companies have no room to invest in R&D.
Raw material price fluctuation	Makes it difficult to create viable business models.
Lack of information for SMEs about support for innovation	Many companies are unaware of the incentives available.
Resistance of SMEs to innovation	Preference for traditional models, with fear of risks and additional costs.

CSS: Plastics and Rubber	
Barrier	**Description**
The low price of virgin raw materials	The low price of virgin raw materials compared to recycled materials discourages the use of recycled materials. Added to that, the fluctuating price per tonne hinders planning and stability of the recycled market.
Difficulty in disposing recycled materials	The recycling industry of rigid plastics faces difficulties in absorbing more material due to the lack of market for the flow.
Lack of incentive to use recycled materials	Need to promote the use of recycled materials by companies, which is currently not sufficiently encouraged.
Perception of lower quality of recycled products	Products with recycled materials are often seen as inferior, which affects market acceptance.

3: Infrastructure, Economic and investment, entrepreneurship

CSS: Food and Feed	
Barrier	**Description**
Price factor associated with innovations	And a paradigm shift from traditional companies focused only on production, with no margin for R&D.

CSS: Food and Feed	
Barrier	**Description**
Lack of scale for small and medium-sized enterprises	Small businesses may not be able to provide the scale and availability of resources to be incorporated into other processes.
Lack of logistics infrastructure	Circular raw material supply, scrap disposal/ processing, waste.

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CSS: Plastics and Rubber	
Barrier	Description
Ease of sending plastic waste to landfill	Avoid diversion to landfill and respective expenses to pay for sending material to landfill, pay for waste disposal, containers and transport and enable energy recovery.
Difficulties in disposing of the recycled material.	The lack of capacity of the rigid plastics recycling industry to absorb more material, due to difficulties in disposing of the recycled material.

CSS: Plastics and Rubber	
Barrier	Description
Low market prices of virgin materials	The current price of virgin raw materials is low compared to the price of recycled raw materials; Fluctuating price per ton.

4: Social inclusion, awareness, and knowledge

CSS: Plastics and Rubber	
Barrier	Description
Lack of awareness among policymakers	Promote understanding and political commitment to the circular economy, ensuring that legislation is enforceable and effective.
Lack of recognition of the quality of products with recycled materials	Overcome the negative perception that products with recycled materials are of lower quality; promote certification and dissemination.
Lack of involvement of users of recycled materials	Low participation of companies that consume recycled materials, which compromises the creation of a circular value chain.
Lack of information on the recyclability of products	Lack of technical and communicational knowledge about how products can be recycled, making informed decisions difficult at the design stage.
Lack of environmental education in younger generations	Lack of educational actions aimed at children and young people on the principles and benefits of the circular economy.
Lack of articulation with educational and research institutions	Little collaboration with academia to study and develop technical solutions, such as the behavior of additives and recycled materials.
circular business	considering that the price of the raw material fluctuates a lot.

1.6 Stakeholder Engagement and Supply Value Chain Analysis

Two associations for each one of the CSSs have been identified and engaged to work on the project in close partnership for the realisation of the replication strategy for the Norte region: PortugalFoods for CSS2 and Smart Waste Portugal for CSS4. These associations are active players in the engagement of stakeholders in their respective sectors. Each of them has more than 150 associates nationwide, from both the private and public sector, namely: academia, companies, and municipalities and governmental agencies.

INEGI – Institute of Science and Innovation in Mechanical and Industrial Engineering, a Research and Technology Organisation (RTO), joined to contribute to the roadmap for the Norte Region. INEGI brings its expertise in research and technology-based innovation activities, technology transfer, consulting and technological services, oriented to the development of industry and economy in general. INEGI is non-profit, private and recognised as a public utility entity. As this entity manages to cover both sectors, it focused on the final part of the value chain (operators and

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waste value chain), with a specific focus on monitoring and indicators, and georeferencing of companies and brought an cross-overview.

There have been some attempts to map the value chain of Food & Feed and the Plastics & Rubber sector (Figure 19).

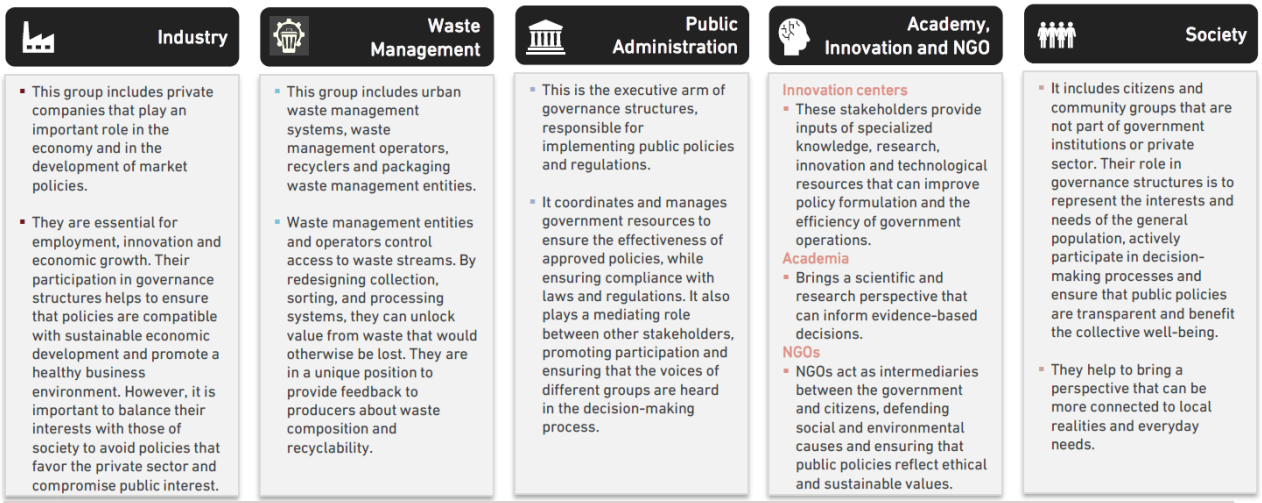

Figure 19 - Key stakeholder groups

Stakeholder Identification

Food & Feed Industry | Animal Production, Farming, Viticulture and Fish Production

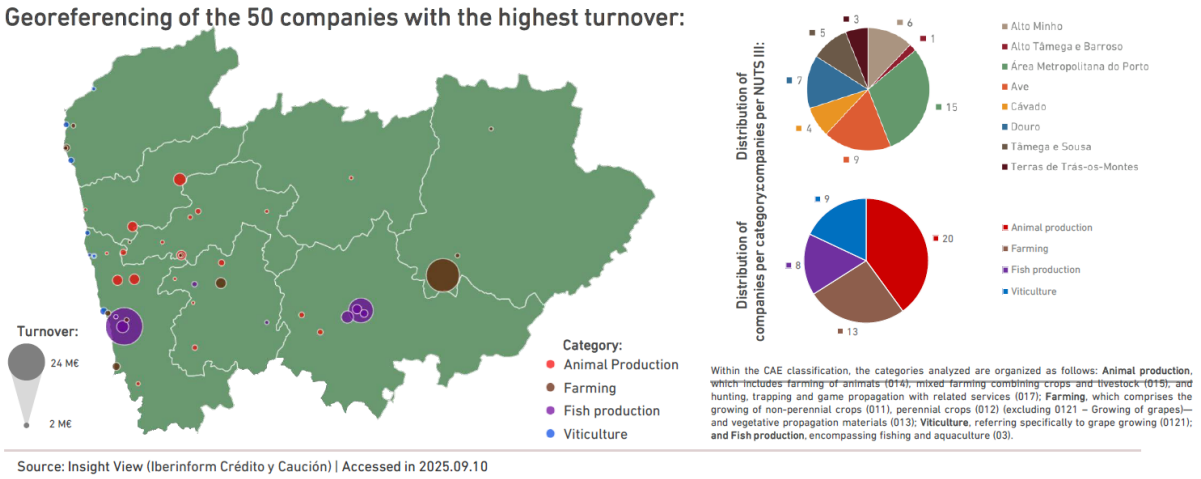

Figure 20 –Stakeholders georeferencing for Food and Feed industry

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Food & Feed Industry | Manufacturing

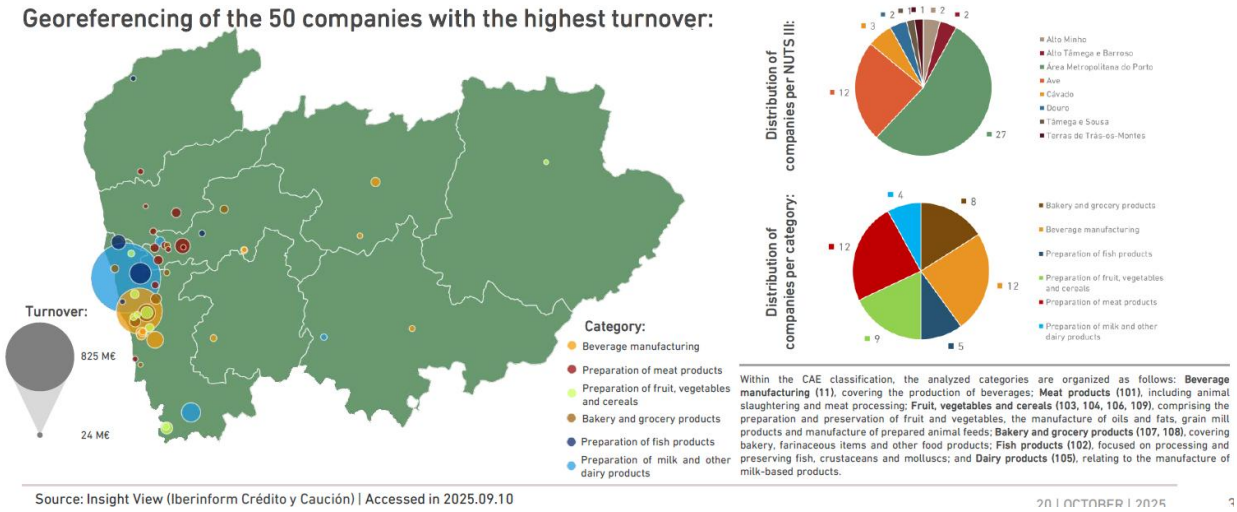

Figure 21 –Stakeholders georeferencing for Food and Feed manufacturing industry

Plastic & Rubber Industry

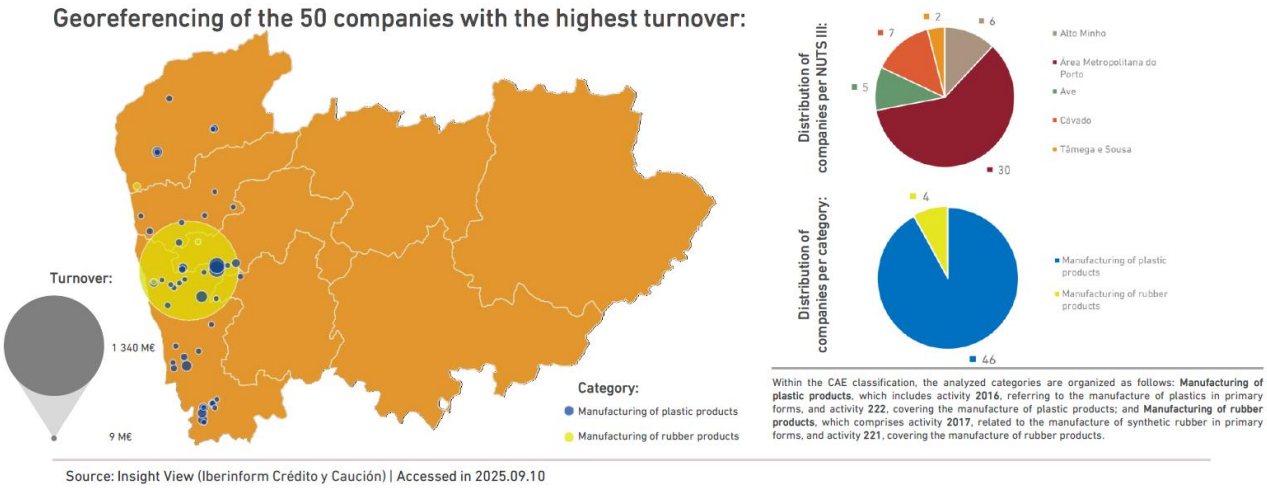

Figure 22 –Stakeholders georeferencing for Plastic and Rubber industry

Below are some of the references that have tried to realise this work (Figures 23 and 24).

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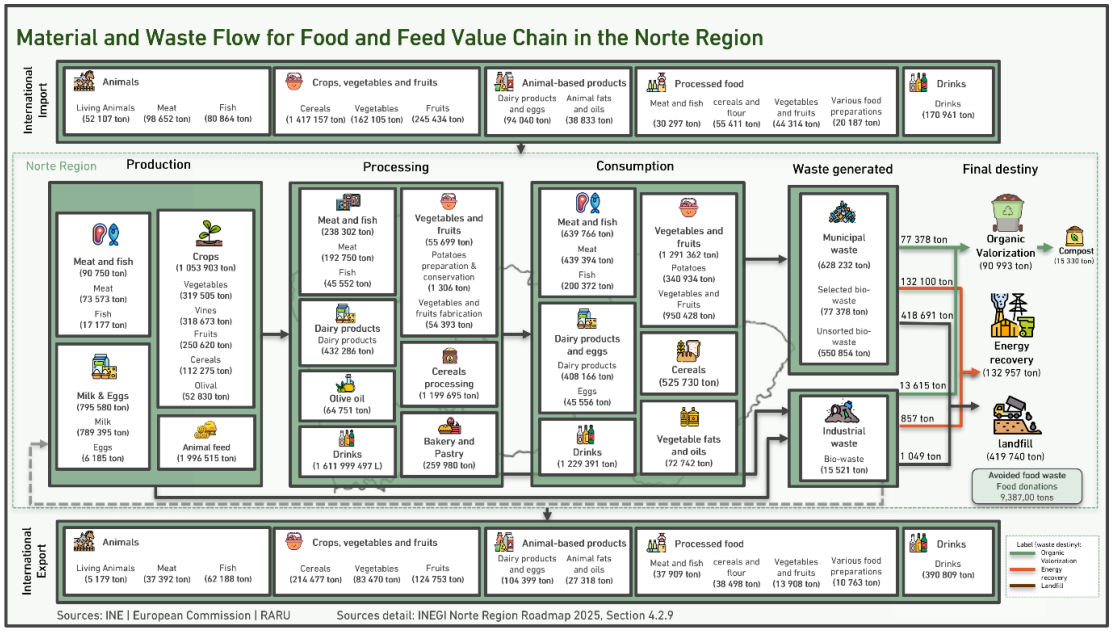

Figure 23 - Norte Region value chain for CSS2. Food & Feed.

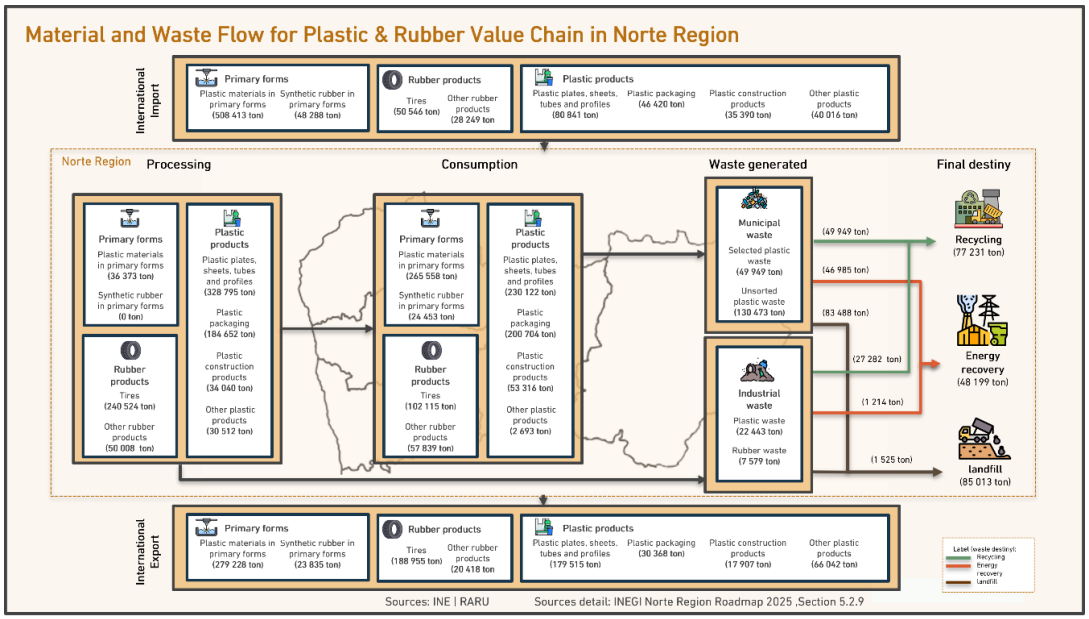

Figure 24 - Norte Region value chain for CSS4. Plastics & Rubber.

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Regarding stakeholder engagement at various levels of the supply value chain, several events have been organised: four workshops (two per CSS) and one seminar for CSS4 in 2024 and one seminar for CSS2 and the last seminar to share and validated results and 3 workshops in 2025 (Table 5). The agendas for the events are available on **Annex 2.**

Table 5 – Stakeholders involved in events in 2024 and 2025

Schedule	*Events*	Stakeholders

Table 5 - Stakeholders involved in events in 2024 and 2025

June 13th 2024: CSS2+CSS4	2 workshops	27
July 11th 2024: CSS2+CSS4	2 workshops	28
December 18th 2024: CSS4	1 seminar	70
TOTAL 2024	**5 events in 2024**	**125**
February 27th 2025: CSS2	1 seminar	144
June 25th 2025: CSS2	1 workshop	91
July 15th 2025: CSS4	1 workshop	46
30th July 2025: CSS2+CSS4	1 workshop	74
14th October 2025: CSS2+CSS4	1 seminar	111
TOTAL 2025	**5 events in 2025**	**466**
TOTAL	**10 EVENTS**	**591**

To be able to formulate the circular challenges from bottom up by different stakeholders' groups, reactive methods such as brainstorming during specific events and individual consultations with various stakeholders were used.

Workshop June 25th | Food Sovereignty and Circularity in Food

Agenda and Communication

- This workshop has been organized by Portugal Foods, INL, and CCDR-N, with the objective of **fostering reflection and debate on key themes shaping the future of food systems**, with particular emphasis on food sovereignty and sustainable public procurement.

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Figure 25 - Workshop on Food Sovereignty and Circularity in Food System in Porto (June 25th)

Main Conclusions

- The first part of the workshop included a presentation on the topic of "**Healthy and Sustainable Food**", during which several municipal councils **shared good practices in implementing sustainability in school meals**. Notable examples included the municipality of Torres Vedras and a case of circularity excellence from the city of Mouans-Sartoux in France.
- The second part of the workshop featured a panel discussion titled "**Food Transition: from production to public procurement, from consumption to education.**" Various stakeholders participated, sharing challenges and barriers to advancing a sustainable food transition. Among the key issues raised were: **limited access to technologies** such as precision agriculture, **insufficient technical training for farmers**, **supply concentration**, labor shortages, difficulties in making the sector attractive, and **low consumer awareness** regarding food waste and sustainable consumption.

Workshop July 15th | Circular Economy in the Plastics and Rubber Sector in the Northern Region

Agenda and Communication

- This workshop has been organized by Smart Waste Portugal, INL and CCDR-N, and focused on the plastics and rubber sector, aiming to strengthen the engagement of regional stakeholders by sharing experiences and best practices, validating key challenges and opportunities related to the Circular Economy, and co-developing solutions and design strategies to address the identified issues.

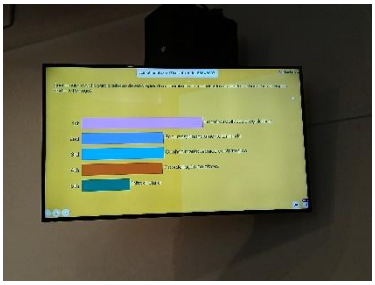

Figure 26 - Workshop Circular Economy Plastics & Rubber: Challenges, Solutions and Actions (July 15th).

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Main Conclusions

- The first part of the workshop was dedicated to validating and prioritizing sector-specific challenges in the region, using the Mentimeter tool. Participants identified **political and legislative barriers as the most significant**, particularly highlighting the absence of legal requirements for incorporating recycled content into materials as a critical issue.
- This exercise also aimed to identify the most tangible and replicable solutions. The top responses included **recycling and waste management**, followed by **traceability**. **Industrial symbiosis and the integration of minimum quotas for recycled products** received equal levels of support.
- In the second part of the workshop, participants were divided into working groups to co-create solutions addressing the previously identified challenges. Within the legal framework, the need to **simplify the waste declassification process was emphasized**. In the innovation domain, proposed actions included **mapping available materials to foster industrial symbiosis.**

Workshop July 30th | Waste Management and Circular Systemic Solutions

Agenda and Communication

- This workshop has been organized by INEGI, INL, CCDR-N, Smart Waste and Portugal Foods and focused on waste management regarding the plastics and rubber sector as well as the food & feed sector, aiming to strengthen the engagement of regional stakeholders by sharing experiences and best practices, validating key challenges and opportunities related to the Circular Economy, and co-developing solutions and design strategies to address the identified issues.

In a pre-event survey of 74 registrants, top barriers identified included: Inconsistent waste management (54.1%), Low consumer awareness (31.1%), Financial constraints (27%), Infrastructure gaps (25.7%), Limited technical knowledge (24.3%), and Market access challenges (16.2%).

A roundtable discussion was held to with stakeholders from different industries, i.e. wine production, waste management, plastic recycling, academia/research centre, and **five strategic opportunities** were identified:

- Cork stopper collection and valorisation (relevant to the wine sector);
- Synergies between waste producers and valorisation industries (e.g., biomass from wine production);
- Reimagining waste collection systems (e.g. more adaptive systems based on waste type and frequency);
- Promoting conscious consumption (e.g. to reduce unnecessary waste and pressure on urban infrastructure);

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- Attracting Investment in Waste Valorisation (e.g. turning waste into resources and stimulating green jobs).

This event featured roundtable discussions and working groups to stir ideas and co-create solutions for urban or industrial waste management for both value chains, During the second part of the workshop participants formed five working groups, split by sector and waste type (industrial or urban), to come up with actionable strategies (Figure 31).

Figure 27 - Workshop in 30th July "Waste management and Circular Systemic Solutions"

Waste Management and Circular Systemic Solutions, July 30th | Main Challenges Identified

- Reduction of the rate of waste sent for disposal (e.g. landfill)
- Increase in material valorization rates
- Increase in energy valorization rates, when material valorization is not an option, as an alternative to landfill disposal
- Identification and development of necessary and currently unsecured value chains in waste management

Waste Management and Circular Systemic Solutions, July 30th | Main Solutions Proposed

- **Create working groups** for **key sectors** of the **food & feed value chain** (fish, flour, meat, dairy, among others) for the mapping of current main waste streams, with identification of key action areas for the development of collaborative solutions together with the academia (valorization of waste as subproducts).
- **Promote industrial symbiosis** trough the mapping of supply and demand in the region or national territory and trough the creation of working groups for key sectors.
- **Legislation review**:
  - Amend legislation to **benefit** (with tax incentives) **companies that achieve a minimum rate of recycled content** incorporated into their products.
  - **Application** of **fees** to **companies who use mainly virgin raw materials** when alternatives do exist.
  - Simplify legislation in order to **allow a more agile disqualification process of waste into subproducts**.
  - Review legislation in order to **allow a more agile development of new business models** related to material valorization.
  - **Streamlining bureaucratic processes** in general, as the responses that companies need are currently not being received quickly enough.
  - **Bring together the entities that develop and ensure application of legislation** (e.g. APA) **and industry** through the creation of an entity that could ensure this proximity and communication.

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- **Intelligent eco-design**, avoiding multi-material products and designing for reuse and/or recycling.
- **Develop recycling solutions for non-PET plastics** which are currently being left aside in favor of PET plastics.
- **Develop and enhance investment in new recycling systems** (e.g., chemical) for plastics considered critical. Study the possibility of this investment being privately funded by organizations that are part of the value chain.
- **Enable energy valorization** when material valorization is not possible.
- **Analyze the logistical infrastructure for biowaste and plastics & rubber waste collection** for the identification of opportunities.
- **Improve waste separation at the source of production (citizens).**
- **Ensure better service levels in the waste collection services** guaranteed by municipal services.

Figure 28 – Overview of main solutions proposed on 30th workshop

Lastly, on October 14th, CCDR-NORTE hosted the final seminar of the FRONTSH1P project at INL. The event entitled "From the Agri-food Sector to the Plastics Sector: Food Sovereignty and Circularity" marked the end of the project with the presentation of the action plans. It mobilized over 100 stakeholders, including exhibitors showcasing circularity practices and models within their own professional activities (e.g. dairy products, short supply chains for vegetables, organic fertilizers and plastic waste valorization) and brought together representatives from public institutions (20%), businesses (22%), research institutions (41%), professional associations (9%) and civil society (8%). Discussions centred on the FRONTSH1P project's contributions to territorial sustainability and regeneration actions for the agri-food, feed, plastics, and rubber value chains. This was an opportunity to present the results to the relevant regional and national authorities. It was also a space to raise questions for future research and lead to new possibilities.

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Figure 29 - Final event of the Norte Region (Oct 14th)

An analysis on the participation in these workshops by participant typology is presented in following figures.

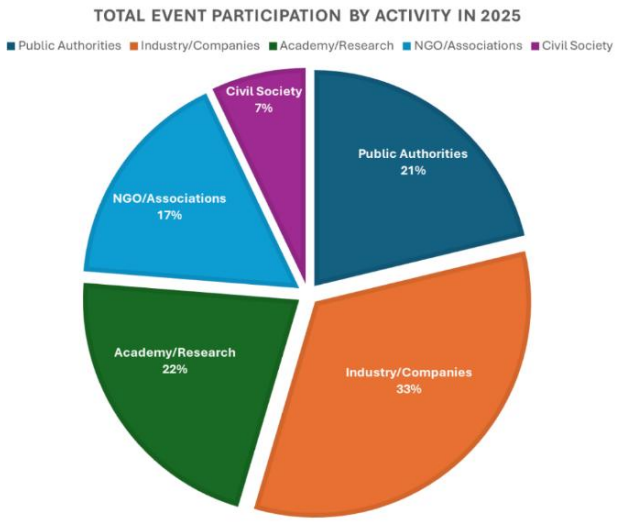

Figure 30 - % of participation in events held in 2025

With significant participation from industries and companies, there is a balanced distribution between academia and public authorities, as well as associations and civil society, albeit to a lesser extent, but with representation from all elements of the quadruple helix to validate challenges, action plans and roadmap.

Most of these institutions have worked on circular economy projects in the agrifood and feed areas, and/or plastics and rubber. Furthermore, several training courses provided by Portuguese academic, industrial and quality institutions (both in and out of the Norte region), directly or indirectly related to circular economy, have been identified as follow:

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Urban Waste Treatment

An Urban Waste Management System (Sistema de Gestão de Resíduos Urbanos - SGRU) is a structure prepared to carry out the operations inherent to the management of urban waste. For the integrated management of urban waste and the pursuit of the priorities that have been defined in the legislation, two types of entities have been envisaged: municipalities or associations of municipalities, where the management of the system can be concessioned to any company, and multi-municipal entities, whose systems are managed by concessionary companies. (APA, n.d.). There are twenty-three SGRUs covering the whole of mainland Portugal, and eight in the Norte region: Ambisousa, Braval, Lipor, Resíduos do Nordeste, Resinorte, Resulima, Suldouro, and Valorminho. Each of these systems has the infrastructure to ensure a suitable final destination for the waste produced in its area. These entities ensure the selective collection of the waste fractions such as paper/cardboard (packaging and non-packaging) and metal, plastic and glass packaging, and used cooking oil.

Selective collection is planned for bio-waste (being implemented throughout the country from the beginning of 2024) and textiles, furniture waste and other bulky waste and hazardous waste (estimated for 2025). Lipor has proven have an active interest in circular economy practices and thus has participated in both workshops for CSS4 and the first workshop for CSS2. We further conducted surveys among the SGRUs to assess the waste management practices throughout the Norte region, collect data on some specific indicators, and go into detail on the challenges that are identified by these stakeholders.

Non-urban Waste Treatment

On the other hand, waste that typically results from economic activities is the responsibility of the initial producer of the waste, or its holder if it is impossible to determine the producer of the waste. Currently only three waste management operators licensed to treat non-urban waste companies in the Norte region (for the concerned sectors) have been identified for the FRONTSH1P project, namely: RDUZ, PreZero Portugal, and Veolia. A representative from Veolia has already been engaged and participated in CSS4 workshops and as speaker in a seminar held on December 18th, 2024. The next step was to engage other operators and discuss some challenges that have been identified, such as scaling up to meet the targets proposed by the EU, consider the need to separate different types of plastic packaging and how to do this to be able to upcycle it later, among others.

Municipalities

Certain municipalities have already been identified as early-adopters for circular economy and/or green transition practices, such as: Braga, Guimarães, Maia, Porto, and Viana do Castelo. A survey is going to be conducted to assess: (1) the solutions/good practices being implemented in Norte

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region's municipalities, (2) the challenges and barriers municipalities face, (3) and what is being done concerning citizen awareness.

Citizens

Citizen involvement was also carried out in two moments in 2024, through events to disseminate the project and the CEAP that is being developed in the Norte region:

- Greenfest, Porto, June 28th, 2024: participation in this event took the form of an informative talk on how stakeholders in the Norte region can contribute to developing a Roadmap for Circular Economy, tailored to their identified needs and opportunities.
- European Researchers Night, Braga, September 27th, 2024: the aim of taking part in this event was to engage with the public, particularly young students, in activities that on the one hand questioned them about their knowledge on circular economy, and on the other told them about the project and what can be implemented in these areas.

Overview on other important stakeholders

Several food and feed clusters exist in Portugal, recognised by IAPMEI, some of which located in the Norte region. (IAPMEI, 2020). Portugal has 35 collaborative laboratories accredited by Foundation for Science and Technology (Fundação para a Ciência e Tecnologia - FCT, of which several are directly or indirectly related to the food and feed sectors, and plastic and rubber sectors, and most of them working in the framework of circular economy, located in Norte. (APA, 2023a).

Interface Centres recognised by the National Agency for Innovation - ANI under the terms of Order no. 8563/2019, of 27th September related to food or feed and located in Norte.

Collaborative laboratories accredited by FCT and Interface Centres recognised by ANI are particularly relevant to the country's circular economy. These institutions are authorised to issue a validation declaration for byproducts, to be submitted to the National Environmental Agency (APA – Agência Portuguesa do Ambiente). (APA, 2023b). Several industrial and agricultural associations exist in Portugal in the food and feed industry, and food retail. Although not specific to the Norte region, all of them involve important players from this region.

Dialogue Council

The assessment of which stakeholders could belong to this committee began in the first months of work on this project, particularly during the first meetings with the two associations that have been working closely on the project and the research centres, which participated in the development and validation of the proposed action plans and roadmap. Although there was no specific formalization, periodic meetings were held by this dedicated group to the work being carried out.

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2. Stage 2: Resources & Missions Selection

In the Norte Region, more than 90% of the territory is occupied by agriculture and forestry and about 82% of the agricultural production systems that are used are highly susceptible to climate change and consequently the impacts will have a large territorial dimension. The distribution of agricultural species by NUTSIII is not homogeneous, with a greater expression in the NUTS Terras de Trás-os-Montes (44%) and Douro (37%), followed by Cávado and Tâmega e Sousa and smallest agricultural area is in the NUTS Alto Minho (19%), (CCDRN, 2021).

The Norte is also one of the most industrialised regions in the country, so, the plastics and rubber sector was defined as a relevant sector with hight impact on this region (CCDRN, 2021).

In line with the analysis in Stage 1 for the replication strategy, to be integrated in the Norte region, the main related sectors are agri-food activities and industries and also plastics and rubber industries.

CSS Definition

Taking into account to the selection of resources and the FRONTSH1P project specifications, the Norte replication plan involves **Circular Systemic Solution 2 (CSS2 Food & Feed),** referring to the valorization of food and feed waste, that was addressed by the Norte Region in the framework of the FRONTSH1P project, and **Circular Systemic Solution 4 (CSS4 Plastics & Rubber),** concerning the valorization of plastics and rubber waste, as a sector also linked to the agrifood and feed industry and also because it is a sector highly represented in the Norte region industry.

CSS2 - Food & Feed

Some important industrial players in the dairy, beverages, cereals and pulses, and bakery and other flour products subsectors in Norte are shown in next figures.

Figure 31 - Industrial players in the dairy sector in Norte.

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Figure 32 - Industrial players in the beverages sector in Norte.

Figure 33 - Industrial players in the cereals and pulses sector in Norte.

Figure 34 - Industrial players in the bakery and other flour products sector in Norte.

Figure 35 - Industrial players in fishing manufacturing industry in Norte.

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Data on animal feeding stuffs production quantities is not available per NUTS II in the national agricultural statistics. However, from indirect data presented for NUTS II (number of companies, turnover, total expenditure and GVA), estimations can be made. When data for Norte is not available, maximum values may be estimated from data for other NUTS II. Norte has 10% of the number of feed producers and ≤12% of the countries' feed production turnover.

The list of manufacturers of animal feedstuffs shows 204 plants with approval numbers (original list from [DGAV, 2024]), classified as:

- Manufacturers of Animal Feed Additives
- Manufacturers of premixes of additives intended for animal feed
- Self-producers of compound feedstuffs
- Compound feed manufacturers

The number of companies is slightly lower, as some companies have two or more plants, and some plants produce more than one type of feed products. Of those feedstuffs' companies, only 15 seem to be in Norte. This data supports the relatively small significance of feed producers in Norte when compared to other NUTS II.

Many feedstuffs' producers deal with animal byproducts. As per Regulation 183/2005, these operators are registered in an information system with DGAV (SIPACE). In addition to those operators accounted for in production of feedstuffs, there are other operators that deal with animal byproducts, but which do not produce feedstuffs. These players may be of importance in terms of circular economy, as they add value to food byproducts. Some of these players are different companies but belong to larger groups that have feedstuff production capacities. The ones identified in SIPACE that were not registered in [DGAV, 2024], located in Norte.

The agrifood and feed sectors are supported by different players, such as clusters, colabs, academic institutions and research institutes, interface institutes, and industrial associations.

Clusters

Several food and feed clusters exist in Portugal, recognised by IAPMEI, some of which located in Norte [IAPMEI, 2020] (Figures 36, 37, and 38).

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Figure 36 - Mission, objectives and data of the Vine and Wine Cluster (IAPMEI, nd-a).

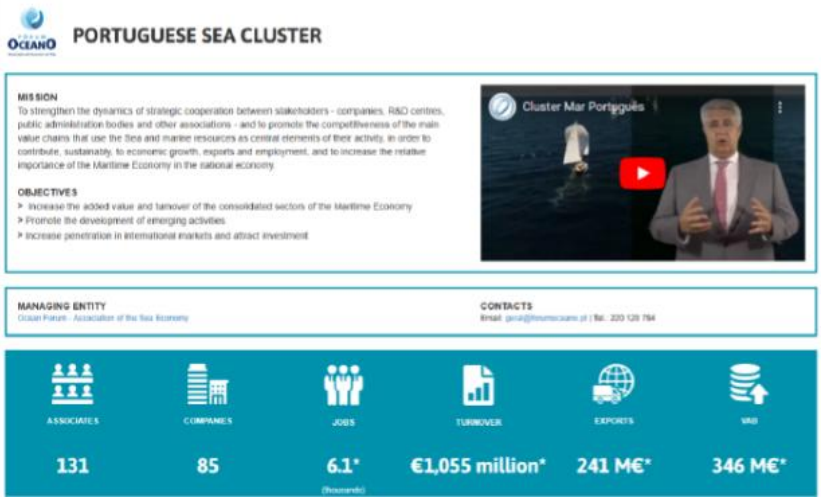

Figure 37 - Mission, objectives and data of the Portuguese Sea Cluster (IAPMEI, nd-b).

Figure 38 - Mission, objectives and data of the Portuguese Agrofood Cluster (IAPMEI, nd-c).

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Interface Centres

Interface Centres recognised by National Innovation Agency (ANI) under the terms of Order no. 8563/2019, of 27th September related to food or feed and located in Norte are shown in Figure 40 below.

	Interface centre	Location
	Waste Recovery Centre	Guimarães, Região Norte
	International Iberian Nanotechnology Laboratory	Braga, Região Norte
piep	Innovation Centre for Polymer Engineering – one of their areas is packaging, relevant to the food industry.	Guimarães, Região Norte

Figure 39 - Interface Centres recognised by ANI in Norte (APA, 2023a).

CoLABs

Portugal has 35 collaborative laboratories accredited by Fundação para a Ciência e Tecnologia (FCT), of which several are directly or indirectly related to the food and feed sectors, located in Norte [APA, 2023a].

Collaborative laboratories accredited by FCT and Interface Centres recognised by ANI are particularly relevant to the country's circular economy. These institutions are authorised to issue a validation declaration for byproducts, to be submitted to the National Environmental Agency (APA – Agência Portuguesa do Ambiente) (see [APA, 2023b].

Colab	How it relates to food or feed	HQ Location	Reference
MORE CoLAB – Montanhas de Investigação	**Bio-based Products and Processes** Valorisation of by-products from agro-industrial and forestry activities, development of natural ingredients for different industrial sectors and branding in the food sector.	Bragança	Morecolab, nd
CoLAB Vines and Wines – Vinha e Vinhos Portugueses, competitividade e sustentabilidade	Led by ADVID, this colab: – Supports the ambition expressed by the sector to increase the export value of Portuguese wines. – Ensures that the Portuguese wine system becomes more efficient, resilient and flexible in order to respond to climate, demographic and economic challenges.	Vila Real	Colabvinesnadwines, 2020
Bioref CoLAB – Laboratório Colaborativo para as Biorrefinarias	Although more in line with the biomass sector (forest), it may work with food and feed byproducts and wastes.	São Mamede de Infesta	Bioref-colab, 2025
CoLab4Food – Laboratório Colaborativo para Inovação na Indústria Alimentar	Colab4Food aims to promote innovation and development (R&D) and knowledge and technology transfer in the agri-food sector through close collaboration between academia and business. Colab4Food also aims to promote the circular economy and food sustainability through by-products valorisation, food	Vila do Conde	Colab4food, nd
Blue Bioeconomy CoLAB	This colab aims to galvanize and support the three main blue bioeconomy sectors with the highest potential: • Living Marine Resources • Marine Biotechnology • and Sustainable Aquaculture.	Matosinhos	B2E, nd
Aquavalor CoLAB	Water Technology Valorisation and Transfer Centre The AquaValor Centre hosts a network of research laboratories aimed at the generation, transfer, integration, and valorisation of scientific and technological knowledge within companies. Its activities are focused on mineral and thermal waters.	Chaves	Aquavalor, 2023

Figure 40 - List of collaborative laboratories accredited by FCT, in Norte, related to the food and feed (APA, 2023a).

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CoLAB FeedInov – Research and Innovation in Animal Nutrition and Feed - is located in Santarém. Although not located in the Northern Region, this colab maybe of relevance to the circular economy in the feed sector for companies located anywhere in the country.

CoLAB S2AQUACoLAB – Collaborative Laboratory for Sustainable and Intelligent Aquaculture – is located in Olhão. Some aquaculture exists in the Northern Region, both marine and river aquaculture.

Universities, Polytechnic Institutes and Vocational Schools

Several Portuguese Universities and Polytechnic Institutes are located in the Northern Region:

- Universidade do Minho (UM)
- Universidade do Porto (UP)
- Universidade de Trás-os-Montes e Alto Douro (UTAD)
- Universidade Católica Portuguesa (UCP)
- Instituto Politécnico de Bragança (IPC)
- Instituto Politécnico do Cávado e do Ave (IPCA)
- Instituto Politécnico do Porto (IPP)
- Instituto Politécnico de Viana do Castelo (IPVC)

Most, if not all, of these institutions have worked on circular economy projects in the agrifood and feed areas.

The Portuguese Association of Agricultural Vocational Schools (APEPA), headquartered in Celorico de Basto, comprises 15 vocational schools offering agricultural training, seven of which are located in the Northern Region (see Table 41).

School		Location
EPAESN	Escola Profissional Agrícola Eng. Silva Nunes	Celorico de Basto
	Escola Profissional Agrícola Conde de São Bento	Santo Tirso
epRégua	Escola Profissional de Desenvolvimento Rural do Rodo	Régua
epa	Escola Profissional Agrícola de Agricultura e Desenvolvimento Rural de Carvalhais/Mirandela	Mirandela
	Escola Profissional de Agricultura e Desenvolvimento Rural de Ponte de Lima	Ponte de Lima
ESCOLA EPAMAC MARCO	Escola Profissional de Agricultura e Desenvolvimento Rural de Marco de Canaveses	Marco de Canaveses
CEACV FORMAÇÃO	Casa Escola Agrícola Campo Verde	Póvoa de Varzim

Table 41 – List of agricultural vocational schools in the Northern Region (APEPA, 2025).

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Other Technological Centres

In addition to CoLABs and interface centres, there are other technological centres that can support companies with technical issues, including those related to the circular economy in the agrifood sector (see Table 42). Although not located in the Northern Region, they may offer relevant synergies and technical support for the sector in this area.

	Name	HQ location
COTHN	National Centre for Horticultural and Fruit Operational and Technological Support (Centro Operativo e Tecnológico Hortofrutícola Nacional)	Alcobaça
COTR CENTRO DE COMPETÊNCIAS PARA O REGADIO NACIONAL	Centre for Irrigation Technology and Operational Support (Centro Operativo e de Tecnologia de Regadio)	Beja
TECMEAT	Agrifood Competence Centre for the Meat Sector (Centro de Competências do Agroalimentar para o Sector das Carnes)	Famalicão, Northern Region

Table 42 – List of technological centres relevant to the Circular Economy in the Agrifood Sector.

Food and Feed Associations

Several industrial and agricultural associations exist in Portugal in the food and feed industry, and food retail. Although not specific to Norte Region, all of them involve important players from this region.

	Name	HQ location
ANICP ASSOCIAÇÃO NACIONAL DOS INDUSTRIAIS DE CONSERVAS DE PEIXE	National Association of Canned Fish Manufacturers	Leça da Palmeira, Norte
ANIL	National Dairy Industry Association	Porto, Norte
aped Associação Portuguesa de Empresas de Distribuição	Portuguese Association of Retail Companies	Lisbon
ASSOCIAÇÃO DE OLIVICULTORES DE TRÁS-OS-MONTES E ALTO DOURO AOTAD	Association of Olive Growers of Trás-os-Montes and Alto Douro (Associação de Olivicultores de Trás-os-Montes e Alto Douro)	Mirandela, Northern Region
CNCFS	National Competence Centre for Tree Nuts (Centro Nacional de Competências dos Frutos Secos)	Bragança, Northern Region
aquacultores.pt	Portuguese Association of Aquaculturists	Portimão
FERA	National Federation of Native Breed Associations	Guimarães, Norte
fipa Federação das Indústrias Portuguesas Agroalimentares	Federation of Portuguese Agri-Food Industries	Lisbon
IACA ASSOCIAÇÃO PORTUGUESA DOS INDUSTRIAIS DE ALIMENTOS COMPOSTOS PARA ANIMAIS	Portuguese Association of Compound Feed Manufacturers	Lisbon
APPITAD	Association of Integrated Pest Management Producers of Trás-os-Montes and Alto Douro (Associação dos Produtores em Proteção Integrada de Trás-os-Montes e Alto Douro)	Mirandela, Northern Region

Figure 43 – Industrial and agricultural associations in Portugal in the food and feed industry, and food retail.

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Primary production

The list of existing certified agricultural cooperatives in the Norte Region is shown in Table 6.

Table 6 – List of certified agricultural cooperatives in Norte region (CCDR-N, 2024a)

Delegation: Trás-os-Montes
Cooperativa Agrícola de Boticas (CAPOLIB) – Boticas
Cooperativa de Ovinos Mirandeses (CHURRACOOP) – Miranda do Douro
Cooperativa de Apicultores do Alto Tâmega (MONTIMEL) -Chaves
Cooperativa dos Produtores de Cabrito de Raça Serrana (CAPRISERRA) – Mirandela
Cooperativa Agrícola Norte Transmontano – Chaves
Cooperativa Agrícola Norteleite – Chaves
Cooperativa dos Produtores de Leite de Cabra Serrana (LEICRAS) – Mirandela
Cooperativa Agrícola de Valpaços (COOPAÇOS) – Valpaços
Cooperativa de Produtores de Cabrito Bravio (ABRAVIA) – Vila Pouca de Aguiar
Cooperativa Agrícola de Vila Pouca de Aguiar – Vila Pouca de Aguiar
Cooperativa Agrícola dos Produtores de Suínos de Raça Bísara de Paredes do Rio (COOPEBISARO) – Montalegre
Delegation: Ave
Adega Cooperativa de Guimarães – Guimarães
Cooperativa dos Agricultores dos Concelhos de Santo Tirso e Trofa – Santo Tirso
Cooperativa Agrícola dos Agricultores de Vieira do Minho – Vieira do Minho
Cooperativa Agrícola de Rações (RACOOP) – Vila Nova de Famalicão
Cooperativa Agrícola de Vila Nova de Famalicão (FRUTIVINHOS) – Vila Nova de Famalicão
União das Adegas Cooperativas da Região dos Vinhos Verdes (VERCOOP) – Santo Tirso
Adega Cooperativa de Santo Tirso e Trofa – Santo Tirso
Delegation: Cávado
Adega Cooperativa de Barcelos – Barcelos
Cooperativa Agrícola de Barcelos – Barcelos
Cooperativa Agrícola de Esposende – Esposende
Cooperativa Agrícola e Leiteira do Concelho da Povoa de Varzim – Póvoa de Varzim
Cooperativa dos Produtores de Leite (LEICARCOOP) – Póvoa de Varzim
Cooperativa Agrícola de Vila do Conde – Vila do Conde
Cooperativa Agrícola de Vila Verde (CAVIVER) – Vila Verde
Delegation: Douro
Adega Cooperativa de Favaios – Alijó
Cooperativa Agrícola (Coopafreixo) – Freixo de Espada à Cinta
Adega Cooperativa de Murça – Murça
Cooperativa Agrícola de Penela da Beira – Penedono
Centro de Aproveitamento de Subprodutos da Vinificação da Região Demarcada do Douro (SUBVIDOURO) – Peso da Régua
Cooperativa Agrícola de Tabuaço (COOPTAB) – Tabuaço
Cooperativa dos Produtores de Carne de Ovinos Terra Quente (OVITEQ) – Torre de Moncorvo Cooperativa dos Produtores de Leite de Ovinos da Terra Quente (QUEITEQ) – Torre de Moncorvo
Organização de Produtores Agrícolas do Varosa – Tarouca
Cooperativa Prod. De Amêndoa de Torre de Moncorvo (AMÊNDOACOOP) – Torre de Moncorvo
Cooperativa Agrícola dos Produtores Amêndoa de Trás-Os-Montes e Alto Douro (CAPATMAD)

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Vila Nova de Foz Côa Cooperativa Agrícola dos Produtores dos Frutos Casca Rija (COAMÊNDOA) – Vila Nova de Foz Côa
Cooperativa de Viticultores e Olivicultores de Freixo de Numão – Vila Nova de Foz Côa
Adega Cooperativa de Freixo de Espada à Cinta – Bragança
Adega Cooperativa de Mesão Frio- Vila Real
Cooperativa Agrícola de Olivicultores de Murça – Vila Real
Cooperativa Agrícola de Távora – Vila Real
Caves Vale do Rodo – Peso da Régua
Delegation: Entre Douro e Vouga
Cooperativa Agrícola de Arouca – Arouca
Agrupamento de Produtores de Bovinos de Carne Arouquesa (CARNAROUQUESA) – Cinfães
Delegation: Minho Lima
Cooperativa Polivalente de Desenvolvimento Rural (VALDELIMA) – Arcos de Valdevez
Adega Cooperativa Regional de Monção – Monção
Adega Cooperativa de Ponte de Lima – Ponte de Lima
Delegation: Nordeste Transmontano
Cooperativa Agrícola de Sabodouro – Mogadouro
Cooperativa Agro-Pecuária Mirandesa – Miranda do Douro
Cooperativa dos Produtores de Mel da Terra Quente e Frutos Secos – Mirandela
Soutos os Cavaleiros – Macedo de Cavaleiros
Cooperativa Agrícola dos Olivicultores de Vila Flor e Ansiães – Vila Flôr
Adega Cooperativa do Rabaçal – Vinhais
Cooperativa Agrícola de Alfândega da Fé – Bragança
Delegation: Tâmega
Cooperativa Agrícola de Basto (COOPERBASTO) – Celorico de Basto
Terras de Felgueiras, Caves de Felgueiras – Felgueiras
Cooperativa Agrícola de Rega da Lomba – Gondomar
Cooperativa Agrícola de Lousada (COPAGRI) – Lousada
Adega Cooperativa de Paredes – Paredes
Cooperativa Agrícola de Penafiel (COOPENAFIEL) – Penafiel

The list of producer organizations recognized by DRAP-Norte, excluding some cooperatives already shown in Table 6, is shown in Table 7.

Table 7 – List of Producer organizations recognized by DRAP-Norte, excluding some coops in Table 1 (CCDR-N, 2024b).

Producer Organization	Legal nature	Sector
Olivicultores Valpaços	Cooperative	Olive oil
Kiwi Greensun	Public limited company	Fruits and vegetables
AGROS	Cooperative	Dairy
PROLEITE	Cooperative	Dairy
UCANORTE – União de Cooperativas Agrícolas	Cooperative union	Cereals, oilseeds and protein crops, including corn
Frutas Douro ao Minho	Public limited company	Fruits and vegetables
TOP – Taipina Organização Produtores	Private limited company	Fruits and vegetables
PAM OP	Private limited company	Fruits and vegetables
B-FRUIT	Public limited company	Fruits and vegetables
LCN	Cooperative	Nuts
Leite do Campo	Cooperative	Dairy

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In addition to fruit and vegetable cooperatives, the Norte Region has several warehouses and first processing plants, some of which shown in next Figure.

			Apple, pear and elderberry aromas	(factory in Pombal)
Régiefrutas[5]	Elderberry processing	Fresh mash and dried elderberries Frozen apples	Generate around 60-70 tons of stalks annually	Tarouca
Alcino Nunes & Irmão[6]	Chestnut's processing and commercialization of other fruits	Chestnuts (fresh and frozen) Blackberries Figs Strawberries	5 000 toneladas/year of chestnuts	Bragança
AgroAguiar[7]	Processing, freezing and commercialization of fruit	Chestnuts (peeled or roasted) Deep frozen raspberries, strawberries, blueberries, blackberries, redcurrants, blackcurrants, elderberries, cherries, sour cherries, black figs, plums, etc. Dried fruit		Vila Pouca de Aguiar

Company/institution	Activity	Main products	Details	Location
Prosa – Produtos e Serviços Agrícolas[2]	Fruit and vegetable warehouse	Kiwi Peach Nectarine Cherry Chayote Lemon	Cold storage capacity 5 000 tons	Marco de Canavezes
KiwiGreenSun[3]	Kiwi warehouse	Kiwi	-	Guimarães
Indumape[4]	Portuguese fruit transformation	Apple Pear Elderberry	Concentrated apple, pear and elderberry juice	Warehouse in Armamar

Figure 44 – Examples of fruit and vegetable warehouses and first processing plants in Norte region.

SWOT analysis for CSS2 Food & Feed

Based on the diagnosis conducted and presented here, as well as consultations with stakeholders from the sector in the region — including:

- the roadmap development workshop for accelerating the Circular Economy in the Northern Region of Portugal (held on 13/06/2024, promoted by CCDR-N and INL),
- the seminar "Circular Economy in the Agrifood Sector in the Northern Region: Challenges of Valorisation for Human and Animal Consumption" (held on 27/02/2025, co-organised by CCDR-N, INL, and PortugalFoods),
- other individual consultations with various stakeholders, and
- the workshop on Food Sovereignty and Circularity in Food, co-organised by CCDR-N, INL, and PortugalFoods on 25/06/2025,

a SWOT analysis of the agrifood system in the Northern Region was carried out (Table 18). It should be noted that weaknesses, opportunities, and threats are not necessarily exclusive to the Northern Region.

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Table 8 – SWOT analysis of the circular agrifood economy in the Norte Region

STRENGTHS	WEAKNESSES
1 Diverse and high-quality production base 2 Strong ecosystem of innovation, entrepreneurship, and sustainability 3 Alert and responsive institutional and territorial ecosystems 4 Early transition efforts that should be leveraged and adapted 5 Existing action plans and legal frameworks promoting the circular agrifood economy	1 Restrictive legislation hindering the circular economy transition 2 Lack of food waste data 3 Low organic recovery of biowaste 4 Limitations in agricultural practices 5 Organisational and market limitations 6 Public health impacted by poor dietary habit
OPPORTUNITIES	**THREATS**
1 Paradigm and consumption shifts 2 Supportive EU policies and targets 3 Valorisation of resources and technical solutions 4 Territorial cohesion and food sovereignty	1 Climate change and sustainability of the primary sector 2 Regulatory, bureaucratic, financial, and logistical barriers 3 Negative perceptions and sociocultural barriers to cooperation

CSS4 – Plastics & Rubber

Manufacturing is one economic activity with the high turnover in the Norte region, wich include the rubber and plastics industry that accounts for about 8.3 % of the manufacturing industry in these Region. It is represented by economic activity code 22, which includes the sub-sectors of rubber and plastic products. Most of national enterprises operating in this sector are in the Norte region, with a total of 533 enterprises, that represent almost 50 per cent of the national total.

When analysing the plastics and rubber sector, it's pertinent to look at waste production to find ways to achieve circularity. In the Norte region, a total of 100,787 tonnes of this type of waste was generated in 2023, according to APA data from the MIRR – Integrated Waste Registration Chart.

The total amount of waste generated by the selected European Waste Code (EWC) shows for the plastics and rubber sector, the highest contribution of End-of-life tyres (160103); Plastic

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packaging (150102); Composite packaging (120105) and Plastic and rubber (191204). Focusing on the NUTS III regions, the three most important wastes in the metropolitan area of Porto are plastic packaging (150102), plastics shavings and turnings (120105) and end-of-life tyres (160103). All these waste subgroups produce more than 10 000 tonnes, which coincide with the NUTSIII with the largest concentration of population and economic activities.

The stakeholders identified as the most relevant were involved in this project, even though some are not based in the northern region, they were included due to their national relevance.

Table 9 – Stakeholders and Value Chains for Plastics & Rubber.

Value chain	*Stakeholders*
Transversal association	Smart Waste Portugal Association
Industry associations	APIP, APICCAPS
Brands	Águas de Monchique, Superbock
Retailers	MC Sonae
Urban waste management systems	LIPOR, Braval, Suldouro, EGF, Resíduos do Nordeste
Waste management companies	Metais Jaime Dias, VEOLIA, Prezero, Grin, Rduz, Euro Separadora
Polymer supply companies	AGI
Plastics manufacturing companies	Muroplas, RAMAG Plast, Intraplás, CEINOP, PROADEC Portugal, PLASTIRSO, Impact World, Silvex, Codil, Artevasi, Ernesto S. Simão
Rubber manufacturing companies	Amorim Cork Solutions, Continental
Footwear manufacturing companies	Procalçado
Components for automative industry manufacturing companies	Simoldes, Faurecia, Sunviauto; TMG Automotive
Recycling companies	Ambitamega, Ecoibéria, R3Natura, Globipedestal, Extruplás, Gintegral, Micronipol, Sirplaste, Prodelix, Verde Peculiar
Academia and Research Centres	INL, CeNTI, INEGI, University of Aveiro, University of Porto, University of Minho, UTAD, IPVC, IPB, CICECO, CVR, PIEP, CTCP, IPP
Regional institutions	CCDR-NORTE
National institutions	APA e DGAE

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Management bodies of specific waste flows.	SPV, Novo Verde, Electrão, Valorpneu
Others	Renewing, Grupo Manuel Champalimaud, ZOR, OLIMEC

The presence of technology centres and collaborative laboratories in the region demonstrates its potential for training and education, which can be transferred to companies. Below is a list of entities considered relevant to the plastics and rubber sectors and based in the North region.

Technology and Innovation Centres

STAR | Institute SEAPOWER | PIEP | ISQ | INESC TEC | INEGI | CVR | Fibrenamics | CTCP | CeNTI CiTin | CEIIA | CCG/ZGDV Institute | Collaborative Laboratories | MORE - Montanhas de Investigação | DTx - CoLab Transformação Digital - Experienciar o Futuro | S2uL - Laboratório Colaborativo para a Sustentabilidade Urbana | B2E – Laboratório Colaborativo para a Bioeconomia Azul.

NGO
Associação SmartWaste
Associação PortugalFoods
Zero Waste Portugal
Quercus (Associação Nacional de Conservação da Natureza)
Circular Economy Portugal
BCSD Portugal
Grace
Associação Portuguesa de Industriais de Borracha
Pacto Português para os Plásticos
VivaLab (Precious Plastic)
Associação Nacional dos Industriais de Conservas de Peixe
Banco Alimentar Contra a Fome Porto
Associação Portuguesa da Indústria de Plásticos

NGO
Aquavalor CoLAB
COTHN - Centro Operativo e Tecnológico Hortofrutícola Nacional
TECMEAT - Centro de Competências do Agroalimentar para o Sector das Carnes
Associação de Olivicultores de Trás-os-Montes e Alto Douro
Associação dos Produtores em Proteção Integrada de Trás-os-Montes e Alto Douro
Centro Nacional de Competências dos Frutos Secos

Society
Well Fished (Vila do Conde)
Quadrilátero Urbano do Minho
ADRAT - Associação de Desenvolvimento da Região do Alto Tâmega
Comunidade Intermunicipal do Alto Minho
Cooperativa Árvore
INDIEROR
ADER-SOUSA – Associação de Desenvolvimento Rural das Terras do Sousa

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SWOT analysis for CSS4 Plastics & Rubber

This first approach to the SWOT analysis was reviewed and validated by the key involved stakeholders and Dialogue Council as a continuous working group.

Table 10 – SWOT analysis of the circular plastics and rubber economy in the Norte Region

OPPORTUNITIES	WEAKNESSES
• Promotion of innovation and the design of new products and monomaterial products. • Design solutions for the recovery of technical and complex materials. • Link companies with universities and research centres to leverage new opportunities for innovation in terms of products and processes. • Investment in chemical recycling solutions that can help recycle some materials that are difficult to recycle mechanically. • Mandatory incorporation of recycled materials by legislation, guaranteeing adequate supervision to avoid greenwashing practices. • Implementation of taxes and/or financial incentives to promote recycling. • Use of digitalisation in processes, such as the adoption of material passports to ensure product traceability throughout the value chain. Existence of funding at regional, national and international level to promote the circular economy.	• Weak rail network for transporting goods • Lack of collaboration between the different stakeholders in the value chain; • A large amount of waste from the plastics industry is sent to landfill; • Difficulty in recovering the purges resulting from the plastics industry's production process, especially in the case of mixed purges; • Lack of dedicated collection and sorting infrastructures; • Difficulty in sorting different types of plastics; • Lack of capacity in the rigid plastics recycling industry to absorb more material, due to difficulties in disposing of recycled material; • Different formulations of plastics in terms of additives that may jeopardise the subsequent transformation of these products; • While packaging plastics are managed by management bodies, the control of non-packaging plastics throughout their life cycle is more difficult; • Lack of training and capacity building for employees on circular practices; • Lack of interest from the producer community (fishing and aquaculture) in preventing the loss of plastics from fishing structures and nets into the environment; • Difficulty in managing the flow of agricultural plastics.
STRENGHTS	**THREATS**
• Strong economic dynamism • Strong industrial profile in the regions of Área Metropolitan a do Porto, Ave, Cávado and Tâmega e Sousa, which can foster the creation of industrial symbioses. • Presence of several universities and research centres with strong relations with companies in the region. • Good level of infrastructure, particularly the motorway network, which connects the main cities in the region and the borders with Spain.	• Low price of virgin raw materials compared to the price of recycled raw materials. • Resistance to improving processes, equipment and infrastructure due to high investment. • Lack of confidence in the performance and quality of products incorporating recycled materials. • The use of bioplastics can make it difficult to sort materials, causing constraints on recycling. • Production downturns in the European automotive sector could affect many companies in the plastics and rubber sector in the region.

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Considering the existing information, we worked with the stakeholders on applying the basic criteria to help select the main resource missions for the CTC defined by the tool, 4NO Filter:

- **Resource area NOT developed:** not yet developed/not used (but should be from the point of view of the circularity of the territory/entity or simply the principles of the circular economy)
- **Area of value-added chains NOT closed:** are or could be part of circular value-added chains (but are not yet part of them - because they may not yet exist)
- **Area of NO adaptation to climate change:** their use could contribute to adapting the territory/entity to climate change (but they are not yet used)
- **Area of NON-convergent activities:** they are not very similar to each other (including in terms of characteristics and potential for use).

A consensus was reached in which it would be advantageous to not only reach out to stakeholders that were already considered an example of best practices but also stakeholders that revealed intention of evolving and allow the project to give them tools for growth. This allowed us to identify rows in the value chain that are not tackled in the Norte Region.

3. Stage 3: Circular Challenges

Validation Circular Challenges

The tables below describe the challenges identified in Norte Region for CSS2 and CSS4.

CSS2 - Food & Feed

Table 11 – CSS2 Food and Feed Challenges

CSS 2 Food and Feed
Legal and Regulatory Framework
1. Systematic measurement and public reporting of food waste in school and institutional canteens. 2. Establish a stable, independent, and technically capable governance structure. 3. Condition and direct public funding. 4. Correct institutional dysfunctions.
Innovation, product design and the value chain

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1. Create a regional network of proximity markets and short agrifood supply chains.
2. Integrate local, organic, and seasonal products in school and institutional canteens.
3. Stimulate partnerships between producers, consumers, and local entities for community-supported agriculture (CSA).
4. Promote regenerative agriculture and agroecology.
5. Increase the production and consumption of organic products.
6. Create (and maintain) regional land banks.
7. Promote the diversification of crops and species and its valorisation.
8. Sustainable management of agricultural water.
9. Prevention of food waste by redirecting all edible food to human consumption.

Infrastructure, investment, entrepreneurship

1. Support family farming.
2. Reactivate or replace local experimental stations.
3. Promote soil health and preservation.
4. Selective Collection and Valorisation of Biowaste.
5. Facilitation of Agrifood Symbiosis.
6. Promote practical cooperation between companies, research centres, and municipalities/CIMs/GALs to jointly develop replicable and economically sustainable circular solutions.

Social inclusion, awareness and knowledge

1. Boost food donation and redistribution networks.
2. Systematize and disseminate information on Sustainable and Territorialized Food Systems.
3. Create urban-rural intermunicipal communities.
4. Provide ongoing and practical training for farmers.
5. Encourage the consumption of “ugly” fruits and vegetables across all channels (retail, food services, social institutions).
6. Training programme in Circular Economy and Sustainability for technical staff in the Northern Region.
7. Education and awareness in school settings.
8. Capacity-building for food system actors.
9. Production and sharing of practical knowledge.
10. Valuing the primary sector and local knowledge.
11. Institutional learning and long-term vision.

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CSS4 - Plastics & Rubber

Table 12 – CSS4 Challenges in the plastics and rubber sector

CSS 4 Plastics and Rubber
Legal and Regulatory Framework
1. Preparation of a study to survey the legal framework of countries with the highest recycling rates and analysis of possible replicas at the national level. 2. Preparation of a study to analyse the impact of implementing specific regulatory and fiscal instruments, defining appropriate oversight mechanisms 3. Preparation of recommendations on simplifying waste declassification and licensing processes. 4. Preparation of specific recommendations on end-of-life management strategies for bioplastics and microplastics 5. Advocacy actions on the challenges of implementing environmental regulations 6. Holding information sessions on the relevant legal framework in the context of the circular economy 7. Creation of an office for personalised legal support to companies
Innovation, product design and the value chain
1. Preparation of a study mapping the materials available in the plastics and rubber sector to promote industrial symbiosis in the Norte region 2. Creation of new specific waste streams, namely composite and multi-material products 3. Creation of a working group to define standard methodologies and information requirements to be included in the digital product passport 4. Identification of existing eco-design tools for the development of new products 5. Creation of solutions that extend the useful life of materials (e.g. reuse, repair, refill, sharing)
Infrastructure, investment, entrepreneurship
1. Carrying out B2B networking activities on waste recovery 2. Establishment of consortia for the development of new solutions, such as additives, to improve the characteristics of recycled plastics 3. Establishment of consortia to increase the recyclability of PET material 4. Investment in pilot units for the development of new circular products and processes for pre- industrial validation 5. Investment in equipment and improvement of selective collection and sorting processes for different types of plastic

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Social inclusion, awareness and knowledge
1. Development of awareness-raising actions on reducing consumption and on the potential for recovering waste in new products 2. Implementation of actions to raise awareness and encourage the use of platforms for waste management/trade 3. Creation of a repository of best practices in circular economy in the plastics and rubber sectors (e.g. agriculture, retail, automotive, etc.) 4. Development of training activities for professionals on the circular economy (eco-design practices, certification and reporting tools, etc.)

As previously mentioned, in the Northern Region, it was considered important to conduct a cross-sectional analysis, complementary to each CSS, with a strategic vision involving both CSSs, which is presented on table below.

Table 13 – Cross-sectoral Circular Challenges for CSS2 and CSS4.

CSS 2 & CSS 4
Legal Framework
1. Encourage Adoption of Sustainable Packaging through Policy and Market Incentives.
Innovation, product design and the value chain
1. Transitioning to Circular Packaging. 2. Industrial Symbiosis for Circular Value Chains.
Infrastructure, investment, entrepreneurship
1. Optimisation of Regional Recycling Infrastructure. 2. Implementation of Waste-to-Energy Solutions.
Social inclusion, awareness and knowledge
1. Working Groups for Collaborative Solutions 2. Optimization of Urban and Rural Waste Collection. 3. Enhanced Visibility for Circular Materials and access to comprehensive data on waste and material flows.

In addition to identifying and validating circular challenges, the workshops, together with individual and small group interviews, also helped to pinpoint the solutions to integrate into the proposed action plans and roadmap that will be presented in stage 4.

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4. STAGE 4: Circular Economy Action Plans and Roadmap for the Norte Region

4.1. Background

This section presents the Action Plan for the Circular Economy in the Food and Feed and Plastics and Rubber sectors and Roadmap for the Norte Region. Based on the CircunPuncture Model within the framework of the FRONTSH1P project: the diagnosis of the region and the stakeholders' consultation, it identifies the objectives, measures, and actions, as well as those responsible for its implementation. As portrayed in the stage III, given the specificities of the region and the sectors, the Norte Region developed **two action plans and a regional roadmap**: an Action Plan for CSS2, an Action Plan for CSS4 and a Roadmap with cross-sectoral actions that tackle both CSS2 and CSS4 circular solutions.

General Objective

Promote the transition to a circular economy in the Food and feed and Plastics and rubber sectors in the north of Portugal by coordinating with the current regulatory framework, strengthening innovation, investment, training and governance, and increasing resource efficiency to create new business models and strengthen regional competitiveness.

Specific Objectives:

- Ensure a clear and simplified legal framework that supports companies and entities in adopting circular practices.
- Foster the development of new products, processes and business models through eco-design, circular supply chains and industrial symbiosis.
- Strengthen cooperation between stakeholders and support investments in technologies, infrastructure and entrepreneurial initiatives that accelerate circularity.
- Mobilise consumers and train professionals in more sustainable practices through awareness-raising, the dissemination of good practice and specialised training in the circular economy.
- Ensure the effective governance of the Action Plan through monitoring, continuous evaluation and the involvement of key stakeholders.

The following action plans integrate a vision for the measures and actions that can accelerate circular economy in the region along with potential partners, funding and timeframes.

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4.2. Action Plan for CSS2 Food & Feed

1. Legal and Regulatory Framework			
Measures	**Actions**	**Key actors**	**Time frame**
1.1 Sustainable and Territorialized Food Systems	Systematic measurement and public reporting of food waste in school and institutional canteens	Public and Private Schools, Municipalities, Regional School Management, CCDR-N	Medium-term
1.2 Governance, Policy and Funding	Identify a regional coordinator to promote the development of actions aligned with municipalities and regional circular economy plans.	CCDR-N, municipalities, CIMs, GALs, Ministry of Agriculture, Ministry of Environment, Directorate-General for Local Authorities, producer associations and cooperatives, universities and research centers, Court of Auditors, and oversight bodies	Short-term
	Public financial mechanisms, and public resources to support circular economy actions.	CCDR-N, ANI, PEPAC, COMPETE	Short-term
	Simplify bureaucratic processes and access to funding.	CCDR-N, CIMs, GALs, municipalities	Short-term Medium-term

2. Innovation, product design, and the value chain			
Measures	**Actions**	**Key actors**	**Time frame**
2.1 Sustainable and Territorialized Food Systems	Create a regional network of proximity markets and short agrifood supply chains: provide suitable spaces for local product distribution pop-up fresh markets and foster regular dialogue between supply and demand.	Municipalities, Intermunicipal Communities (CIMs), Local Action Groups (GALs) e producer associations	Short-term
	Integrate local, organic, and seasonal products in school and institutional canteens.	Municipalities, schools, social institutions (IPSS), CCDR-N, nutritionists	Medium-term
	Stimulate partnerships between producers, consumers, and local entities for community-supported agriculture (CSA)	Municipalities, CIMs, GALs, producer associations, cooperatives	Short-term
2.2 Sustainable and Regenerative Agrifood Production	Promote regenerative agriculture and agroecology.	DGADR, Regional Agricultural Directorates, GALs, producers, cooperatives, agricultural training institutions	Medium-term Long-term
	Increase the production and consumption of organic products: expand organic farming areas by modifying PEPAC rules to allow annual applications (instead of 3-year cycles) and introduce partial inclusion of organic fruit and vegetables in public procurement.	DGADR, Ministry of Agriculture, CCDR-N, CIMs, GALs	Short-term Medium-term
	Create (and maintain) regional land banks using common lands and underutilized public lands, as well as partnerships with private landowners	Municipalities, CIMs, GALs	Short-term Medium-term

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	Promote the diversification of crops and species, both in production and consumption: preserve and propagate autochthonous varieties in cooperation with local producers, the Portuguese Germplasm Bank, and municipal nurseries, while promoting R&D projects on the behaviour of native species and varieties.	NIAV, Germplasm Bank, Municipalities, GALs, agricultural institutions, cooperatives, farmers, universities, ICNF	Short-term Medium-term
	Sustainable management of agricultural water: improve water management through borehole monitoring, consumption metering, and proportional tariffs, as well as support reuse of treated wastewater for irrigation.	DGADR, Municipalities, CIMs, GALs, Regional Agricultural Directorates	Short-term
2.3 Circular Economy and Resource Management	Prevention of food waste by redirecting all edible food to human consumption.	APA, SGRUs, CCDR-N, APED, retailers, municipalities, IPSS	Short-term

3. Infrastructure, investment, entrepreneurship			
Measures	**Actions**	**Key actors**	**Time frame**
3.1 Sustainable and Regenerative Agrifood Production	Support family farming: support and implement the Family Farming Statute, ensuring better living conditions, technical support, and institutional recognition and value the farming profession.	Ministry of Agriculture, DGADR, Regional Agricultural Directorates, Municipalities, CIMs, Employment Centres, IPSS	Short-term Medium-term Long-term
	Reactivate or replace local experimental stations.	CCDR-N, DGADR, Ministry of Agriculture, Agricultural Schools, Universities	Medium-term
	Promote soil health and preservation through promotion of good agricultural practices through training and recover of degraded areas through revegetation, nutrient and pH correction, and organic matter incorporation.	DGADR, CIMs, GALs, GPP, farmer support institutions, PEPAC, ICNF, R&D centres	Medium-term
3.2 Circular Economy and Resource Management	Selective Collection and Valorisation of Biowaste.	APA, SGRUs, municipalities, private waste operators, universities, R&D centres	Short-term Medium-term
	Facilitation of Agrifood Symbiosis by using existing digital platforms to promote resource exchanges and identifying and activating regional biowaste streams with high circular valorisation potential.	CCDR-N, APA, Ministry of Environment, Ministry of Agriculture, municipalities, parish councils, CIMs, GALs, SGRUs, private waste managers, farmers, food industry	Short-term
3.3 Capacity Building, Innovation, and Circular Food Citizenship	Promote practical cooperation between companies, research centres, and municipalities/CIMs/GALs to jointly develop replicable and economically sustainable circular solutions.	CCDR-N, CIMs, GALs, universities, institutes, CoLabs	Short-term

4. Social inclusion, awareness, and knowledge

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Measures	Actions	Key actors	Time frame
4.1 Sustainable and Territorialized Food Systems	Boost food donation and redistribution networks.	Municipalities, IPSS, redistribution institutions	Short-term
	Systematize and disseminate information on Sustainable and Territorialized Food Systems.	CCDR-N, circular city networks, schools, municipalities	Short-term
	Create urban-rural intermunicipal communities.	Municipalities, CIMs, CCDR-N	Medium-term
4.2 Sustainable and Regenerative Agrifood Production	Provide ongoing and practical training for farmers.	DGADR, Regional Agricultural Directorates, GALs, producers, Cooperatives, agricultural training institutions	Medium-term Long-term
4.3 Circular Economy and Resource Management	Encourage the consumption of "ugly" fruits and vegetables across all channels (retail, food services, social institutions).	APA, SGRUs, APED, retailers, municipalities, IPSS, CCDR-N	Short-term
4.4 Capacity Building, Innovation, and Circular Food Citizenshipx	Training programme, education and raising awareness in Circular Economy and Sustainability for technical staff in the Norte Region.	Associations, Universities, Municipalities, Agricultural Schools, Regional Education Directorates, School Cluster, CCDR-N	Short-term, Medium-term
	Capacity-building for food system actors through development of modular training programmes in (agrifood) circular economy.	Vocational training entities, Universities, Associations CIMs, GALs	Short-term
	Production and sharing of practical knowledge, such as the results of the project, good practices, and outcomes of funded projects, and organise an annual sustainability forum for all stakeholders from the Norte Region.	FCT, ANI, Municipalities, Universities, CIMs, GALs, CCDR-N	Short-term Medium-term Long-term
	Valuing the primary sector and local knowledge from the earliest levels of education, also by fostering intergenerational relationships between IPSS and local schools through knowledge sharing and practical workshops in agriculture, beekeeping, and cooking — for the benefit of both younger and older generations.	IPSS, municipalities, parish councils, school clusters, community gardens, NGOs, CCDR-N	Short-term Medium-term Long-term
4.5 Governance, Policy and Funding	Identify a monitoring platform with updated regional data	APA, CCDR-N, Smart Waste Portugal, PortugalFoods, INEGI	Short-term Medium-term Long-term

4.3. Action Plan for CSS4 Plastics & Rubber

1. Legal and Regulatory Framework				
Measures	Actions	Key actors	Target audience	Time frame
1.1 Knowledge creation and policy recommendations	Preparation of a study to survey the legal framework of countries with the highest recycling rates and analysis of possible	APA; CCDR-N; Associations	APA; Government; Manufacturing industry; Waste	Short-term

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to support decision-making	replicas at the national level.		management operators	
	Preparation of a study to analyse the impact of implementing specific regulatory and fiscal instruments, defining appropriate oversight mechanisms	APA; CCDR-N; Associations	APA; Government. Manufacturing industry. Waste Management operators	Medium-term
	Preparation of recommendations on simplifying waste declassification and licensing processes	Associations Licensing bodies	APA; Government. Licensing bodies; Companies	Short-term
	Preparation of specific recommendations on end-of-life management strategies for bioplastics and microplastics	Academia, recycling industry.	APA; Government	Short-term Medium-term
	Advocacy actions on the challenges of implementing environmental regulations	Associations	MEPs; APA; government	Short-term Medium-term
1.2 Strength of support and clarification for companies in applying the legal framework	Holding information sessions on the relevant legal framework in the context of the circular economy	APA; CCDR-N; Associations	Manufacturing industry; Universities; Research Centres; Companies	Short-term Medium-term
	Creation of an office for personalised legal support to companies	APA; CCDR-N; Associations	Companies	Short-term Medium-term

2. Innovation, Product Design and Value Chain				
Measures	**Actions**	**Key actors**	**Target audience**	**Time frame**
2.2 Creation of knowledge and development of resources necessary for the implementation of circular strategies	Preparation of a study mapping the materials available in the plastics and rubber sector to promote industrial symbiosis in the Norte Region	CCDR-N; Associations	Manufacturing and Recycling Industry; Universities and Research Centres	2026-2027
	Creation of new specific waste streams, namely composite and multi-material products	APA; Associations	Industry; Distribution; Retailers; PRO	2026-2027
	Creation of a working group to define standard methodologies and information requirements to be included in the digital product passport	IAPMEI; Associations	Industry; Distribution; Retailers; PRO	2028-2029
2.2 Promotion of circularity through eco-design and repair and reuse solutions	Identification of existing eco-design tools for the development of new products	Companies; ENESII	Manufacturing industry	2027-2030

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	Creation of solutions that extend the useful life of materials (e.g. reuse, repair, refill, sharing)	Municipalities; Companies; Recycling Companies	Industry; Consumers	2027-2030

3. Infrastructure, investment, entrepreneurship						
Measures	**Actions**	**Key actors**	**Funding**	**Target audience**	**Indicators**	**Time frame**
3.1 Strength of collaboration between different stakeholders through the establishment of consortia	Carrying out B2Bnetworking activities on waste recovery	CCDR-N; Associations	Internal financial resources	Manufacturing industry;	No. of networking events held	2026-2030
	Establishment of consortia for the development of new solutions, such as additives, to improve the characteristics of recycled plastics	Universities; Research Centres; Industry	Fundo Ambiental, Compete 2030, Norte2030, Horizonte 2030, LIFE	Industry	No. of project applications submitted	2027-2030
	Establishment of consortia to increase the recyclability of PET material	Universities; Research Centres; Industry	Fundo Ambiental, Compete 2030, Norte2030, Horizonte 2030, LIFE	PRO; Universities; Research Centres; Companies	No. of project applications submitted	2026 - 2030
3.2 Increased investment in developing new Products, technologies and processes based on the circular economy.	Investment in pilot units for the development of new circular products and processes for pre-industrial validation	Academia; Research Centres and Companies	Fundo Ambiental, Compete 2030, Norte2030,	Industry	Investment in pilot units (€)	2027 - 2030
	Investment in equipment and improvement of selective collection and sorting processes for different types of plastic	Urban waste Management Systems; Municipalities; Research Centres; Companies	Fundo Ambiental, Compete 2030, Norte2030,	Urban waste Management systems; Municipalities ; Consumers	Increase in selective collection rates in the Norte region	2026 - 2030

4. Social inclusion, awareness and knowledge						
Measures	**Actions**	**Key actors**	**Funding**	**Target audience**	**Indicators**	**Time frame**
4.1 Public engagement and behavioural change	Development of awareness-raising actions on reducing consumption and on the potential for recovering waste in new products	APA; Municipalities; Associations; Urban waste management system	Internal financial resources	Consumers. Companies	No. of municipalities where actions were carried out	2026-2030

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4.2 Strength of the technical capacity of professionals in the plastics and rubber sectors	Implementation of actions to raise awareness and encourage the use of platforms for waste management/trade	ASWP; Other entities with waste management/trading platforms	Internal financial resources	Industry	No. of actions taken	2026-2030
	Creation of a repository of best practices in circular economy in the plastics and rubber sectors (e.g. agriculture, retail, automotive, etc.)	CCDR-N, Associations	Internal financial	industry resources	Repository published No. of best practices included in the repository	2026-2030
	Development of training activities for professionals on the circular economy (eco-design practices, certification and reporting tools, etc.)	Associations, companies, training institutions, universities	Internal financial	Companies' resources	No. of training courses developed	2026-2030

In addition to the other 4 categories of challenges, it was esteemed that a new one should be created to represent a category of challenges that address the governance.

5. Institutional and Governance						
Measures	**Actions**	**Key actors**	**Funding**	**Target audience**	**Indicators**	**Time frame**
5.1 Monitoring the implementation of the Action Plan	Definition of the governance model for the Action Plan	CCDR-N; Associations	Internal financial resources	CCDR-N; Associations. Monitoring Committee.	Governance model defined	2025
	Establishment of a committee to monitor the actions implemented under the Action Plan	CCDR-N; Associations	Internal financial resources	CCDR-N; Associations Companies	Monitoring Committee established	2026-2030
	Holding meetings to monitor the implementation of the Action Plan	Monitoring Committee	Internal financial resources	Monitoring Committee	No. of meetings held	2026-2030
5.2 Monitoring and Evaluation of the Action Plan	Creation and implementation of monitoring tool	Monitoring Committee	Internal financial resources	Monitoring Committee	Monitoring tool created and implemented	2026 - 2030
	External evaluation of the implementation of the Action Plan	Monitoring Committee	Internal financial resources	Monitoring Committee	External evaluation report published	2030

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4.4. Roadmap for Food & Feed and Plastics & Rubber

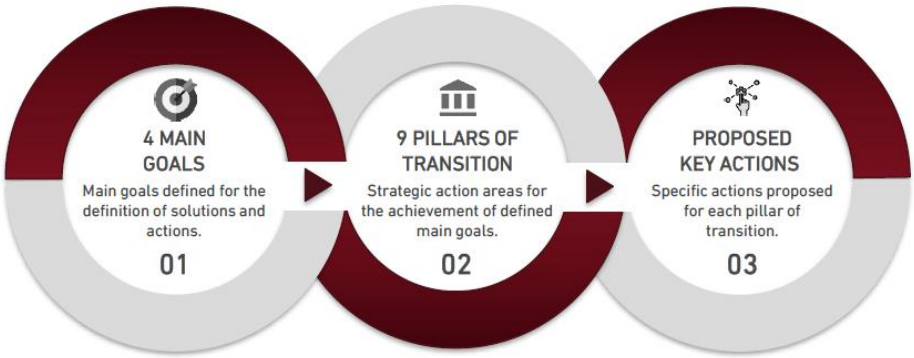
The developed proposal of a Roadmap for Circular Economy in the sectors of Food & Feed and Plastics & Rubber, in the context of the FRONTSH1P Project, seeks to provide a blueprint for taking decisive action to achieve higher levels of circularity, putting the Norte Region of Portugal on a more sustainable path, reducing emissions, creating a cleaner and greener economy and society, and contributing, to the extent possible, to protecting against the devastating consequences of climate change, through the definition and demonstration of highly replicable regenerative Circular Systemic Solutions (CSS).

The circularity analysis conducted for the Norte Region in the previous step, with a special focus on the socioeconomic analysis and material and waste flows, provides an overview of the region's current performance with regards to Circular Economy, serving as a starting point for identifying opportunities for circularity. Circular systems prioritize regenerative production, waste and pollution elimination, and seek to keep products and materials in use for as long as possible, prioritizing practices such as reuse, repair, remanufacturing, and recycling, ensuring that resources remain in closed cycles in the economy rather than being discarded.

Proposed Circular Systematic Solutions, for the Food & Feed and Plastics & Rubber value chains, aim to address the current challenges and needs of the region, transforming them into opportunities for economic growth, social inclusion, decarbonization of production and consumption systems, improvement of the quality of life for citizens, and reconnection between the urban and rural area.

This proposal of solutions was elaborated taking into consideration conclusions from the conducted Norte Region's circularity analysis as well as inputs obtained from consultation with stakeholders, mainly through developed workshops with these stakeholders.

Considering the analysis made and conclusions obtained **4 main goals for the roadmap; 9 pillars of transition and 32 key actions** will be showcased as follow.



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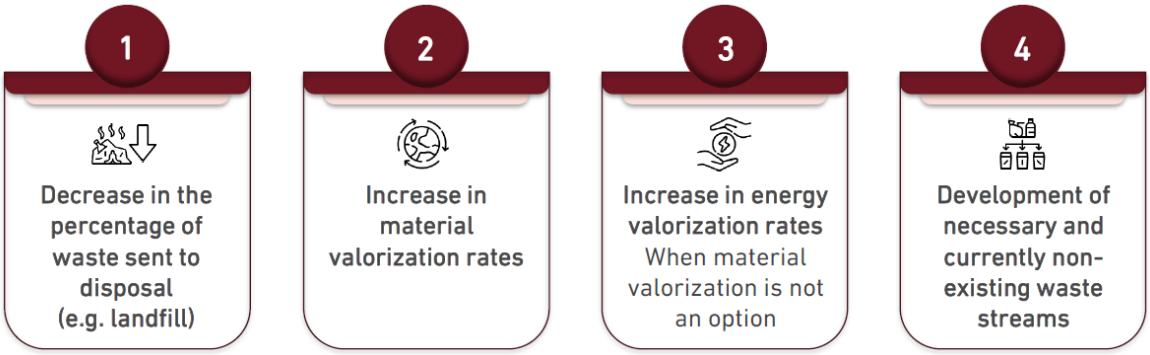

Figure 45 - Overview of proposed roadmap and main goals.

Pillar of Transition	Goal 1 Decrease in the percentage of waste sent to disposal (e.g. landfill)	Goal 2 Increase in material valorization rates	Goal 3 Increase in energy valorization rates when material valorization is not an option	Goal 4 Development of necessary and currently non-existing waste streams
Sustainable packaging design	●	●		
Collaborative solutions for key industry sectors	●	●		●
Industrial symbiosis	●	●		
New or improved recycling systems	●	●		●
Recycling solutions for non-PET plastics	●	●		●
Improvement of waste collection processes	●	●		
Energy valorization	●		●	
Streamline of bureaucratic processes	⟷	⟷	⟷	⟷
Better data and enhanced visibility	⟷	⟷	⟷	⟷

⟷ Pillars with general indirect contribution in the different goals.

Figure 46 - Contribution of each of the 9 Pillars of transition to the defined main goals.

Roadmap proposal for the Norte Region:

(1) Sustainable packaging design			
Measures	**Key Actions**	**Key Actors**	**Time frame**
	(1) Launch Initiative and Define Priorities Identify critical challenges, such as multi-material packaging, and set the basis for targeted eco-design strategies.	Industry Research centres and Universities	Short-term

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 **Transitioning to Circular Packaging**	**(2) Co-define Eco-Design Guidelines** Work with packaging producers, food and beverage industries, and research institutions to co-create regional eco-design guidelines. These focus on mono-material solutions, reduced material use, and full compatibility with recycling streams. Training and awareness sessions support early adoption.		Medium-term Long-term
	(3) Support Innovation and Pilot Alternative Materials Foster R&D and collaborative pilots with universities, technology centres, and industrial partners to test biodegradable, compostable, or reusable packaging.		Medium-term
	(4) Adopt Standards and Scale Solutions Turn guidelines and pilot results into regional standards and incentives		Long-term

(2) Collaborative solutions for key industry sectors			
Measures	**Key Actions**	**Key Actors**	**Time frame**
 **Working Groups for Collaborative Solutions**	**(5) Creation of Working Groups** Identify stakeholders for selected key areas, map interests & roles. Define governance & structure, including roles & responsibilities. Establish decision-making rules and setup working methodology	Industry Research centres and Universities	Short-term
	(6) Co-creation of Solutions Prioritize challenges & opportunities, identifying key leverage points and defining priority focus areas for each working group. Implement design thinking or innovation sprints with stakeholders.		Short-term
	(7) Roadmap & Implementation Planning Develop roadmap proposal, including KPIs & monitoring framework as well as responsibilities & funding sources.		Medium-term
	(8) Pilot Projects & Demonstrations Launch small-scale pilots to test collaborative solutions. Measure impact and document learnings. Scale up promising solutions across the industry.		Medium-term Long-term

(3) Industrial Symbiosis			
Measures	**Key Actions**	**Key Actors**	**Timeframe**
 **Industrial Symbiosis for Circular Value Chains**	**(9) Map Industrial Flows and Identify Collaboration** Opportunities: Engage industries, research centres, and municipal authorities to map residual streams, identify potential synergies, and prioritize high-impact exchange opportunities across plastics, rubber, and agro-food sectors	Industry, Waste operators Research centre and universities	Short-term Medium-term
	(10) Identify and Prioritize Synergies Using mapping results, potential resource exchanges are analysed and prioritized based on impact and feasibility.		Short-term
	(11) Establish Industrial Symbiosis Networks and Coordination Platforms Create working groups or regional platforms to facilitate		Medium-term

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	partnerships, define roles, and provide governance structures for pilot exchanges.		
	(12) Pilot, Monitor, and Scale Resource Exchange Programs Implement pilot projects for selected industrial symbiosis opportunities, monitor results in terms of waste reduction, resource efficiency, and economic benefits, and develop strategies for scaling successful models across the region.		Medium-term Long-term

(4) New or improved recycling Systems			
Measures	**Actions**	**Key Actors**	**Time frame**
 **Optimisation of Regional Recycling Infrastructure**	**(13) Comprehensive Assessment of Existing Facilities and Material Flows** Analyse current recycling infrastructure and map material flows for plastics, rubber, and agro-food residues, identifying capacity gaps, technological limitations, and contamination issues to guide future improvements.	Municipalities Waste operators Research centres and universities	Short-term
	(14) Strategic Planning and Stakeholder Coordination Bring together municipalities, waste operators, industrial partners, and research centres to develop a coordinated plan for optimizing regional recycling infrastructure. Define investment priorities, governance structures, operational standards, and collaboration mechanisms to ensure that upgraded or new facilities are aligned with market demand, regulatory frameworks, and circular economy goals.		Short-term Medium-term
	(15) Pilot Implementation and Scaling of Optimized Systems Deploy pilot projects to test new or upgraded recycling technologies, monitor performance, and scale the most effective solutions across the region to maximize resource recovery and support circular practices.		Long-term

(5) Recycling solutions for non-PET plastics			
 **Implementation of Plastics Beyond PET Initiative**	**(16) Map and Coordinate Stakeholders on Non-PET Plastics**: The coordinator starts the initiative by framing objectives and engaging stakeholders. Municipalities, recyclers, universities, technology centres, and industrial partners share knowledge and map flows of PE, PP, and PS, identifying gaps and high-impact opportunities for recycling and valorization.	Municipalities, Industries, Waste operators, Research centres and Universities	Short-term
	(17) Develop Collaborative Mechanisms and Strategic Pilots Create working groups or a regional platform to define roles, responsibilities, and governance for pilot projects, ensuring regulatory compliance and alignment between public and private stakeholders.		Short-term Medium-term
	(18) Pilot Innovative Recycling Solutions Evaluate and select appropriate technologies for non-PET plastics. Implement pilot projects targeting streams with the highest impact, testing efficiency, quality, and industrial integration.		Long-term

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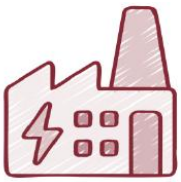
	(19) Implement and Scale Recycling Solutions Evaluate available technologies for PE, PP, and PS, prioritize streams with the highest impact, and design pilot projects that can be expanded regionally, fostering industrial reuse and integration into circular economy value chains.		Long-term

(6) Improvement of waste collection processes			
 **Optimization of Urban and Rural Waste Collection**	**(20) Convene Stakeholders and Launch Dialogue** Bring together municipalities, intermunicipal waste systems, waste operators, research centres, and community organizations to share knowledge on current collection challenges, validate available data, and initiate a coordinated discussion on priorities and opportunities across urban, semi-urban, and rural contexts.	Municipalities waste operators Society Research centres and Universities	Short-term
	(21) Define Collaborative Mechanisms Establish working groups or a regional coordination forum to define roles, responsibilities, communication channels, and joint decision-making processes, ensuring that all stakeholders are aligned on objectives and approaches for improving selective waste collection.		Short-term Medium-term
	(22) Identify Priorities and Explore Solutions Through workshops and consultations, stakeholders collectively identify key focus areas (e.g., bio-waste, plastics, rural vs. urban collection), explore possible technical and operational solutions, and outline criteria for pilot programs and future initiatives.		Medium-term Long-term

(7) Energy Valorization			
Measures	**Key Actions**	**Key Actors**	**Timeframe**
 **Implementation of Waste-to-Energy Solutions**	**(23) Engage Stakeholders on Fast-Track Energy Recovery** Initiate dialogue with municipalities, waste operators, industrial actors, energy utilities, and research institutions to map residual flows and explore immediate opportunities for energy recovery from plastics, rubber, and agro-food waste.	Municipalities Waste operators Research centres and Universities	Short-term
	(24) Coordinate Regional Energy Valorisation Efforts Set up working groups or a regional platform to define roles, responsibilities, regulatory compliance, and joint decision-making for implementing energy valorisation projects efficiently across different waste streams.		Short-term Medium-term
	(25) Identify Priority Streams and Deploy Pilot Projects Analyse residual streams, evaluate suitable technologies (anaerobic digestion, controlled incineration, pyrolysis), and plan pilot projects that can quickly reduce landfill disposal while generating renewable energy and supporting circular economy objectives.		Long-term

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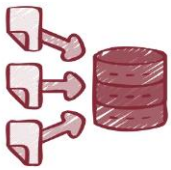
(8) Streamline bureaucratic processes			
Measures	**Actions**	**Key Actors**	**Time frame**
 **Efficient Regulatory Pathways for Waste Management**	**(26) Map Regulatory Barriers and Bottlenecks** Conduct a thorough review of current waste management legislation, permitting processes, and administrative procedures.	Public administration Municipalities Research centres and Universities	Short-term
	(27) Develop Updated Guidelines and Simplified Procedures Engage policymakers, municipalities, industries, and legal experts to design updated regulatory guidelines and streamlined procedures		Short-term Medium-term
	(28) Pilot and Implement Regulatory Reforms Test new procedures in selected municipalities or sectors, monitor effectiveness, gather feedback from stakeholders, and scale successful approaches regionally.		Long-term

(9) Better Data and Enhanced Visibility			
Measures	**Key Actions**	**Key Actors**	**Timeframe**
 **Enhanced Visibility for Circular Materials**	**(29) Launch Initiative and Map Data Practices** The coordinator initiates the program by reviewing current data collection methods. Municipalities, waste operators, and industrial partners are engaged to identify gaps and standardize practices for tracking material flows, recycling rates, and residual streams.	Industry Research centres and universities	Short-term
	(30) Develop Standardized Guidelines and Protocols Based on the mapping, the coordinator works with stakeholders to establish clear, standardized methods and protocols for consistent and comparable data across the region	Industry Research centres and universities	Short-term
	(31) Build Integrated Digital Platforms Shared information systems are created to centralize data, visualize material flows, and provide real-time insights. These platforms support planning, monitoring, and reporting for all stakeholders.	Industry Research centres and universities	Medium-term
	(32) Leverage Data for Decision-Making and Collaboration Collected data is used to identify priorities, monitor the effectiveness of initiatives, inform policy, and foster collaboration among municipalities, industries, and research centres for targeted circular economy interventions.	Industry Research centres and universities	Medium-term

4.5. Progress Monitoring and Evaluation

The main objective of the Circularity Monitoring and Evaluation Framework is to monitor, evaluate and ensure the effective implementation of Circular Systemic Solutions (CSS) in the territory. This instrument allows monitoring the implementation of the measures defined in the Plan, identifying

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critical areas that require more incisive interventions and recognizing opportunities for future actions to promote circularity in the territory.

To ensure a consistent and evidence-based approach, Key Performance Indicators (KPIs) have been defined based on the methodology of the EU Circular Economy Monitoring Framework, developed under the Circular Cities and Regions Initiative (CCRI).

This methodology recommends that indicators should be designed according to SMART criteria — Specific, Measurable, Attainable, Repeatable, Relevant and Time-bound — and structured in three complementary levels: Output (actions taken), Outcome (direct impacts) and Impact (indirect impacts), which will be detailed in the following methodology chapter. This step is essential to ensure that circular economy actions are meeting the defined objectives, allowing for strategic adjustments, accountability and continuous improvement within the scope of the Circular Economy of the North region.
The Monitoring and Evaluation Framework covers:

- **Socio-economic indicators** that are planned by the European Union for monitoring the Circular Economy. These indicators provide information on the socio-economic characteristics of a territory over the years,
- **CCRI Self-Assessment** Tool indicators these indicators were selected after the assessment of the Self-Assessment Tool indicators by Circular Cities and Regions Initiative (CCRI).
- **Roadmap specific indicators** comprising the identified Pillar of Transitions and Key actions under the roadmap structured in three complementary levels, as provided under the Circular Cities and Regions Initiative (CCRI) methodology:

    - **Output**: these are indicators that monitor concrete actions taken (e.g., number of pilot projects launched, number of platforms created).
    - **Outcome**: these indicators inform the immediate and measurable effects of actions (e.g., waste reduction, jobs created).
    - **Impact:** these indicators inform on the expected indirect – measurable through complementary approaches, e.g., LCA – impacts generated by the outcome or output (e.g., CO_2 reduction, increased biodiversity).

The indicators and targets enable a more direct assessment of the actions that facilitate the monitoring of the plan's implementation, please see the following figure.

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Pillars of Transition	Output indicators	Outcome indicators	Impact indicators
Sustainable Packaging Design	• Number of pilot projects launched to test alternative materials • Number of workshops held on eco-design • Number of standards or certifications developed for circular packaging	• Percentage of packaging produced with alternative materials (biodegradable, compostable, reusable) • Number of companies adopting mono-material packaging • Reduction of virgin plastic used (tons)	• Reduction of CO_2 emissions associated with packaging production (via LCA) • Overall reduction in packaging waste in the region (%) • Increase in recyclability rate of packaging materials (%)
Collaborative Solutions for Key Industry Sectors	• Number of companies per industrial sector of both CSS • Number of collaboration agreements signed in each key industry sectors • Number of digital platforms created for by-product exchange.	• Quantity of waste diverted for collaborative use (tons) • Number of new circular business models implemented	• Reduction in raw material extraction (via LCA) • Increase in regional circularity rate (%)
Industrial Symbiosis	• Number of industrial symbiosis initiatives identified and implemented • Number of companies that incorporate waste into their production process • Number of eco-parks under development	• Amount of resources reused between industries (ton) • Energy recovered through process integration (MWh)	• Reduction of GHG emissions by replacing virgin inputs (ton CO_2 eq.) • Improvement in overall energy efficiency of the industrial symbiosis (%) • Reduction in industrial waste generation (%)

Pillars of Transition	Output indicators	Outcome indicators	Impact indicators
New or Improved Recycling Systems	• Number of strategic plans developed • Number of new recycling facilities installed per sub-region • Number of bio-waste treatment facilities	• Increase in regional plastic recycling rate (%) • Amount of waste treated in recycling facilities (ton) • Amount of compost produced (ton)	• Reduction of waste sent to landfill (ton) • Reduction of GHG emissions associated with disposal (ton CO_2 eq.) • Agricultural area that used organic fertilizers (m^2)
Recycling Solutions for Non-PET Plastics	• Number of pilot projects launched for non-PET plastic recycling • Number of partnerships established with recyclers • Number of innovative recycling technologies tested	• Amount of non-PET plastics diverted from landfill (ton) • Percentage increase in recycling rate for non-PET plastics (%)	• Reduction in CO_2 emissions from avoided incineration or landfill (ton CO_2 eq.). • Increase in recycling efficiency for non-PET plastics (%)
Improvement of Waste Collection Processes	• Number of smart collection points installed • Number of awareness campaigns conducted	• Reduction in contamination levels in recyclables (%) • Increase in regional selective waste collection (%) • Percentage of selective waste collection by sub-region (%)	• Reduction of waste sent to landfill (ton)

Pillars of Transition	Output indicators	Outcome indicators	Impact indicators
Energy Valorization	• Number of energy recovery facilities implemented • Number of agreements for energy valorization signed • Number of governance frameworks defined	• Energy recovered from waste (MWh) • Percentage of residual waste converted into energy (%)	• Increase of waste into energy generation (MWh) • Reduction of waste sent to landfill (ton)
Streamline Bureaucratic Processes	• Number of regulatory bottlenecks identified • Number of guidelines drafted	• Reduction in average time for circular project approvals (days) • Increase in number of circular projects initiated	• Increase in adoption rate of circular initiatives (%) • Improvement in regulatory efficiency index
Better Data and Enhanced Visibility	• Number of data platforms created • Number of stakeholders involved in standardization	• Number of databases created • Number of standardized indicators adopted	• Improvement in decision-making speed (%) • Increase in data reliability index • Increase in data availability on material flows (%)

Figure 47 - Roadmap specific indicators to monitor the identified Circular Systemic Solutions in the Norte Region (Source: CCRI Self-Assessment Tool)

Monitoring should be carried out annually by the Steering Committee using the identified indicators. It should be noted that the implementation of actions may not have a short-term impact on the overall objectives identified.

The planned actions and indicators may also be reviewed annually by the Steering Committee, considering the existing regulatory, economic, and social context, which may change during the implementation of the Action Plan.

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4.6. Communication Plan

The results obtained through the Action Plans for the Norte Region should serve the purpose of raising awareness, involving the business sector, the community, and academia, as well as aligning actions and defining common goals. To achieve the project's aims, the communication approach required should go beyond the mere dissemination of outputs and instead promote stakeholder mobilization.

The communication objectives of the FRONTSH1P Project will therefore focus on encouraging concrete actions and interaction from key players in both sectors, contributing to a greater understanding of the transformations needed to achieve circularity, and fostering research and development of projects aimed at making these value chains more circular.

Target groups

The communication plan aim the target groups identified in the action plans proposed, namely companies and stakeholders working within the food & feed and plastics & rubber value chains, industry associations, researchers and universities. These groups are directly interested in the practical outcomes of the project, its industrial applications, and its impact on the value chains. Communication with this audience can therefore be more technical, focusing on data, indicators and opportunities for scaling up the developed solutions.

The involvement of municipalities is also crucial, particularly due to their role in managing urban waste and their relevance to certain industrial parks.

From a broader perspective, there is also a need to bring the results to the public. For this reason, communication should also be educational and aimed at raising awareness of the topic within public networks and communities.

Conveying the key messages

The communication of the FRONTSH1P Project's results should be based on a clear, mobilizing, and inspiring message that reflects the transformative vision the action plans aim to promote. This message should convey a cutting-edge and systemic approach, focused on circularity and territorial sustainability, challenging different audiences to rethink the current production and consumption paradigm within the sectors under study.

In this regard, communication should emphasize that the action plans are not merely technical outcomes of the project, but strategic tools for mobilizing businesses, academic institutions, and the scientific community around a common goal: to promote circular solutions and reduce the environmental impact of the food & feed and plastics & rubber sectors.

Therefore, it is essential to engage and inspire stakeholders to become active participants in this

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transition, taking on a leadership role in building more circular, efficient, and eco-friendly value chains. This is the most effective approach to ensure the project has a clear impact after the results are published, as it seeks to position the action plans as a seed for fostering future advancements toward the circularity of food & feeds and plastics & rubber.

Communication channels

With the aim of disseminating the keys messages and achieving the project's objectives, a set of communication channels has been identified and serves as a bridge between the knowledge generated in the action plans and the stakeholders of both sectors. These are compiled in the next Table.

Table 14 - Communication channels

Communication Channels		
Channel	**Description**	**Content**
Institutional websites	As the involved entities, institutional websites from project partners of the project in the Norte Region, are appropriate online platforms to find information about the actions plans.	News; Web page.
Social media	As a complement to the website, social media channels can help boost the reach of news about the project. Instagram and LinkedIn are the platforms where the institution has the strongest presence within the community and should therefore feature posts related to the development of the action plans.	Pre and post event releases
Articles	This is the communication channel closest to the entities interested and should therefore serve to share project-related news published on the website.	News.
Website FRONTSH1P Project, Articles, and social media	As part of a European consortium funded by the Horizon 2020 Programme, it is important to bring information about the Norte Region action plans to an international audience. Therefore, the project's website reports on key events held in the region during the developmental stage, such as events and the results achieved. To reach wider and international audiences, online articles and social media should also be used to boost the reach of the news published on the website.	News.
National Press	The media is inevitably the best interface for reaching the public. There are even media outlets that may see great news value in the project, such as publications more focused on the environment and the Norte region – Público, Observador, Porto Canal, Jornal de Notícias, and RTP.	Press release and post event highlights
Partners	As an essential part of the development of the action plans, it is important to provide these partners with tools to also disseminate the results achieved and stimulate interest in the topic, to pave the way for the achievement of the proposed goals. Among the partners, we can find INEGI, PortugalFoods, Smart Waste Portugal Association and the Portuguese Pact for Plastics (PPP).	Roadmap and action plans; Social Media Post Template.

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Direct mail	Results can also be disseminated directly via stakeholder mailing lists.	E-mail.
Events	To convey the information about the action plans and roadmap and engage the key players in the field, from companies to the scientific community and authorities, it is important to organize events that promote the co-creation of solutions, interaction among stakeholders, and raise awareness about the urgency of the topic.	Workshops; Seminars.

4.7. Governance

To reinforce the continuity of circular economy efforts in the Northern Region, at the end of the last seminar, CCDR-NORTE, APA, INEGI, PortugalFoods, and Smart Waste Portugal signed a protocol to monitor circular initiatives throughout the Northern Region. This Steering Committee will monitor the continuity of the project outside the scope of Horizon 2020, for the food and feed, plastics and rubber sectors, and for others such as textiles and fashion.

5. Conclusions

The developed proposal of a Regional Roadmap and two Action Plans for Circular Economy of two key sec sectors of the Norte Region of Food & Feed and Plastics & Rubber seeks to provide a blueprint for taking decisive action to achieve higher levels of circularity, putting the Norte Region of Portugal on a more sustainable path, reducing emissions, creating a cleaner and greener economy and society, and contributing, to the extent possible, to protecting against the devastating consequences of climate change, through the definition and demonstration of highly replicable regenerative Circular Systemic Solutions (CSS).

The proposed Circular Systematic Solutions for the Food & Feed and Plastics & Rubber value chains aim to address the current challenges and needs of the region, transforming them into opportunities for economic growth, social inclusion, decarbonization of production and consumption systems, improvement of the quality of life for citizens, and reconnection between the urban and rural areas.

The transition to a circular agrifood economy represents a strategic opportunity to regenerate the food systems of the Northern Region, promote short and fair supply chains with positive impacts on public health, environmental sustainability, and territorial cohesion.

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The transition to a circular economy in the plastics and rubber sectors will be possible through coordination with the current regulatory framework and the strengthening of innovation, investment, training, and governance in order to increase resource efficiency, create new business models, and enhance regional competitiveness.

Taking into consideration the analysis of the region and the discussions with the stakeholders, four cross-sectional main goals were defined:

- Reduce waste and losses and the percentage of waste sent to disposal (e.g. landfill);
- Increase material valorisation rates;
- Increase energy valorisation rates (when material valorisation is not an option);
- Develop necessary and currently not-existing waste streams.

Over 16 months, the Norte Region promoted 10 events, 7 workshops and 3 international seminars, with the participation of others FRONTSH1P stakeholders. An overview shows more than 600 regional stakeholders and across more than 250 regional organisations mobilised. In 2025, more than 450 stakeholders participated in FRONTSH1P events with 33% representing industries and business, 22% Research Institutions, and 21% Public Authorities. Overall, all work developed to reach this Roadmap involved a large spectrum of stakeholders of both value chains, Food&Feed and Plastics&Rubber, but also different units of public institutions with knowledge and responsibilities in these matters.

Currently, infrastructure and logistics are geared towards a linear economic system based on 'extraction-production-consumption-disposal'. Creating a circular supply chain means considering ‘waste’ as ‘resources’, investing in the necessary infrastructure to promote reverse logistics and industrial symbiosis, and taking eco-design strategies into account during product development.

In the context of the circular economy, investment in infrastructure is needed, including collection and sorting centres to enable the dismantling and separation of products and materials, and facilities and equipment for recycling materials. Investment is also needed in industrial parks designed for infrastructure sharing, which would enable industrial symbiosis between companies. The creation of Circular Business Zones, which facilitate collaboration between companies from various sectors, could therefore be a useful way to encourage industrial symbiosis.

Circular supply chains comprise a series of logistical processes and participants involved in collecting end-of-life goods, recovering residual value through reuse, repair, remanufacturing and recycling, and redistributing products and materials for reuse within the economy. Activities that enable the return of pre- or post-consumer products are essential to closing the product cycle.

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Eco-design strategies incorporate environmental considerations throughout the product lifecycle, from design to end of life, with the aim of developing products that can be easily reused, repaired, remanufactured and recycled. These strategies may include material recovery, simplification and reduction of raw materials, waste recovery and reuse, use of renewable energy sources and design of more durable products.

Although circular supply chains are more complex than traditional systems, several technologies can support the transition, including barcode and scanning technologies, blockchain, e-commerce and the Internet of Things (Mallick et al., 2023). Therefore, investment in digital technologies is also essential.

The circular economy can generate several socio-economic benefits, such as the creation of new jobs, products, services and business models. According to the European Union's Circular Economy Action Plan, empowering consumers and public purchasers is key, as is developing skills through education, training and lifelong learning systems.

The Norte region has many universities, polytechnic institutes and centres of technological excellence that can support companies by providing training and building capacity in human resources for the circular economy.

The lack of specific regional and sectoral data is one of the main challenged identified during roadmap development.

FRONTSH1P provided a valuable opportunity to raise awareness and advance work on the Circular Economy. As a 'never-ending story with ongoing challenges,' we remain committed to co-developing solutions with stakeholders to strengthen our network, boost the bioeconomy, invest in innovation and capacity building and accelerate the transition toward a more sustainable region.

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Annex

Criação de um Plano de Economia Circular para a região Norte

Quer participar na definição de um Plano de Economia Circular na área Agroalimentar e dos Plásticos para a região Norte? Auscultaremos as necessidades e oportunidades que a industria da regiao Norte tem para criar acções que acelerem a economia circular.

Agenda

Data: 13 de Junho de 2024
Localização: CCDR-N, Porto

Time	Topic	Responsible
09:30 – 09:40	Benvindas	CCDR-N
09:40 – 10:00	Apresentação projeto FrontSh1p	Nuria Barros, INL
10:00 – 10:10	Introduçao as sessões paralelas	CCDR-N
10:10 – 11:00	Sessão paralela 1: Agroalimentar	Moderadora: Teresa Carvalho, PortugalFoods
	Sessão paralela 2: Plásticos	Moderadora: Luísa Magalhães/Cristiana Ribeiro, Smart Waste Portugal
11:00 – 11:15	Coffee Break	
11:15 – 11:45	Continuação Sessão paralela 1: Agroalimentar	Moderadora: Teresa Carvalho, PortugalFoods
	Continuação Sessão paralela 2: Plásticos	Moderadora: Luísa Magalhães/Cristiana Ribeiro, Smart Waste Portugal
11:45 – 12:00	Resumo dos Trabalhos e Próximos Passos	CCDR-N

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FRONTSH1P

Circular Economy Workshop for the Norte Region:

Agrifood and Plastics

11th July 2024

Location: INL, Braga

Time		Speaker
16:00 – 16:25	**Setting the Scene**	
	Intro to Frontsh1p and Relevance for Norte Region	Nuria Barros, INL
	What is Circupuncture approach? Experience in Poland	Ewa Kochanska, PROAKADEMIA
	Experience from a frontrunner: Friesland region	Erik Fledderus, Circular Friesland
16:25 – 16:50	**Circular Economy Use Cases**	
	Plastic & Rubber	Kamil Maszczyk, K-Flex
	Food & Feed	Daniele Turati, NOVAMONT
	Wood	Marco Baratieri, Unibz
	Water & Nutrients	Alberto Reis, LNEG
16:50 – 17:00	**Circular Economy Action Plan in the Norte Region**	
	Results from 1st stakeholders meeting in Norte region and next actions	Ricardo Simões, CCDR-N
17:00 – 18:00	**Working Groups**	
	Agrifood - Definition of challenges & opportunities	Moderated by Marta Brazão, Circular Economy Portugal
	Plastics - Definition of challenges & opportunities	Moderated by Smart Waste
	Conclusions	Ricardo Simões, CCDR-N

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Seminário "Economia Circular no setor dos plásticos na Região Norte: Legislação e Implementação"

Organização:

A **Associação Smart Waste Portugal**, em parceria com a **CCDR-Norte** - Comissão de Coordenação e Desenvolvimento Regional do Norte e o **INL** - International Iberian Nanotechnology Laboratory, e no âmbito do projeto europeu Frontsh1p, organiza o **seminário "Economia Circular no setor dos plásticos na Região Norte: Legislação e Implementação"**.

Data: 18 de dezembro de 2024

Local: INL - International Iberian Nanotechnology Laboratory

Enquadramento:

O projeto FRONTSH1P, com financiamento através do Programa Horizonte 2020, visa garantir uma transição verde e justa da região polaca de Łódzkie para a descarbonização e regeneração territorial através da demonstração de modelos sistémicos circulares altamente replicáveis, onde a Região Norte se inclui.

A CCDR-N e o INL participam desde 2021 no FRONTSH1P cujo término está previsto para outubro de 2025. A nível regional prevê-se:

- A caraterização da região, nomeadamente a nível dos setores dos Plásticos e Alimentar, na perspetiva dos 5R's;
- Análise das partes interessadas e das cadeias de valor;
- Desenvolvimento de um Roadmap e um Plano de Ação para a Região Norte, para cada um destes setores, com estratégias, inovação, monitorização, medidas e ações para se alcançar a circularidade.

Pretende-se assim criar iniciativas que promovam o envolvimento dos diferentes atores, criando uma plataforma de diálogo e cooperação entre eles.

No seguimento de workshops anteriores, este seminário surge com os seguintes objetivos:

- **Avaliar a dimensão regulamentar** na área dos plásticos e borracha;
- **Refletir desafios e oportunidades** da economia circular para a indústria;
- **Valorizar boas práticas e tecnologias** disponíveis para a implementação da economia circular;
- **Promover a partilha de experiências** e alimentar uma rede de cooperação entre os diferentes atores.

A ênfase numa economia circular e em sistemas de recursos sustentáveis poderia beneficiar a indústria, especialmente no que diz respeito a materiais ecológicos, redução de resíduos e transformação digital nos processos de produção.

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Programa:

14h00	Receção dos participantes
14h30	Sessão de abertura **Ado Jório**, INL **Ricardo Rio**, Câmara Municipal de Braga **Luísa Magalhães**, Associação Smart Waste Portugal
15h00	Painel: Estado da arte da Estratégia Nacional para a Economia Circular Perspetiva Ambiental - **Ana Cristina Carrola**, Agência Portuguesa do Ambiente Perspetiva Económica - **Carla Pinto**, Direção Geral das Atividades Económicas
15h30	Estudo de caso: Desafios tecnológicos Testemunho de parceiro do Projeto Frontsh1p – Maria Teresa Scrivani, Consorzio Proplast (EN)
15h45	Pausa para café
16h00	Estudo de caso: Pacto Português para os Plásticos: colaboração e envolvimento da cadeia de valor Patrícia Carvalho, Pacto Português para os Plásticos
16h15	Mesa-redonda: Legislação e Aplicabilidade prática Moderador: Luísa Magalhães, Associação Smart Waste Portugal Nuno Aguiar, APIP Filipe Carneiro, LIPOR Sandra Silva, Veolia
17h15	Síntese dos trabalhos Ricardo Simões, Unidade de Inovação CCDR-Norte
17h30	Sessão de encerramento **António Cunha**, CCDR-Norte

Inscrição gratuita mas obrigatória até dia 17 de dezembro às 13h

Link para inscrição

Para mais informações sobre o projeto FRONTSH1P: https://frontsh1p.eu/

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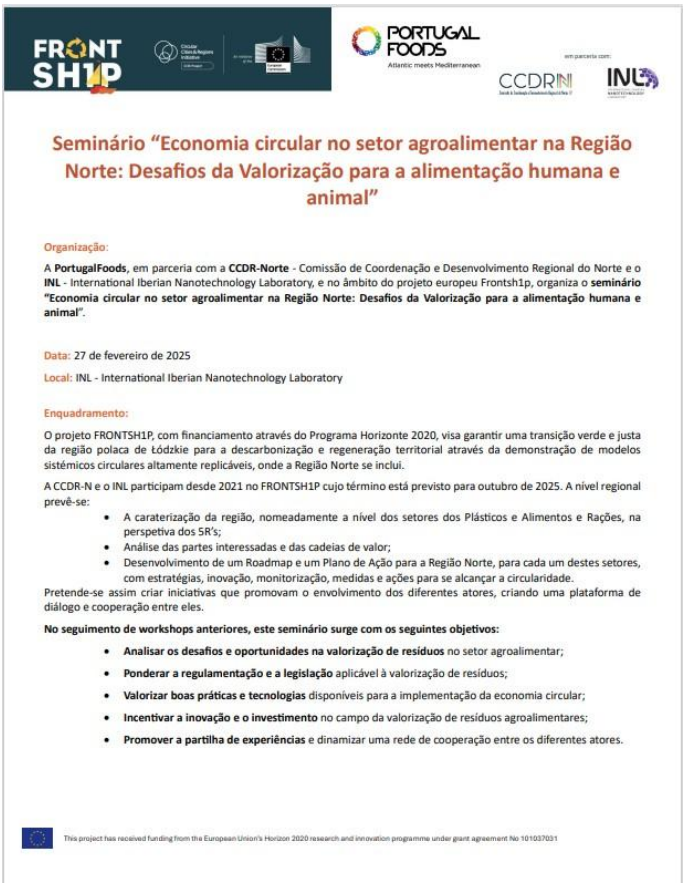

Seminário "Economia circular no setor agroalimentar na Região Norte: Desafios da Valorização para a alimentação humana e animal"

Organização:

A **PortugalFoods**, em parceria com a **CCDR-Norte** - Comissão de Coordenação e Desenvolvimento Regional do Norte e o **INL** - International Iberian Nanotechnology Laboratory, e no âmbito do projeto europeu Frontsh1p, organiza o **seminário "Economia circular no setor agroalimentar na Região Norte: Desafios da Valorização para a alimentação humana e animal"**.

Data: 27 de fevereiro de 2025

Local: INL - International Iberian Nanotechnology Laboratory

Enquadramento:

O projeto FRONTSH1P, com financiamento através do Programa Horizonte 2020, visa garantir uma transição verde e justa da região polaca de Łódzkie para a descarbonização e regeneração territorial através da demonstração de modelos sistémicos circulares altamente replicáveis, onde a Região Norte se inclui.

A CCDR-N e o INL participam desde 2021 no FRONTSH1P cujo término está previsto para outubro de 2025. A nível regional prevê-se:

- A caraterização da região, nomeadamente a nível dos setores dos Plásticos e Alimentos e Rações, na perspetiva dos 5R's;
- Análise das partes interessadas e das cadeias de valor;
- Desenvolvimento de um Roadmap e um Plano de Ação para a Região Norte, para cada um destes setores, com estratégias, inovação, monitorização, medidas e ações para se alcançar a circularidade.

Pretende-se assim criar iniciativas que promovam o envolvimento dos diferentes atores, criando uma plataforma de diálogo e cooperação entre eles.

No seguimento de workshops anteriores, este seminário surge com os seguintes objetivos:

- **Analisar os desafios e oportunidades na valorização de resíduos** no setor agroalimentar;
- **Ponderar a regulamentação e a legislação** aplicável à valorização de resíduos;
- **Valorizar boas práticas e tecnologias** disponíveis para a implementação da economia circular;
- **Incentivar a inovação e o investimento** no campo da valorização de resíduos agroalimentares;
- **Promover a partilha de experiências** e dinamizar uma rede de cooperação entre os diferentes atores.

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PROGRAMA

09h00 | Receção dos participantes

09h40 | Sessão de abertura
INL
António Cunha, CCDR-Norte
Ricardo Rio, Câmara Municipal de Braga

10h00 | Painel: Regulamentação e legislação na valorização de resíduos
Moderador: Olga Moreira, INIAV
- Estado da arte da estratégia nacional para a economia circular - Ana Cristina Carrola, APA
- Regulamentação na utilização de materiais consoante origem - Ana d'Avelar e Susana Gonçalves, DGAV

10h45 | Estudo de Caso: Envolvimento de stakeholders e oportunidades de valorização na Polónia
Testemunho de parceiro do Projeto Frontsh1p - Daniele Turati, Novamont (EN)

11h05 | Coffee Break

11h35 | Estudos de Caso: Valorização de subprodutos para a indústria alimentar, cosmética e nutracêutica
Manuela Pintado, Universidade Católica Portuguesa

11h55 | Mesa-Redonda: Desafios e oportunidades na valorização de subprodutos agroalimentares
Moderador: Deolinda Silva, PortugalFoods
Alexandre Gonçalves, MORE Colab
Débora Campos, AgroGrin Tech
Maria João Mota, Grupo Soja de Portugal
Telmo Machado, Lipor
Vasco Esteves, Tecmafoods

12h50 | Síntese dos trabalhos
Ricardo Simões, Unidade de Inovação CCDR-Norte

13h00 | Sessão de encerramento
Deolinda Silva, PortugalFoods

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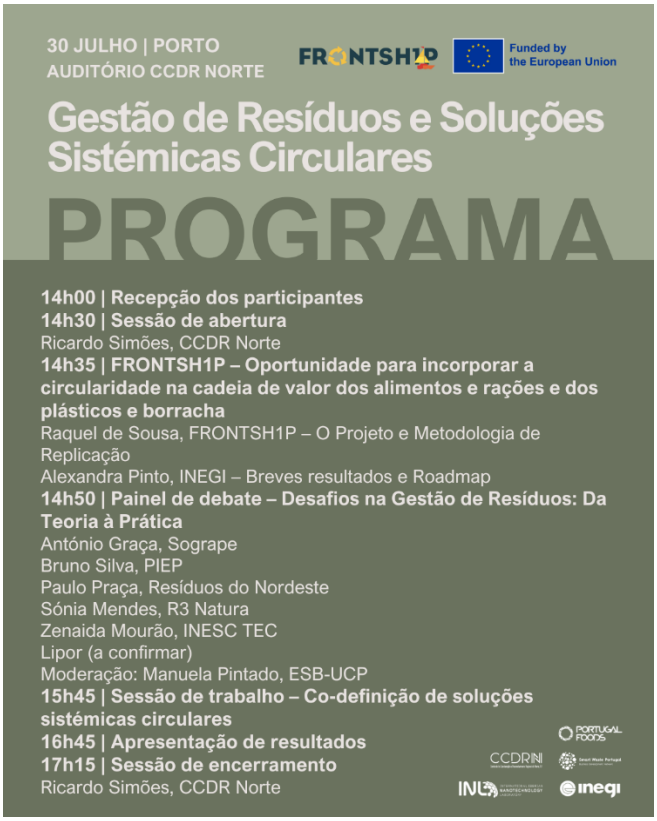

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Seminário Internacional "Do setor Agroalimentar ao Setor do Plásticos: Soberania Alimentar e Circularidade"

Contributos do projeto FRONTSH1P para a Inovação e Sustentabilidade na Região Norte

Data: 14 de Outubro de 2025, 9h00-14h30

Local: Auditorium Paulo Freitas, INL- International Iberian Nanotechnology Laboratory, Avenida Mestre José Veiga s/n 4715-330 Braga, Portugal

Organização: A **CCDR-Norte** - Comissão de Coordenação e Desenvolvimento Regional do Norte em parceria com o **INL** - International Iberian Nanotechnology Laboratory, **INEGI**, **PortugalFoods e Smartwaste** no âmbito do projeto europeu Frontsh1p, organiza o **seminário "Do setor Agroalimentar ao Setor do Plásticos: Soberania Alimentar e Circularidade"**. Contributos do projeto FRONTSH1P para a Inovação e Sustentabilidade na Região Norte.

Enquadramento: O projeto FRONTSH1P, com financiamento através do Programa Horizonte 2020, visa garantir uma transição verde e justa da região polaca de Łódzkie para a descarbonização e regeneração territorial através da demonstração de modelos sistémicos circulares altamente replicáveis, onde a Região Norte se inclui.

A CCDR-N e o INL participam desde 2021 no FRONTSH1P cujo término ocorre no final de outubro de 2025. A nível regional promoveu-se:

- Caraterização da região, nomeadamente a nível dos setores dos Alimentos e Rações, Plásticos e Borracha, na perspetiva dos 5R's;
- Identificação das cadeias de valor e partes interessadas;
- Desenvolvimento de um Roadmap e um Plano de Ação para a Região Norte, para cada um destes setores, com estratégias, inovação, monitorização, medidas e ações para se alcançar a circularidade.

Pretende-se divulgar iniciativas, promover o envolvimento dos diferentes atores, criar plataforma de diálogo e cooperação e promover um compromisso de futuro.

No seguimento de workshops e seminários anteriores, este seminário final surge com os seguintes objetivos:

- **Analisar os desafios e oportunidades** na valorização de cadeias de valor de recursos;
- **Ponderar regulamentação e a legislação** aplicável à valorização de resíduos e sub-produtos;
- **Valorizar boas práticas e tecnologias** disponíveis para a implementação da economia circular;
- **Incentivar a inovação e o investimento** no campo da valorização de recursos;
- **Promover a partilha de experiências** e dinamizar uma rede de cooperação entre diferentes atores.

Expositores:

• Quinta da Borgonha – Atividades Agrícolas, Lda. (Póvoa do Varzim). Dedicando-se inicialmente à produção de leite, ovos e mel a afirmação da empresa no mercado tem crescido gradualmente assentando essencialmente em 3 pilares: paixão, ética e qualidade. Queijos, Gelados, Restaurante, Quinta Pedagógica.
• Projeto PROVE Cávado – PROVE É CÁ DA TERRA, um projeto de comercialização de produtos agrícolas locais e sazonais, em circuito curto ou de proximidade. No território do CÁVADO (Amares, Barcelos, Braga, Esposende, Terras de Bouro e Vila Verde) contam já com a colaboração de 12 produtores locais, e entregam cabazes de legumes e frutas da época colhidos no próprio dia da entrega, a consumidores que se inscrevem previamente online: https://www.prove.com.pt/ ou Facebook PROVE
• Nutrimais - um produto de valorização orgânica 100% natural um corretivo adequado para a agricultura biológica, foram os primeiros produtos a serem desenvolvidos pela LIPOR que hoje conta com uma estratégia de produtos que reflete o seu propósito de ir além do tratamento de resíduos, promovendo inovação.
• Ecoiberia – Criar um mundo melhor com os nossos parceiros através de soluções recicláveis sustentável - 100% Recycled PET flakes: https://www.ecoiberia.pt/
• ZOURI -Calçado dos Plásticos do Oceano (Guimarães), 100% Made in Portugal, Produção justa e ética - - https://www.zouri-shoes.com/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037031

Programa:

9h00	**Receção dos participantes Café de Boas Vindas, Networking & Visita a expositores**
9h30	**Sessão de abertura** Lorenzo Pastrana, INL Ricardo Simões, Diretor da Unidade de Inovação da CCDR Norte
9h45	**FRONTSH1P: Replicabilidades regionais e articulação entre ações** Ewa Kochańska, Proakademia (ONLINE) e Raquel de Sousa, INL
10h00	**Contribuição de soluções biotecnológicas inovadoras com microalgas para a região Norte de Portugal** Alberto Reis e Patrícia Moura, LNEG (ONLINE)
10h15	**FRONTSH1P: Propostas de Replicação na Região Norte** Teresa Carvalho, PortugalFoods; Catarina Gonçalves, Smartwaste; Alexandra Pinto, INEGI
11h00	Debate
11h15	**Intervalo Networking & Visita a expositores**
11h30	**Mesa-redonda Desafios da Economia Circular: Novos Empregos, Oportunidades de Financiamento, Comunidades em Transformação, Modelos de Governança** Moderadora: Manuela Pintado, Universidade Católica Portuguesa António Afonso, Administrador da ARH Norte, APA Programa Norte 2030 João Cerejeira, U. Minho António Vasconcelos, Planetiers New Generation
12h15	Debate
12h30	**Assinatura de protocolo para o acompanhamento da Economia Circular no Norte**
12h45	**Sessão de encerramento** Paulo Ramalho, Vice-Presidente CCDR-Norte
13h00	**Almoço Networking & Visita a expositores**

Inscrição gratuita mas obrigatória até dia 13 de outubro às 13h00

Garanta já a sua inscrição e faça parte desta transição verde através do link ou QR code https://lnkd.in/dAsEaAJC

Para mais informações sobre o projeto FRONTSH1P: https://frontsh1p.eu/

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