3er Taller SMIBIO
Biorrefinerías de pequeña escala para el Desarrollo Rural en América Latina y Europa

Proyecto CLaMBer: Un impulso regional a la Bioeconomía en España

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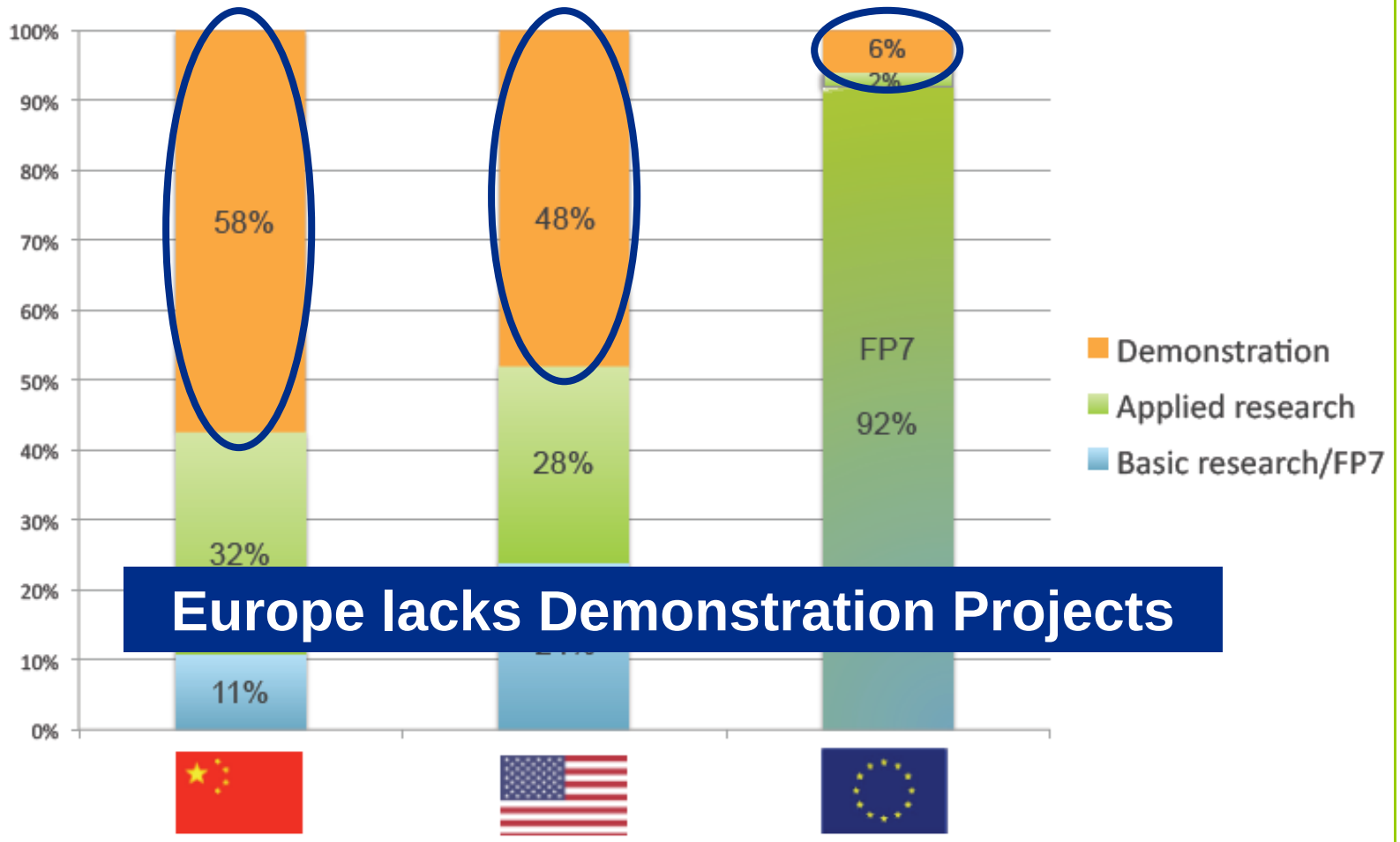
CIEMAT

FUNDED BY:

Research & Development Statistics

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD
Ciemat
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

International benchmark on the share of basic, applied and development activities



Europe lacks Demonstration Projects

Source: Key Science and Engineering Indicators, National Scientific Board, 2010 Digest, NSF, http://cordis.europa.eur/erawatch, OECD "Research & Development Statistics"

CLaMBer is an initiative of the Regional Government of Castilla-La Mancha with EU-Funds to support the strategic sector of bioeconomy.

- **Surface:** 79.461 Km^2 **Population:** ~ $2x10^6$
- **Agricultural** sector represents **a high percentage** of the region GDP (12%): Vineyard, Olive, Cereals).
- Castilla- La Mancha region has a **high potential** of agricultural, forestry and agroindustrial **residues**. 3 Mton lignocellulosic biomass, 9.5 Mt biodegradable residues

CLAMBER specific objectives are:

- To create a technologically advanced biorefinery pilot/demo plant that allows the research on production of innovative bioproducts.
- To develop a technology hub in the region to enable synergies with both companies producing biomass and bioproducts users and encourage the creation and exploitation of new market niches.
- To revitalize the local economy and reverse the negative demographics that characterizes rural areas.
- To contribute to an efficient public-private cooperation system in order to increase scientific and technological progress and to stimulate European and international research initiatives.

CLaMber Funding

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD
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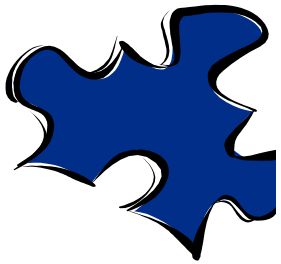
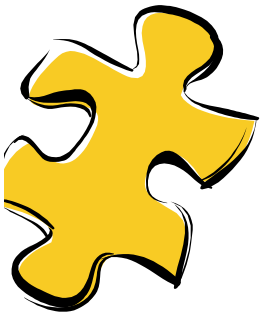
Castilla-La Mancha
EL GRECO 2014

MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD
FEDER
Fondo Europeo de Desarrollo Regional
UNIÓN EUROPEA
"Una manera de hacer Europa"

4 M€



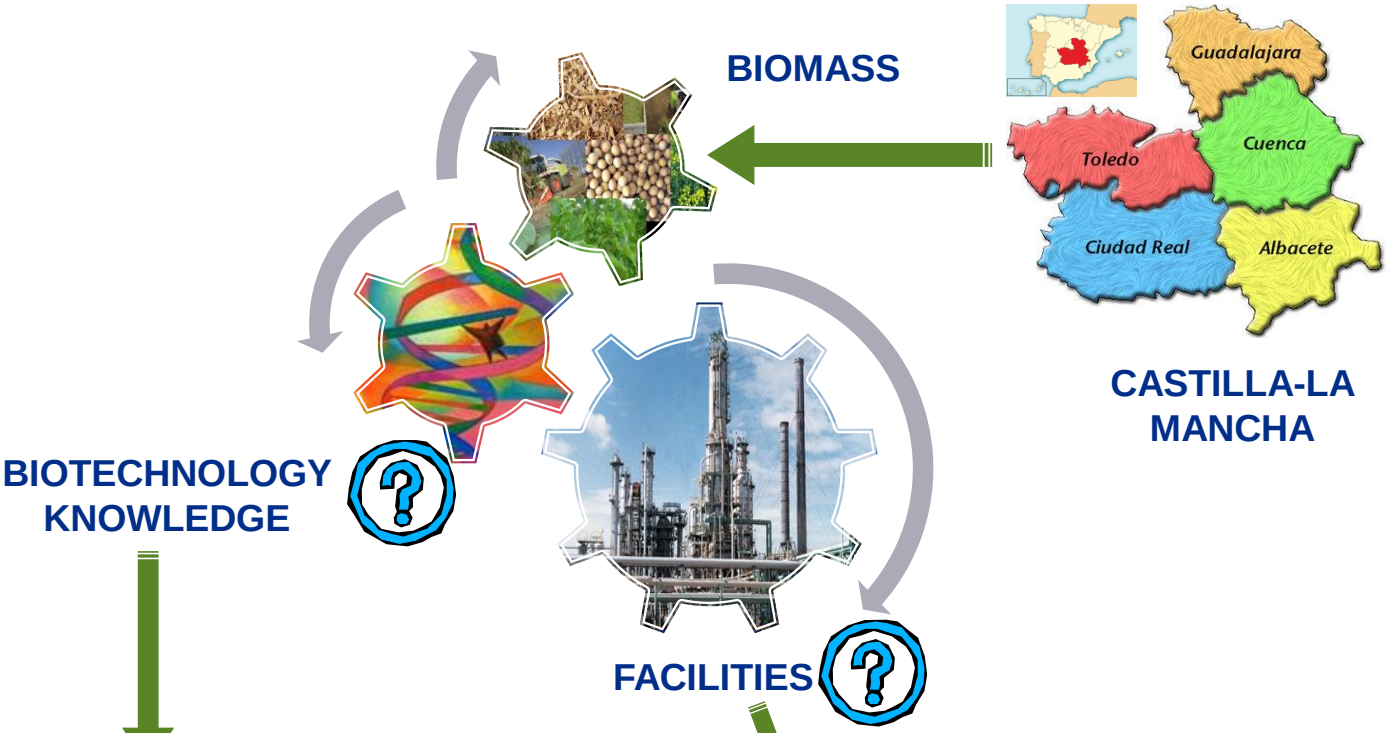


16 M€

CLaMber

20 M€

CLaMber actions



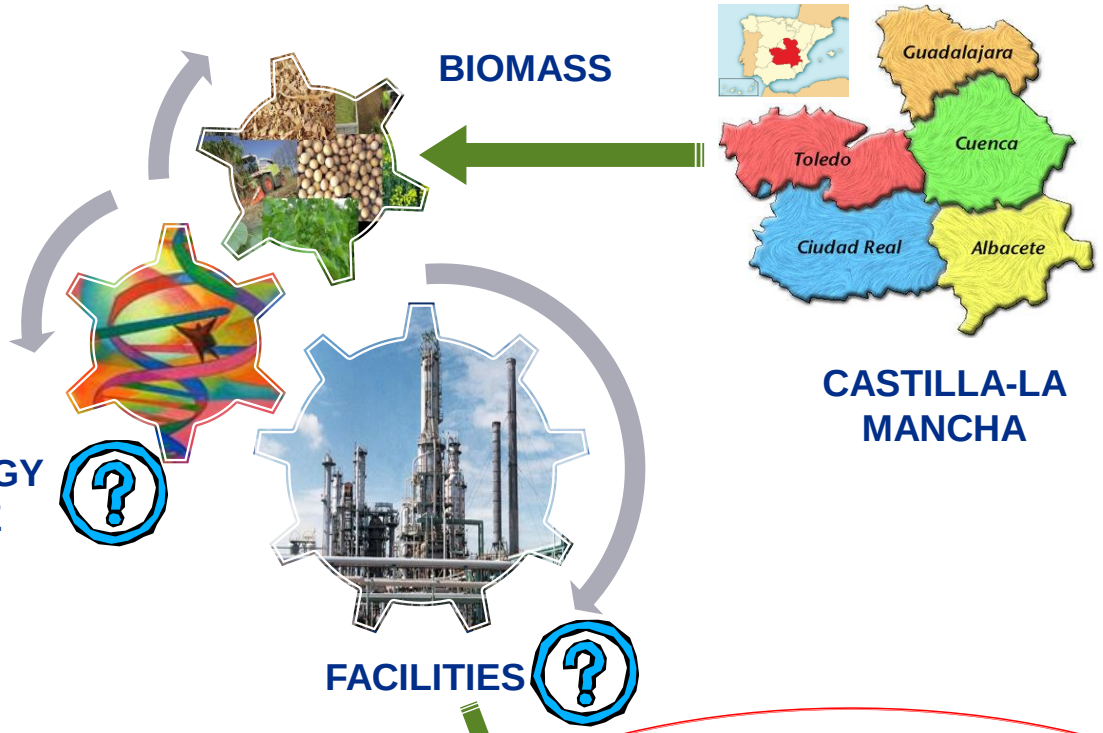
Promotion of R&D activities on biotechnology developed by companies in Castilla La Mancha.

Pre-Commercial Public Procurement (PPP)

(19 projects - 5,8 M Euros)

Construction of a demonstration scale biorefinery to test innovative process for the production of high value added bioproducts and bio-fuels from biomass on a larger scale

CLaMber actions



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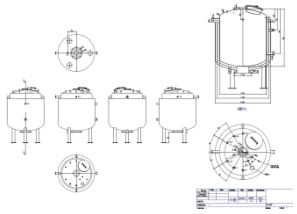
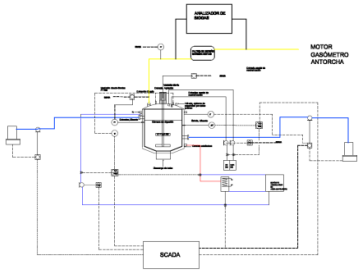
First action involved in the CLaMber Project

CONSTRUCTION OF A DEMONSTRATION SCALE BIOREFINERY





INTEGRAL | **MODULAR** | **FLEXIBLE** | **INNOVATIVE**

1 t dry material per day

KEY ASPECTS FOR FOCUSING :

EFFICIENCY,
COST REDUCTION
VALIDATION OF NEW BIOPROCESSES

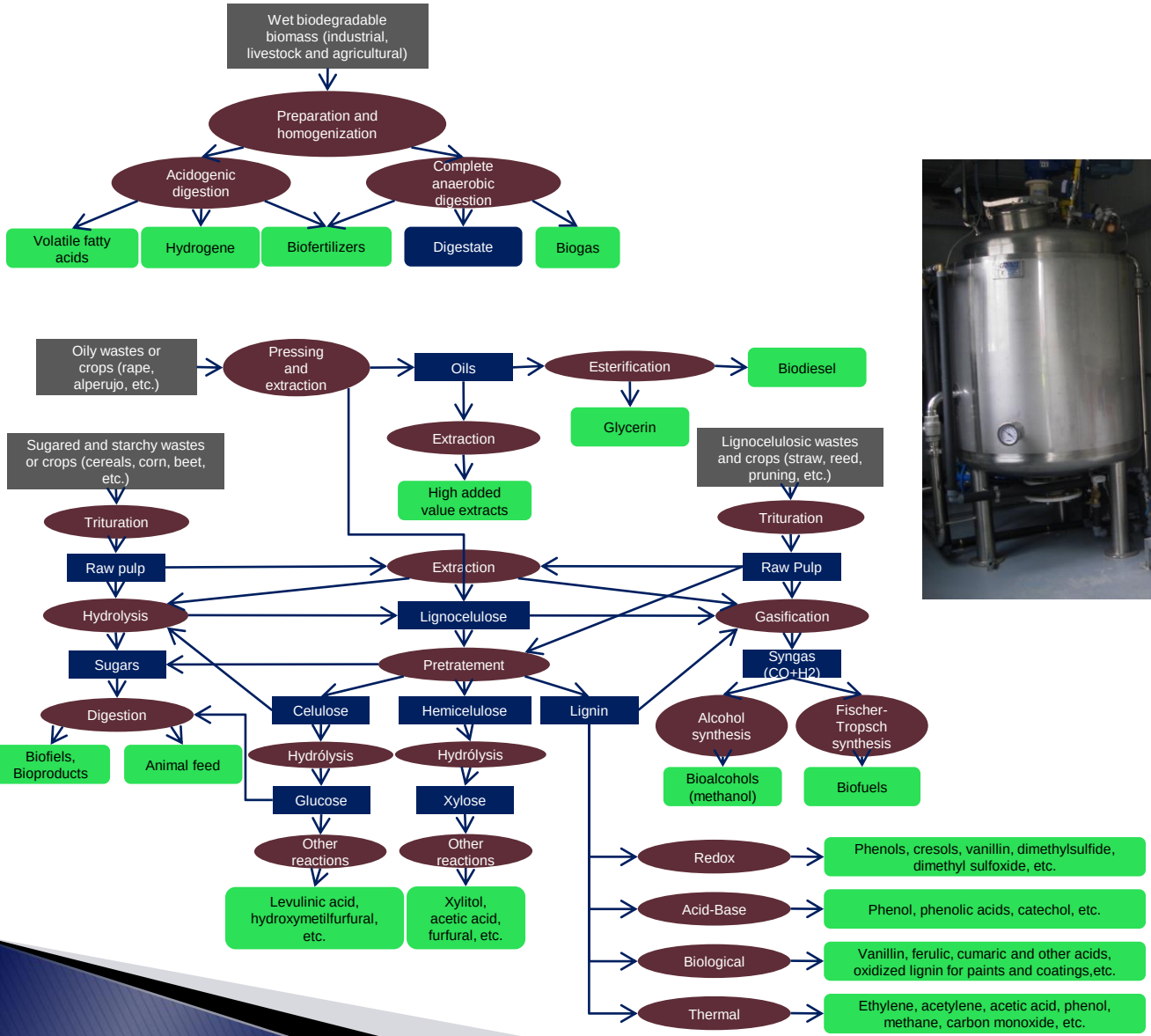
SERVICES:

- RENTAL OF FACILITIES
- PROCUREMENT OF R&D PROJECTS
- PARTNER FOR COMPETITIVE FUNDINGS
- TRAINNING IN BIOTECHNOLOGY

CLAMBER Plant: Main Characteristics

- ***Flexibility*** to develop several processes from very different raw materials. Also, it must be able to integrate different technologies temporarily, specially in up-stream and down-stream areas.
- ***Relevant Size*** of basic operations and technologies, because the objectives are the concept trials and the information for process scale-up.
- ***Technologically Robust,*** which allows the development of innovative processes.
- ***Complementary*** to existing capacities in Spain and specially in Castilla La Mancha Region.
- ***Modular***, bearing in mind two points of view : a) it can work on isolated areas and processing units without using the whole plant and b) It can be extended to other technologies not covered in the initial project.
- ***Sustainable***, in its demonstrative activity of processes, and feasible in terms of energy consumption and effluent management.

Simplified flow diagram



CLAMBER PLANT LOCATION

- ***It is located in an area of 19,000 m2*** in Puertollano and close to REPSOL Petrochemical Industrial Complex.

Clamber Plant Building

- ***The plant has a surface of 5,130 m²***
  - 1,400 m² are for the biorefinery
  - 600 m² are offices and laboratory

Front Plant View

Back Plant View

Biorefinery Areas

The demonstration pilot plant is organized into several areas:

- ✓ **Up-stream:** Storage, Milling (200 kg/h), Biomass Preconditioning, Two-step Steam Explosion Reactor (400 L), Solid- liquid separators (2 x 15 m^3/h)

Up-stream – Covered Solid Biomass Storage

Up-stream: Pretreatment section

Up- stream Area : Cooking tank & Steam explosion reactor

Biorefinery Areas

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- ✓ **Up-stream:** Storage, Milling (200 kg/h), Biomass Preconditioning, Two-step Steam Explosion Reactor (400 L), Solid- liquid separators (2 x 15 m3/h)

- **Mid-stream:** Microbiology laboratory (starters, inoculants, etc.), reactors for hydrolysis and aero and anaero fermentation (2 x 3 L , 2 x 30 L , 1 x 300 L, 1 x 3,000 L , 1 x 20,000 L), Substrate Preparation System (1 x 1 m^3 , 1 x 5 m^3), Sterilization, Addition of sterile reactants, CIP and other utilities.

Media Preparation & Sterile Reactants Area

30 L bioreactors

300 – 3,000 & 20,000 L Bioreactors

ANAEROBIC DIGESTION PLANT

- Liquid storage tank (20 m^3)
- Solid storage hopper (10 m^3)
- Pasteurization tank (1 m^3)
- Homogenization tank (3 m^3)
- Digester (11 m^3)
- Digestate tank (5 m^3)
- Gasometer (10 m^3)

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- **Down-stream:** Harvesting tanks 2x10000 L 2x1500 L, Microfiltration (1 m^3/h), Centrifugation system (1.5 m^3/h).

DOWN-STREAM

DOWN-STREAM

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- **Down-stream:** Harvesting tanks 2x10000 L 2x1500 L, Microfiltration (1m^3/h),Centrifugation system (1,5 m^3/h).

- **Utilities: (Electrical Power Supply, Steam Boilers, Process water, Cooling tower water, Chiller water, Glycol water, Compressed process air, Instrumentation & service air, Process Gases - NH_3, N_2, O_2, CO_2.**

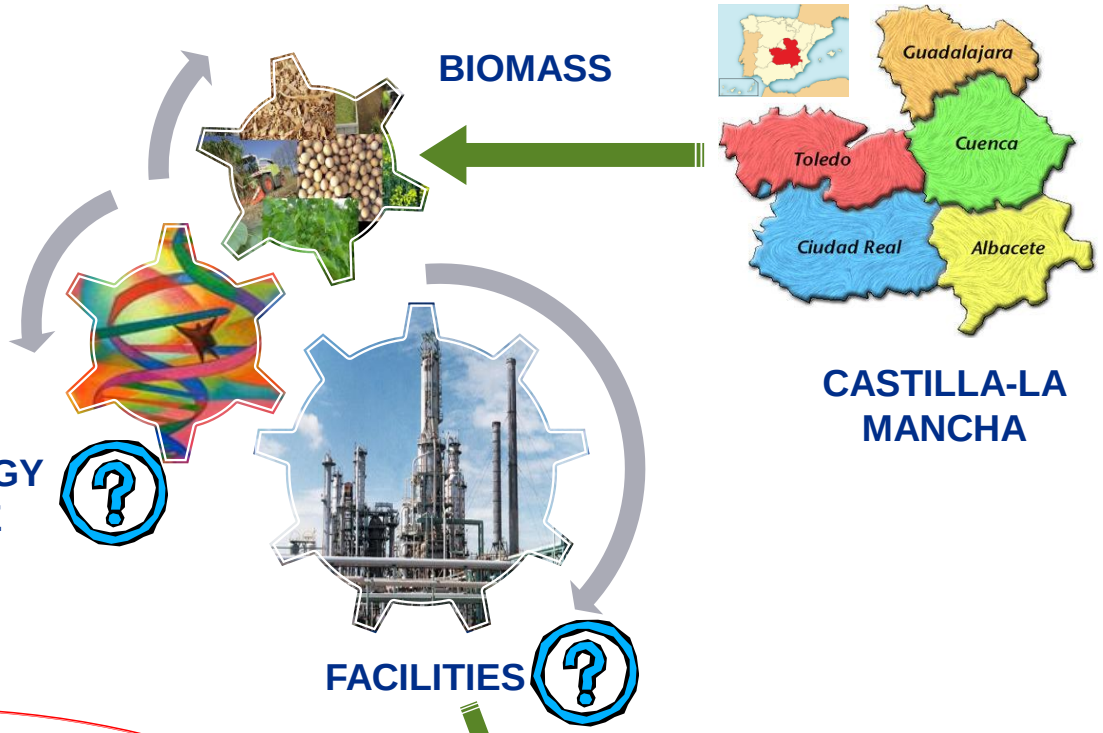
- **Waste Management**

UTILITIES

Waste Water Plant

Laboratory

CLaMber actions



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Compra Pública de Innovación (CPI)

Compra Pública de Innovación (en inglés, **Innovation Procurement**) son actuaciones administrativas cuyo objetivo es el fomento de la innovación a través de la contratación pública.

Impactos:

- La administración o los entes públicos correspondientes se modernizan mediante la adquisición de bienes y servicios novedosos.
- Las empresas desarrollan e introducen por primera vez en el mercado dichos bienes y servicios, con la consiguiente mejora de su competitividad.
- La innovación se dirige desde el lado de la demanda –en este caso del sector público– y no desde la oferta, como es habitual cuando las empresas tratan de introducir nuevos productos y servicios en el mercado.

Tipos:

- **Compra pública** (de tecnología) **innovadora** (CPI, CPTI) (en inglés, Public Procurement of Innovative solutions, PPI). Soluciones incipientes, que están a punto de llegar al mercado o empezando a introducirse en el mismo. No es necesario realizar actividades de I+D. La contratación pública "abre" el mercado y facilita que las empresas puedan escalar la producción y comercialización.

- **Compra pública precomercial** (CPP) (en inglés, Pre-Commercial Procurement, PCP). Soluciones que están aún lejos de llegar al mercado y, por tanto, es necesario llevar a cabo un esfuerzo de I+D considerable.
- Es una contratación de servicios de I+D en los que el comprador público comparte con las empresas los riesgos y beneficios de la investigación necesaria para desarrollar soluciones innovadoras que superen las que hay disponibles en el mercado. La CPP se circunscribe a actividades de I+D, no incluye el desarrollo comercial.

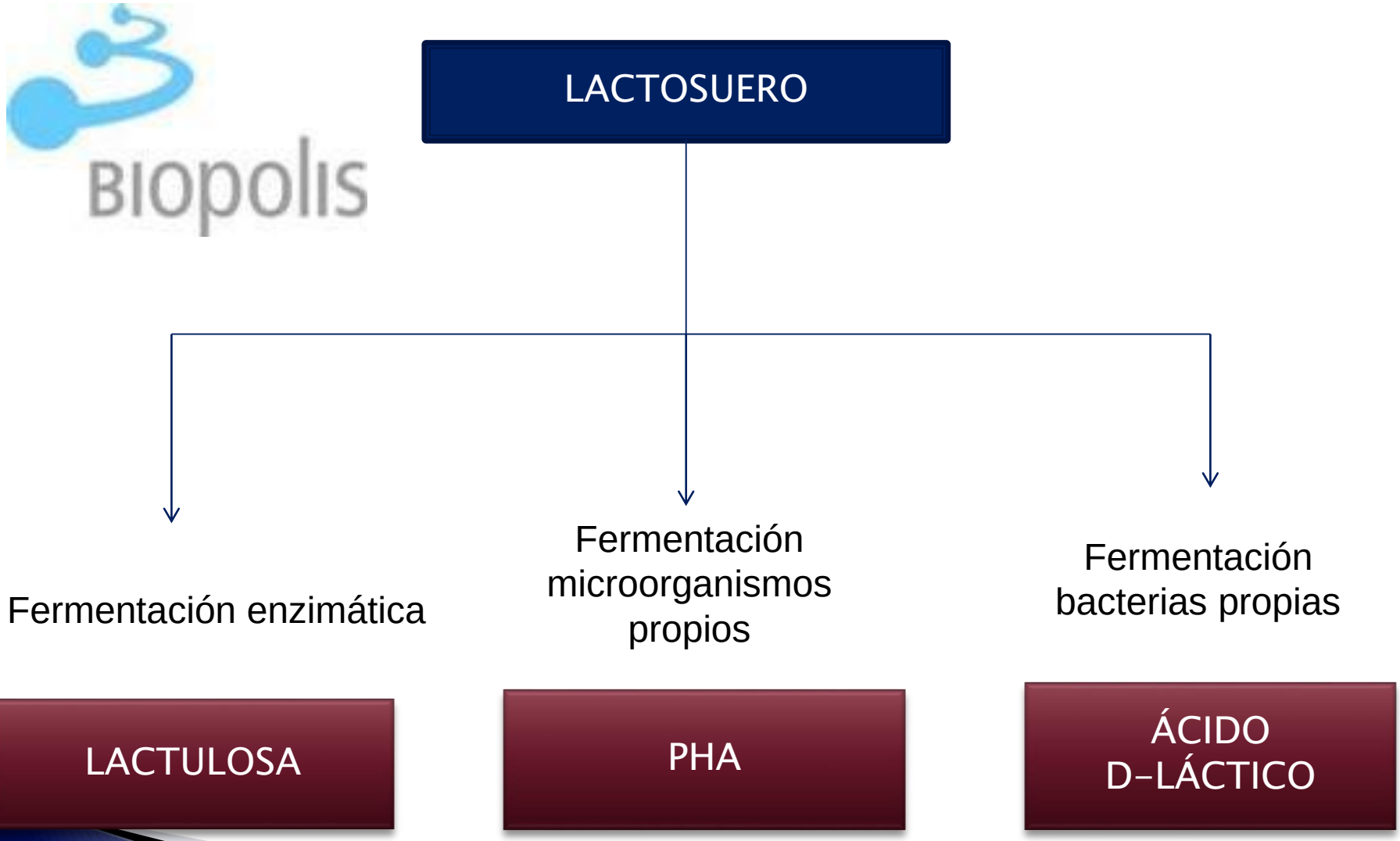
Adquisición de conocimiento

ALINEADAS CON LA ESTRATEGIA EUROPEA DE INVESTIGACIÓN DEL H2020, LAS LICITACIONES PUBLICADAS ENGLOBAN LOS SERVICIOS DE INVESTIGACIÓN, DESARROLLO E INNOVACIÓN PARA LA UTILIZACIÓN INTEGRAL DE:

- **BIOMASA LIGNOCELULÓSICA:**
  - BIOMASA RESIDUAL LEÑOSA
  - BIOMASA RESIDUAL HERBÁCEA
  - CULTIVOS LIGNOCELULÓSICOS
  - LIGNINA
- **BIOMASA RESIDUAL AGROALIMENTARIA:**
  - HOLLEJOS, PEPITAS Y LÍAS
  - ALPERUJO
  - LACTOSUERO
  - RESIDUOS CÁRNICOS
  - ALPECHÍN, VINAZAS Y OTRAS AR
- **BIOMASA OLEAGINOSA**
- **BIOMASA RESIDUAL GANADERA Y NO AGROALIMENTARIA**
  - ESTIERCOLES
  - FORSU
  - LODOS DE EDAR
  - GLICERINA
  - BIOGÁS NO ENERGÉTICO

Valorización Integral de Hollejos, Pepitas y Lías de Fermentaciones Vinícolas

Valorización Integral del Lactosuero



Gracias por la atención

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