

Regional project development assistance for the uptake of an Aragonese circular economy

D2.4.Guidelines for the effective transition towards a Circular Bio- Economy

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EXECUTIVE SUMMARY

RESOURCE is a 36-month project funded by the **European Union's Horizon Europe programme**, designed to develop and test a **methodology to accelerate private financing of circular economy projects** with the goal of mobilising **€20 million in private investment**. The approach is tested in the **Aragón Region (Spain)** as a pilot and is intended for replication across Europe.

This deliverable, **D2.4 – Guidelines for the Effective Transition towards a Circular Bio-Economy**, consolidates the results and recommendations produced under **WP2 (Circular Economy Project Preparation)** and its related tasks on **economic feasibility and policy coherence**. It provides a comprehensive framework for supporting regions, policymakers, and stakeholders in their transition towards a **sustainable circular bio-economy model**.

Building on analytical inputs from **D2.1, D2.2, and D2.3**, this document translates the knowledge gathered through regional diagnostics, stakeholder consultations, and policy reviews into **actionable guidelines**. These guidelines outline the enabling conditions for circular bio-economy deployment—focusing on governance, innovation, investment, and social acceptance. The document reflects the lessons learned from the Aragonese context, while offering a transferable methodology adaptable to other European regions.

The approach combines **policy analysis, stakeholder engagement, and market feasibility assessment**, ensuring that bio-based transition strategies are both economically viable and socially inclusive. Key findings emphasise the need for:

- A **robust policy and regulatory framework** that aligns regional and EU-level objectives.
- **Public-private collaboration** to overcome financial and infrastructural barriers.
- **Technological and non-technological innovation** for circular value-chain transformation.
- **Citizen awareness and capacity-building** to ensure societal acceptance and behavioural change.

The document also highlights successful regional practices and sectoral insights—particularly in **agrifood, waste valorisation, and bio-materials**—showcasing opportunities for scaling through investment and partnership mechanisms.

Finally, these **Guidelines** synthesise practical recommendations for policymakers, enterprises, and innovation intermediaries to design, fund, and implement circular bio-economy initiatives. They aim to support the **Government of Aragón** and other regional authorities in shaping long-term strategies aligned with the **European Green Deal** and **UN Sustainable Development Goals**, ensuring that the transition towards a circular bio-economy is effective, inclusive, and financially sustainable.

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ABBREVIATIONS

Abbreviations	Meaning
GoA	Government of Aragon
CEEA	College Of Economists of Aragón
FECEM UNIZAR	Facultad de Economía y Empresa de Universidad de Zaragoza
REA IBERCAJA	Revista de Economía Aragonesa Ibercaja Bank

1 Introduction

1.1. Context

Circularity is an essential aspect of the industry transformation towards resource-efficiency, climate neutrality and long-term competitiveness.

The RESOURCE project is currently studying the private funding opportunities needed in circular projects and facilitating their development. RESOURCE's overarching objective is to develop new Project Development Assistance (PDA) services to fund regional circular economy investment projects. More precisely RESOURCE is:

- building an integrated expertise pool to support technically, economically, and legally the regional circular economy pilots SMEs,
- developing innovative financing schemes and business models,
- launching concrete investments.

The methodology developed for the RESOURCE project ensures the sustainability of those circular economy projects by potentially completing their private funding with other sources of financing (European, national, and regional public funds).

The RESOURCE methodology consists of seven steps:

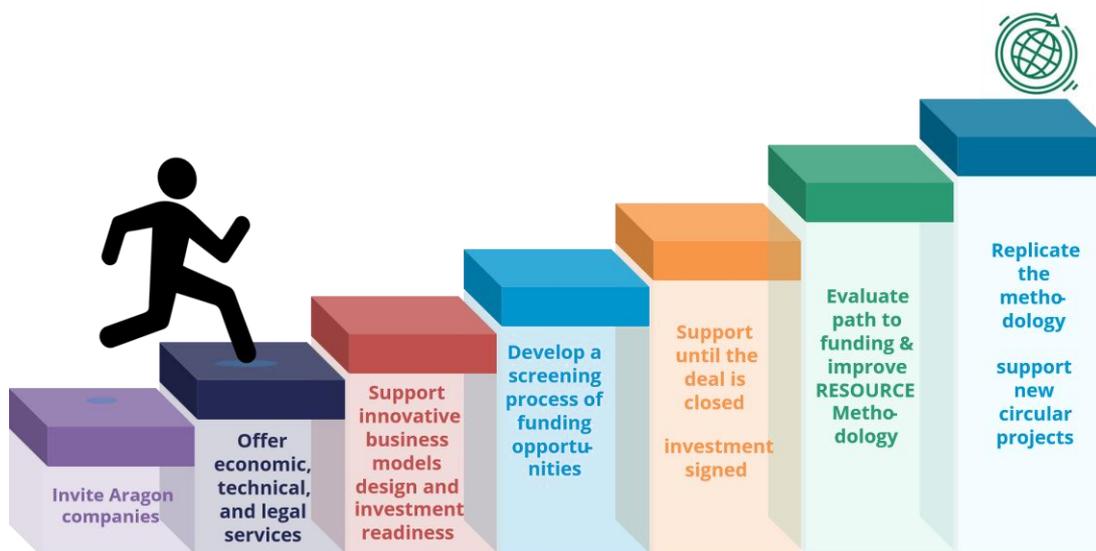


Figure 1 - The RESOURCE methodology in 7 steps

The strong interest coming from Aragon companies to shift towards circular practices will guarantee a sustainable pipeline of projects to test the RESOURCE methodology. The final and overall objective of the RESOURCE project through the creation of a portfolio of project development assistance services, is to accelerate the development of the circular economy in Aragon and to reach €20M direct private investment in circular projects over a period of 36 months, until the end of June 2025.

1.2. Expected outcomes and impact

This document is the **final deliverable (D2.4)** of **WP2**, consolidating tools, analyses, and recommendations to enable an effective transition towards a **Circular Bio-economy** in Aragón. It builds on: **D2.1** (opportunity identification via environmental/economic analysis), **D2.2** (regional maturity assessment), and **D2.3** (legislative recommendations to accelerate adoption). **Crucially, it also enables the connection with good practices identified and curated in WP4, so that regions can improve their maturity level through validated, transferable solutions and brokerage pathways.**

A **Circular Bio-economy** replaces fossil-based inputs with renewable biological resources for **food, feed, bio-based products, and bioenergy**, closing material/energy loops. This transition contributes directly to the **European Green Deal, EU CEAP, and the SDGs.**

Expected outcomes

- A **coherent policy and governance framework** integrating circular bio-economy principles into regional planning and regulation.
- **Improved coordination** among government, industry, academia, and civil society, supported by WP4's **catalogue of good practices and orchestration tools** that facilitate replication.
- **Enhanced innovation and investment capacity**, with actionable pathways from maturity gaps (D2.2) to **practice adoption (WP4)** and enabling **legislative levers (D2.3)**.
- **Greater public awareness and engagement**, promoting behavioural change and citizen participation.

Impact

- **Accelerated deployment** of bio-based and low-carbon value chains in Aragón through **adoption of WP4 good practices** matched to local gaps and priorities.
- **Stronger, more connected innovation ecosystem**, capable of scaling solutions and attracting investment.
- **Replicable regional model** for other EU territories, supported by clear policy guidance (D2.3), maturity diagnostics (D2.2), opportunity pipelines (D2.1), and a **good-practice bridge (WP4)**.

The guidelines promote a **systemic, cross-value-chain approach**—from biomass production to end-of-life—prioritising **resource efficiency, waste reduction, reuse, and skills/education** as enablers. Economic, social, and legislative dimensions advance in tandem, ensuring a **resilient, inclusive, and investable Circular Bio-economy.**

2 List of Guidelines

A circular bio-economy is a system that aims to replace fossil-based resources with renewable biological resources, which are then used to produce food, feed, bio-based products, and bioenergy. This system is inspired by nature's circular processes, where waste does not exist and everything is reused in a continuous cycle.

These are the main guidelines in order to be success into this transition:

1. Change management and social acceptance
2. Policy framework,
3. Technological and non-technological innovation
4. Overcoming legislative barriers
5. Securing investment

The following **Guidelines** aim to support public authorities, private organisations, and civil society in advancing towards a sustainable Circular Bio-Economy. They provide a coherent and integrated framework that combines change management, policy design, innovation, investment, and regulatory reform.

2.1. Change Management and Social Acceptance

A successful transition depends on cultural change and collective awareness. Citizens, businesses, and policymakers must understand the value of circularity and collaborate in its implementation.

Key actions

- **Education and awareness:** Develop educational programmes in schools, universities, and vocational centres, complemented by regional campaigns (media, social networks, community events) showcasing tangible benefits such as job creation, waste reduction, and resource efficiency.
- **Stakeholder engagement:** Create inclusive advisory boards and co-creation workshops where businesses, academia, NGOs, and local authorities jointly shape priorities and identify barriers.
- **Transparent communication:** Establish two-way communication channels — newsletters, online dashboards, public consultations — to monitor progress, collect feedback, and counter misinformation.

2.2. Policy and Governance Framework

Effective governance is essential to guide the circular transition and ensure coordination between administrative levels and sectors.

Key actions

- **Regulatory support:** Introduce fiscal incentives (tax credits, low-interest loans, R&D grants) for companies adopting circular practices, and enforce penalties for excessive waste or non-compliance.

- **Public procurement:** Integrate circular criteria and bio-based product requirements in all public tenders to stimulate demand.
- **Standardisation and harmonisation:** Develop certification schemes and shared metrics (e.g., carbon footprint, resource efficiency) while aligning regulations across agriculture, energy, and manufacturing.
- **International cooperation:** Promote cross-border collaboration, joint R&D projects, and mutual recognition of standards to facilitate market access for bio-based products.

2.3. Technological and Non-Technological Innovation

Innovation — both technical and organisational — is at the heart of the circular bio-economy.

Key actions

- **R&D and demonstration:** Support innovation in biotechnology, bio-materials, waste-to-energy systems, and digital traceability tools through public-private partnerships and pilot projects.
- **Business model innovation:** Encourage models such as *product-as-a-service*, *sharing platforms*, and *reverse logistics* to reduce waste and extend product life cycles.
- **Skills development:** Implement training programmes in circular design, bio-processing, and waste valorisation, including reskilling for workers from traditional sectors, in collaboration with universities and innovation centres like **CEEI Aragón**.

2.4. Overcoming Legislative Barriers

Legal and regulatory frameworks must evolve to enable rather than hinder circular practices.

Key actions

- **Regulatory review:** Conduct a comprehensive legal audit at EU, national, and regional levels to identify inconsistencies that discourage reuse, recycling, or secondary raw-material markets.
- **Legislative reform:** Update and harmonise laws to enable extended producer responsibility, cascading use of biomass, and the recovery of nutrients from bio-waste.
- **Regulatory sandboxes:** Create controlled environments to test innovative solutions with flexible compliance requirements, and digitalise permitting systems to reduce

administrative burden.

2.5. Securing Investment and Financing

Financial mobilisation is a prerequisite for scaling circular bio-economy solutions and attracting private participation.

Key actions

- **Public investment:** Allocate regional and national funds to priority areas such as bio-materials, waste valorisation, and renewable integration, leveraging EU programmes (Horizon Europe, LIFE, NextGenerationEU).
- **Private investment:** Encourage banks and funds (e.g., *REA Ibercaja Bank*) to create tailored products such as green bonds and sustainability-linked loans, supported by guarantees or co-financing tools to mitigate risk.
- **Public-private partnerships:** Promote joint ventures and regional innovation clusters connecting industry, academia, and authorities to accelerate deployment.
- **Investor awareness:** Organise training and forums on the profitability and long-term impact of circular bio-economy projects, and develop standard metrics for measuring social and environmental returns.

3 Methodology for the Guidelines

The methodology used to elaborate these **Guidelines for the Effective Transition towards a Circular Bio-economy** builds upon the analytical and participatory groundwork established in **WP1 – Stakeholder Mapping and Needs Assessment**, and the subsequent activities carried out under **WP2**.

The process combined **qualitative stakeholder engagement**, **regional analysis**, and **cross-regional validation** to ensure that the recommendations are evidence-based, practical, and aligned with both local and European priorities.

Step 1 – Stakeholder Identification and Engagement

Under WP1, the **Government of Aragón (GoA)** and **CEEIARAGÓN** jointly identified and interviewed a broad spectrum of stakeholders representing the **quadruple helix**: public administrations, private enterprises, research organisations, and civil-society actors active in the Circular Economy domain. These interviews provided first-hand insights into the existing barriers, opportunities, and maturity level of the regional ecosystem.

Step 2 – Regional and Cross-Regional Data Collection

Beyond Aragón, CEEIARAGÓN leveraged its extensive network of **Spanish CEEIs** to gather complementary information from other regions. This cross-regional perspective enriched the understanding of national dynamics, regulatory differences, and transferable practices. Direct

consultations with **innovative private projects and start-ups** added a bottom-up dimension, capturing the operational and financial challenges faced by circular initiatives.

Step 3 – Validation through Collaborative Workshops

An essential milestone in the methodology was the **Working Day on Circular Economy**, held on **26 April 2024**, which convened key factors such as **venture capital funds, banks, public companies, and large corporations**. During this session, participants discussed investment bottlenecks, policy gaps, and strategic priorities. The event generated valuable feedback, which was systematically integrated into the draft guidelines and influenced the proposed governance and funding recommendations.

Step 4 – Synthesis and Framework Development

The qualitative evidence gathered through interviews and workshops was combined with the analytical findings of Deliverables **D2.1, D2.2, and D2.3**. This integration allowed the team to identify patterns of maturity, benchmark good practices, and define concrete policy and operational measures for an effective transition towards a **Circular Bio-economy**.

Outcome

The resulting methodology ensures that the **Guidelines** are grounded in real stakeholder needs, informed by regional and cross-regional evidence, and validated by ecosystem actors—thus offering a **replicable, participatory, and impact-oriented approach** to support other European territories in advancing their circular transformation.

4 Conclusion

In conclusion, these **Guidelines for the Effective Transition towards a Circular Bio-Economy** offer a comprehensive and actionable framework to accelerate the shift towards a more sustainable, resilient, and competitive economic model. They serve as a strategic reference for both **public and private organisations**, outlining clear directions for integrating circular and bio-based principles into policies, business models, and regional development plans.

The document emphasises that the transition towards a Circular Bio-Economy requires **coordinated action across governance, innovation, finance, and citizen engagement**. It highlights the importance of fostering collaboration between regional authorities, enterprises, research institutions, and civil society to ensure that circular transformation generates tangible environmental, economic, and social benefits.

By aligning regional priorities with European strategies such as the **Green Deal**, the **Circular Economy Action Plan**, and the **Bioeconomy Strategy**, these guidelines provide a pathway for regions—starting with **Aragón**—to strengthen their innovation ecosystems, attract sustainable investment, and promote resource efficiency.

Ultimately, the guidelines aim to contribute to the creation of a **fair, inclusive, and innovation-driven circular economy**, capable of generating long-term value for society while preserving natural capital and enhancing regional competitiveness across Europe.