URBIOFIN
urban biorefinery

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

Editorial

It's time to celebrate on the project's success and achievements.

The URBIOFIN project team welcomes back all newsletter readers and cordially thanks them for following through its five-year journey! In this URBIOFIN newsletter you can catch up with the project's progress and accomplishments...

We proudly host the views of two project partners Alba Serna Maza (URBASER) and José María Gómez Palacios (BPE) on the future of biorefineries, while women in bioeconomy give us their viewpoints on the prospects of the sector. Read on the latest news captured by URBIOFIN, URBIOFIN's event in World Bio Markets and the progress towards the Sustainable Development Goals in URBIOfun facts and figures. Finally, don't miss out on the most important upcoming events we have selected for you.

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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...

"URBIOFIN is proudly presenting its achievements & contributions to the bio-based economy."

Bioethanol production process from the organic fraction of municipal biowaste in PERSEO Biotechnology semi-industrial plant has achieved the targeted yields. Following an optimized process using the fed-batch strategy, PERSEO Biotechnology evaluated the addition of other fractions from Zaragoza MSWT plant. The bioethanol production can be increased with the addition of other fractions (co-feeding). The optimization of the models for the ethanol and glucose measurements has been showing promising results that confirm alignment with actual measurements. Bioethanol is effectively being further processed into bioethylene and the quantities required for the ripening and de-greening tests have been successfully collected.

The continuous operation of the two-phase Anaerobic Digestor was achieved following two considerable plant modifications that allowed the improved and seamless operation of the feeding and dewatering lines. Regarding the conversion of OFMSW into VFA, improved concentrations of VFA have been achieved and fresh VFA-rich liquid from a stable and well-operated digester has been used to conduct PHA accumulation trials. A stable biogas production has been accomplished and URBASER is currently working on a strategy to increase biogas flow by re-inoculating the methanogenic digester and intensifying the feeding of both anaerobic digesters, with a view to making the biogas lines independent. MCFA production following the new VFA elongation protocol has provided good results, whilst scl-PHA produced has been delivered for testing final applications and industrial validation. At the same time a demo scale fermentation of mcl-PHA is being run and the PHA extracted is being assessed for its feasibility. New demo optimization processes are being implemented to improve yields.

The photobioreactor for biogas upgrading has maintained high productivity and variability of the microalgae population and significant amounts of dry biomass have been extracted. Regarding the photosynthetic biogas upgrading, desulfurisation has achieved removal efficiencies of up to 100%, even at excessive H_2S concentrations.

CH_4 bioconversion into PHA has operated continuously and when temperatures were appropriate an exponential biomass growth was observed. Siloxanes removal efficiency increased significantly at higher siloxanes' concentrations in the biogas.

Relatively to the final applications different bioethylene ripening validation trials are running for bananas, whilst citrus degreening experiments will start soon. Two films containing URBIOFIN PHA have been obtained to be validated as bags. Also, Pots containing URBIOFIN PHA have been produced and validation trials are on-going. Two different URBIOFIN PHA based formulations have been developed and successfully extruded as films. Currently, they are being assessed for their biodegradation as mulch in soil and they will then be formulated/produced in an industrial film. URBIOFIN PHBV has been used to produce compounds together with commercial PHBV via extrusion and injection moulding. Moreover, blends using URBIOFIN mcl-PHA combined with other biodegradable compounds are being developed.

Three different organo-mineral granulated products coming from the solid fraction of OFMSW digestate have been produced and validated as fertilising products in controlled conditions on lettuce and in the open field on tomato crops. The results indicate they are benefiting the soil-plant system and a second trial is running to assess mid-term agronomic effects. The hydrolysate obtained from microalgae meets legal requirements and has a high concentration of aminoacids.

The final URBIOFIN biorefinery scenario has been modelled and the total CAPEX has been estimated taking into account the equipment cost of each module. The Life Cycle Assessment and Life Cycle Cost modelling has been updated in accordance with the final scenario, results are being interpreted and the potential social improvements of URBIOFIN as an OFMSW valorisation system are being quantified. URBIOFIN processes & bio-based products have also been reviewed based on the latest legislative changes.

Coming close to the end of the URBIOFIN project and the realization of our vision, we have asked two of the project partners representing Waste Management Companies to give us their views on the future of biorefineries.

INTERVIEW #1

José María Gómez Palacios

Director of BIOMASA PENINSULAR BPE

BIOMASA PENINSULAR is a Spanish SME providing technology and services for the recycling of bioresidues. BIOMASA operates 5 recycling centers and manages 170,000 tn/year.

What are the difficulties faced in sustainable waste management?

Speaking in a positive manner, the sustainable municipal waste management, must depart from some fixed premises for avoiding the usual difficulties that arise when these premises are not being accomplished:

- The most essential premise is that separation at the source and the separate collection are indispensable, as well as that they are a legal imperative in the EU.
- For this, political compromise, planning and continuous communication and education in schools are obligatory conditions to guarantee the collaboration of citizens, commercial activities and other organisations.
- In case of having high atmospheric temperatures and longer times in collection and bio-waste storage systems provoke the fermentation of biowaste, making the biotechnological processes unfeasible, but also the Anaerobic Digestion and Composting in reasonable operational conditions.
- Higher investment and operational costs must be expected at least in the first years of the implementation of sustainable waste management.
- Lack of proper legislation, compliance assessment and enforcement measures with low landfill taxes are the main conditions that create the perfect frame for "unsustainable municipal waste management".

Can biorefineries be the solution for Municipal Waste Management?

The Biorefinery concept is perfectly suitable to be applied to the OFMSW or clean municipal bio-waste, although the above defined premises for sustainable municipal bio-waste management may be fulfilled. As any other biomass source, it requires a general mechanical pre-treatment and sorting phase. A second phase pre-treatment will be necessary with the supply of hot water, steam, enzymes, chemicals or pressure treatments, or different combinations of them. Processes like the Anaerobic Digestion (yielding biogas), Alcoholic fermentation (yielding bioethanol) or similar biotech processes are suitable, demonstrated and economically feasible, especially in the context of increasing fossil energy prices and environmental constraints.

The URBIOFIN project has a strong team of women researchers. Solid to our commitment to empowering women researchers we have asked Gracia and Maroulla to share their views on the bioeconomy!

WOMEN IN BIOECONOMY

Gracia Silvestre Tormo

ainia
centro tecnológico

Biowaste has become an important source of raw materials in the bioeconomy to produce a huge range of valuable bioproducts like bioplastics, biochemicals and biofertilizers.

We obtain income from the bioproducts produced from the biowaste, instead of investing money in their treatment. This is a total paradigm shift. I think the biowaste will have a market price in near the future.

INTERVIEW #2

Alba Serna Maza

Biological Processes Technician at URBASER

URBASER, group belonging to the company FIRION INVESTMENTS, is a worldwide reference in the area of environment, dedicated to activities in street cleaning, waste removal and transporting, urban waste treatment and recycling, comprehensive management of the water cycle and urban landscape and gardening.

What are the difficulties faced in sustainable waste management?

Municipal solid waste is produced at different population centres, consequently it can be concentrated or dispersed. For this reason, different treatment and valorization business models are required to fit the different configurations. Additionally, the implementation of source segregation in the organic fraction of municipal solid waste is required to set the recycling objectives set in the EU regulations. However, inadequate social awareness on waste hierarchy and source segregation increases improper materials in the OFMSW stream and deficiency of the resources needed to implement certain technologies when they are only economically viable at large scale. Therefore, incentive schemes are required in order to achieve population awarenes for the right segregation of waste. This needs to be promoted by strong political commitment and support. The presence of improper material in the waste stream increases energy consumption linked to product pre-treatment and refinement due to a higher heterogeneity and complexity of the waste stream. This fact is translated into higher cost of the final bio-products compared to fossil based products.

Bio-products market needs to be boosted applying a bio fee on the final price or promoted by EU legislation, taxes or standards. On the contrary, lack of end-user acceptance of the bio-products generated with waste origin can be a difficulty to overcome applying close control and quality checks.

Can biorefineries be the solution for Municipal Waste Management?

Disposal of municipal solid waste is a major concern as it poses risks to the environment. Municipal solid waste itself represents a potential and valuable resource. Biorefineries are able to convert the organic fraction of municipal solid waste into energy and other beneficial byproducts that can be adapted to locally available raw materials or waste streams. In that sense, they are able to contribute towards new models based on a circular vision of waste treatment in the city and will offer citizens alternative waste management that will generate wealth and qualified employment through new innovative techniques. An additional benefit is replacing fossil fuel-based raw materials with renewable resources and reducing dependency on imported raw materials. It also contributes in reducing the disposal of organic matter in landfills, and greenhouse gas emissions as established by European regulations.

WOMEN IN BIOECONOMY

Maroulla Schiza

etam s.a.
consulting services

Research and innovation should focus on bioeconomy to accelerate progress towards a circular and low-carbon economy.

The bioeconomy can provide the solution to environmental problems like climate change, resource sustainability and waste management by creating new value chains and greener and viable industrial processes, whilst strengthening competitiveness and driving sustainable development.

URBIO*fun* FACTS & FIGURES...

Eurostat published the sixth report on "Sustainable development in the EU-2022 monitoring report on progress towards the Sustainable Development Goals (SDGs)" which provides a statistical overview of progress towards the Sustainable Development Goals. The analysis in this publication builds on the EU SDG indicator set that comprises around 100 indicators and is structured along the 17 SDGs. For each SDG, it focuses on aspects that are relevant from an EU perspective. SDG 11 Sustainable cities and communities and SDG12 Responsible consumption and production examine amongst other aspects of waste management and the circular economy. Results are more than encouraging.

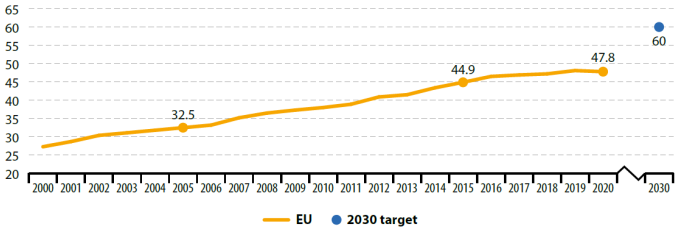
Recycling rate of municipal waste

47.8% of total municipal waste generated in the EU was recycled in 2020

Circular material use rate

12.8% of the materials used in the EU came from collected waste in 2020

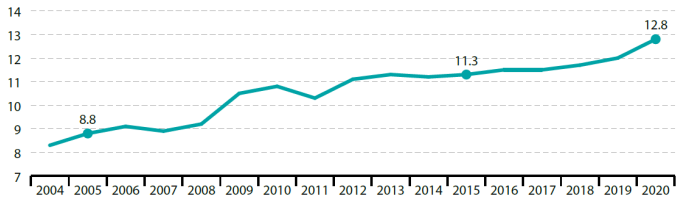
Recycling rate of municipal waste, EU, 2000–2020 (% of total municipal waste generated)



Note: 2019 and 2020 data are Eurostat estimates.
Compound annual growth rate (CAGR): 2.6 % per year (observed) and 2.5 % per year (required to meet target) in the period 2005–2020; 1.3 % per year (observed) and 2.0 % per year (required to meet target) in the period 2015–2020.

Source: Eurostat (online data code: sdg_11_60)

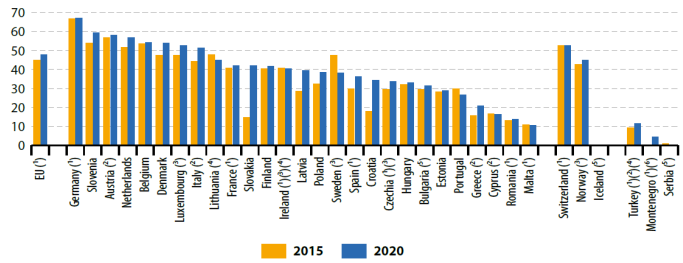
Circular material use rate, EU, 2004–2020 (% of material input for domestic use)



Note: Data for odd years (2005, 2007, etc.) and for 2020 are estimated.
Compound annual growth rate (CAGR): 2.5 % per year in the period 2005–2020; 2.5 % per year in the period 2015–2020.

Source: Eurostat (online data code: sdg_12_41)

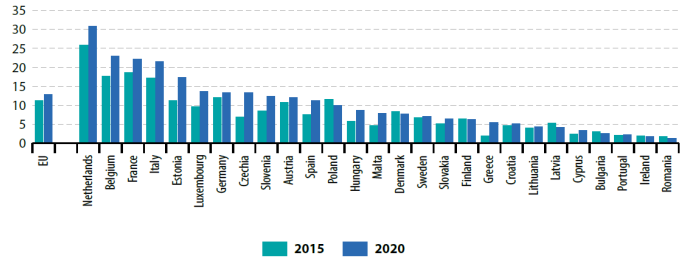
Recycling rate of municipal waste, by country, 2015 and 2020 (% of total municipal waste generated)



(1) Estimated and/or provisional data.
(2) 2019 data (instead of 2020).
(3) Break(s) in time series between the two years shown.
(4) 2016 data (instead of 2015).
(5) 2018 data (instead of 2020).
(6) No data for 2015.

Source: Eurostat (online data code: sdg_11_60)

Circular material use rate, by country, 2015 and 2020 (% of material input for domestic use)



Note: Data are estimated (all countries).

Source: Eurostat (online data code: sdg_12_41)

CAPTURED BY URBIOFIN...

Bioeconomy strategy development in EU regions

The European Commission's Knowledge Center for Bioeconomy has recently published the final report on the study of "Bioeconomy strategy development in EU regions". The study was conducted from July 2021 to March 2022 and covered regulatory frameworks in place or under development as of November 2021. Overall, there are 359 bioeconomy-related strategies at regional level in the EU-27. 324 of these are regional and 10 are multi-regional (e.g., cross-border, interregional or macroregional) strategic frameworks. Access the report here.

New BIC search tool for regional funding for bio-based projects

Amongst the key objectives of the Bio-based Industries Consortium is to bridge the gap between bio-based investment opportunities and financial incentives at regional level. To this end BIC launched a new platform to better connect industry members with European regions. The focus of the database is on funding for advanced projects in the bioeconomy (at least technology readiness level 7). BIC will update the database twice a year. The next update is in September 2022. Access the database here.

Bio-based plastics listed as "green investments" in the EU's Taxonomy

In a recent 'european bioplastics' press release it is stated that the EU's Taxonomy has correctly listed bio-based plastics as "green investments". In order to meet the European Union's climate and energy targets for 2030 and reach the objectives of the European Green Deal, the European Commission aims at directing investments towards sustainable projects and activities. The Taxonomy establishes six environmental objectives, several of which directly relate to bioplastics. Read the article here.

Biowaste AD market is growing in Europe

According to ecoprog's latest market report it is expected that until 2030, about 8.1 million annual tons of additional capacity will be built for the fermentation of municipal biowaste. AD capacities for treating commercial biowaste will be developed as well. The main reasons for this growth are EU regulation stipulating a separate biowaste collection from 2024 onwards as well as the booming biomethane market. Find out more here.

Commission launches Consultation on the revision of the Waste Framework Directive

The Commission has launched a public consultation on the revision of the Waste Framework Directive. The revision aims to improve the environmental outcome of waste management in line with the waste hierarchy and the implementation of the polluter pays principle, as well as setting EU food waste reduction targets. The consultation focuses on waste prevention (including reduction of food waste), separate collection, waste oils and textiles. The public consultation is open for feedback until 16 August 2022. The consultation is available here.

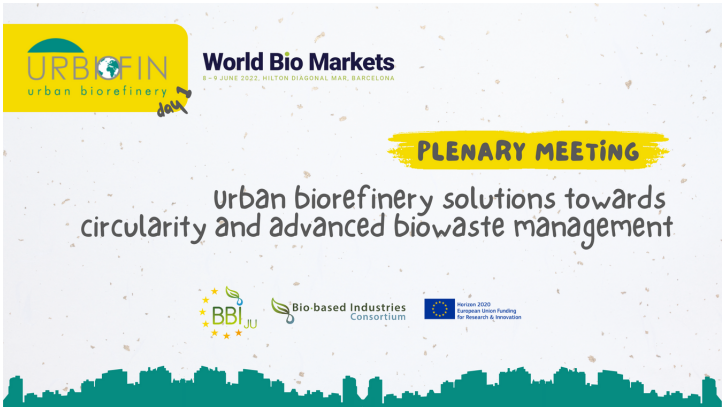
CBE JU Annual Work Programme & Strategic Research and Innovation Agenda

CBE JU published its Annual Work Programme, including information about the 2022 call for project proposals. A total of €120 million will be dedicated to advance competitive circular bio-based industries in Europe across 12 topics. Additionally, it published the Strategic Research and Innovation Agenda (SRIA) that identifies the strategic priorities and the essential research and innovation actions required to achieve the objectives of the Circular Bio-based Europe Joint Undertaking. Access the publications here & here.

URBIOFIN IN World Bio Markets

8 - 9 JUNE 2022, HILTON DIAGONAL MAR, BARCELONA

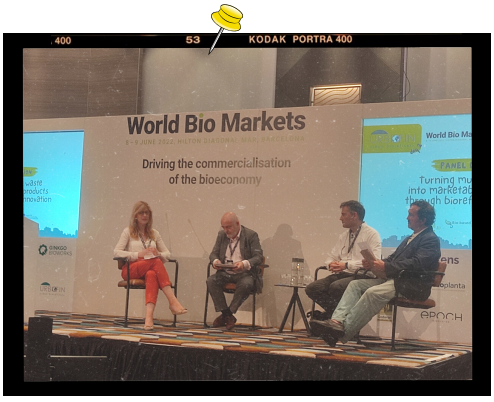
World Bio Markets the bio industry's premier business event connects and generates deal flow between bio producers, global Fast Moving Consumer Goods (FMCG) brands, investors and suppliers and provides a forum for cross sector knowledge exchange and transfer as we accelerate the transition to a post petroleum economy. The URBIOFIN project participated in World Bio Markets 2022 on 8-9 June, along with over 200 industry leaders, in an in-person 2-day programme of knowledge exchange, 1-2-1 meetings and networking.



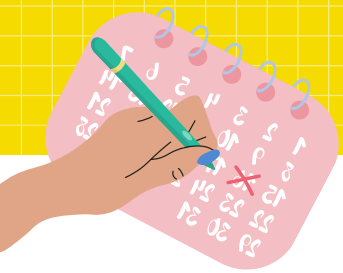
In a plenary event coordinated by PERSEO biotechnologies, we shared our advances in biotechnological process developments at industrial level to produce biofuel, bioenergy and bioproducts from organic and celulosic wastes.

On day one "Urban biowaste concerns, bioproduct alternatives and regulatory perspectives in EU", were presented with the participation of project partners and hosting Margarita de Gregorio (Bioplat), Víctor Mitjans (Area Metropolitana de Barcelona), as well as the research projects WaysTUP!, VALUEWASTE and DEEP PUPRLE.

Day two focused on a panel discussion about "Value chain innovations from lab to feedstocks to biorefineries to waste streams and market ready products", based on the URBIOFIN Project biorefinery model.



The URBIOFIN project was delighted to have had the opportunity to share its experiences with other companies and experts of the field!



2022 UPCOMING EVENTS...

WORLD bioeconomy FORUM

7-9 September

The 5th World BioEconomy Forum will be held in **Ruka, Finland** on 7-9 September 2022 in a **hybrid** format. The Forum will focus on the role of Bioeconomy and Bioproducts into climate change mitigation as they are not currently an instrumental part of relevant policies. A major highlight of the Forum's programme is that, for the first time ever, the Bio-Giants including USA, Japan, and China will be around the same table and the discussion will be based on the most recent developments in their respective country [more info].

26-28 September

The 4th Bioeconomy Congress Baden-Württemberg will be held in Porsche Arena, Stuttgart Germany, on 26-28 September 2022. The Congress is organized by the Ministry of Food, Rural Affairs and Consumer Protection and it will present four sessions and a final discussion under the title "Contributions of the Bioeconomy to the European Green Deal." The target groups of the congress are bioeconomy experts and any interested parties from science and politics. To complement the congress, several side events will take, such as workshops, discussion platforms, or excursions to lighthouse projects or research institutions [more info].

ISBP 2022

13-16 September

The Int'l Symposium on Biopolymers (ISBP) will take place on 13-16 September 2022 in **Sion, Switzerland**, and it is organized by the University of Applied Sciences and Arts Western Switzerland and the University of Stuttgart. ISBP2022 will focus on (bio)polymers like polyhydroxyalkanoates (PHA), cellulose, pullulan, cyanophycin, polylactic acid (PLA), and polyisoprenes (rubbers), but is also open for bio-based polymers like PEF and will include inorganic biopolymers such as polyphosphate (polyP). In a keynote speech GO!PHA will cover the industrialization of the PHA platform, will look back at the 2nd PHA-platform World Congress, and will present its own organizational development [more info].

retaste rethink food waste 2022

20-21 October

The second RETASTE International Conference, will be held in **Heraklion, Greece**, on 20-21 October 2022. Recognizing the grand food waste challenges, the RETASTE Conference initiates the dialogue for innovative solutions and optimization schemes that take advantage of the significant opportunities for food waste reduction, reuse, and recycling at all levels of the food life cycle, as well as their scalability and commercial translatability. Through the effective conservation of natural resources, the strengthening of the social fabric, and the creation of new value chains, RETASTE strives to advance the applicability of Circular Economy concepts [more info].

EFIB'22

26-27 October

The European Forum for Industrial Biotechnology & the Bioeconomy (EFIB) is the market leading annual event in Europe for Industrial Biotechnology and the Bioeconomy. The conference will be held in **Vilnius, Lithuania** on 26-27 October 2022. EFIB will bring together the community that enables the industry to deliver, including researchers, policy makers, academia, regulators, global organisations and local leaders that build the framework for a sustainable society. This year's theme is: "Next generation economies: Industrial biotechnology for a sustainable society' [more info].

european bioplastics conference

6-7 December

The 17th European Bioplastics Conference will be held in **Berlin, Germany** on 6-7 December 2022. With more and more brands and manufacturers embracing the potential of bioplastics, and with policy makers stepping up their efforts to create frameworks that benefit the growth of sustainable bio-industries, this is the time to put bioplastics on top of the agenda of a bio-based circular economy in Europe and beyond. This year's edition will focus on the latest innovations in bio-based and biodegradable plastics, the current political landscape, as well as environmental aspects, and opportunities for growth in the circular economy [more info].

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