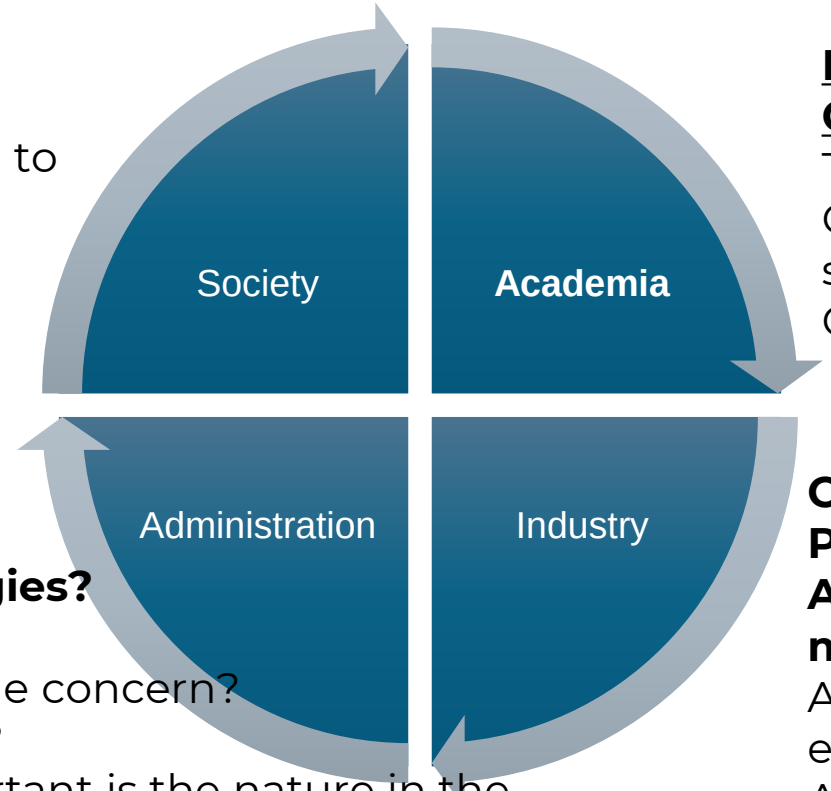
Programming the Inter-University Master in Circular Bioeconomy and Sustainability (MCBS) (University of Almeria, Spain): A study case

Step 1: Questions to the QH actors :

Social Concern?
Access to knowledge?
Awareness on the need to the transition?
Attitudes to change?



<u>Knowledge Gaps?</u>
<u>Capacity building demanded?</u>
Trans, inter and **multi-disciplinarity?**
Open to collaborate with other stakeholders?
Connection between knowledge áreas?

Policy priorities?
National or regional strategies?
Funding programmes?
Environment, climate-change concern?
Promoting decarbonisation?
Awareness about how important is the nature in the wealthbeing of general population?

Companies demand?
Potential for employment?
Attitude to the transition of business models?
Awareness about the value of externalities?
Awareness about natural resources dependency?
LCA of processes?

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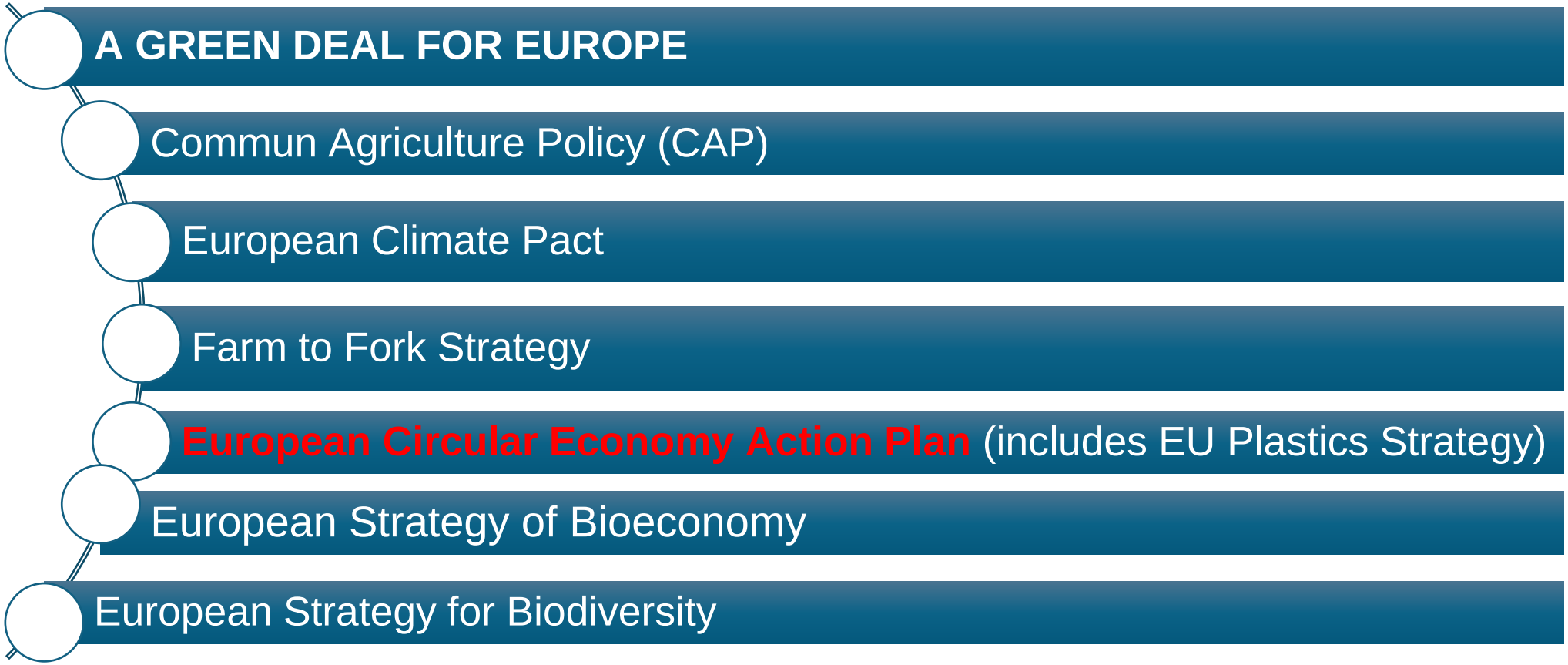
Example: Policy Priorities

European Circular Economy Action Plan



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European Circular Economy Action Plan

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Examples

3.4. Plastics

The **EU Strategy for Plastics in the Circular Economy**[28] has set in motion a comprehensive set of initiatives responding to a challenge of serious public concern. However, as consumption of plastics is expected to double in the coming 20 years, the Commission will take further targeted measures to address the sustainability challenges posed by this ubiquitous material and will continue to promote a concerted approach to tackle plastics pollution at global level as set out in section 7.

To increase uptake of recycled plastics and contribute to the more sustainable use of plastics, the Commission will propose **mandatory requirements for recycled content and waste reduction measures** for **key products such as packaging, construction materials and vehicles**, also taking into account the activities of the Circular Plastics Alliance.

In addition to measures to reduce plastic litter, the Commission will address the **presence of microplastics in the environment** by:

- **restricting intentionally added microplastics** and tackling pellets taking into account the opinion of the European Chemicals Agency;
- developing **labelling, standardisation, certification and regulatory measures** on unintentional release of microplastics, including measures to increase the **capture of microplastics** at all relevant stages of products' lifecycle;
- further developing and harmonising methods for **measuring unintentionally released microplastics**, especially from tyres and textiles, and delivering harmonised data on microplastics concentrations in seawater;
- closing the gaps on **scientific knowledge related to the risk and occurrence** of microplastics in the environment, drinking water and foods.

Furthermore, the Commission will address emerging sustainability challenges by developing **a policy framework on**:

- **sourcing, labelling and use of bio-based plastics,** based on assessing where the use of bio-based feedstock results in genuine environmental benefits, going beyond reduction in using fossil resources;
- **use of biodegradable or compostable plastics,** based on an assessment of the applications where such use can be beneficial to the environment, and of the criteria for such applications. It will aim to ensure that labelling a product as

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3.5. Textiles

Textiles are the fourth highest-pressure category for the use of primary raw materials and water, after food, housing and transport, and fifth for GHG emissions[30]. It is estimated that less than 1% of all textiles worldwide are recycled into new textiles[31]. The EU textile sector, predominantly composed of SMEs, has started to recover after a long period of restructuring, while 60% by value of clothing in the EU is produced elsewhere.

In the light of the complexity of the textile value chain, to respond to these challenges the Commission will propose **a comprehensive EU Strategy for Textiles**, based on input from industry and other stakeholders. The strategy will aim at strengthening industrial competitiveness and innovation in the sector, boosting the EU market for sustainable and circular textiles, including the market for textile reuse, addressing fast fashion and driving new business models. This will be achieved by a comprehensive set of measures, including:

- applying the **new sustainable product framework** as set out in section 2 to textiles, including developing **ecodesign measures** to ensure that textile products are fit for circularity, ensuring the uptake of secondary raw materials, tackling the presence of hazardous chemicals, and **empowering business and private consumers to choose sustainable textiles** and have **easy access to re-use and repair services**;
- improving the business and regulatory environment for sustainable and circular textiles in the EU, in particular by providing **incentives and support to product-as-service models, circular materials and production processes,** and increasing transparency through **international cooperation**;
- providing guidance to achieve **high levels of separate collection of textile waste**, which Member States have to ensure by 2025;
- boosting the **sorting, re-use and recycling of textiles,** including through **innovation, encouraging industrial applications and regulatory measures** such as extended producer responsibility.

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3.7. Food, water and nutrients

The circular economy can significantly reduce the negative impacts of resource extraction and use on the environment and contribute to restoring biodiversity and natural capital in Europe. Biological resources are a key input to the economy of the EU and will play an even more important role in the future. The Commission will aim at ensuring the sustainability of renewable bio-based materials, including through actions following the Bioeconomy Strategy and Action Plan.

While the food value chain is responsible for significant resource and environmental pressures, an estimated 20% of the total food produced is lost or wasted in the EU. Therefore, in line with the Sustainable Development Goals and as part of the review of Directive 2008/98/EC[38] referred to in section 4.1, the Commission will propose a **target on food waste reduction**, as a key action under the forthcoming EU Farm-to-Fork Strategy, which will address comprehensively the food value chain.

The Commission will also consider specific measures to increase the sustainability of food distribution and consumption. Under the sustainable products initiative, the Commission will launch the analytical work to determine the scope of a legislative initiative on reuse to **substitute single-use packaging, tableware and cutlery by reusable products in food services**.

The new Water Reuse Regulation will encourage circular approaches to water reuse in agriculture. The Commission will **facilitate water reuse and efficiency, including in industrial processes**.

Furthermore, the Commission will develop an **Integrated Nutrient Management Plan**, with a view to ensuring more sustainable application of nutrients and stimulating the markets for recovered nutrients. The Commission will also consider **reviewing directives on wastewater treatment and sewage sludge** and will assess **natural means of nutrient removal such as algae**.

European Circular Economy Action Plan

2.3. Circularity in production processes

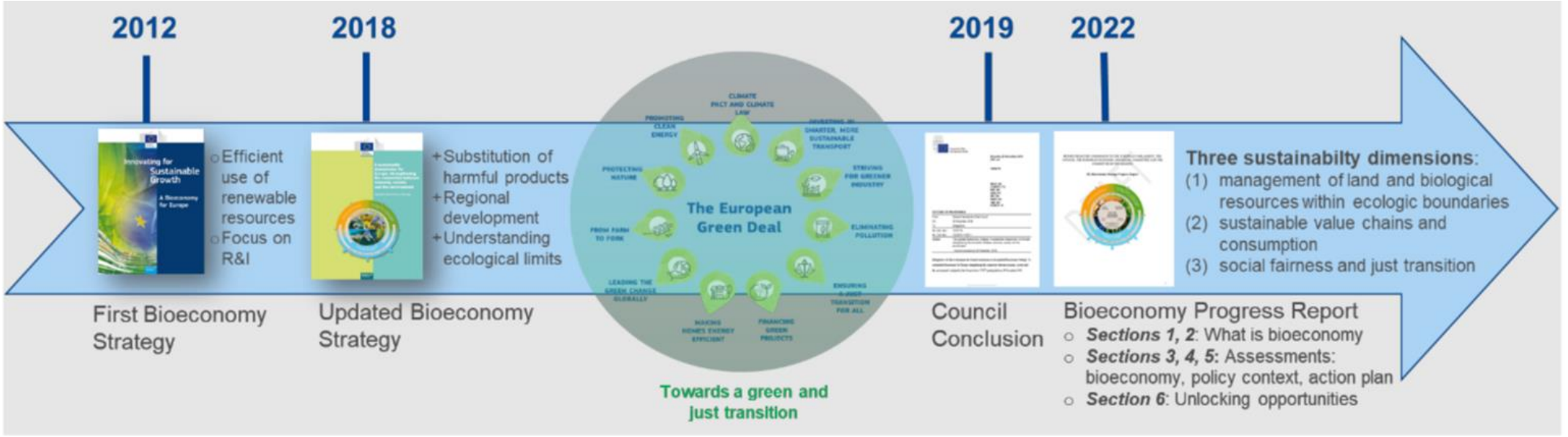
Circularity is an essential part of a wider transformation of industry towards climate-neutrality and long-term competitiveness. It can deliver substantial material savings throughout value chains and production processes, generate extra value and unlock economic opportunities. In synergy with the objectives laid out in the Industrial Strategy[16], the Commission will enable greater circularity in industry by:

- assessing options for further promoting circularity in industrial processes in the context of the review of the **Industrial Emissions Directive**[17], including the integration of circular economy practices in upcoming Best Available Techniques reference documents;
- facilitating industrial symbiosis by developing an **industry-led reporting and certification system,** and enabling the implementation of industrial symbiosis;
- supporting the **sustainable and circular bio-based sector** through the implementation of the Bioeconomy Action Plan[18];
- promoting the use of **digital technologies for tracking, tracing and mapping of resources**;
- promoting the uptake of green technologies through a system of solid verification by **registering the EU Environmental Technology Verification scheme** as an EU certification mark.

The new **SME Strategy**[19] will foster circular industrial collaboration among SMEs building on training, advice under the Enterprise Europe Network on cluster collaboration, and on knowledge transfer via the European Resource Efficiency Knowledge Centre.

European Bioeconomy Action Plan

Sectors related with biobased raw materials and bioprocesses are more favorable for scaling up the CE from front-runners to the mainstream economic players



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European Bioeconomy Action Plan

2012

Food Security focuss

Sustainable management of natural resources

To reduce dependency from non-renewable resources

Mitigation and adaptation to climate change

Generation of employments keeping competitiveness of economies while replacing fossil resources by bioproducts and new or existing bioprocesses

Revision 2018

3 Key Areas

To strengthen and scale-up bio-sectors

Development of LOCAL BIOECONOMIES

Understanding the ecological boundaries of production systems

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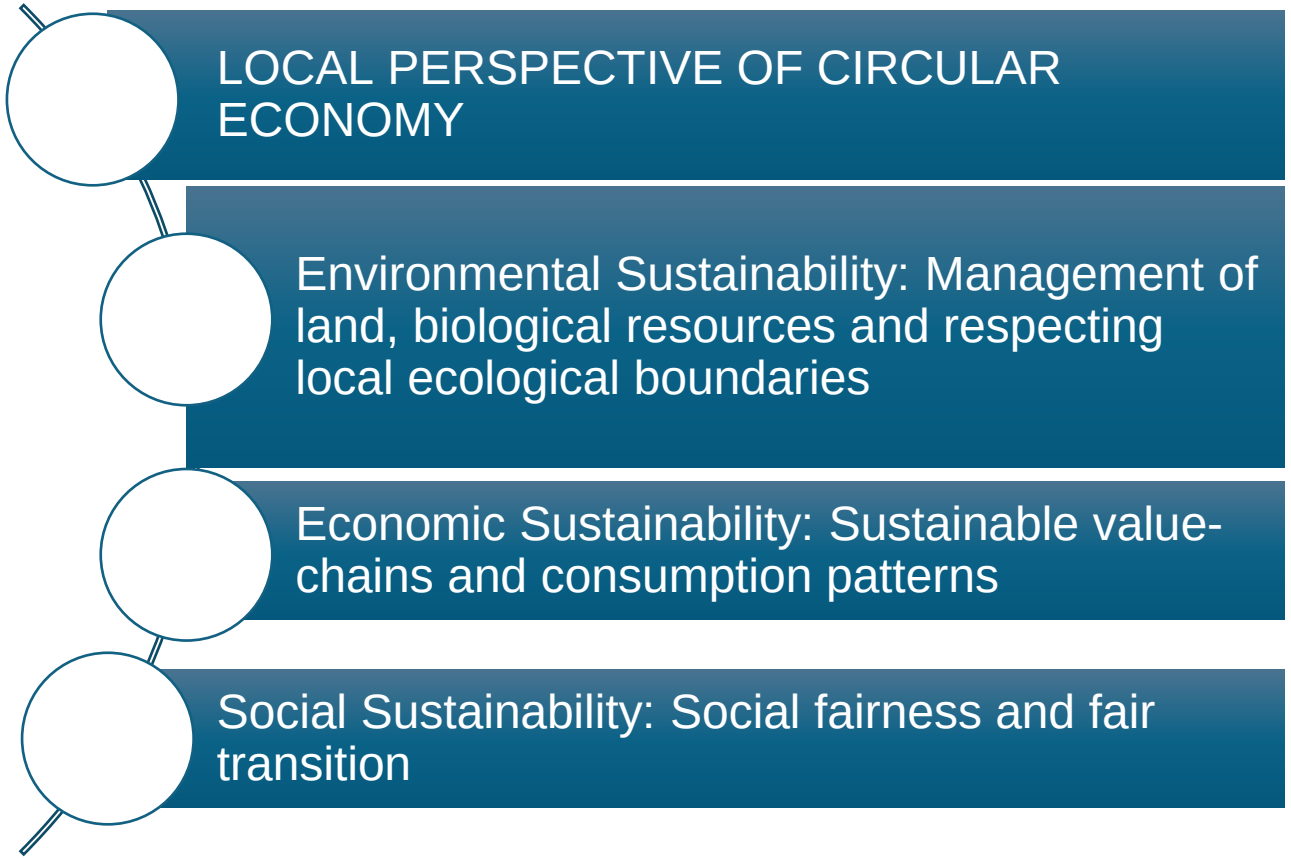

Capacities related with:

Live Sciences
Environmental Sci
Genetics
Chemistry
Biology
Engineering
Marine sciences
Animal production
Digitalisation
Social Sciences
Ecology
Law
Economics and Business Sciences
Bioprocesses
Biochemistry
Logistics
Marketing……

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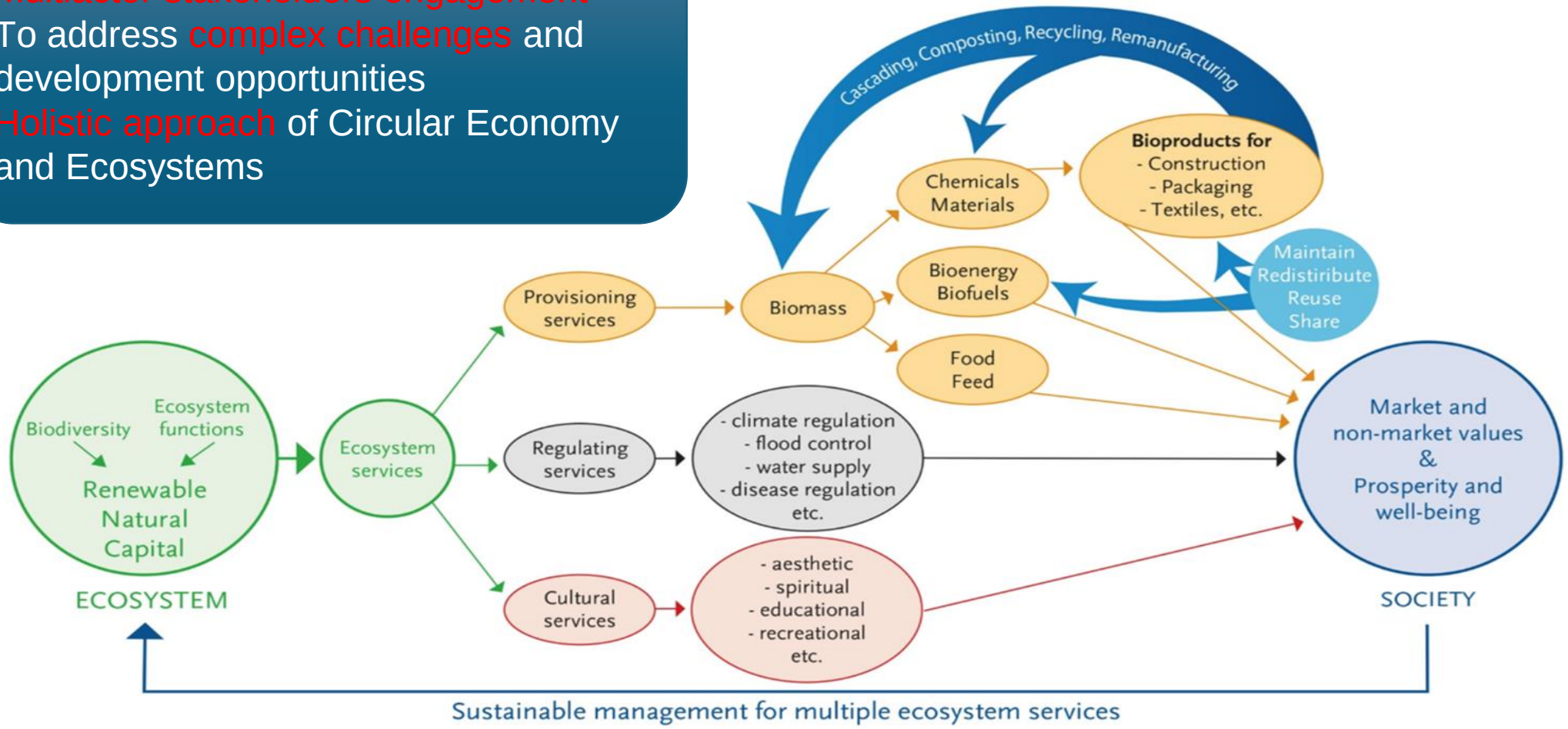
Multiactor stakeholders engagement
To address complex challenges and development opportunities
Holistic approach of Circular Economy and Ecosystems



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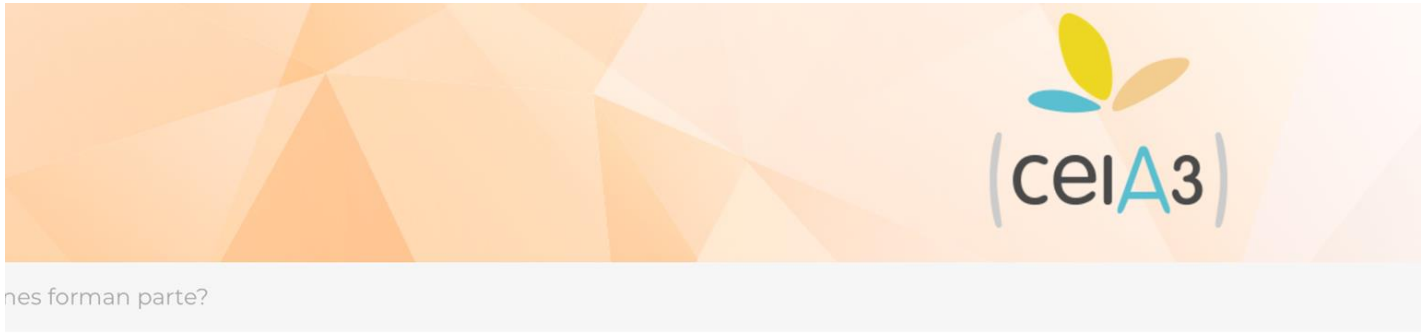
At local scale, in Andalucía: **Cluster of Universities interested in Circular Economy**– CEIA3



UNIVERSITI SAINS MALAYSIA UNIMAS UNIVERSITI MALAYSIA SARAWAK UNIVERSIDAD DE ALMERÍA Politécnico de Coimbra incoma

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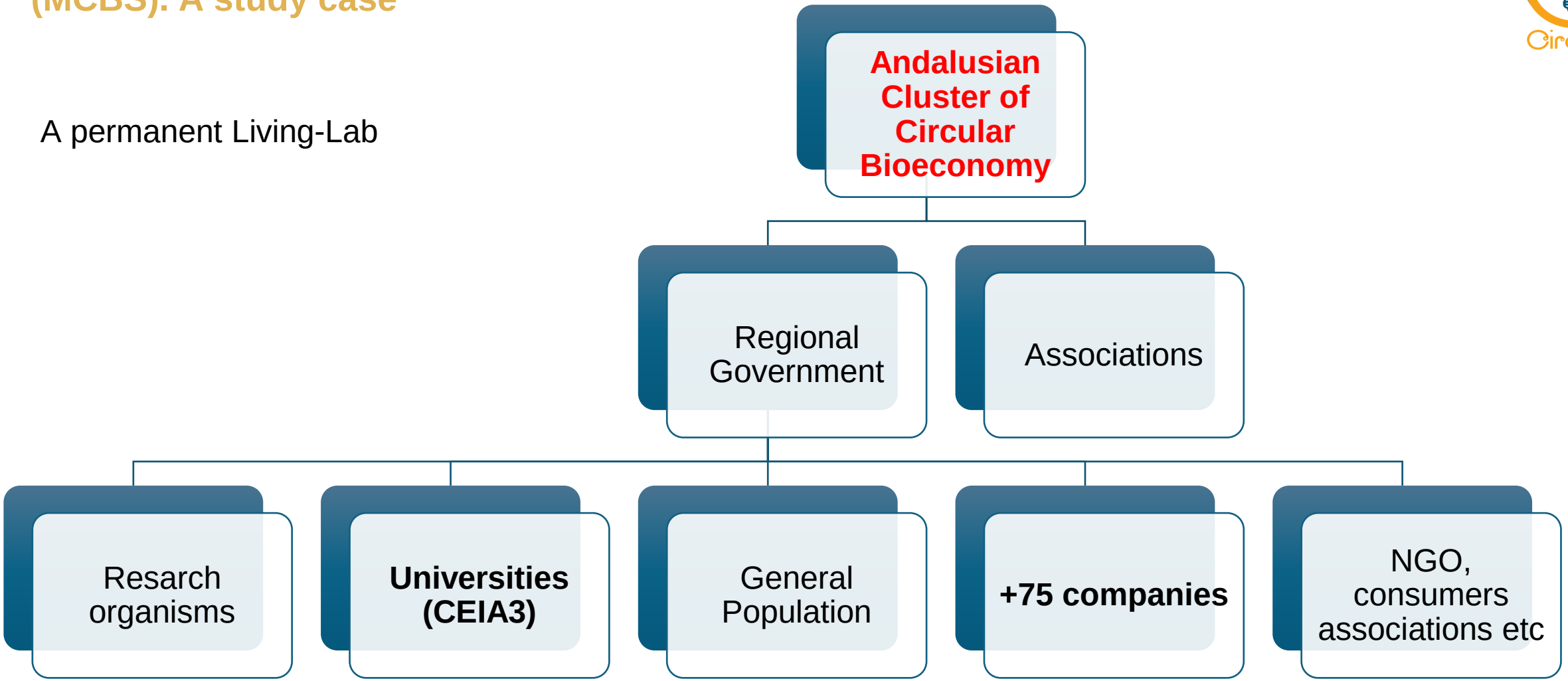
A permanent Living-Lab



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The Andalusian Strategy of Circular Bioeconomy address the interest in boosting capacity building in Circular Economy

Related with biomass resources

Characterisation of biomass flows in Andalusia and its potential valorization

- 1.1. Measuring biomass production and digitalisation of flows
- 1.2. Planing biomass valorisation from agriculture, silviculture, livestock farming and aquaculture, fisheries
- 1.3. **GIS localization of biomass resources**
- 1.4. Management separation of waste and municipal management
- 1.5. Quantify the potential of microalgae as biomass supply
- 1.6. **Chemical characterisation of biomass**
- 1.7. **Standardization and certification of biomass supply chains**

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Structure of MCBS

Blue bioeconomy and microalgae
Biorefineries, valorisation as bioenergy and compost
Characterisation of raw materials with potential valorisation
Management of knowledge-based companies and innovation
Circular economy policies regional, national and local
Biochemistry applied to bioprocesses
Agroecosystems as sources of raw materials in the frame of circular economy
Bioblocks and industry application
Business management and innovation
Clusters and Agroparks
New markets settings
Sociecological perspectives of circular economy
Proteomics
Training in companies
Master thesis

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Blue Bioeconomy and Microalgae

Theoretical contents:

1. Blue Bioeconomy in the EU context.
2. Current situation of extractive fisheries and aquaculture: current problems and alternatives.
3. The need for feed resources for aquaculture: sustainable sources of ingredients.
4. Algal biomass as feed raw material: potential and limitations.
5. The role of algae in the circular bioeconomy.
6. Applications of algae: wastewater utilization, carbon sequestration.
7. Characteristics of bioreactors for algae cultivation.
8. Algae as a source of new bioproducts with interest in pharmacology, cosmetics and agronomy.

Practical contents- Fundamentals of algae production- Photobioreactors for algae production- Design and evaluation of formulas for aquaculture fish- Technical visit to experimental feed service- Evaluation of objective quality parameters of fish for human consumption.

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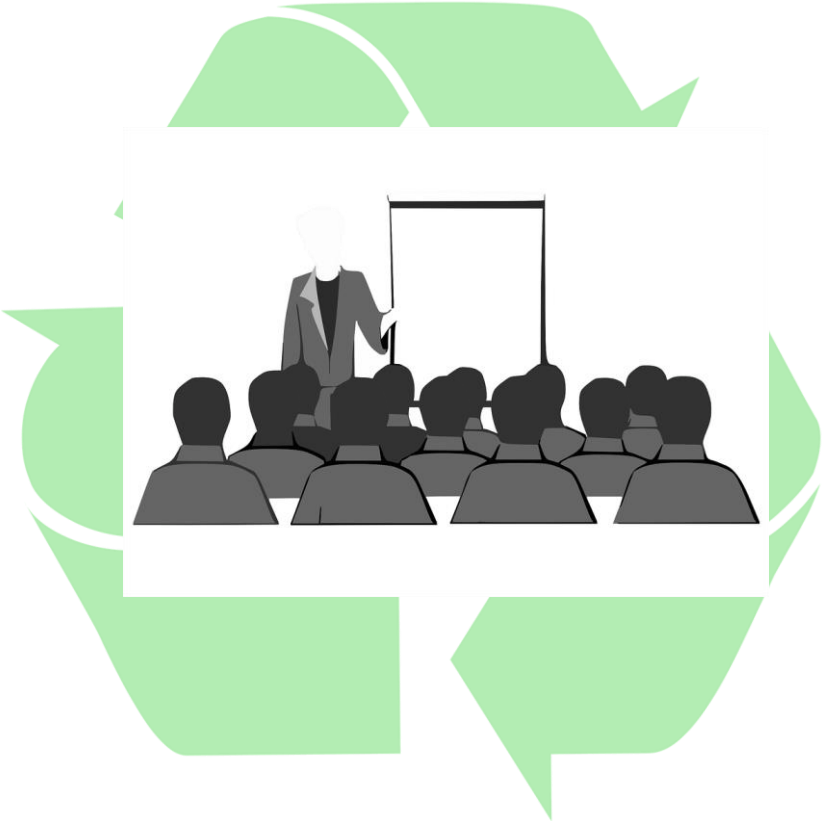
Biorefineries, energy and compost

MAIN OBJECTIVE of the COURSE:
Development of competences in the use of biomass, for obtaining bioproducts, but especially for the production of energy, compost and other by-products of agronomic interest.



Most relevant aspects of the subject:

To allow the student to know the most important characteristics of biomass, how to determine it, and how to identify its possible uses based on it.

To teach the student how to analyze the different ways of transforming biomass into valuable products, to introduce the student to these processes at industrial level and the problems faced by this sector.

To show the student the role of microorganisms in the biomass transformation processes as well as the importance of the use of biofertilizers in terms of sustainability.

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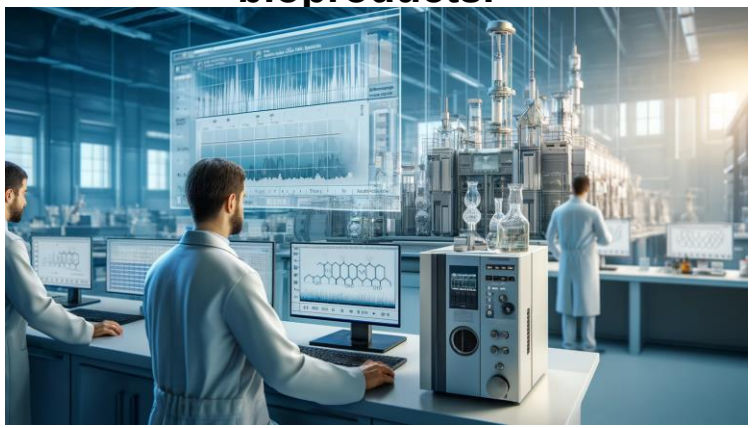
Chemical Characterisation of raw materials

raw materials

Characterization of raw materials → Essential to ensure that the inputs used in biotechnological processes are of high quality and sustainable..

Detailed analysis of the composition, properties and functionalities of raw materials → Optimization of processes and ensuring the efficiency of the final bioproducts.



Advanced analytical techniques

Rigorous assessment of potential risks to human health and environment

Bioproducts

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Business management and innovation

What do you know about business management within the bioeconomy?

CONTENTS OF THE COURSE

Block 1. Financial analysis in the company.

1. General and competitive environment.
2 Financial-Accounting Information System.
3. Financial Plan.
4 Valuation of Investment Projects.
5. Financing of Investment Projects.

Block 2. Strategic analysis and innovation.

6. Organization of internal systems in the company.
7. Generation of ideas for the creation of companies.
8 From the idea to the business opportunity. Strategic feasibility
9. Value innovation creation projects.
10. Strategic process for the creation of innovative companies.

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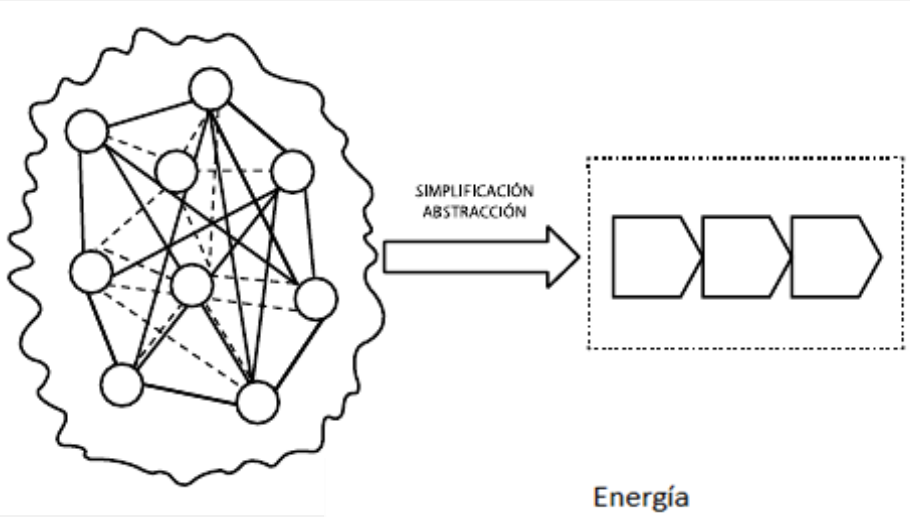
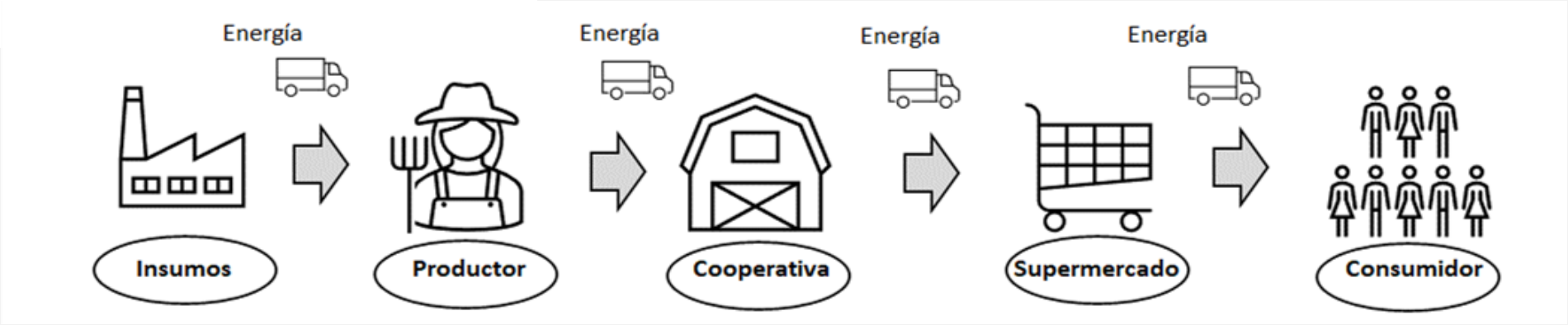
Clusters, sustainable value-chains and Agroparks



1. **Organization of agri-food companies.**
2. **Cooperation**: clusters, agro-parks and chain relations.
3. **Characterization of sustainable supply chains.**
4. Introduction to life cycle analysis methodology
5. Examples and applications of life cycle analysis.



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New markets settings

Market research as a strategic tool for the bioeconomy:

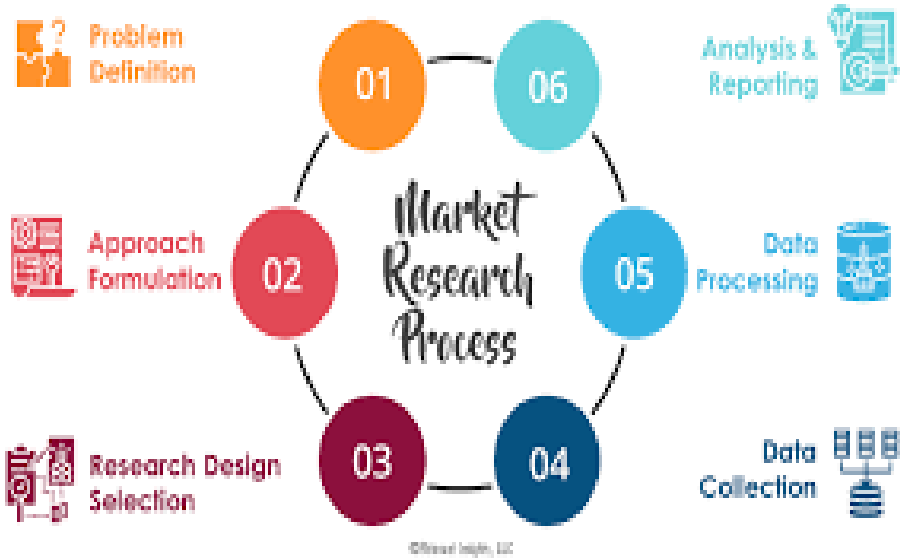
Identification of commercial opportunities: market niches and commercial opportunities for products and services derived from biological resources.

Validation of concepts and products: validating their viability and consumer acceptance.

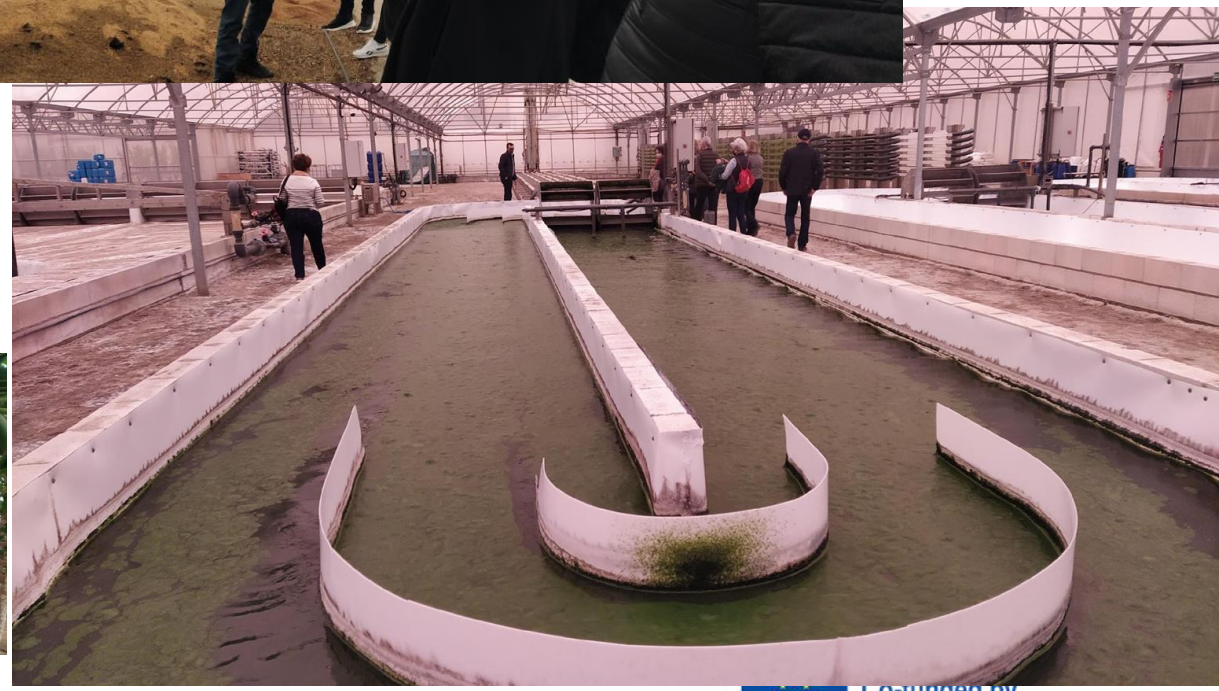
Pricing: effective pricing strategies.

Development of marketing strategies: promoting bioeconomy-derived products and services, identification of target market segments, development of brand messages and selection of appropriate distribution channels.

Product lifecycle management: evolving demand, market trends and innovation opportunities, adapt and improve products to stay competitive in the marketplace.



Master Thesis--- Dual programmes: important role of companies



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Master Thesis--- Training in companies (+30)

- Chemical evaluation of water reclamation processes
- Disinfection by solar photochemistry of treated wastewater for reuse
- Optimization of microalgae production
- Characterisation of the Flow of Biomass from agrifood industry
- Use of agro-industrial by-products as a source of bioactive compounds of interest in aquaculture
- Bioeconomy strategies from a socioecological perspective
- Use of organic waste by composting

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