URBIOFIN
urban biorefinery

FROM **URBAN** WASTE TO **BIOPRODUCTS** THROUGH **BIOREFINERY**

Editorial

Change is the only constant in life and as such we welcome you back from summer holidays with URBIOFIN's fully refreshed **7th newsletter**.

In this issue you can get the latest update on the project's progress and read an insightful interview of Caterina Coll, CEO of PERSEO biotechnology and URBIOFIN's coordinator. Enjoy Urbio-FUN Facts & Figures and check out the latest news that were captured by URBIOFIN. Finally, find out which upcoming events we have selected for you.

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the project

Demonstration of an integrated innovative biorefinery for the transformation of municipal solid waste (MSW) into new biobased products.

Each person in Europe generates an average of 500 kg of MSW per year. Around 50% of this waste is composed of organic matter, made up of carbohydrates, proteins and lipids, all of which represent useful raw materials to synthesize value added products.

However, to date this potential has not been fully exploited. Therefore, the URBIOFIN project aims to demonstrate the technoeconomic and environmental viability of converting the organic fraction of MSW into bio-based chemicals such as building blocks, biopolymers and additives.

stay TUNED

BBI JU Bio-based Industries Consortium

This project has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement N° 745785.

PROJECT PROGRESS...

“URB1OF1N project is coming close to its final course of implementation, following a 5-year journey and results are already leading to the achievement of the objectives and milestones.”

More specifically, the conversion of OFMSW to bioethanol as building block to produce bioethylene has achieved significant progress. The demonstration activities of PERSEO bioethylene semi-industrial plant are ongoing, applying the optimized conditions from the lab tests. High bioethanol concentrations with yields similar to the parallel lab controls have been achieved. The addition of other more favourable raw materials or fractions richer in carbohydrates will be evaluated to increase the ethanol yield and equipment optimization tests will also run.

The supplementation of an enzyme additive and different process temperatures have also been tested with the aim of increasing the hydrolysis yields. Preliminary tests on the behaviour of the bioethylene module have been performed. The catalyst to be used in the module has also been tested at high times on stream, providing good activity for the ethylene production and stability. New catalysts based on heteropoly acids have been synthesized and tested for the bioethanol dehydration reaction.

Regarding the conversion of OFMSW to VFAs, the 2-phase pilot-scale anaerobic digestion system has been operating in a continuous mode to provide the required streams to the partners. The objective to reach at least 20 g/L of VFA in the liquid fraction of the effluent was achieved. The cost-effectiveness of scl-PHA production through operational changes is continued to be evaluated. Several pilot and demo scale trials have been performed to implement mcl-PHA process which remains to be optimized at demo-scale in the coming months.

Following the verification of extraction of the PHA at Lab Scale, Demo Scale extraction was carried out and remains to be optimised. Scl-PHA mixed culture production surpassed the goal of the project to obtain accumulation content of around 40-50%. Nevertheless, mcl-PHA production resulted to lower concertation levels and focus was given to improve the efficiency of the procedure.

The photobioreactor for the upgrading biogas from the anaerobic digesters is being operated continuously since inoculation and results showed that the microalgae-bacteria consortium has maintained a high photosynthetic activity.

Regarding the task for algal biomass recovery and revalorization, the biomass harvesting process was optimized. The goal to obtain a bioconversion of algal protein into free amino acids of up to 80 % and an average daily production of 0.18 kg amino acids was reached and scaling up will follow.

In relation to the Bioconversion of CH4 into PHAs, hydraulic tests have been performed on all equipment. All necessary permissions and certification of the low voltage plan have been received. Laboratory scale tests for siloxanes removal from biogas assessed the influence of the key operating parameters and optimized the system performance.

Regarding the industrial validation of the biobased products developed preliminary production has been carried out with the use of similar materials available in the market to optimize the formulation and production processes.

The validation trials of the preliminary produced materials are in progress whilst, in the following months, the intermediate materials produced in the pilot plants will be used to formulate and produce the different bio-based products; their potential will be validated for the selected end-user purposes complying with EU legislation.

The integration simulation process of the three modules developed within URB1OF1N including further updates of PFDs, process simulation basis, stream lists and equipment lists have been carried out. Modelling work has started in setting out the integrated biorefinery model and LCA model boundaries and modelling approach have been defined. The assessment of regulatory aspects that may have an impact on the URB1OF1N biorefinery value chain has been provided and potential regulatory drivers or gaps have been identified.

INTERVIEW WITH...

Caterina Coll

URBIOFIN
Project Coordinator

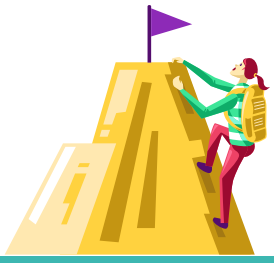
Can biorefineries effectively address the environmental objectives of circular economy?

A key driver to meet the energy and materials future demand of the society in a sustainable way is the implementation of the bioeconomy, which is based on renewable bio-based resources for the production of materials and energy. In this context Biorefineries are the main element in the framework of the emerging bioeconomy as the broad spectrum of biomass resources offers great opportunities for a wide-ranging product portfolio to satisfy the different needs of society.

Biomass, especially residual sustainable biomass, has to be used as efficiently as possible. In this context biocascading and biorefining approaches have to be applied in circular economy basis. The products obtained in biorefineries help to cover future demands for food, feed, chemicals, materials, transportation fuels, power and heat. Biorefineries and bio-based products are vital in reducing global emissions and decarbonizing our energy and production systems.

In this context URBIOFIN project showcases a comprehensive biorefinery model where municipal biowaste is processed with the aim of obtaining a zero-waste urban biorefinery, in an innovative example of circular economy systems (from waste to resources).

Which are the latest achievements of the project?



URBIOFIN project started in June 2017. At the latter part of 2020, the demonstration activities started to work continuously. Currently, all the biorefinery processes have been integrated within the 3 Spanish pilot facilities at PERSEO, CLAMBER and CIAM. The demonstration phase is ongoing with very promising results.

Committed quality and quantities of the target bioproducts (bioethanol, biotehylene, SCI- and MCL PHAs, biocomposites as well as liquid and solid bio-based fertilisers) will be achieved following the scheduled trials.

The bioproducts obtained in URBIOFIN biorefinery are being validated at industrial scale to verify that they meet their expected properties and functions. The validations consists of: i) the use of bio-ethylene as ripening gas in fruit chambers; ii) the production of PHA-based agronomic mulch films and plastic bags and as well as cosmetic packaging; iii) and the use of solid and liquid bio-based fertiliser for several crops in the field.

Moreover, the biorefinery is being modelled to prove its techno-economic viability and environmental performance and the latest regulatory aspects related to the new processes and bioproducts were recently assessed.

URBIOFUN FACTS & FIGURES...

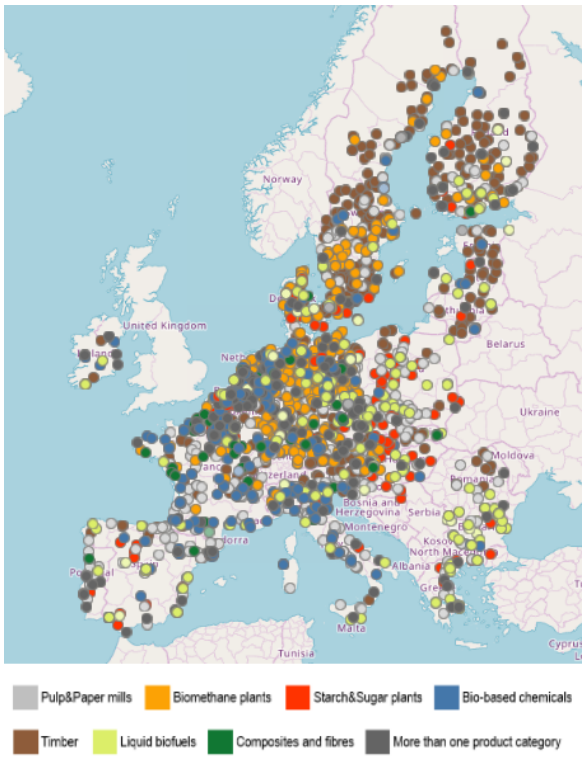
The EU bio-based industry is quickly evolving but clear data on the development of this emerging sector are still missing. A new *JRC report* illustrates the work of the JRC in building an extensive database of EU facilities producing different categories of bio-based products: - bio-based chemicals - liquid biofuels - bio-based composites and fibres - pulp and paper - biomethane - starch, sugar and derived products - timber (sawmills). This database is publicly available and accompanied by an online interactive dashboard implemented in the EC Data portal of agro-economics Modelling (DataM) and in the EC Knowledge Centre for Bioeconomy. Here is a glimpse of the visualised data presented in the *interactive dashboard*.

FACT

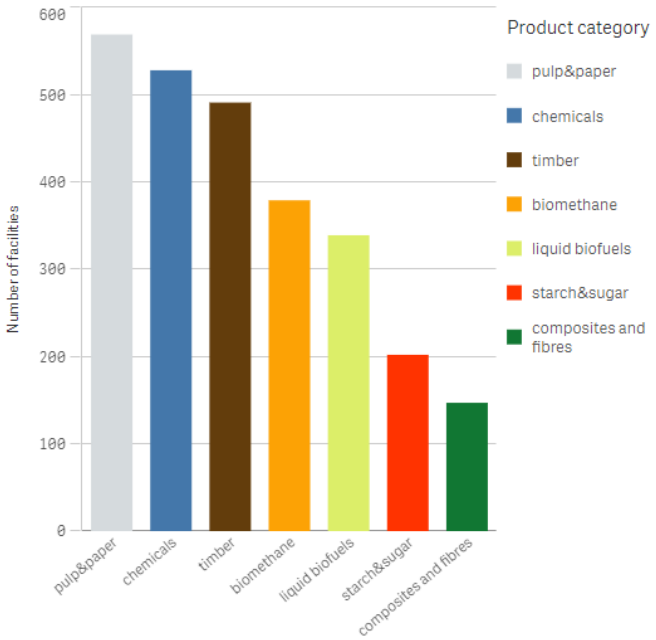
WITH A SHARE OF 34%, BIO-WASTE IS THE LARGEST SINGLE COMPONENT OF MUNICIPAL WASTE IN THE EU

SOURCE: EEA REPORT, NO 04/2020

Distribution of biobased industry plants, including biorefineries



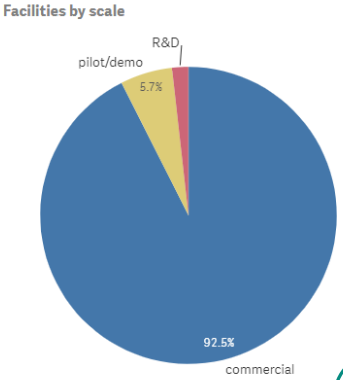
Biobased industry plants per product category

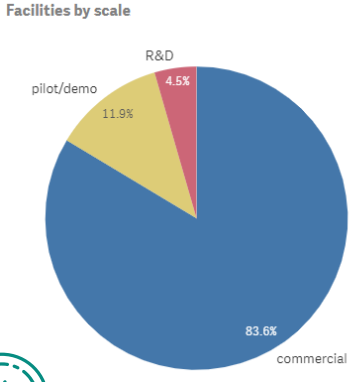


Total number and scale of facilities

N. of Facilities

2,362





Number and scale of facilities using waste feedstock

N. of Facilities

201

CAPTURED BY URBIOFIN...

Biobased products industry responsible for 4.6M US jobs

This Economic Impact Analysis of the U.S. Biobased Products Industry unveils that the biobased industry is a substantial generator of economic activity and jobs, and that it has a significant positive impact on the environment. Biobased products displace approximately 9.4 million barrels of oil annually and have the potential to reduce greenhouse gas emissions by an estimated 12.7 million tons of CO2 eq. / year. Access the report *here*.

BBI JU, a booster of Europe's bioeconomy

EFB Bioeconomy Journal presents the impact the BBI JU has had over the last decade on addressing the environmental objectives that are currently at the heart of the European Green Deal. This article also shows the BBI JU contribution to key policy areas including the EU's Circular Economy Action Plan, the Farm to Fork Strategy and the Bioeconomy Strategy and the actions taken by the partnership to support research and innovation across Europe. Read the article *here*.

Waste biorefineries: a solution to global issues

The special collection of *Biotechnology for Biofuels* presented an article – review that aimed to highlight the waste biorefinery as a sustainable bio-based circular economy, and, therefore, promoting a greener environment. Several case studies on the bioprocesses utilising waste for biopolymers and bio-lipids production are well discussed. The strategy of waste biorefinery integrated with circular bioeconomy in the perspectives of unravelling the global issues can help to tackle carbon management and greenhouse gas emissions. More on this article *here*.

Circular economy strategies "de-risking" investments'

The Ellen MacArthur Foundation in collaboration with Bocconi University and Intesa Sanpaolo, has published the white paper "The Circular Economy as a de-risking strategy and driver of superior risk-adjusted returns". This recently released white paper sets out how circular economy strategies might reduce investment risk by decoupling economic growth from resource consumption, diversifying business models, and allowing businesses to better anticipate stricter regulation and changing customer preferences. Download the white paper *here*.

Bio-waste in Europe-Turning challenges into opportunities

Bio-waste is a key waste stream with a high potential for contributing to a more circular economy. A new EEA report provides an overview of bio-waste generation, prevention, collection, and treatment in Europe. It aims to support countries by sharing experiences and best practices. Bio-waste can play an important role in the transition to a circular economy, by both preventing its generation and capturing its potential as a source of valuable secondary resources. Download the report *here*.

Anaerobic Digestion as a climate change mitigation solution

Following the Inter-Governmental Panel on Climate Change (IPCC) publishing of the *sixth assessment report on climate change* on August 9, the World Biogas Association (WBA) has renewed its call for the potential the biogas industry holds to be 'urgently unlocked'. WBA states that biogas can help deliver the "rapid reductions in GHG emissions and in particular methane" that according to the IPCC is necessary to address the climate emergency. Find out more *here*.

UPCOMING EVENTS...

22-23 Sep. 2021

The 2nd PHA-platform World Congress will be organized as a hybrid event on 22–23 September 2021 in Cologne, Germany. The congress will address the progress, challenges and market opportunities for the formation of this new polymer platform in the world. Every step in the value chain will be addressed. Raw materials, polymer manufacturing, compounding, polymer processing, applications, opportunities and end-of-life options will be discussed by parties active in each of these areas.

MORE INFO

6-7 Oct. 2021

Europe's Leading Event on Industrial Biotechnology and the Bioeconomy will be held in Vienna, Austria on October 6–7 2021. For more than ten years, EFIB brings together industry experts throughout the vibrant and innovative biobased community to discuss the key issues and gain a snapshot of the most significant developments on scale up of commercial biorefineries around the world. This year's theme is "Delivering the EU Green Deal: Industrial biotechnology into business".

MORE INFO

11-17 Oct. 2021

Circular Week is a series of international events and initiatives dedicated to circular economy and sustainable development taking place all over Europe. On the wave of success of last year's edition, which was attended by over 3,500 people, this fourth CIRCULAR WEEK will take place from the 11th to the 17th of October 2021. This year's CIRCULAR WEEK will include workshops, debates, meetings, experts' panels and matchmaking sessions for business.

MORE INFO

15 Oct. 2021

The International Conference Mazovia Circular Congress will be the focal point of the Circular Week 2021 and it will be held on October 15, 2021. This event is one of the biggest and most prestigious conference in Poland on circular economy. During the conference there will be presented international case studies with recommendations and discussions on possible implementation of similar projects in Poland. Panel discussion of various stakeholder groups on the use of circular economy solutions will also be held.

MORE INFO

18-20 Oct. 2021

The World BioEconomy Forum is a global platform for circular bioeconomy stakeholders to share ideas and promote bio-based solutions. The Forum's fundamental purpose is to encourage the replacement of non-renewable based industries, products and services to facilitate a more sustainable economy while mitigating climate change. The Forum will be held in Belém, the capital of the state of Pará on October 18-20, 2021. The Forum is co-hosted by the state of Pará with partners the Brazilian Agribusiness Association and The Brazilian Tree Industry.

MORE INFO

24-25 Nov. 2021

ACI's Future of Biogas Europe 2021 Summit will take place on the 24th & 25th November 2021 in Berlin, Germany. The 2-day event will bring together senior executives and experts from the full value chain to provide a forum for all parties active in the field of anaerobic digestion of organic matter and renewable energy production in the form of biogas. Power producers, leading technology & solution providers, farmers, as well as representatives from the food & beverage industry, and waste industry will share their experiences, expertise and ideas to successfully fight GHG emissions and take the right path to reach carbon neutrality by 2030.

MORE INFO

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THE CONSORTIUM...

stay tuned

www.urbiofin.eu

caterina@perseobiotech.com

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