



# EBC 2030

2030 CATALAN  
BIOECONOMY  
STRATEGY

# ACTION PLAN 2022-2024

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**EBC 2030** 2030 CATALAN  
BIOECONOMY  
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# CONTENTS

|                                                                                                          |    |
|----------------------------------------------------------------------------------------------------------|----|
| <b>CONTEXT</b>                                                                                           | 5  |
| <b>VALUE CHAINS</b>                                                                                      | 9  |
| 1 / Improvement in forest management and the use of forest resources                                     | 11 |
| 2 / Resource recovery from livestock waste and organic waste                                             | 21 |
| 3 / Recovery of coproducts and byproducts from the food chain                                            | 26 |
| 4 / Creation of resilient farm and forest landscapes and the sustainable provision of ecosystem services | 31 |
| <b>METODOLOGY</b>                                                                                        | 35 |
| <b>TRANSFORMATIVE ACTIONS</b>                                                                            | 37 |
| Transformative action info sheets                                                                        | 40 |
| <b>SYSTEM OF TRACKING AND ASSESSTMENT</b>                                                                | 56 |
| Comanagement Board                                                                                       | 58 |
| <b>TIMELINE</b>                                                                                          | 59 |
| <b>FUNDING</b>                                                                                           | 61 |



## List of tables

|                 |                                                                                                |    |
|-----------------|------------------------------------------------------------------------------------------------|----|
| <b>Table 1.</b> | Strategic goals, strategic lines and measures of EBC2030                                       | 6  |
| <b>Table 2.</b> | Productions within the forest chain in Catalonia (annual average 2014-2018)                    | 13 |
| <b>Table 3.</b> | Projected productions in the forest value chain of Catalonia in a bioeconomy scenario for 2030 | 16 |
| <b>Table 4.</b> | List of lead units of the 2022-2024 Action Plan                                                | 36 |
| <b>Table 5.</b> | Transformative actions of the 2022-2024 Action Plan                                            | 39 |
| <b>Table 6.</b> | Transformative action timeline                                                                 | 60 |
| <b>Table 7.</b> | Transformative action funding                                                                  | 62 |

## List of figure

|                  |                                                                                                                                          |    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Figure 1.</b> | General outline of the forest value chain                                                                                                | 12 |
| <b>Figure 2.</b> | Outline of the livestock waste and organic waste chain                                                                                   | 22 |
| <b>Figure 3.</b> | Adaptation of the food use hierarchy                                                                                                     | 27 |
| <b>Figure 4.</b> | Catalonia, land of forests                                                                                                               | 32 |
| <b>Figure 5.</b> | Characteristic elements and stress factors to which Catalan farm and forest landscapes and forest ecosystems will potentially be subject | 34 |



**ACTION  
PLAN**  
2022-2024

# Context

## Context /

The **2030 Catalan Bioeconomy Strategy** (EBC2030), passed by Agreement GOV/141/2021, of 14 September, established seven strategic goals for spearheading the use of local and renewable biological resources in all economic sectors. These goals must be accomplished through 17 strategic lines and 37 measures which the Ministry of Climate Action, Food and Rural Agenda (DACC), in collaboration with the other departments of the Government of Catalonia and additional implicated parties, has chosen to prioritise in the push toward a circular bioeconomy in Catalonia.

**EBC2030** will be brought to term through triennial action plans, which will execute the measures of the Strategy and contribute to the development of certain **value chains**. Thus, this **2022-2024 Action Plan I** defines **15 transformative actions** which the Government of Catalonia will implement in this period, although some of these actions may continue beyond the triennial period.

The **strategic goals (O)**, **strategic lines (O L)** and **measures (M)** of EBC2030 are shown in **Table 1**.

**Table 1**  
**Strategic goals, strategic lines and measures of EBC2030**

|                                                                                                                                                    |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>O1 Improve the use of biomass in Catalonia through the characterisation, quantification and optimisation of its management and distribution</b> |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>O1 L1</b>                                                                                                                                       | Provide biomass data in a format which adds value for the users                                           | <b>M1</b> Integrate and complete the existing data on the circular bioeconomy in an observatory<br><b>M2</b> Integrate systems of digitalisation and advanced data use                                                                                                                                                                                                                |
| <b>O1 L2</b>                                                                                                                                       | Ensure sustainability and efficiency in the management and distribution of biomass                        | <b>M3</b> Facilitate biomass availability and quality<br><b>M4</b> Prioritise the local recovery of organic matter and byproducts<br><b>M5</b> Improve the management and distribution of biomass                                                                                                                                                                                     |
| <b>O2 Develop a business community based on the circular bioeconomy throughout the territory, paying special attention to the primary sector</b>   |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>O2 L1</b>                                                                                                                                       | Promote cooperative work between companies throughout the supply chain to attract supply and demand       | <b>M6</b> Develop the Bioeconomy Hub using existing infrastructures<br><b>M7</b> Foster the creation of industrial symbiosis initiatives<br><b>M8</b> Identify and inventory the value chains, necessary technology and market potential of bioproducts, biomaterials and bioenergy while simultaneously geolocating producers, logistics operators, tech companies and end consumers |
| <b>O2 L2</b>                                                                                                                                       | Strengthen the growth of existing companies based on the circular bioeconomy                              | <b>M9</b> Reinforce lines of aid and funding for investment and development in circular bioeconomy                                                                                                                                                                                                                                                                                    |
| <b>O2 L3</b>                                                                                                                                       | Provide incentives for the creation of new companies and business models based on the circular bioeconomy | <b>M10</b> Foster the design of viability studies (economic, social and environmental) and business models<br><b>M11</b> Reinforce lines of aid and funding for new businesses in circular bioeconomy<br><b>M12</b> Facilitate the ceding of venues for the implementation of businesses                                                                                              |

Continued from the previous page

Table 1 / Strategic goals, strategic lines and measures of EBC2030

| <b>O3 Encourage the use and consumption of bioproducts, bioenergy and biomaterials on the market</b>                                                                 |                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>O3 L1</b> Generate demand for the use and consumption of bioproducts, biomaterials and bioenergy                                                                  | <b>M13</b> Use tenders and public purchasing as a tool for furthering the circular bioeconomy<br><b>M14</b> Spearhead communication and marketing plans and publicise success stories on bioproducts, biomaterials and bioenergy                                       |
| <b>O3 L2</b> Improve the positioning of bioproducts, biomaterials and bioenergy on the market                                                                        | <b>M15</b> Promote the commercialisation and differentiation of the bioproducts on the market and facilitate informed decision-making by consumers<br><b>M16</b> Encourage manufacturers to affiliate themselves with environmental statements and labelling systems   |
| <b>O4 Promote resilient agricultural and forest landscapes and the sustainable provision of ecosystem services in the context of the Catalan circular bioeconomy</b> |                                                                                                                                                                                                                                                                        |
| <b>O4 L1</b> Promote the establishment of resilient agricultural and forest landscapes using advanced tools and expertise                                            | <b>M17</b> Support a form of territory management which fosters resilient landscapes and the definition of priority areas for their establishment<br><b>M18</b> Foster the creation of new economic activities which facilitate the management of resilient landscapes |
| <b>O4 L2</b> Conserve and improve the quality of agricultural soils and foster their role as a carbon sink                                                           | <b>M19</b> Foster a more sustainable form of organic fertilisation on agricultural soils<br><b>M20</b> Implement agronomic practices designed to conserve and improve soil quality                                                                                     |
| <b>O4 L3</b> Foster the provision of ecosystem services                                                                                                              | <b>M21</b> Identify ecosystem services in the context of the Catalan bioeconomy<br><b>M22</b> Establish payment mechanisms for environmental services which favour territorial management and facilitate the social and economic viability of the territory            |



Continued from the previous page

Table 1 / Strategic goals, strategic lines and measures of EBC2030

| <b>O5 Situate knowledge as a motor of the circular bioeconomy</b>                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>O5 L1</b> Promote research, innovation and technological transfer associated with the circular bioeconomy                                    | <p><b>M23</b> Identify the principal challenges and solutions and promote research/transfer/innovation projects linked to circular bioeconomy</p> <p><b>M24</b> Promote projects which enable proof of concept studies and the preindustrial and industrial escalation of new products and services</p> <p><b>M25</b> Promote technological improvements and technology-based companies, start-ups, spin-offs and scale-ups linked to the circular bioeconomy</p> <p><b>M26</b> Encourage companies to spearhead research and innovation projects in circular bioeconomy</p> |
| <b>O5 L2</b> Promote knowledge transfer and exchange                                                                                            | <p><b>M27</b> Incorporate companies into collaborative spaces for processes of creativity and experimentation</p> <p><b>M28</b> Create a programme to capitalise on research and innovation linked to the circular bioeconomy and disseminate the knowledge and innovations generated by the programme</p> <p><b>M29</b> Provide advice about the circular bioeconomy throughout the value chain</p>                                                                                                                                                                         |
| <b>O5 L3</b> Provide trained professionals and attract talent                                                                                   | <p><b>M30</b> Train the existing professionals, develop new professional profiles and spearhead training projects linked to the circular bioeconomy</p> <p><b>M31</b> Reinforce the capacity to train and recruit talent in the sphere of the circular bioeconomy</p>                                                                                                                                                                                                                                                                                                        |
| <b>O6 Strengthen the role of the Administration and adapt the legal and regulatory framework to favour the circular bioeconomy in Catalonia</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>O6 L1</b> Adapt the legal and regulatory framework                                                                                           | <b>M32</b> Identify and adapt the legislation and laws which could represent barriers to or opportunities for the development of the circular bioeconomy in Catalonia                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>O6 L2</b> Facilitate the implementation of circular bioeconomy activities in the territory                                                   | <p><b>M33</b> Develop the Bioeconomy Office</p> <p><b>M34</b> Orient and coordinate funding sources (European, national and local) to provide impetus to the circular bioeconomy</p>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>O7 Prepare Catalan society for the change toward the circular bioeconomy</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>O7 L1</b> Inform and raise awareness among the citizenry on the need to implement, and the benefits of, the circular bioeconomy              | <p><b>M35</b> Promote awareness-raising and publicity campaigns aimed at citizens to improve their perception of the circular bioeconomy</p> <p><b>M36</b> Integrate the circular bioeconomy into educational and training curricula</p>                                                                                                                                                                                                                                                                                                                                     |
| <b>O7 L2</b> Incorporate civil society into the design and execution of new projects associated with the circular bioeconomy                    | <b>M37</b> Design a system of co-governance with the citizenry and all other parties involved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |





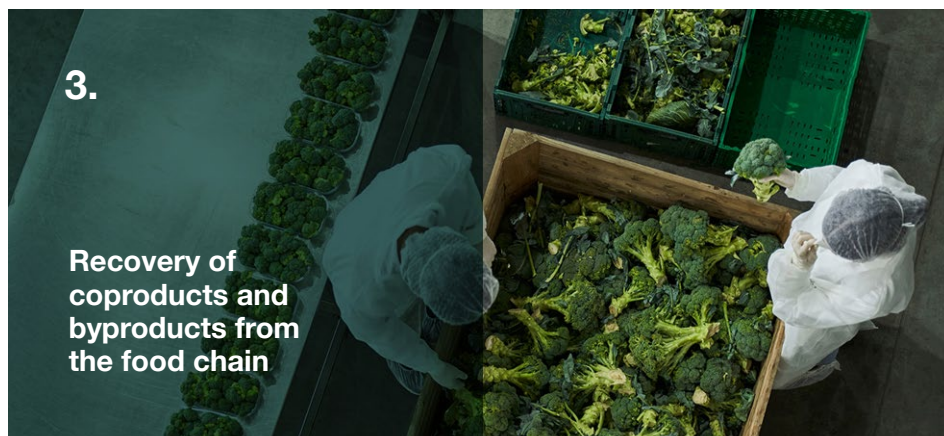


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2022-2024

# Value chains

## Value chains /

The present Action Plan is geared toward development of the following value chains:



Improvement  
in forest mana-  
gement and the  
use of forest  
resources



# 1 / Improvement in forest management and the use of forest resources

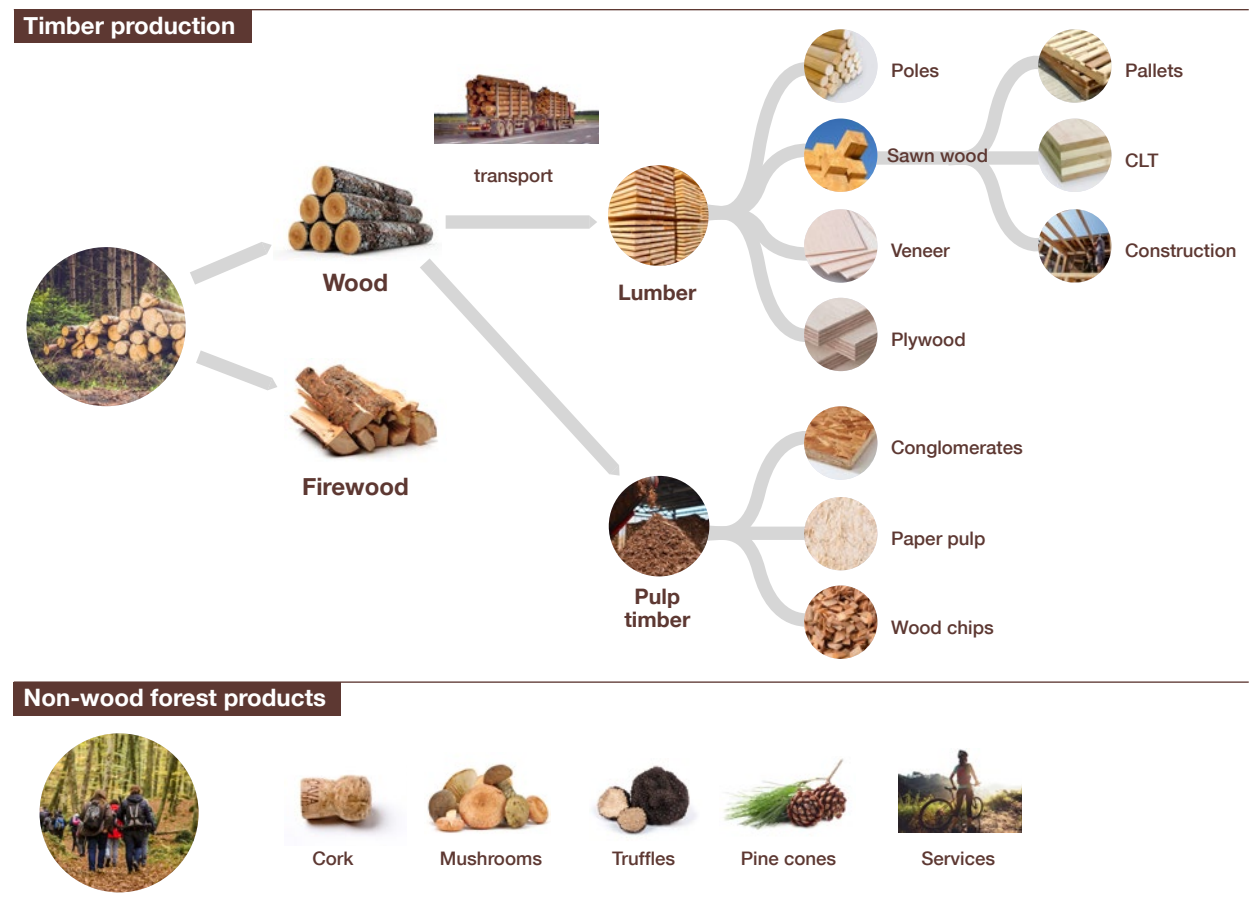
## Description

Given that the forested area (which apart from forests includes pastures, thickets and barren lands) represented, in 2018, **65% of the Catalan territory**, improving the management of forests and use of their resources is key for advancing toward the circular bioeconomy in our country.

This entails intervening in the two main flows of the wood value chain (**Figure 1**):

1. Timber production, which includes raw materials for industry (timber, pulpwood and all its products and byproducts) and energy generation (wood chips and firewood).
2. Non-wood products.

**Figure 1**  
General outline of the forest value chain / Source: CTFC



## Current resource recovery routes

### Resource recovery in the forest chain

**Taula 2** shows the average production of the forest value chain for the 2014-2018 period and distinguishes between the three main product lines: wood for industry, wood chips and firewood. The latter two categories are used for bioenergy production (150,000 m<sup>3</sup> and 227,000 m<sup>3</sup>, respectively). With regard to the first category, the four industrial wood destinations in Catalonia are sawmills, cross-laminated timber (CLT)<sup>1</sup> production, the production of poles, sticks and stakes, and shredding for export. Table 2 also specifies the origin of the roundwood used in industry and distinguishes between imported roundwood (78,000 m<sup>3</sup>) and the roundwood produced in

Catalonia (440,000 m<sup>3</sup>), and it also displays the production after industrial transformation, in terms of manufactured products and the different types of byproducts (chips, sawdust and bark).

As the table illustrates, every year approximately **one million m<sup>3</sup>** of roundwood is extracted from Catalan forests, of which 62% enters the primary transformation industry (mainly sawmills), 23% is earmarked for firewood, and the remaining 15% is use directly for energy production.

With respect to industrial production, the largest proportion (45% of the total felled in Catalonia) is allocated primarily to sawnwood production and the secondary transformation industry, mainly

packages and packing material. In addition, a significant amount of poles, billets, sticks and stakes (9%) is also produced, as well as pulpwood exported for paper and board production (7.5%). In contrast, the manufacture of CLT currently only accounts for a mere 0.2% of Catalan wood production, despite its great advantages as a construction material.

As for the byproducts of the wood processing, three types can be distinguished: chips, sawdust and bark. An annual average of 371,424 m<sup>3</sup> of these byproducts is generated, which end up on the market as pellets, animal bedding, etc. This quantity, added to the wood chips and firewood for bioenergy, makes for a total of 748,424 m<sup>3</sup> of forest byproducts generated in Catalonia.

**Table 2**  
**Productions within the forest chain in Catalonia (annual average 2014-2018)**

Source: Own elaboration (CTFC) based on forestry data from the DARP and the IDESCAT Industrial Product Survey. To make the figures for the source data comparable, they are unified and simplified to m<sup>3</sup> with densities of 1t / m<sup>3</sup>.

| FOREST WORK LINES                    | INDUSTRIAL DESTINATION              | ROLL WOOD (m <sup>3</sup> ) |         | ELABORATED PRODUCT (m <sup>3</sup> ) | BY-PRODUCTS (m <sup>3</sup> )              |         |        | TOTAL FOREST BY-PRODUCTS (m <sup>3</sup> ) |
|--------------------------------------|-------------------------------------|-----------------------------|---------|--------------------------------------|--------------------------------------------|---------|--------|--------------------------------------------|
|                                      |                                     | Import                      | Catalan |                                      | Wood chips                                 | Sawdust | Bark   |                                            |
| Industry                             | Sawmills                            | 78.000                      | 440.000 | 188.552                              | 167.314                                    | 84.434  | 77.700 | 329.448                                    |
|                                      | CLT                                 |                             | 6.000   | 2.184                                | 1.938                                      | 978     | 900    | 3.816                                      |
|                                      | Sticks, turning, hangers and stakes | 16.000                      | 90.000  | 67.840                               | 16.960                                     | 6.360   | 14.840 | 38.160                                     |
|                                      | Crushing (export)                   |                             | 74.000  | 74.000                               |                                            |         |        |                                            |
| Wood chip for energy                 |                                     |                             | 150.000 |                                      |                                            |         |        | 150.000                                    |
| Firewood                             |                                     |                             | 227.000 |                                      |                                            |         |        | 227.000                                    |
| TOTAL wood in roll (m <sup>3</sup> ) |                                     | 94.000                      | 987.000 |                                      | TOTAL FOREST BY-PRODUCTS (m <sup>3</sup> ) |         |        | 748.424                                    |

<sup>1</sup> Cross-laminated timber (CLT) is currently sawn in the CLT industry itself, but its raw material could come from other sawmills.

## Non-wood products

Of the non-wood products, the most relevant in Catalonia are **mushrooms**, with a highly variable level of production depending on the year. Thus, while the all-time record (200.34 kg/ha) for production was achieved in 2014, the minimum (15 kg/ha) was recorded three years later. On average, the production for the 2015-2020 period was 66.8 kg/ha. In terms of total commercial production, 2,277.29 tonnes were sold in 2020, although the annual average for the 2015-2020 period was significantly higher at 4,351.34 tonnes.

As for other non-wood products, an estimated 2,150 kg of **black truffles** were produced in the 2019-2020 season, which contrasts with an annual average production of 4,351.34 kg over the 2015-2020 period. As for **pine nuts**, the seeds contained within the cones of the stone pine (*Pinus pinea*), 28 tonnes were produced in



2020, similar to the annual average production of 26 tonnes over the 2014-2019 period. In terms of wild **medicinal and aromatic plants**, in 2020 22 tonnes of **bearberry** and 1.3 tonnes of medicinal plants were produced on public land.

With regard to these products, one of the main trends in the coming years will be consolidation in the regulation and traceability of their commercialisation.



## Opportunities

This Action Plan aims to capitalise on the following value chains in the forest sphere through the development of the bioeconomy:

### Resource recovery in the forest chain in the bioeconomy

EBC2030 intends to foster a bioeconomic development scenario in which the Catalan production of roundwood increases by 30%, which entails achieving a volume of 1,334,000 m<sup>3</sup> (Table 3). This increase is justified by the following reasons:

- In the last twenty years, the amount of **aerial biomass** accumulated in the forests of Catalonia has risen from 157,989,809 m<sup>3</sup> (2000) to 218,980,245 m<sup>3</sup> (2020). In other words, around 3 million m<sup>3</sup> of aerial biomass has been added every year during this period.
- In turn, the annual **pace of timber extraction** is approximately one million m<sup>3</sup>, although with somewhat of a decrease in recent years. Thus, the extraction rate with respect to the growth rate is 30-40%, far below the European average of 67%.
- In the current context of **climate change**, these accumulations of biomass and unmanaged forested area are unsustainable, given that it puts Catalonia at a high risk of large-sized forest fires like those which have already begun to occur in other places with a mediterranean climate, such as California, Australia, Chile or Portugal. Moreover, the health of forests will tend to worsen as a result of droughts, forest diseases and pests, which will make the forests even more vulnerable.
- These factors are combined with the need to reduce the current level of **external dependence**, given that in Catalonia seven mil-



lion bulk m<sup>3</sup> of round timber in products derived from wood is consumed, in contrast to the national production of one million.

- To turn this situation around, and taking the extraction rate as an indicator, it is considered important to **converge with the European average with respect to the levels of extraction and harvesting from Catalan forests** as a long-term goal (2050). This would entail increasing annual harvests to 1.5 million m<sup>3</sup>, always taking into account the most severe climate scenarios possible, the resilience of the forests, biodiversity conservation, and a balanced provision of ecosystem services. This policy also contributes to the **prevention of large forest fires**, which requires prioritising and incentivising forest management in certain strategic areas.
- In any event, in order to achieve this level of sustainable harvesting, it is necessary to set a goal of progressive growth to raise the current 30-40% of harvesting to 68% in 2050, with the following midway targets in 2030 (Table 3).



**Table 3**  
**Projected productions in the forest value chain of Catalonia in a bioeconomy scenario for 2030.**

Source: CTFC

| FOREST WORK LINES              | INDUSTRIAL DESTINATION              | ROLL WOOD (m³) |           | ELABORATED PRODUCT (m³) | BY-PRODUCTS (m³)                     |         |        | TOTAL FOREST BY-PRODUCTS (m³) |
|--------------------------------|-------------------------------------|----------------|-----------|-------------------------|--------------------------------------|---------|--------|-------------------------------|
|                                |                                     | Import         | Catalan   |                         | Wood chips                           | Sawdust | Bark   |                               |
| Industry                       | Sawmills                            | 5.000          | 595.000   | 218.400                 | 193.800                              | 97.800  | 90.000 | 381.600                       |
|                                | CLT                                 | 5.000          | 99.000    | 37.856                  | 33.592                               | 16.952  | 15.600 | 66.144                        |
|                                | Sticks, turning, hangers and stakes | 5.000          | 95.000    | 64.000                  | 16.000                               | 6.000   | 14.000 | 36.000                        |
|                                | Crushing (export)                   |                | 90.000    | 90.000                  |                                      |         |        |                               |
| Wood chip for energy           |                                     |                | 200.000   |                         |                                      |         |        | 200.000                       |
| Firewood                       |                                     |                | 255.000   |                         |                                      |         |        | 255.000                       |
| <b>TOTAL wood in roll (m³)</b> |                                     | 15.000         | 1.334.000 |                         | <b>TOTAL FOREST BY-PRODUCTS (m³)</b> |         |        | 938.744                       |

This initial increase would make it possible to:

- Cover the needs of **the Catalan packaging industry**, while simultaneously reducing its dependence on roundwood imports. The growth of the Catalan packaging industry is fundamental to stimulating forest management. Although pallets are in high demand due to the large amounts of exports, the growth of this sector is currently impeded by a lack of raw material from Catalan forests.
- Obtain nearly 100,000 m³ of roundwood for the development of a **secondary processing forest industry** which exploits higher quality wood for construction.







## Wood construction

- Supply raw material to the **Catalan furniture industry**, with annual revenues of €1.322 billion<sup>2</sup>, to help it cover part of its production with local wood.
- Maintain the production of **billets, poles, sticks, etc.**
- Guarantee the **export** commitments made by some Catalan companies to foreign paper makers.
- Supply biomass to the current **electric power plants and thermal boilers**, and also provide enough biomass for the anticipated increase in the Strategy for the use of farm and forest biomass in Catalonia for the 2021-2027 period.

- Continue with the **current production of firewood**; future increments are not anticipated, given that it has remained relatively stable in recent years.

In total, a 30% increase in roundwood production is predicted for 2030, a feasible volume given the current insufficient exploitation of Catalan forests and compatible with the sustainable forest management criteria established at the Forest Europe Conference in Lisbon. In any event, predictions made using the forest planning instruments currently in force would always be taken into account.

Building with wood makes it possible to reduce the amount of material use, waste and installation time, given that wood has higher thermal efficiency and its production generates fewer CO<sub>2</sub> emissions in comparison with cement. Thus, the development of new wood-based materials, including CLT, represents an opportunity to **increase energy efficiency and reduce emissions** in the building sector. In fact, of the one million m<sup>3</sup> of roundwood harvested from Catalan forests in 2019, only 2,000 m<sup>3</sup> was used for CLT production.

In accordance with the foreseen bioeconomy scenario, the development of a secondary wood processing industry would make it possible to transform some 100,000 m<sup>3</sup> of roundwood into CLT, thereby adding **maximum value to the highest quality wood and creating jobs** in the forest chain.



<sup>2</sup> **The housing sector in Catalonia: Sector snapshot.** ACCIÓ, Generalitat de Catalunya (2018)

## Biocombustibles forestals

Forest biofuels include firewood, wood chips and pellets derived from primary wood processing, as well as byproducts from the secondary industrial processing of wood. To this end, the Government of Catalonia has passed the **Strategy for Promoting Farm and Forest Biomass Energy Use in Catalonia** as a priority area in energy policy for the important environmental, social and economic benefits it entails, because the CO<sub>2</sub> balance from biomass combustion is considered neutral if we set aside extraction processes and biomass transport.

In fact, given the absence of a Catalan papermaking industry which would consume pulpwood or other forest products with lower added value, **forest harvesting to produce biofuels represents the**



**most environmentally and economically sustainable option** for giving these products a commercial outlet. As for the potential volume, it must be considered that, after the conversion process, some 750,000 tonnes of forest biomass (with 50% humidity) are produced, of which 45% corresponds to wood chips, 30% to firewood, 13% to bark, and 12% to sawdust. While it is true that part of this biomass is exported, although with a significant decrease in recent years, the rest does not have energetic purposes.

With the bioeconomic scenario envisioned in EBC2030, the increase in biomass production for energy purposes would occur both directly, with the 30% increase in roundwood production in Catalonia, and indirectly through industrial byproducts. In this sense, by 2030, the production of forest biomass (with 50% humidity) is expected to rise to 938,200 tonnes, 48% of which would correspond to wood chips, 27% to firewood, 13% to sawdust, and 12% to bark.

With regard to its destination, the **Strategy for Promoting Farm and Forest Biomass Energy Use in Catalonia** envisions a significant reduction in the exportation of industrial wood chips, in contrast to a slight increase in the consumption of firewood and generation of electricity from biomass, as well as the ongoing growth of wood chip consumption for pellets and heating purposes.



## Cork

Cork is a material with a high regeneration capacity and a combination of properties which make it unique for its versatility and suitability for a wide range of applications in various sectors. It stands out, in particular, for its lightness, impermeability, and low heat and sound transmission, as well as its high compressibility, elasticity, flexibility, durability, stability and rigidity.

According to the **Catalan Forest Observatory**, in 2020, 7,034 tonnes of cork was produced, of which 4,954 tonnes corresponded to 'reproduction cork' and the remaining 2,080 tonnes to the harvesting of lower-quality 'virgin cork'. It represents a total production close to the average for the 2015-2020 period, albeit with a different composition, since reproduction cork would come to an annual average of 5,406 tonnes and virgin cork to 1,617 tonnes.

According to figures from the Catalan Cork Institute, Catalonia produced 550 million sparkling wine (including cava) corks and 137 million still wine corks. Nonetheless, it must be taken into account that the material for manufacturing these corks is imported basically from southern Spain (Andalusia and Extremadura) and Portugal, because the production of Catalan cork groves is insufficient.

This Catalan cork sector is concentrated mainly in the counties of Girona and is made up of some twenty companies, which directly employ 400 workers, in addition to bark stripping crews, which represent another 300 workers. The value of the sector's production comes to €144.2 million.

Through the byproduct generated in the **production of wine and cava corks**, the circular bioeconomy contemplates other possible uses for cork: for example, as a **structural component in construction** (to make buildings lighter, or as an element of anti-vibra-

tion or thermal and acoustic insulation), **coatings in construction and industry**, uses in the **sectors of decoration and fashion, or energy-related applications**.

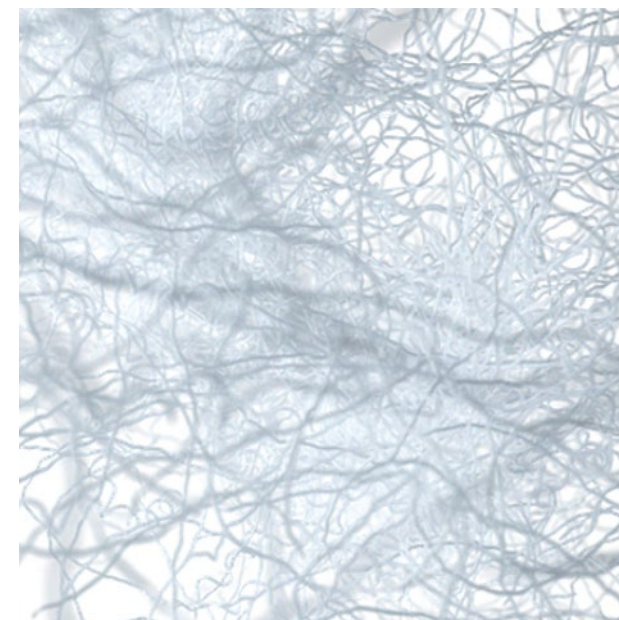
## Other innovative uses

The potential for innovative uses lies both in non-wood products (resins, mushrooms, truffles, medicinal and aromatic plants) and wood products alike, but in any event, turning them into **products of high added value** will require the development of **biorefineries** in the coming years as a key factor.

Some of these bioproducts will be acquired using **integrated forest biorefineries**, designed to make the best possible use of the various components of lignocellulosic biomass (cellulose, hemicellulose and lignin) in order to maximise the added value of the great diversity of products obtained from this biomass (biomaterials, bio-fuels, bioproducts and bioenergy).

In this way, using thermochemical or biological means to process forest biomass, as well as farm biomass, sludges and slurries, biorefineries make it possible to obtain bioproducts of high added value, **such as chemicals, fertilisers, nanocellulose, additives and active ingredients for the cosmetics and nutraceutical industry**. In fact, the development of these biorefineries is presented as an opportunity to **add value to low value wood and waste derived from clearings and trimming, thereby making the management of forested areas more profitable**.

As for fungi, their use is not restricted merely to food: new uses for them are being identified, as is the case of **muskin** (an alternative to animal leather), or as **natural log biodegraders, or in the development of new medicines** not only for humans but also for insects, such as the bees fundamental to pollination, among others.



**Resource  
recovery from  
livestock waste  
and organic waste**



## 2 / Resource recovery from livestock waste and organic waste

### Description

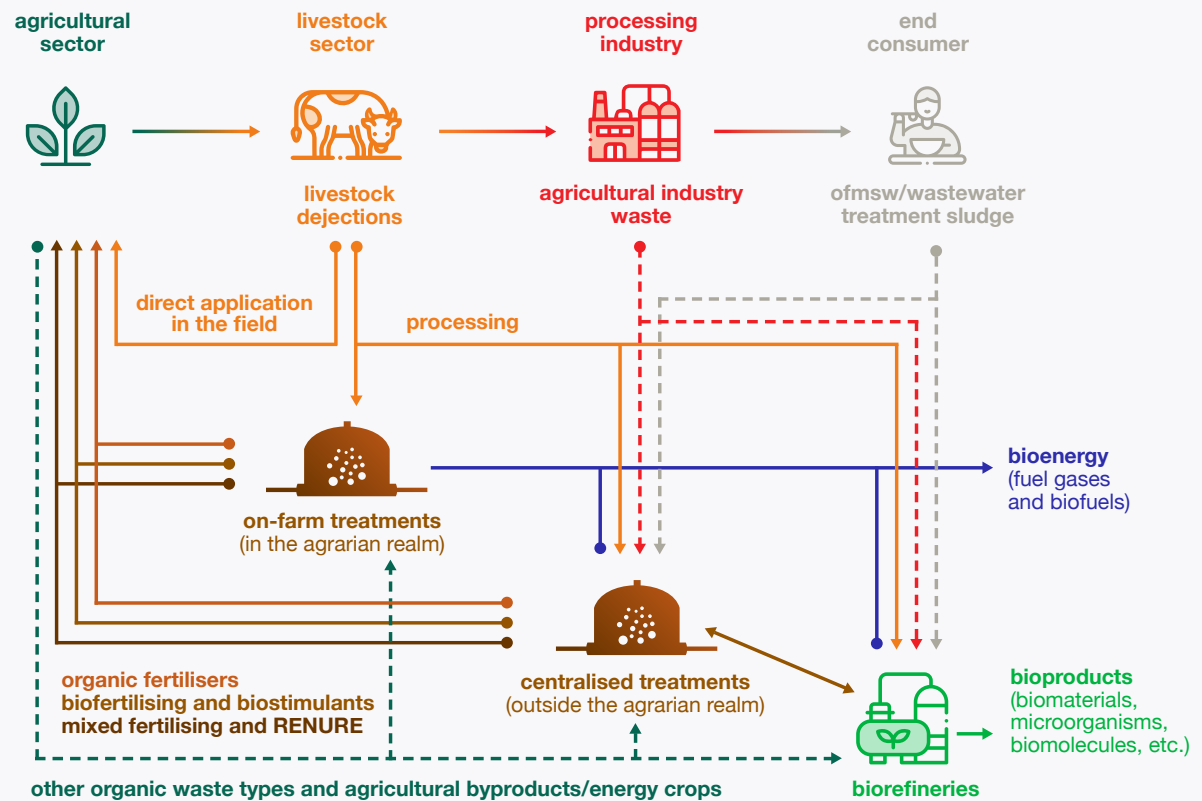
In Catalonia, according to **consolidated data from 2019**, there are 7.9 million pigs, 637,000 head of cattle and 44.6 million units of poultry, which generate 9.4 million tonnes of slurry and 2.8 million tonnes of **manure and poultry litter** every year<sup>3</sup>. This waste contains a significant amount of nutrients and organic matter, equivalent to 136, 77 and 113 thousand tonnes of N, P and K, respectively. In comparison, 49,488 tonnes of nitrogenous mineral fertilisers, 24,189 tonnes of phosphorous fertilisers and 37,937 tonnes of inorganic (mineral or chemically synthesised) potassium fertilisers **were applied to fields in 2020**, levels which have remained stable over the last three years.

Thus, the development of a resource recovery chain for livestock waste and organic waste would make it possible to reduce this dependence on nonrenewable raw materials, while simultaneously lowering emissions, improving nutrient recovery, and increasing the sustainability of agricultural systems through circular-bioeconomy-based strategies which provide a higher economic value. To accomplish these goals, a chain of this type must include: 1) the recovery of nutrients in the form of **organically based fertilisers** through direct application or processing; 2) the production of **bio-energy** through anaerobic digestion and other processes of energy recovery such as pyrolysis and/or gasification; and 3) the integration of these processes in the context of a biorefinery for the extraction and/or synthesis of new **bioproducts** with higher added value (Figure 2).

<sup>3</sup> Guia de les tecnologies de tractament de les dejeccions ramaderes a Catalunya. [Guide to livestock waste treatment technologies in Catalonia]. DACC, Generalitat de Catalunya (Government of Catalonia) (2020).

**Figure 2**  
Outline of the livestock waste and organic waste chain.

Source: IRTA



## Current resource recovery routes

Due to its simplicity, the method traditionally applied for the management of livestock dejections has been to spread them on crop fields (**direct application**) with no prior processing. However, this method entails a number of disadvantages, mainly the difficulty involved in applying adequate doses of nutrients, emissions of greenhouse gases, ammonia and foul odours, and the presence of pathogenic microorganisms, as well as the possible leaching of nitrates into groundwater. Moreover, the transport of dejections from areas with



high livestock density to more distant fields would not be economically feasible due to the low concentration of nutrients in this waste. Consequently, in this area, innovation is geared toward designing application systems which generate fewer emissions, such as injecting or burying waste in the soil, or which incorporate methods for in situ nutrient monitoring and geolocation of the application of the waste, in order to guarantee a fertilisation scheme better suited to the needs of the crops and, in the case of areas vulnerable to nitrates, and to guarantee compliance with environmental law.

The other management option is the **processing** of livestock waste to match it to agronomic needs and produce higher-quality organic fertilisers through physicochemical and biological treatments. In fact, the generalisation of treating waste in the agrarian sector (on the farms themselves) is one of the principal initiatives for improving the management of nutrients of organic origin, although this treatment can also be used in non-farm situations in a more complex way to produce organically-based commercial fertilisers. The external plants producing such fertiliser rely on technical specialisation and economies of scale to work. The most commonly used treatments in Catalonia within the agrarian sector are the **separation of slurry** and the **composting** of manures, litters, and the solid phase of previously separated slurry. Treating waste solves some of the disadvantages of using livestock waste. For example, the water content is lowered, and the proportion of certain nutrients and organic matter is increased and, in the case of compost, the treated product is sanitised. Some livestock operations also opt to eliminate surplus nitrogen through **nitrification-denitrification**. It must be taken into account, however, that to the extent to which this technology represents the destruction of a resource instead of its recovery, it contravenes the principles of the bioeconomy and its consideration as the best available technology is restricted.



## Opportunities

The present Action Plan aims to reinforce the development of the following value chains in the area of livestock waste:

### Biogas and biomethane

One form of treatment with high potential in the bioeconomic sphere is **anaerobic digestion**. Two products are obtained through this process: **biogas** (fuel gas) and **digestate** (stabilised organic fertiliser). The implementation of anaerobic digestion plants represents a major investment, frequently not feasible for the smallest livestock companies. The centralised plants (outside the agricultural sector) which serve multiple livestock companies can take advantage of economies of scale, but they are subject to a more complex system of administrative management, as well as higher costs and health risks when it comes to transporting the livestock waste. The new opportunities for anaerobic digestion are associated with **codigestion with other types of organic waste** from the food production industry which has a higher potential to generate methane, and its enrichment in the form of **biomethane**. Biomethane may be compressed and used in situ as a fuel for vehicles, but current legislation also allows for its sale and injection into the natural gas network.



### Innovative organic fertilisers

In 2019, the European Union (EU) published a new **regulation on fertilisers** which harmonises the definition of various products, such as **biofertilisers**, which have been classified as **biostimulants**. The regulation, which will enter into force on 16 July 2022, makes fertiliser production more transparent and eliminates barriers to trading it within the European market.

In 2020, the EU also published a technical report<sup>4</sup> proposing a new category of fertilisers derived partly or totally from livestock waste: recovered nitrogen from manure (**RENURE**). RENURE fertilisers could be used in areas vulnerable to nitrate pollution, according to the exact same provisions as the ones applied to nitrogenous chemical fertilisers. In these circumstances, it could be possible to incentivise a major replacement of the inorganic nutrients which, in general, have a larger environmental impact on a global scale than organic nutrients.



<sup>4</sup> **Technical proposals for the safe use of processed manure above the threshold established for Nitrate Vulnerable Zones by the Nitrates Directive 91/676/EEC.** Comissió Europea, Centre Comú de Recerca, Huygens, D., Orveillon, G., Lugato, E., et al., Publications Office (2020).



## Other products of high added value

In addition to recovering nutrients and bioenergy from livestock waste, the integration of these processes in the context of a **bi-refinery** may facilitate the extraction and/or synthesis of new products with **higher added value**. As of today, these resource recovery routes are still in a relatively early phase of development and, with the exception of a few niche products, processes mature enough to result in marketable products have yet to be identified. Some of these emerging processes include the manufacturing of **biomaterials**, whether through the route of fibre (cellulose) extraction or the **biosynthesis of polymers** (polyhydroxyalkanoates for the manufacture of bioplastics), or through the production of **new sources of biomass** derived from livestock waste (insects, algae, mould, etc.), which in turn may serve to synthesise new bioproducts.



Recovery of  
coproducts and  
byproducts from  
the food chain



### 3 / Recovery of coproducts and byproducts from the food chain

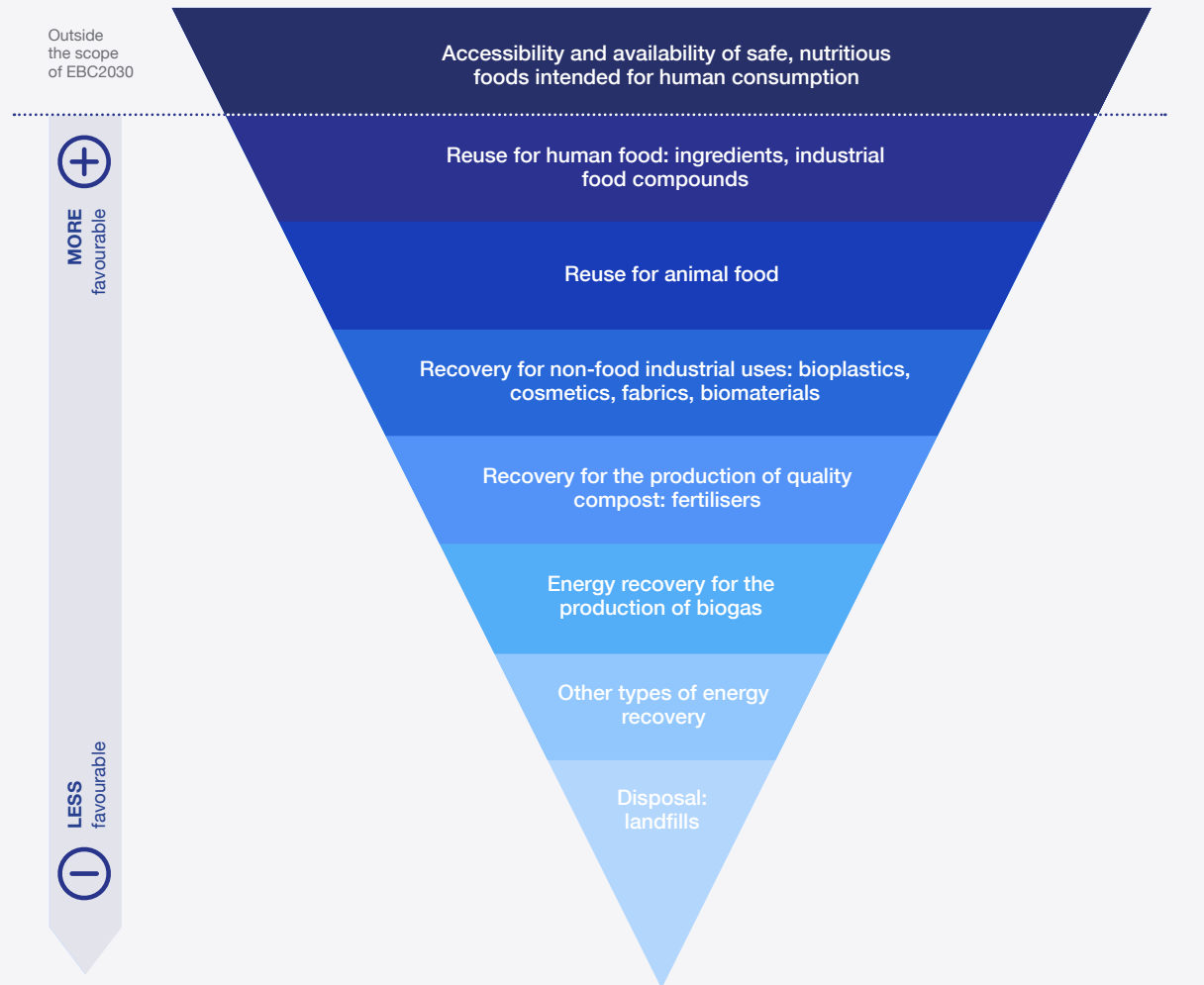
## Description

In Catalonia, **according to data from 2020**, an average of 226,000 tonnes of vegetables, 179,000 tonnes of citrus, and 750,000 tonnes of sweet fruit is produced. If we also include cereals, legumes, forage crops, tubers, vines and olives, a total of 3,833,000 tonnes of plant products are produced. With respect to **fruit** production, the percentages of **food loss and waste (FLW)** in the primary sector, agricultural industry and wholesale distribution lie between 0.1% and 2.7% for apple, between 0.4% and 3% for pear, and between 0.4% and 3.5% for peach and nectarine, which accumulate, over the course of their chains, FLW quantities of 16,009 tonnes, 10,815.6 tonnes and 32,373.6 tonnes, respectively<sup>5</sup>. With respect to products of animal origin, Catalonia produces more than **two million tonnes of meat** every year from all domestic livestock (pigs, cattle, sheep, horses, poultry and rabbit) and has established itself as one of the most important production centres on the European continent (in 2017 it was the second-largest pork meat producer in Europe and the tenth-largest pork meat producer in the world). Animal byproducts not intended for human consumption (ABPs) are generated in slaughterhouses, processing industries, retail sale food establishments and households, for commercial or health reasons. Biomass from animal industry waste rose, in 2017,

<sup>5</sup> **Diagnosi de les pèrdues i el malbaratament alimentari al sector fruiter de préssec-nectarina, poma i pera: quantificació, impacte ambiental i econòmic.** Resum executiu. CREDA-UPC-IRTA, DARP i ARC (2020).

**Figure 3**  
**Adaptation of the food use hierarchy**

Source: CREDA-UPC-IRTA & DACC, 2019.



to 4,124 tonnes<sup>6</sup>; estimate based on DARIS data, from the Catalan Registry of Agrarian and Food Industries [RIAAC], and from the Iberian Accounts Analysis System [SABI]).

In the resource recovery chain of coproducts<sup>7</sup> and byproducts<sup>8</sup> of the food chain, the most favourable option for their **reuse is in human food** (ingredients, food industry compounds, etc.), followed by their **reuse for human food**. Up to this point, food safety continues to be a central concern. The following options include the recovery of elements and substances contained in food waste for **non-food industrial** uses (bioplastics, cosmetics, textiles, biomaterials, etc.) followed by nutrient recovery for the creation of **quality compost** (fertilisers), energy recovery for **biogas** production, and finally, prior to elimination, **other types of energy recovery** (Figure 3).

6 Estudis sobre les oportunitats d'aprofitament en els principals sectors agroalimentaris de Catalunya. [Studies on resource recovery opportunities in the main food and agriculture sectors of Catalonia.] CREDA-UPC-IRTA, DARP and ARC (2020).

7 Product usually obtained from a food after its technological processing, with a significantly higher value than other coproducts or derivatives of the value chain.

8 All waste items used as substitutes for commercial products and/or raw materials, and which can be recovered without being subjected to treatment operations, are considered byproducts and therefore may be managed as such.

## Current resource recovery paths

### Plant products

There are a broad range of opportunities for use and recovery in the plant product sector. In the first instance, there are possibilities for the **fresh consumption of products discarded** for aesthetic reasons or market standards. Next, there are many opportunities for transformation of the **fresh product into manufactured products**, where the plant material may be the main ingredient of the manufacturing or form part of the formulation of a final product. The plant material may be used in a wide variety of food product categories: horticultural coproducts are used in sauces, spreads, vegetables (mainly canned/frozen), precooked meals, side dishes, snacks, soups, dairy products (mainly cheeses), baked goods, processed meat and fish, or sweets. In the **fruit sector**, juice is the main processed product made from discarded fruit, but the discarded fruit is also used in fruit salads, canned, candied as an ingredient in traditional desserts, jams, etc. It can also be **transformed into different ingredients** used in other food products (powder, pulp, syrup, etc.). These ingredients are incorporated into many categories of food products, such as yoghurt, ice cream and confectionery, dried or candied fruit, alcoholic drinks like beer, and non-alcoholic drinks like iced tea.

Meanwhile, the high content of substances or active ingredients in many plant byproducts such as peels, seeds or flours allows them to be used for therapeutic, aromatic, dietetic or gastronomic purposes. The **bioactive compounds** extracted from plant material are widely used in the food and agriculture sector to replace synthetic dietary complements or serve as functional supplements.

**Composting and its use for animal feed** are also typical paths for the reuse of these products. In addition, there is a wide variety of waste types which can be used in **anaerobic digestion**, although not all have the same properties in terms of their potential for **biogas production**.



## Animal products

The main **animal byproduct** recovery paths begin with the **slaughter and butchering** of the carcasses. In this sense, the processing of the internal organs, blood, fur, skin, claws, fat and bones makes it possible to obtain a broad spectrum of **products for human and animal consumption** (functional ingredients, collagen, gelatin, protein hydrolysates, etc.) and **products for the pharmaceutical industry** (insulin, heparin, hormones and enzymes).

Similarly, the entrails, heads, skin, eyes, spines and scraps of muscle tissue originating from the processing of fish (**aquaculture coproducts**) can be transformed into products suitable for **human consumption** (surimi, etc.), animal consumption (fishmeal and fish oil, protein hydrolysates, etc.), and the **cosmetics and pharmaceutical industry** (bioactive peptides, collagen, vitamins, hyaluronic acid, protamine, etc.).



## Opportunities

This Action Plan aims to reinforce the development of the following value chains in the area of coproducts and byproducts of the food chain through the bioeconomy:

### Plant-based products

Given the large volume of plant byproducts and coproducts unable to enter the market chain while fresh, other recovery paths are being studied. One of the most valuable is the **reincorporation of the substances present in byproducts into other food products** (processed snacks, appetisers, baked products, etc.). One example is the use of broccoli stems and their health-benefits in terms of fibre, glucosinolates and phenolic compound contents when added to other products like crackers, baked products or soups/sauces. In the case of the tomato, pulp derived from its processing can be reused as an ingredient in other foods, or intermediate food products (IFP). The processing of the pulp and peels of fruits like apples or peaches into highly nutritious powders with antioxidant, colouring, thickening and nourishing properties opens a range of possibilities to be used in the manufacturing of different products.

Another option which has been gaining ground and is a topic of research is the use of pulp and peels in **biorefineries**, using sequential extraction to obtain **products with added value**, such as compounds with functional or technofunctional properties, or aromas for the food industry, or other products for the cosmetics or pharmaceutical industry. There are a number of examples along these lines: they are a potential source of polyphenols in byproducts from the olive oil industry or wine sector, of pectins in plant products derived from citrus fruit, apples and peaches, or of high  $\beta$ -glucan content in cereal flours. **Bioconversion with insects/mushrooms/microorganisms** may be an interesting method for



## Animal products

There are different paths to adding value to the products obtained from animal coproducts, which can be classified according to what purpose they are used for:

With regard to use for human consumption, **protein recovery**, in addition to as a nutritional source or load protein (amino acids/proteic nitrogen), a more effective valorisation can be obtained with the production of different fractions (proteins and fat) and the development of **protein isolates and hydrolysates** with different technological functionalities, which in some cases can be conveniently modified. The value of these protein isolates will depend on their emulsification, thickening, foaming, texturizing and other properties, and the extent to which they can be adapted to the food industry's needs. The use of **whey** (cheese coproduct) as a source of pep-

tides and proteins with high biological value offers an interesting opportunity for the development of dairy and plant-based creams and beverages.

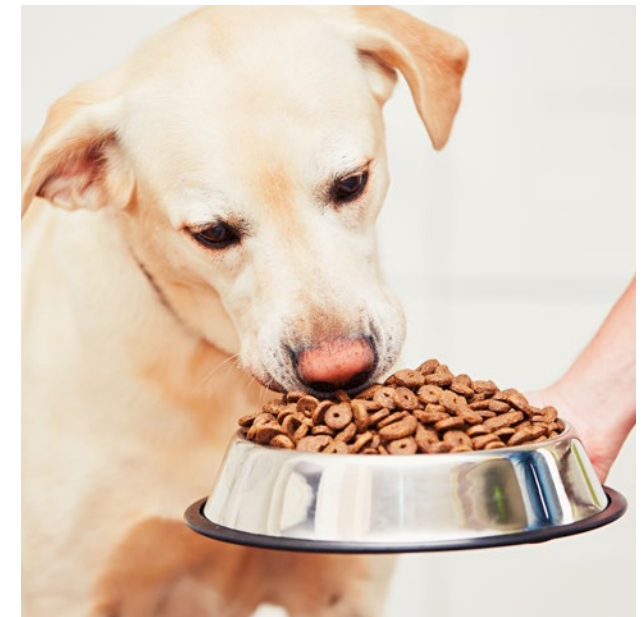
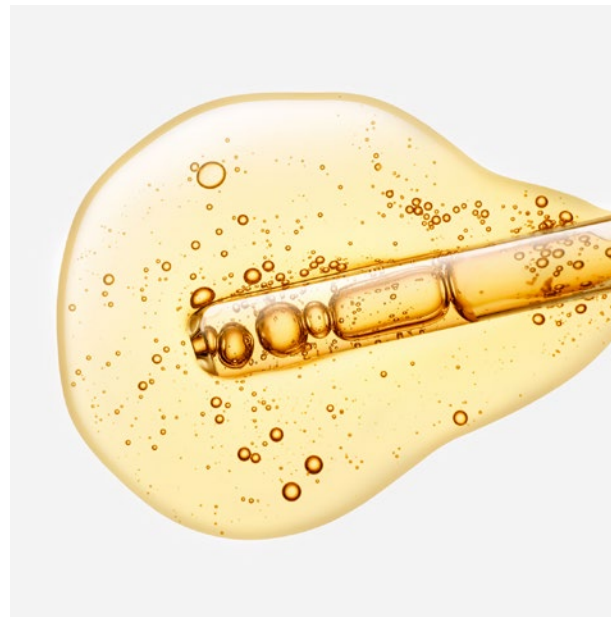
In relation to its use in animal feed, the development of **pet food ingredients** makes it possible to obtain higher added value than when these substances are allocated to livestock; however, at the same time it is necessary to develop certain very specific product characteristics for each application. The use of **fermentation and bioconversion processes** can be exploited through the transformation of different organisms (bacteria, moulds, yeasts, insects, etc.).

Another use with great potential is the pharmaceutical industry, through the production of **new bioactive compounds** (enzymes, peptides, protein hydrolysates) and/or development of more efficient obtainment processes, from the point of view of both the performance and the stability of the compounds.

obtaining biomass rich in proteins and bioactive components.

In any event, the waste produced in the extraction process at these biorefineries may be used in animal feed, fertiliser, compost or bio-fuels.

Another example may be **pomace/bagasse**, which can be reused for technical applications associated with food production, such as the production of xylitol, lactic acid and prebiotics. It is also a source of phenolic compounds and can be used as a substrate for the growth of various microorganisms.



**Creation of resilient  
farm and forest  
landscapes and the  
sustainable provision  
of ecosystem services**



## 4 / Creation of resilient farm and forest landscapes and the sustainable provision of ecosystem services

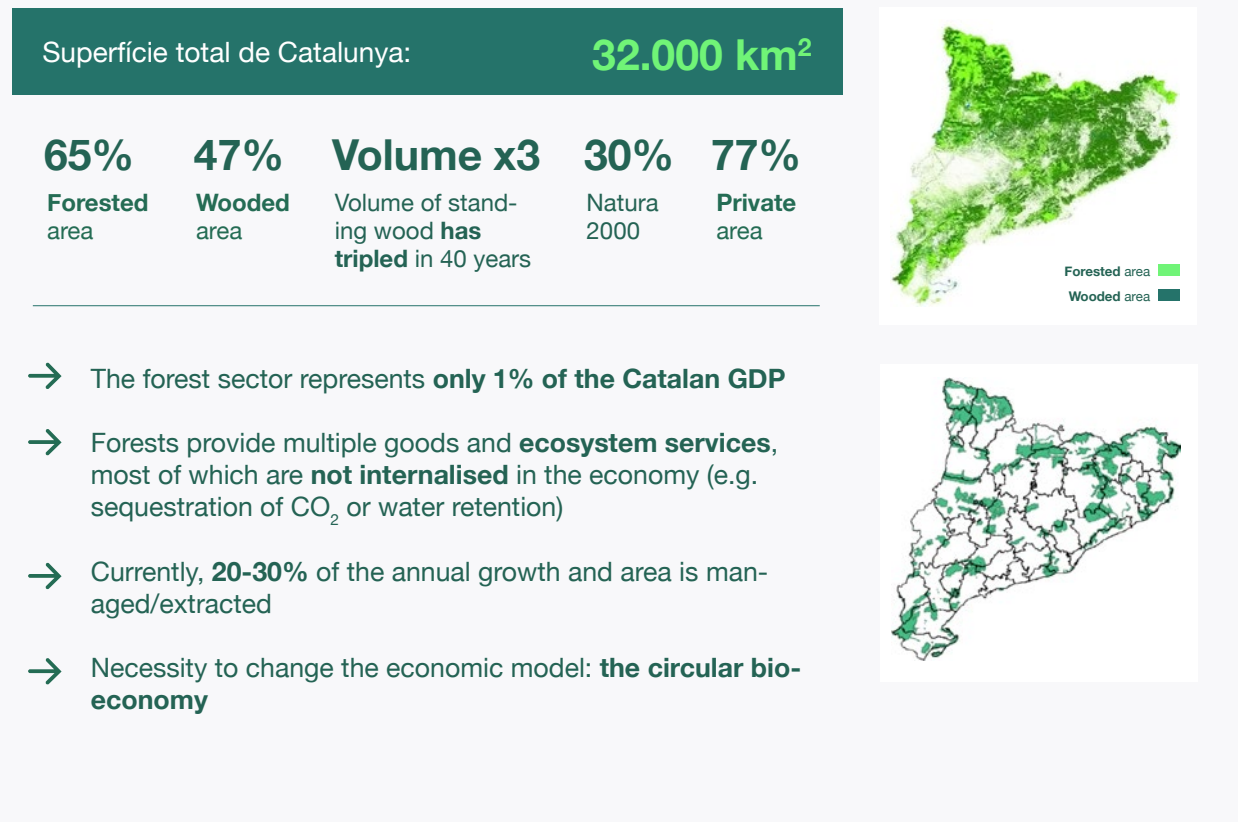
### Description

Catalonia is a land of forests (Figure 4). **Managing forest and agricultural ecosystems in an environmentally friendly and socially and economically stable way** constitutes, today, a national challenge, especially in light of the impacts caused by climate change and the food and raw material supply chain crisis.

The development of **resilient farm and forest landscapes and the sustainable provision of ecosystem services** aims to offer a response to this context, transforming a challenge into an opportunity for regional planning and management which makes it possible to add value to local natural resources, in addition to pursuing a model of sustainable rural development which incorporates the territory's needs.

**Figure 4**  
Catalonia, land of forests

Source: CTFC





## Current situation

In the current context of global change, there is a need to explore and find answers and practical solutions to:

- 
- Preserve a variety of diverse and healthy ecosystems.
- 
- Conserve and improve the quality of agricultural soils and foster their role as a carbon sink.
- 
- Stop biodiversity loss.
- 
- Design and restore farmland-forest mosaic landscapes which enable environmental, social and economic stability, and which are resilient to the effects of climate change.
- 

Although the concept of the farmland-forest landscape amounts to an attractive framework for designing and managing a large part of Catalan landscapes, with great potential for confronting environmental, social and economic changes on a local and global scale, **it is currently a challenge to put into practice**. Implementing resistant and resilient landscapes will require keeping the following aspects in mind:

- Forest analysis and planning
- Ecosystem service provision and biodiversity conservation
- Socioeconomic and governmental mechanisms
- Legal and urban planning framework
- Risks



## Opportunities

To manage landscape resilience or design a resilient farm and forest landscape, it is first necessary to identify which **attributes of the system** must be resilient and which environmental or socioeconomic stressors these attributes must be resilient to. The resilience “of what?” and “to what?” must be determined. **Figure 5** lists some of the characteristic elements and stress factors to which Catalan forest ecosystems and farm and forest landscapes will potentially be subjected.

Through understanding landscape resistance and resilience, the aim is to develop technological, environmental, security-related and socioeconomic solutions in the landscape and to incorporate all relevant agents/roles with responsibilities in these processes of change. Given the complex, cross-cutting dimension which defines the establishment of these landscapes, the following approaches ought to be considered:

- **Scientific/technical analysis** through advanced **modelling** tools to define priority management areas for preventing risks, balancing and improving ecosystem service provision, and encouraging biodiversity.
- Cooperative framework on a **public and private** level to incentivise the establishment of commercially competitive farm and forest value chains through diverse economic and financial mechanisms: grants on a regional and European level, improvement of insurance plans (e.g. fire insurance), etc.
- **Governance** processes to favour a good match of the multiple parties involved: landowners, businesses, etc.
- **Mechanisms** to incentivise work and activity in the territory (tax breaks, credits, etc.).



**Figure 5**  
Characteristic elements and stress factors to which Catalan farm and forest landscapes and forest ecosystems will potentially be subject

Source: CTFC

|                    | Agroforest landscape                                                                                                                                                                                                                                     |                                                                                                                                                                                                     |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resilience of what | <ul style="list-style-type: none"> <li>• Forest habitats and open habitats (shrubland, meadows and farmland)</li> <li>• Biodiversity</li> </ul>                                                                                                          | <ul style="list-style-type: none"> <li>• Water balance</li> <li>• Food security and sovereignty</li> <li>• Carbon balance</li> <li>• Wood supply</li> </ul>                                         |
| Resilience to what | <ul style="list-style-type: none"> <li>• Habitat loss and fragmentation</li> <li>• Overexploitation of natural resources</li> <li>• Demand for bioproducts</li> <li>• Fluctuations in the market prices of agricultural and forestry products</li> </ul> | <ul style="list-style-type: none"> <li>• Extreme weather events (drought, floods, etc.)</li> <li>• Invasive species</li> <li>• Risk of forest fires</li> <li>• Impacts of climate change</li> </ul> |



**ACTION  
PLAN**  
2022-2024

# Methodology

## Methodology /

The following methodology has been followed in the design of the 2022-2024 Action Plan:

1. Identification of the series of **interventions** in the sphere of EBC2030 which the Government of Catalonia intends to develop in the 2022-2024 period.
2. Detailed analysis of the different **interventions** for the identification of overlaps and/or gaps in relation to the strategic goals, strategic lines and measures of EBC2030 and the four value chains prioritised in the present Action Plan.
3. Definition of **transformative actions** based on this analysis and the following criteria:
  - / Need and opportunities for implementation
  - / Viability of execution
  - / Transformative potential to generate systemic changes
4. Validation of the transformative actions by the different lead units of the Government of Catalonia. This validation has been performed via a meeting of the EBC2030 Intradepartmental Commission and various bilateral meetings.

The different units of the Government of Catalonia in charge of the transformative actions are presented as follows.

**Table 4**  
**List of the lead units of the 2022-2024 Action Plan**

|                |   |                                                   |
|----------------|---|---------------------------------------------------|
| <b>DACC</b>    | / | Ministry of Climate Action, Food and Rural Agenda |
| <b>ARC</b>     | / | Catalan Waste Agency                              |
| <b>ACA</b>     | / | Catalan Water Agency                              |
| <b>ICAEN</b>   | / | Catalan Energy Institute                          |
| <b>ACCIÓ</b>   | / | Agency for Business Competitiveness               |
| <b>DPRE</b>    | / | Ministry of the Presidency                        |
| <b>DE</b>      | / | Ministry of Education                             |
| <b>DEH</b>     | / | Ministry of Economy and Finance                   |
| <b>DREU</b>    | / | Ministry of Research and Universities             |
| <b>DEMT</b>    | / | Ministry of Business and Labour                   |
| <b>INCASÒL</b> | / | Catalan Soil Institute                            |

The Action Plan is a **living document**, designed to monitor the development and implementation of the transformative actions as well as all other interventions in the sphere of EBC2030 which the Government of Catalonia aims to pursue in the 2022-2024 period.



**ACTION  
PLAN**  
2022-2024

# Transformative actions

## Transformative actions /

The 2022-2024 Action Plan is made up of **15 transformative actions** which cover the seven strategic goals, 15 strategic lines and 30 measures of EBC2030. The transformative actions develop more than **81% of the Strategy's measures**. The remaining 19% are not covered by the transformative actions, either because they are measures already being developed through interventions programmed by the various governmental departments or because they will be included in forthcoming triennial action plans.

The **Ministry of Climate Action, Food and Rural Agenda is involved in all 15 transformative actions**, of which two will be promoted by the DACC and the rest jointly developed by the units connected to the DACC and other units of the Government of Catalonia.

With regard to the value chains, **eight actions affect all four value chains in a cross-cutting manner** and the rest have effects in one or more chains.

The following table displays the **15 transformative actions (AT)** contemplated in Action Plan I, from AT1 to AT15, and their relationship to the value chain they develop, the strategic goals, strategic lines and measures of EBC2030, as well as the lead units in charge of developing them:



**Table 5** Transformative actions of the 2022-2024 Action Plan

| AT    | Transformative actions                                                  | Lead units                         | Chain          | Strategic goals | Strategic lines | Measures            |
|-------|-------------------------------------------------------------------------|------------------------------------|----------------|-----------------|-----------------|---------------------|
| AT 1  | Circular Bioeconomy Observatory                                         | DACC, ARC, ACA, ICAEN              | TR             | O1              | O1.L1           | M1, M2              |
| AT 2  | Circular Bioeconomy Hub                                                 | DACC, ARC, ACCIÓ, ICAEN            | TR             | O2              | O2.L1, O2.L3    | M5, M6, M7, M8, M10 |
| AT 3  | Public procurement                                                      | DACC, DPRE, DEH                    | TR             | O3              | O3.L1           | M13                 |
| AT 4  | Raising citizen awareness                                               | DACC, ARC, ACCIÓ, DE, DREU         | TR             | O3, O7          | O3.L2, O7.L1    | M15, M35, M36       |
| AT 5  | Circular Bioeconomy Research and Innovation Platform                    | DACC, ARC, ACA, ACCIÓ, ICAEN, DREU | TR             | O5              | O5.L1, O5.L2    | M23, M26, M27, M28  |
| AT 6  | New professional profiles and ongoing training                          | DACC, DE, DREU, DEMA, DPRE, ACCIÓ  | TR             | O5              | O5.L3           | M30                 |
| AT 7  | Circular Bioeconomy Office                                              | DACC                               | TR             | O6              | O6.L1, O6.L2    | M32, M33, M34       |
| AT 8  | Circular Bioeconomy Comanagement Board                                  | DACC                               | TR             | O7              | O7.L2           | M37                 |
| AT 9  | Energy production from local biomass                                    | DACC, ARC, ICAEN, ACA              | FOR, DEJ, ALIM | O1              | O1.L2           | M4, M5              |
| AT 10 | Biomass access and management                                           | DACC, ARC, ACA                     | FOR, DEJ, ALIM | O1              | O1.L2           | M5                  |
| AT 11 | New business models based on circular bioeconomy                        | DACC, ACCIÓ, INCASÒL               | FOR, DEJ, ALIM | O2              | O2.L3           | M11, M12            |
| AT 12 | Network of plants on a preindustrial scale                              | DACC, ACA                          | FOR, DEJ, ALIM | O5              | O5.L1           | M24                 |
| AT 13 | Organic fertilisers and improvement in soil quality                     | DACC, ARC                          | DEJ, PAIS      | O4              | O4.L2           | M19                 |
| AT 14 | Pilot projects for the creation of resilient farm and forest landscapes | DACC, ACA                          | PAIS           | O4              | O4.L1           | M17, M18            |
| AT 15 | Ecosystem service valuation                                             | DACC, ACA                          | PAIS           | O4              | O4.L2, O4.L3    | M20, M21, M22       |

In all actions of a territorial nature with the potential to affect biodiversity conservation, a cost-benefit study will be conducted to assess the impacts, both positive and negative, on natural wealth and biodiversity, and the main risks and conditioning factors to be considered.

**TR:** Cross-cutting  
**FOR:** Improvement in forest management and the use of forest resources  
**DEJ:** Recovery of livestock waste and organic waste  
**ALIM:** Recovery of coproducts and byproducts from the food chain  
**PAIS:** Resilient farm and forest landscapes and sustainable provision of ecosystem services



## Transformative action info sheets /

The 15 transformative actions are detailed below in the format of an info sheet which includes the following fields:

**Strategic goals** of EBC2030 to which the transformative action provides a response.

**Strategic lines** of EBC2030 to which the transformative action provides a response.

**Measures** of EBC2030 to which the transformative action provides a response.

**Description** of the objectives of the transformative action and a list of the different actions for development.

**Major targets** of EBC2030 to which the transformative action contributes.

**Lead units** responsible for developing and implementing the transformative action.

**Value chains** which the transformative action will promote.

Description of the **obstacles to overcome** in the development and implementation of the transformative action.

**Possible funding sources** for the development and implementation of the transformative action.

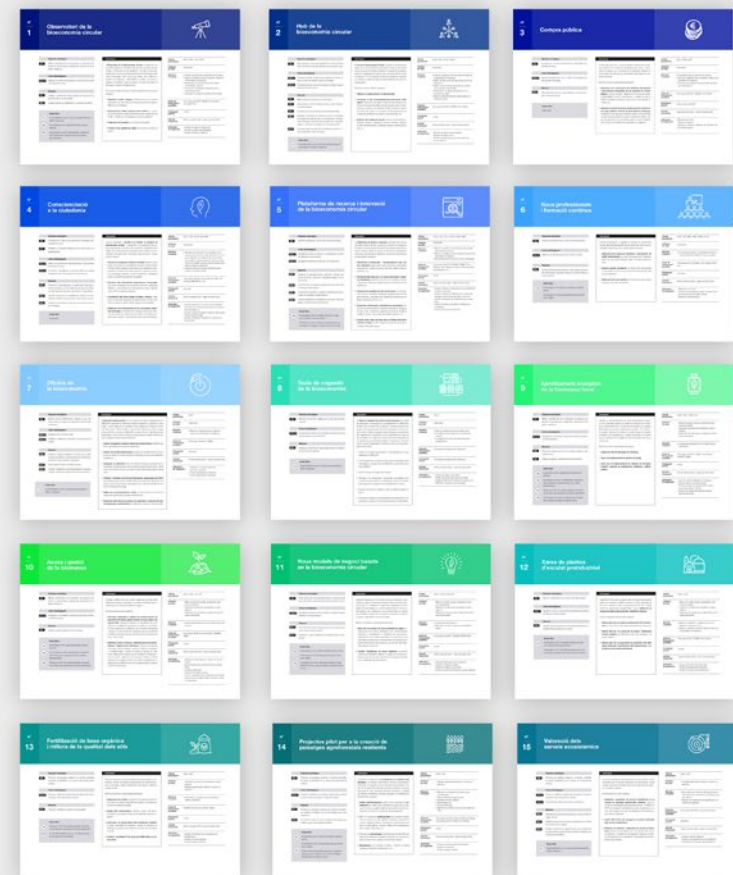
**Budget estimate** for the development and implementation of the transformative action.

**Period of execution** for the development and implementation of the transformative action within the period of the Action Plan.

**Tracking indicators** for monitoring of the development and implementation of the transformative action.

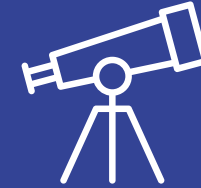
# ACTION PLAN 2022-2024

EBC2030 2030 CATALAN BIOECONOMY STRATEGY





# Circular Bioeconomy Observatory



## Strategic goals

- O1.** Improve the use of Catalonia's biomass by characterising it, quantifying it, and optimising its management and distribution.

## Strategic lines

- O1.L1** Provide biomass data in a format which adds value for users.

## Measures

- M1.** Integrate and complete the existing data on the bioeconomy in an observatory..
- M2.** Integrate systems of digitalisation and advanced data use.

## Major targets

- F1.** Increase the weight of the bioeconomy in Catalonia's gross value added (GVA) by up to 5%.
- F5.** Increase the use of forest resources by 30%.
- F6.** Increase the use and recovery of coproducts and byproducts from the food chain by 40%.

## Description

The **Circular Bioeconomy Observatory** will consist of a digital platform to be incorporated within the Circular Bioeconomy hub. The Observatory must centralise and convey the information, quantification and evolution of potential biomass flows using a common tool and methodology which incorporates, among other parameters: the location and availability of waste and resources; the mapping of quantities and types of waste and resources; biomass inventories, and infrastructure mapping.

For its creation, the development of the following actions is foreseen:

- Identifying, gathering and integrating** into the Observatory all available data needed to characterise the biomass and its future availability in Catalonia.
- Structuring the data and generating new data** to complete the existing data: it will be necessary to determine which new data must be collected and establish a methodology for generating it.
- Publishing the data** in an interoperable format.
- Creating a digital platform** to facilitate the use of the data.

**Lead units** DACC, ARC, ACA, ICAEN

**Value chains** Cross-cutting

**Obstacles to overcome**

- Establish an adequate form of data governance.
- Lack of coordination between the different units of the Government of Catalonia.
- Fragmentation and heterogeneity of the existing data and methodologies.
- Incorporate the technology suitable for optimal functioning.
- Ensure the regular updating of the data.

**Possible funding sources** Own funds of the DACC, ERDF, Climate Fund, REACT-EU Fund

**Budget estimate** €1.5 M

**Period of execution** First half 2022 – second half 2024

**Tracking indicators**

- Number of visits to the Observatory website.
- Number of data downloads.
- Number of reports produced.

# Circular bioeconomy hub



## Strategic goals

- O2.** Develop a business community based on the bioeconomy throughout the territory, with special attention paid to the primary sector.

## Strategic lines

- O2.L1** Promote cooperative work between companies throughout the supply chain to attract supply and demand.
- O2.L3** Provide incentives for the creation of new companies and business models based on the bioeconomy.

## Measures

- M5.** Develop the Bioeconomy hub using existing infrastructures.
- M6.** Foster the creation of industrial symbiosis initiatives.
- M7.** Identify and inventory the value chains, necessary technology and market potential of bioproducts, biomaterials and bioenergy, and geolocate producers, logistics operators, tech companies and end consumers.
- M8.** Foster the design of viability studies (economic, social and environmental) and business models.
- M10.** Improve biomass management and distribution.

## Major targets

- F1.** Increase the weight of the bioeconomy in Catalonia's GVA by up to 5%.

## Description

The **Circular Bioeconomy hub** will consist of a digital platform to be developed via the Circular Catalonia hub. It constitutes a meeting place for companies and institutions which provide solutions and strategies for advancing toward a circular bioeconomy in Catalonia. The hub will incorporate the different existing facilitating platforms and will offer a series of services addressed to the participants in the bioeconomy.

The actions to be carried out include:

- 1. Creation of a map of participants in the bioeconomy.**
- 2. Incorporation of facilitating tools/platforms/instruments into the hub:** Circular Bioeconomy Observatory, Circular Bioeconomy Research and Innovation Platform, byproduct exchange banks, industrial symbiosis initiatives, market studies for determining supply and demand, prospective studies for identification of trends in consumption and potential uses, etc.
- 3. Definition of the service catalogue:** services of guidance and mentoring, training and qualification, research and innovation, fundraising, consulting and diagnosis, industrial symbiosis, etc.

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, ARC, ACCIÓ, ICAEN                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Value chains</b>             | Cross-cutting                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Lack of coordination between the different units of the Government of Catalonia.</li> <li>• Define a structure useful for the interested parties.</li> <li>• Define a suitable form of governance which facilitates growth and functionality.</li> <li>• Incorporate the technology suitable for optimal functioning.</li> <li>• Encourage the various related initiatives and avoid duplicating resources.</li> </ul> |
| <b>Possible funding sources</b> | Own funds of the DACC, ERDF, Climate Fund                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Budget estimate</b>          | €1.5 M                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Period of execution</b>      | First half 2022 – second half 2024                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Number of connected organisations.</li> <li>- Number of visits to the hub.</li> <li>- Number of organisations which have used the hub's services.</li> </ul>                                                                                                                                                                                                                                                           |



# Public procurement



## Strategic goals

- O3.** Encourage the use and consumption of bioproducts, bioenergy and biomaterials in the market.

## Strategic lines

- O3.L1** Generate demand for the use and consumption of bioproducts, biomaterials and bioenergy.

## Measures

- M13.** Use tenders and public purchasing as a tool for furthering the bioeconomy.

## Major targets

Cross-cutting

## Description

Actions designed to exploit the potential of public spending in the procurement of supplies, building projects and service contracts as a mechanism for facilitating the opening of new markets for bioproducts, biomaterials and bioenergy and their associated services.

The actions to be developed include:

- Design of a prior study to identify biomaterials and bioproducts susceptible to being promoted in public procurement:** for example, the design of a prior study on the availability of local wood and cork for construction with the aim of establishing minimum use percentages for biomaterials in construction.
- Foster the inclusion of circular bioeconomy criteria in the green public procurement of the Government of Catalonia:** the design of a guide for incorporating circular bioeconomy criteria in public procurement and hiring processes, such as the incorporation of a minimum percentage of certified wood in the construction of government buildings.

|                                 |                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, DPRE, DEH                                                                                                                                                                                                                                                     |
| <b>Value chains</b>             | Cross-cutting                                                                                                                                                                                                                                                       |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Complexity of bidding procedures.</li> <li>• Lack of coordination between the different units of the Government of Catalonia.</li> <li>• Insufficient knowledge on the market for biomaterials and bioproducts.</li> </ul> |
| <b>Possible funding sources</b> | Own funds of the DACC, ERDF, Climate Fund                                                                                                                                                                                                                           |
| <b>Budget estimate</b>          | DACC resources                                                                                                                                                                                                                                                      |
| <b>Period of execution</b>      | Second half 2022 – first half 2023                                                                                                                                                                                                                                  |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Design of studies.</li> <li>- Publication of guides.</li> <li>- Number of contracts which include bioeconomy criteria.</li> </ul>                                                                                          |

# Raising citizen awareness



## Strategic goals

- O3.** Encourage the use and consumption of bioproducts, bioenergy and biomaterials in the market.
- O7.** Prepare the Catalan society for the change toward the circular bioeconomy.

## Strategic lines

- O3.L2** Improve the positioning of bioproducts, biomaterials and bioenergy on the market.
- O7.L1** Inform citizens and raise their awareness on the necessity of implementing and benefits of the bioeconomy.

## Measures

- M15.** Promote the commercialisation and differentiation of the bioproducts on the market and facilitate informed decision-making by consumers.
- M35.** Promote awareness-raising and publicity campaigns aimed at citizens to improve their perception of the bioeconomy.
- M36.** Integrate the circular bioeconomy into academic and vocational training curricula.

## Major targets

Cross-cutting

## Description

Actions aimed at **familiarising society with the concept of the circular bioeconomy** and at transmitting its potential for providing benefits on a social, economic and environmental level in order to increase its social acceptance and influence the behaviour of the potential consumers of the products and services derived from it.

1. **Design of mass media campaigns** to familiarise the citizenry with the concept of circular bioeconomy, as well as specific campaigns for the dissemination of the characteristics and benefits of local wood and cork, education about the concepts of resilient landscapes and ecosystem services, and raising awareness concerning the necessity of managing the landscape.
2. **Promotion of biomaterials, bioproducts and bioenergy:** execute communication, promotion and marketing campaigns aimed at consumers to raise consumption and disseminate success stories to generate confidence.
3. **Coordination with other spaces of debate and reflection:** pursue the recognition and incorporation of the circular bioeconomy in the various spaces of debate and reflection addressed to the citizenry.
4. **Incorporation of the bioeconomy into educational and training curricula:** incorporation of innovation and circular bioeconomy content into primary and secondary school curricula, undergraduate and master's degree programmes and vocational programmes in associated sectors.

**Lead units** DACC, ARC, ACCIÓ, DE, DREU

**Value chains** Cross-cutting

**Obstacles to overcome**

- The concept of the bioeconomy is still abstract to many people, and consequently this presents difficulties in educating the public about the bioeconomy and its potential to mitigate climate change, foster rural development, create jobs, and to promote the sustainable provision of ecosystem services.
- Confusion between the concepts of the circular bioeconomy and the circular economy.

**Possible funding sources** Own funds of the DACC, own funds of the ARC, European funds (ERASMUS+, etc.)

**Budget estimate** €250,000

**Period of execution** First half 2022 – second half 2024

**Tracking indicators**

- Number of communication initiatives executed.
- Rise in the consumption of bioproducts, biomaterials and bioenergy (%).
- Number of spaces for debate and integration which include the circular bioeconomy.
- Number of educational initiatives in the field of the bioeconomy.

# Circular Bioeconomy Research and Innovation Platform



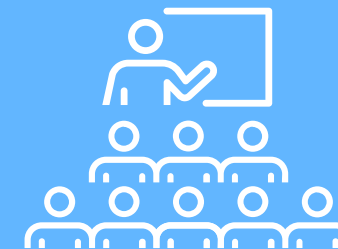
| Strategic goals |                                                                                                                                                                                 |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>O5.</b>      | Situate knowledge as a motor of the bioeconomy.                                                                                                                                 |
| Strategic lines |                                                                                                                                                                                 |
| <b>O5.L1</b>    | Promote research, innovation, and technological transfer associated with the bioeconomy.                                                                                        |
| <b>O5.L2</b>    | Promote knowledge transfer and exchange.                                                                                                                                        |
| Measures        |                                                                                                                                                                                 |
| <b>M23.</b>     | Identify the main challenges and solutions and promote research, innovation and transfer projects associated with the bioeconomy.                                               |
| <b>M26.</b>     | Encourage companies to spearhead innovation and research projects in bioeconomy.                                                                                                |
| <b>M27.</b>     | Incorporate companies into collaborative spaces aimed at promoting creativity and innovation.                                                                                   |
| <b>M28.</b>     | Create a programme to capitalise on research and innovation associated with the bioeconomy and disseminate this research.                                                       |
| Major targets   |                                                                                                                                                                                 |
| <b>F4.</b>      | Increase the number of start-ups and scale-ups in the bioeconomy sphere by 20%.<br><br>Increase the number of companies developing technologies in the bioeconomy sphere by 10% |

| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The <b>Research and Innovation Platform</b> will be incorporated into the Circular Bioeconomy hub and will serve to connect the knowledge surrounding the bioeconomy in a way that makes it possible to optimise efforts and guide and align research, innovation and technological transfer with the challenges identified. The anticipated actions for development include:</p> <ol style="list-style-type: none"> <li><b>1. Collaborative and interdisciplinary identification of challenges and solutions:</b> focus groups, innovation boards, public-private partnerships, research and innovation studies, brainstorming sessions and hackathons, etc.</li> <li><b>2. Orientation of aids for researching the identified challenges and solutions:</b> research agendas for the orientation of grants, calls for grant proposals to support research projects focused on challenges, etc.</li> <li><b>3. Knowledge capitalisation programme:</b> compilation of R+D+I initiatives, topic-based communities, groupings in emerging technologies, connections with existing platforms for the diffusion of R+D+I initiatives, etc.</li> <li><b>4. Knowledge dissemination and technological transfer:</b> awards designed to recognise innovative solutions, dissemination of success stories, conferences, programme for promoting the application and transfer of academic papers to the market and society, etc.</li> <li><b>5. Creation of a living lab network in the circular bioeconomy sphere:</b> through existing spaces to promote co-creation and open innovation.</li> </ol> |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, ARC, ACA, ACCIÓ, ICAEN, DREU                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Value chains</b>             | Cross-cutting                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Lack of coordination and collaboration between different research centres.</li> <li>• Lack of coordination between the different units of the Government of Catalonia.</li> <li>• Disconnection between research and the business world.</li> </ul>                                                                                                                         |
| <b>Possible funding sources</b> | Own funds of the DACC, EAFRD, ERDF, Climate Fund, European research and innovation funds (LIFE, HorizonEurope, etc.)                                                                                                                                                                                                                                                                                                 |
| <b>Budget estimate</b>          | €20 M                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Period of execution</b>      | Second half 2022 – second half 2024                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Number of initiatives performed to identify challenges and solutions.</li> <li>- Number of initiatives performed to orient research grants toward the challenges and solutions.</li> <li>- Number of knowledge capitalisation initiatives.</li> <li>- Number of technological transfer and diffusion initiatives.</li> <li>- Creation of the living lab network.</li> </ul> |



# New professionals and ongoing training



## Strategic goals

**O5.** Situate knowledge as a motor of the bioeconomy.

## Strategic lines

**O5.L3** Provide training for professionals and attract talent.

## Measures

**M30.** Train the existing professionals, develop new professional profiles and spearhead training projects linked to the bioeconomy.

## Major targets

**F2.** Increase primary sector jobs by 10%.

Increase youth incorporation into the rural and maritime sphere by 15%.

## Description

Actions geared toward ensuring that professionals in the associated sectors, and new professionals, are trained in issues concerning the circular bioeconomy. The actions for development include:

1. **Design a study to identify and characterise the professional profiles** that will be necessary for the execution of a new productive model based on the circular bioeconomy.
2. **Include learning activities** in the field of the bioeconomy in the vocational training programmes of related sectors.
3. **Design a training programme** in the field of the circular bioeconomy for new professionals.

**Lead units** DACC, DE, DREU, DEMT, DPRE, ACCIÓ

**Value chains** Cross-cutting

**Obstacles to overcome**

- The multidisciplinary and cross-cutting nature of the bioeconomy makes it difficult to define the requirements/obstacles.

**Possible funding sources** Own funds of the Government of Catalonia, European funds (ESF, etc.)

**Budget estimate** €150,000

**Period of execution** First half 2022 – second half 2023

**Tracking indicators**

- Design of the study.
- Number of professionals trained in the field of bioeconomy (public and private sectors).
- Design of the training programme.

# Bioeconomy Office



## Strategic goals

- O6.** Strengthen the role of the Administration and adapt the legal and regulatory framework to favour the bioeconomy in Catalonia.

## Strategic lines

- O6.L1** Adapt the legal and regulatory framework.
- O6.L2** Facilitate the implementation of bioeconomy activities in the territory.

## Measures

- M32.** Identify and adapt the laws and regulations which could represent a barrier or an opportunity for the development of the bioeconomy in Catalonia.
- M33.** Develop the Bioeconomy Office.
- M34.** Orient and coordinate funding sources (European, national, local) to provide impetus to the bioeconomy.

## Major targets

- F1.** Increase the weight of the bioeconomy in Catalonia's GVA by up to 5%.

## Description

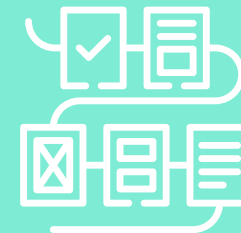
The **Bioeconomy Office** aims to accelerate the implementation of EBC2030 and ensure its alignment with the law, standards and strategies, and also to pursue the coordination of the policies associated with the circular bioeconomy. The Office will have a virtual space on Ruralcat<sup>1</sup> to raise awareness about the bioeconomy, disseminate EBC2030 and its action plans, and publicise related activities and success stories in the sphere of the Catalan bioeconomy. The main actions for development include:

- 1. Assess the current legislation surrounding the bioeconomy:** identify obstacles and opportunities and propose recommendations.
- 2. Assess the current administrative procedures** for implementing projects in the sphere of the bioeconomy: make proposals for their streamlining and simplification.
- 3. Ensure coherence between the different initiatives promoted by the Government of Catalonia** which have an impact on the bioeconomy: coordination between the circular economy roadmap and the 2030 Bioeconomy Strategy.
- Orient and coordinate the funding sources managed by the DACC to promote the bioeconomy: establish criteria to guarantee the local recovery of biomass resources, use hierarchy and circularity criteria in current funding sources.
- 5. Pursue the incorporation of bioeconomy criteria** into funding sources administered by other departments.
- 6. Issue periodic reports to track and assess the development and implementation** of EBC2030 and the triennial action plans.

|                                 |                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC                                                                                                                                                                                                                      |
| <b>Value chains</b>             | Cross-cutting                                                                                                                                                                                                             |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Lack of coordination between the different units of the Government of Catalonia.</li> </ul>                                                                                      |
| <b>Possible funding sources</b> | Own funds of the DACC, ERDF                                                                                                                                                                                               |
| <b>Budget estimate</b>          | €600,000                                                                                                                                                                                                                  |
| <b>Period of execution</b>      | First half 2022 – second half 2024                                                                                                                                                                                        |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Number of requests made to the Bioeconomy Office.</li> <li>- Standards adapted.</li> <li>- Administrative procedures simplified.</li> <li>- Funding sources oriented.</li> </ul> |

<sup>1</sup> <https://ruralcat.gencat.cat/>

# Bioeconomy Comanagement Board



## Strategic goals

- 07.** Prepare the Catalan society for the change toward the bioeconomy.

## Strategic lines

- 07.L2** Incorporate civil society into the design and execution of new projects associated with the bioeconomy.

## Measures

- M37.** Design a system of co-governance with the citizenry and all other parties involved.

## Major targets

- F1.** Increase the weight of the bioeconomy in Catalonia's GVA by up to 5%.

## Description

The **Circular Bioeconomy Comanagement Board** will be the body of participation and governance for the execution of EBC2030 and its action plans. Proposals for advancing the implementation of interventions based on the circular bioeconomy will be debated and specified by the Comanagement Board. It will be made up of representatives from the competent departments, local administrations, universities and research centres, business sector, professional farm organisations and cooperatives, the primary sector, the manufacturing/processing sector, and the service sector. Its main functions will be:

1. Act as a body of participation and governance for the implementation of EBC2030.
2. Monitor the completion of the strategic goals, strategic lines, measures and targets of EBC2030, based on the established indicators.
3. Report the triennial monitoring plans.
4. Participate in the planning of interventions necessary for the fulfilment of the Strategy's goals, in accordance with the results of the tracking indicators and the availability of resources.
5. Propose actions of coordination between the different parties involved.
6. Propose the priority value chains which will have to be considered in the triennial action plans foreseen in the Strategy.

**Lead units** DACC

**Value chains** Cross-cutting

**Obstacles to overcome**

- Lack of commitment and motivation from the participants.
- Coordination between existing bodies of participation.
- Adequate and representative configuration of working groups.

**Possible funding sources** Additional funding not required

**Budget estimate** Additional funding not required

**Period of execution** First half 2022 – second half 2022

**Tracking indicators**

- Number of board meetings convened.
- Number of working group meetings.
- Number of tracking and assessment reports issued on EBC2030 and the triennial action plans.



# Energy production from local biomass



## Strategic goals

- O1.** Improve the use of biomass in Catalonia through the characterisation, quantification and optimisation of its management and distribution.

## Strategic lines

- O1.L2** Ensure sustainability and efficiency in the management and distribution of biomass.

## Measures

- M4.** Prioritise the local recovery of organic matter and byproducts.  
**M5.** Improve biomass management and distribution.

## Major targets

- F5.** Increase the use of forest resources by 30%.  
**F6.** Increase the use and recovery of coproducts and byproducts from the food chain by 40%.  
**F8.** Lower emissions associated with the management of livestock waste and food waste by 30%.  
**F9.** Increase the use of renewable fuels in the primary sector by 100%.

## Description

Spearhead the development of biomass energy use sites close to production spaces to facilitate local use, as per the principles established by the Strategy to promote farm and forest biomass energy use. It is particularly important to ensure that the boilers meet certain emissions standards to prevent them from affecting air quality, particularly in terms of particle emissions.

The actions for development include:

- Design of the Biogas Plan of Catalonia.**
- Grants for the implementation of biogas plants.**
- Grants for the implementation of agricultural and forest biomass boilers on farms, on industrial sites and in public buildings.**

## Lead units

DACC, ARC, ICAEN, ACA

## Value chains

- Improvement in forest management and the use of forest resources.
- Recovery of livestock waste and organic waste.
- Recovery of coproducts and byproducts from the food chain.

## Obstacles to overcome

- Administrative complexity in the implementation of the project

## Possible funding sources

Own funds of the DACC, NGEU, Climate Fund, EAFRD, ERDF

## Budget estimate

€65 M

## Period of execution

First half 2022 – second half 2024

## Tracking indicators

- Passing of the Biogas Plan of Catalonia.
- Number of biogas plants created.
- Energy capacity installed (MW and thermal) and natural gas saved (CO<sub>2</sub>eq).
- Number of farm and forest biomass boilers installed.



# Biomass access and management



### Strategic goals

- O1.** Improve the use of biomass in Catalonia through the characterisation, quantification and optimisation of its management and distribution.

### Strategic lines

- O1.L2** Ensure sustainability and efficiency in the management and distribution of biomass.

### Measures

- M5.** Improve biomass management and distribution.

### Major targets

- F5.** Increase the use of forest resources by 30%.
- F6.** Increase the use and recovery of coproducts and byproducts from the food chain by 40%.
- F8.** Lower emissions associated with the management of livestock waste and food waste by 30%.

### Description

Spearhead the improvement in the access, management and distribution of biomass through investments aimed at improving infrastructures and optimising networks of distribution and logistics.

The following actions are projected:

- 1. Investments allocated to improving wildfire prevention and forest management infrastructures and the road network in rural areas:** the aim is to reduce the environment's vulnerability and facilitate its accessibility and mechanisation capacity, thus increasing the capacity to mobilise farm and forest biomass and lower the cost of extraction and transport. It includes the investments compiled in wildfire prevention plans and subsidies for rural roads.
- 2. Identify, raise awareness on and optimise biomass distribution and logistics networks: the aim is to reinforce the joint use of biomass:** connect preparation and storage sites and integrate the different value chains. It includes designing studies to identify management and distribution infrastructures of the existing biomass, disseminating reverse logistics initiatives, and creating decentralised logistical platforms for joint storage and transport of biomass.

|                                 |                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, ARC, ACA, CPF                                                                                                                                                                                                                                                                                                                                                    |
| <b>Value chains</b>             | <ul style="list-style-type: none"> <li>- Improvement in forest management and the use of forest resources.</li> <li>- Recovery of livestock waste and organic waste.</li> <li>- Recovery of coproducts and byproducts from the food chain.</li> </ul>                                                                                                                  |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Administrative complexity in the implementation of the project</li> </ul>                                                                                                                                                                                                                                                     |
| <b>Possible funding sources</b> | Own funds of the DACC, Climate Fund, EAFRD, NGEU                                                                                                                                                                                                                                                                                                                       |
| <b>Budget estimate</b>          | €45 M                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Period of execution</b>      | First half 2022 – second half 2024                                                                                                                                                                                                                                                                                                                                     |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Kilometres of repair and construction of roads and paths.</li> <li>- Euros granted in the subsidies for rural roads and paths.</li> <li>- Investments made.</li> <li>- Initiatives of reverse logistics.</li> <li>- Creation of decentralised logistical platforms for the joint storage and transport of biomass.</li> </ul> |



# New business models based on the circular bioeconomy



| Strategic goals |                                                                                                                                      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>O2.</b>      | Develop a business community based on the bioeconomy throughout the territory, with special attention paid to the primary sector.    |
| Strategic lines |                                                                                                                                      |
| <b>O2.L3</b>    | Provide incentives for the creation of new companies and business models based on the bioeconomy.                                    |
| Measures        |                                                                                                                                      |
| <b>M11.</b>     | Reinforce lines of aid and funding for new businesses in the bioeconomy.                                                             |
| <b>M12.</b>     | Facilitate the provision of space for the set-up of businesses.                                                                      |
| Major targets   |                                                                                                                                      |
| <b>F2.</b>      | Increase the number of jobs in the primary sector by 10%.<br><br>Increase youth employment in the rural and maritime sectors by 15%. |
| <b>F3.</b>      | Make 30% of new businesses in the food production sector based on the circular bioeconomy                                            |

| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Encourage investments in the creation of new companies and new business models in existing companies based on the circular bioeconomy and the mobilisation of underused physical spaces, for the purpose of developing an industrial sector based on biological resources which contributes to a more sustainable and efficient, low-carbon economy, as well as to economic growth and jobs, especially in rural areas.</p> <p>The interventions for development include:</p> <ol style="list-style-type: none"> <li><b>Grants for the creation of new business activity:</b> investments for the creation of key, transformative industries aimed at the use and/or recovery of coproducts and byproducts from the food chain in products of higher added value, and investments for the implementation of industries of the secondary transformation of wood for uses of higher added value, especially construction.</li> <li><b>Facilitate the establishment of new businesses:</b> reconversion of industrial parks and structures in disuse for the production and transformation of biomass and use of industrial areas for the establishment of new projects.</li> </ol> |

|                                 |                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, ACCIÓ, INCASÒL                                                                                                                                                                                                                                  |
| <b>Value chains</b>             | <ul style="list-style-type: none"> <li>- Improvement in forest management and the use of forest resources.</li> <li>- Recovery of livestock waste and organic waste.</li> <li>- Recovery of coproducts and byproducts from the food chain.</li> </ul> |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Administrative complexity.</li> <li>• Difficulties accessing the market due to legal impediments.</li> </ul>                                                                                                 |
| <b>Possible funding sources</b> | Own funds of the DACC, EAFRD, FEMP, NGEU                                                                                                                                                                                                              |
| <b>Budget estimate</b>          | €24 M                                                                                                                                                                                                                                                 |
| <b>Period of execution</b>      | First half 2023 – second half 2024                                                                                                                                                                                                                    |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Investments made in businesses.</li> <li>- Number of businesses created.</li> <li>- Number of industrial parks repurposed.</li> <li>- Number of industrial areas in disuse coming back into use.</li> </ul>  |

# Network of plants on a preindustrial scale



| Strategic goals |                                                                                                                                                                                        |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>O5.</b>      | Situate knowledge as an engine of the bioeconomy.                                                                                                                                      |
| Strategic lines |                                                                                                                                                                                        |
| <b>O5.L1</b>    | Promote research, innovation and technological transfer associated with the bioeconomy.                                                                                                |
| Measures        |                                                                                                                                                                                        |
| <b>M24.</b>     | Promote projects which enable the preindustrial and industrial scaling of new products and services.                                                                                   |
| Major targets   |                                                                                                                                                                                        |
| <b>F4.</b>      | Increase the number of start-ups and scale-ups in the bioeconomy sphere by 20%.<br><br>Increase the number of companies developing technologies in the field of the bioeconomy by 10%. |

| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Implementation of a network of preindustrial-scale pilot plants in Catalonia to study the economic, social and environmental viability of the new value chains, while simultaneously promoting their use as open spaces of cogeneration, experimentation and testing. <b>It will be necessary to create a map of existing pilot plants and identify barriers.</b></p> <p>The intention is to promote the following pilot plants:</p> <ol style="list-style-type: none"> <li><b>1. Secondary transformation of local wood</b> for uses of higher added value, especially in construction.</li> <li><b>2. Production of biogas and organically based fertilisers</b> to recover resources from livestock waste and organic waste.</li> <li><b>3. Generation of products of high added value through the recovery of byproducts and coproducts from the food chain.</b></li> </ol> |

|                                 |                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, ACA                                                                                                                                                                                                                                             |
| <b>Value chains</b>             | <ul style="list-style-type: none"> <li>- Improvement in forest management and the use of forest resources.</li> <li>- Recovery of livestock waste and organic waste.</li> <li>- Recovery of coproducts and byproducts from the food chain.</li> </ul> |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Lack of coordination and collaboration between the different research centres.</li> <li>• Lack of coordination between the different units of the Government of Catalonia.</li> </ul>                        |
| <b>Possible funding sources</b> | Own funds of the DACC, ERDF, Climate Fund                                                                                                                                                                                                             |
| <b>Budget estimate</b>          | €4.5 M                                                                                                                                                                                                                                                |
| <b>Period of execution</b>      | Second half 2022 – first half 2024                                                                                                                                                                                                                    |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Creation of the pilot plant network.</li> <li>- Number of pilot plants funded.</li> <li>- Number of pilot plant users.</li> </ul>                                                                            |



# Organically based fertilisation and improvement in soil quality



### Strategic goals

- O4.** Promote resilient landscapes and the sustainable provision of ecosystem services in the context of the Catalan bio-economy.

### Strategic lines

- O4.L2** Conserve and improve the quality of agricultural soils and foster their role as a carbon sink.

### Measures

- M19.** Encourage application of organic fertiliser to agrarian soils.

### Major targets

- F8.** Reduce emissions linked to the management of livestock waste.
- F10.** Annually increase organic carbon in the agricultural soils of Catalonia by 0.4%.

### Description

Support the local generation of organically based fertiliser in Catalonia. The goal is to reduce dependency on nonrenewable raw materials, improve the use of nutrients, and improve soil quality.

The interventions to be developed include:

- Design of a comparative study** of the carbon footprint and environmental impact of organic fertilisers and biofertilisers versus mineral fertilisers.
- Analysis of the conditioning factors** –territorial, social, legal and technological– for meeting the challenge of organically based fertilisation.
- Determine the potential of RENURE fertilisers** in vulnerable areas of Catalonia, and adapt the legislation on fertilisers to these new products, in accordance with EU criteria.
- Creation and coordination of a working group on carbon in the soil.**

### Lead units

DACC, ARC

### Value chains

- Resource recovery from livestock waste and organic waste.
- Resilient farm and forest landscapes and ecosystem services.

### Obstacles to overcome

- Coordination and cooperation between the different competent units.

### Possible funding sources

EAFRD, EAGF, Climate Fund, NGEU

### Budget estimate

€11 M

### Period of execution

Second half 2022 – first half 2024

### Tracking indicators

- Number of initiatives for the production of biofertilisers.
- Number of studies completed.
- Creation of the group of experts.



# Pilot projects for the creation of resilient farm and forest landscapes



### Strategic goals

- O4.** Promote resilient landscapes and the sustainable provision of ecosystem services in the context of the Catalan bio-economy.

### Strategic lines

- O4.L1** Promote the establishment of resilient farm and forest landscapes through advanced tools and expertise.

### Measures

- M17.** Support a form of territory management which fosters resilient landscapes and the definition of priority areas for their establishment.
- M18.** Foster the creation of new economic activities which facilitate the management of resilient landscapes.

### Major targets

- F2.** Increase primary sector jobs by 10%.  
Increase youth employment in the rural and maritime sectors by 15%.
- F7.** Prevent the loss of agricultural areas and restore the management of at least 10% of the agrarian land abandoned in the last 30 years.

### Description

On the basis of comprehending **landscape resistance and resilience**, the aim is to develop technological, environmental, security-related and socioeconomic solutions in the landscape and to incorporate all relevant agents/roles with responsibilities in these processes of change. Given the complex, cross-cutting dimension which defines the establishment of these landscapes, the following approaches are considered:

- 1. Scientific/technical analysis** through advanced **modelling** tools to define priority management areas for preventing risks, balancing, and improving ecosystem service provision, and encouraging biodiversity conservation.
2. Framework for **public and private** cooperation to incentivise the establishment of commercially competitive farm and forest value chains through diverse economic and financial mechanisms: grants on a regional and European level, improvement of insurance plans (e.g. fire insurance), etc.
- 3. Governance** processes to favour a good match of the multiple parties involved: landowners, businesses, etc. Creation of a working group on resilient farm and forest landscapes.
- 4. Mechanisms** to incentivise work and activity in the territory (tax breaks, credits, etc.).

|                                 |                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, ACA                                                                                                                                                                                                                                                                                                                                            |
| <b>Value chains</b>             | - Resilient farm and forest landscapes and ecosystem services.                                                                                                                                                                                                                                                                                       |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Difficulty in the integration of frequently opposing visions.</li> <li>• Lack of involvement of some parties.</li> <li>• Diversity of parties involved.</li> <li>• New methodology.</li> <li>• Few existing examples/models.</li> <li>• Difficulty of maintaining the interventions implemented.</li> </ul> |
| <b>Possible funding sources</b> | Own funds of the DACC, Natural Heritage Fund, own funds of the ACA, NGEU, Climate Fund                                                                                                                                                                                                                                                               |
| <b>Budget estimate</b>          | €30 M                                                                                                                                                                                                                                                                                                                                                |
| <b>Period of execution</b>      | First half 2022 – first half 2024                                                                                                                                                                                                                                                                                                                    |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Number of pilot projects implemented.</li> <li>- Area restored.</li> <li>- Creation of the group of experts.</li> </ul>                                                                                                                                                                                     |



# Ecosystem service valuation



| Strategic goals |                                                                                                                                                                |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>O4.</b>      | Promote resilient landscapes and the sustainable provision of ecosystem services in the context of the Catalan bio-economy.                                    |
| Strategic lines |                                                                                                                                                                |
| <b>O4.L2</b>    | Conserve and improve the quality of agricultural soils and foster their role as a carbon sink.                                                                 |
| <b>O4.L3</b>    | Foster the provision of ecosystem services.                                                                                                                    |
| Measures        |                                                                                                                                                                |
| <b>M20.</b>     | Implement agronomic practices which improve the quality of the soil.                                                                                           |
| <b>M21.</b>     | Identify and promote ecosystem services in the context of the Catalan bioeconomy.                                                                              |
| <b>M22.</b>     | Establish payment mechanisms for environmental services which favour territorial management and facilitate the social and economic viability of the territory. |
| Major targets   |                                                                                                                                                                |
| <b>F1.</b>      | Increase the weight of the bioeconomy in Catalonia's GVA by up to 5%.                                                                                          |

| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Actions geared toward supporting ecosystem services and the biodiversity which supplies them through a circular bioeconomy based on the sustainable management of forests and agricultural, livestock and maritime systems.</p> <p>The following actions are foreseen:</p> <ol style="list-style-type: none"> <li><b>1. Identify and quantify ecosystem services in the context of resilient farm and forest landscapes,</b> taking into account the methodology developed by DACC, CREAM and CTFC to identify and map ecosystem services in the framework of technical projects for the planning of Catalonia's green infrastructure.</li> <li><b>2. Management of the territory to ensure the sustainable provision of ecosystem services.</b></li> <li><b>3. Valuation and payment schemes for ecosystem services:</b> design of methodologies for the valuation of ecosystem services and payment mechanisms; implement a system of payment for the establishment of a resilient mosaic of farmland and forest.</li> </ol> |

|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lead units</b>               | DACC, ACA                                                                                                                                                                                                              |
| <b>Value chains</b>             | - Resilient farm and forest landscapes and ecosystem services.                                                                                                                                                         |
| <b>Obstacles to overcome</b>    | <ul style="list-style-type: none"> <li>• Unfamiliarity with the dynamics of ecosystem services and the benefits they produce.</li> <li>• Difficulty in quantification and establishing a system of payment.</li> </ul> |
| <b>Possible funding sources</b> | Own funds of the DACC, ACA                                                                                                                                                                                             |
| <b>Budget estimate</b>          | €200,000                                                                                                                                                                                                               |
| <b>Period of execution</b>      | Second half 2022 – second half 2023                                                                                                                                                                                    |
| <b>Tracking indicators</b>      | <ul style="list-style-type: none"> <li>- Number of studies completed.</li> <li>- Investment in a payment scheme for the establishment and maintenance of a mosaic of farmland and forest (€).</li> </ul>               |



**ACTION  
PLAN**  
2022-2024

# System of tracking and assessment



## System of tracking and assessment /

The tracking and assessment of the 2022-2024 Action Plan is the responsibility of the Technical Bureau of the Ministry of Climate Action, Food and Rural Agenda, through the Bioeconomy Office.

The Bioeconomy Office will be the division tasked with tracking and assessing the Plan's development and implementation, both with respect to transformative actions and the rest of the interventions the Government of Catalonia intends to develop during the term of the Action Plan, as well as its compliance with the strategic goals, strategic lines, measures and targets of EBC2030.

The tracking and assessment of the Action Plan will be formalised with the issuing of periodic reports. These reports will adapt to any possible changes which may appear.



## Comanagement Board /

Section 8. *Governance of EBC2030 of the 2030 Catalan Bioeconomy Strategy* foresees the constitution of a comanagement board where the participation of technical representatives from public Administration, universities and research centres, private companies, the tertiary sector and civil society will be materialised. Thus, the 2022-2024 Action Plan includes the creation of a Comanagement Board as one of the transformative actions –specifically transformative action 8 (AT 8).

In the functioning of the Comanagement Board, an effort will be made to exploit the existing participatory bodies and articulate their tasks to orient them in the pursuit of the bioeconomy in Catalonia.

However, the Comanagement Board itself may divide itself into topic-based working groups with the agents of the territory to outline specific aspects of the Action Plan; an interlocutor will be appointed to coordinate the working groups.



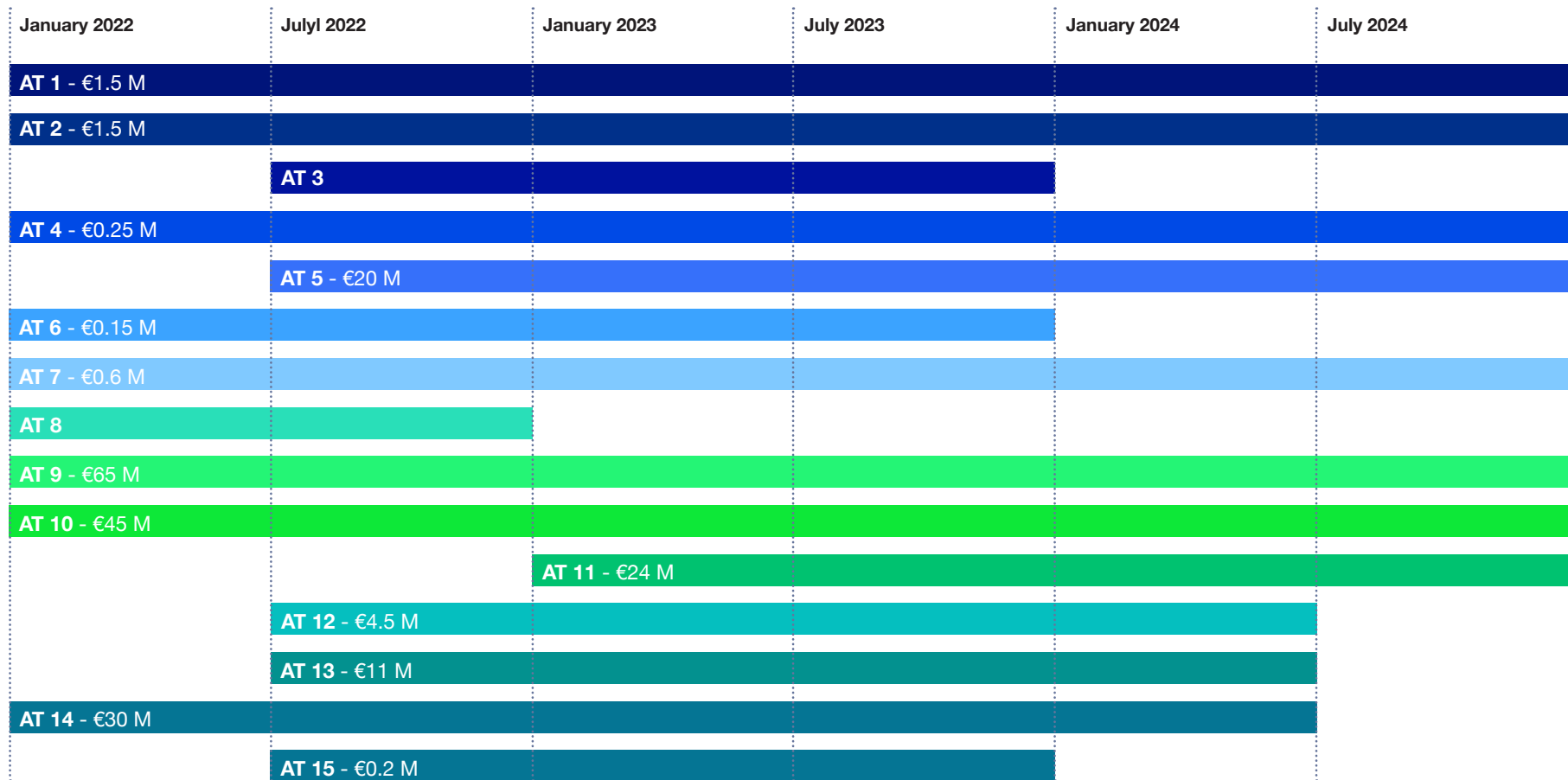


**ACTION  
PLAN**  
2022-2024

# Timeline

## Timeline /

The sequence of execution of the series of transformative actions (AT1-AT15) to pursue in the 2022-2024 Action Plan is shown along the following timeline:



**Table 6** Transformative action timeline



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# Funding

## Funding /

All in all, between 2022 and 2024, a total budget of **€203.7 M** is anticipated for the development and implementation of the transformative actions.

**Table 7** Transformative action funding

| AT           | BUDGET (in €M) |             |              |              | Possible funding sources                                                                                               |
|--------------|----------------|-------------|--------------|--------------|------------------------------------------------------------------------------------------------------------------------|
|              | 2022           | 2023        | 2024         | TOTAL        |                                                                                                                        |
| AT 1         | 0.5            | 0.5         | 0.5          | <b>1.5</b>   | Own funds of the DACC, FEDER, Climate Fund, REACT-EU Fund                                                              |
| AT 2         | 0.5            | 0.5         | 0.5          | <b>1.5</b>   | Own funds of the DACC, FEDER, Climate Fund                                                                             |
| AT 3         |                |             |              |              | DACC resources                                                                                                         |
| AT 4         | 0.1            | 0.1         | 0.05         | <b>0.25</b>  | Own funds of the DACC, own funds of the ARC, European funds (ERASMUS+, etc.)                                           |
| AT 5         | 2              | 9           | 9            | <b>20</b>    | Own funds of the DACC, FEADER, FEDER, Climate Fund, European research and innovation fund (LIFE, Horizon Europe, etc.) |
| AT 6         | 0.05           | 0.1         | -            | <b>0.15</b>  | Catalan government funds, European funds (FSE, etc.)                                                                   |
| AT 7         | 0.2            | 0.2         | 0.2          | <b>0.6</b>   | Own funds of the DACC, FEDER                                                                                           |
| AT 8         |                |             |              |              | DACC resources                                                                                                         |
| AT 9         | 21             | 22          | 22           | <b>65</b>    | Own funds of the DACC, NGEU, Climate Fund, FEADER, FEDER                                                               |
| AT 10        | 15             | 15          | 15           | <b>45</b>    | Own funds of the DACC, NGEU, Climate Fund, FEADER, NGEU                                                                |
| AT 11        | -              | 16          | 8            | <b>24</b>    | Own funds of the DACC, FEADER, FEMP, NGEU                                                                              |
| AT 12        | 0.5            | 2           | 2            | <b>4.5</b>   | Own funds of the DACC, FEDER, Climate Fund                                                                             |
| AT 13        | 3              | 4           | 4            | <b>11</b>    | FEADER, FEAGA, Climate Fund, NGEU                                                                                      |
| AT 14        | 8              | 11          | 11           | <b>30</b>    | Own funds of the DACC, Natural Heritage Fund, own funds of the ACA, NGEU, Climate Fund                                 |
| AT 15        | 0.1            | 0.1         | -            | <b>0.2</b>   | Own funds of the DACC, own funds of the ACA                                                                            |
| <b>TOTAL</b> | <b>50.95</b>   | <b>80.5</b> | <b>72.25</b> | <b>203.7</b> |                                                                                                                        |

**EAFRD:** European Agricultural Fund for Rural Development

**EAGF:** European Agricultural Guarantee Fund

**ERDF:** European Regional Development Fund

**EMFF:** European Maritime and Fisheries Fund

**ESF:** European Social Fund

**NGEU:** Next Generation EU fund











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