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CIRCULAR BIOCARBON:

Turning urban waste streams into added-value products

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CIRCULAR BIOCARBON

What is CIRCULAR BIOCARBON?

- First-of-its-kind flagship biorefinery.
- Co-digestion of the organic fraction of municipal solid waste (OFMSW) and sewage sludge, aiming to \checkmark obtain intermediate products (chemical platforms) with purity and quality equivalent to those of fossil origin.
- Creation of end products starting from the intermediate products \checkmark
- More efficient management approach for OFMSW within a circular economy framework. \checkmark
- Implementation of process lines in two different locations: Zaragoza (Spain) and Sesto San Giovanni (Italy), \checkmark



AIM AND APPROACH

- \checkmark Valorize 100% of the waste generated by a medium-sized city into final products that enter the market
- ✓ <u>Zaragoza</u> facilities will have a treatment capacity of <u>14,000 tons</u> of waste per year, and those in <u>Sesto San Giovanni</u> are designed to treat <u>4,000 tons</u> annually.
- \checkmark Demonstrate the large-scale production of four high value-added products.
- Innovation: cascading technologies to treat mixed urban waste streams, achieving TRL 8-9.
- ✓ <u>Relevance</u>: empirical evidence on the effectiveness of integrated urban biorefineries and reduction of the waste that ends up in landfill.
- Impact: reduction of the environmental footprint of urban areas and promotion of the use of renewable resources. Scalable model for waste valorization.



ZARAGOZA BIOREFINERY

DLC coatings for tooling industry and graphene-based devices



SEWAGE



RESULTS from Zaragoza site

Current operation of a 2400m³ anaerobic digester: succesful co-digestion of OFMSW and sewage sludge under a mesophilic regime, producing biogas with a methane content near 55%.

CONCLUSIONS

- Succesful initiation of most of the technologies deployed in Zaragoza (Spain), achieving good
- **Upgrading facility working properly**: biogas is refined and ultrapure methane and carbon dioxide streams are obtained with a purity > 98% in both cases.
- **Composting of the solid fraction** from the digester: obtention of a C- and P-rich organic matrix with a high degree of maturity.
- Aerobic biotreatment of the liquid fration from the digester: production of an ultrapermeated \checkmark liquid , used to fill the algae reactor.
- **Current operation of algae reactor** using the refined carbon dioxide stream obtained after the \checkmark biogas upgrading. Algae growth proceding correctly, currently reaching a concentration > 0,7 g/L.

results.

- Normal operating regime of the entire biorefinery will be reached soon. Economic viability of the business model and its potential replicability will be demonstrated.
- Expected good results of the new fertilizers formulated to address changes in European legislation regarding origin of waste.





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