

# URBIOFIN

## THE PROJECT

The demonstration of an integrated innovative biorefinery for the transformation of Municipal Solid Waste into new biobased products

Each person in Europe generates an average of 500 kg of municipal solid waste (MSW) per year. Around 50 percent of this is **organic waste**, made up of carbohydrates, proteins and lipids, all of which represent useful **raw materials for creating valuable products**. However, until today this potential has not been fully exploited. Therefore, the URBIOFIN project will demonstrate the techno-economic and environmental viability of **converting the organic fraction of MSW into chemical building blocks, biopolymers and additives**.

## OUR ACHIEVEMENTS SO FAR

The 3<sup>rd</sup> general meeting was hosted by the project partner Wageningen University & Research (WUR) on 7<sup>th</sup> and 8<sup>th</sup> June 2018 to discuss the achievements of the first project year. During these two days the URBIOFIN working groups presented their latest results, exchanged knowledge and discussed ongoing and upcoming activities to properly prepare the next 6 months period. A site visit at WUR facilities completed the inspiring days.



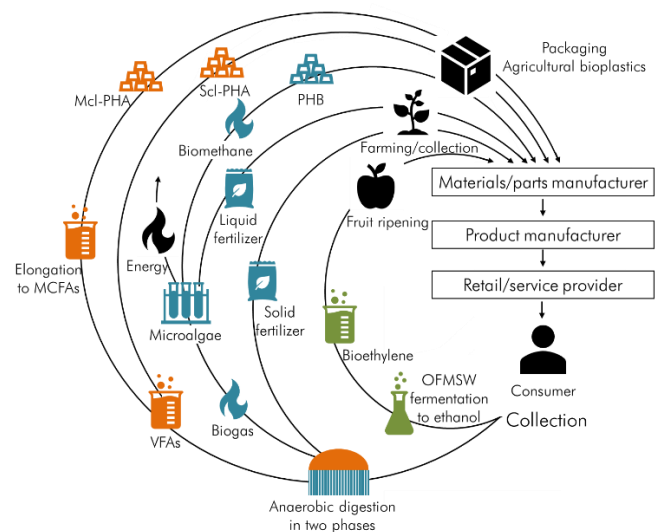
URBIOFIN project partners attending the 3<sup>rd</sup> General Meeting at Wageningen University, The Netherlands

In the following, the achievements per Work Package are briefly described:

## WP1 - PRELIMINARY ACTIONS FOR THE URBAN BIOREFINERY DESIGN

The URBIOFIN feedstock - the organic fraction of the municipal solid waste (OFMSW) - is a complex stream with variable composition. URBIOFIN was designed based on the variability of the OFMSW composition. The essential biological processes, such as bioethanol fermentation and anaerobic digestion were selected because they are predestined to deal with complex and heterogeneous substrates. The target feedstock for the URBIOFIN processes is OFMSW from selective collection.

URBIOFIN aims to convert all components of OFMSW into a wide range of products. In the circular system of URBIOFIN most of the nutrients present on the OFMSW could be returned to the biosphere by its capturing into solid and liquid fertilizers. Most of the organic content is transformed into biodegradable plastics composites, that can be recycled and utilized as new carbon source susceptible to be biologically transformed by any other biorefinery into another bio-based products.



Circular economy diagram for the URBIOFIN biorefinery. Adapted from Ellen MacArthur Foundation.

Currently, unavoidable biowaste, at best, is used to produce biogas, compost or animal feed and, at worst sent to landfill. With today's technologies, as some of the applied in the URBIOFIN model, it is possible to aim for higher value products other than bioenergy or compost. More importantly, there is a potential market for the URBIOFIN bio-based products.

To successfully enter the targeted markets (cosmetic packaging, films, ripening gas and fertilisers) the requirements of the bioproducts must be defined. The products must fulfil some requirements, in terms of

technical properties and compliance with existing or upcoming European regulations.

### WP2 - CONVERSION OF OFMSW TO BIOETHANOL AS BUILDING BLOCK FOR THE PRODUCTION OF BIOETHYLENE

During the first year of the project, the pre-treatment and enzymatic hydrolysis processes of the OFMSW feedstocks for bioethanol production have been optimized in joint cooperation of CIEMAT, NOVOZYMES and IMECAL. A number of different yeasts for the sugars fermentation into bioethanol were evaluated and the optimum strain was selected. IMECAL performed an engineering study for the adaptation of the PERSEO Bioethanol® semi-industrial plant and carried out different modifications in the plant units. Preliminary engineering studies for the installation of an ethanol-to-ethylene demonstration module in PERSEO Bioethanol® semi-industrial plant have been performed. IMECAL and VISUM defined the key process parameters to be monitored in real-time during plant-operation. Furthermore, VISUM is working on the development of new sensors and a new control platform to monitor the plant key parameters. IMECAL together with the WP2 partners and URBASER set the preliminary demonstration planning schedule, defined timing, capacities and logistics for the demonstration stage. The continuous demonstration activities of URBIOFIN biorefinery, located in L'Acudia (Valencia), will be carried out during the next months of the project.

### WP3 - CONVERSION OF OFMSW TO VFAS FOR THE PRODUCTION OF PHA

WP3 of the URBIOFIN's project is currently working towards the construction and the start-up of the bio-plastic section of the urban biorefinery. The first unit corresponds to the optimization of the VFA production. This plant has been thoroughly designed, expecting to be fully operational by early October 2018. The VFA stream is used for the elongation to MCFA, SCL-PHA and MCL-PHA production. The PHA demo plant is fully constructed and ready to be operated as soon as the VFA stream is produced. The PHA extraction system has also been studied and improved to produce bioplastics and to complete the biorefinery concept.

### WP4 - BIOGAS BIOCONVERSION TO BIOMETHANE AND ADDED VALUE PRODUCTS

In the coming months the pilot photosynthetic biogas upgrading plant, the pilot anoxic biofilter for biogas desulfurization and the pilot plant for biogas conversion to biopolymers will be built up at URBASER facilities. Four contracts for consumable supplies were also assigned to cover the remaining three years of plant monitoring and operation. UVA has been currently assessing the analytical interactions of the most common siloxanes and enriching

microbial communities able to biodegrade these hydrophobic biogas pollutants.

### WP5 - FINAL APPLICATIONS AND INDUSTRIAL VALIDATION OF THE BIOBASED PRODUCTS DEVELOPED

Over the last months, WP5, has mainly focused on the definition of the specific methodologies for the validation of the bio-based products performances within URBIOFIN. AINIA is developing a methodology for carrying out accelerated aging-tests (time vs. temperature) on the different cosmetic packaging formulations and domestic waste bags obtained in URBIOFIN to substitute conventional plastic materials (usually polyolefins). Furthermore, preliminary characterization trials regarding fertilizing and biostimulant properties of liophyllised microalgae have been performed.

Moreover, new formulations of PHA-based composites are being designed to be applied for cosmetic packaging, plastic bags and agricultural film applications to improve processing and thermo-mechanical properties of the new bioplastic materials. Preliminary design and formulation tests are being performed at WUR Bio-based Products Innovation Plant.



*Bio-based Products Innovation Plant of WUR*

### WP6 - INTEGRATION OF THE URBAN BIOREFINERY. ECONOMIC, ENVIRONMENTAL AND REGULATORY ASSESSMENTS

WP6 aims at integrating, modelling and assessing the overall urban biorefinery concept developed in the project, including the processes and the bioproducts. The activities started early in the project and are being prepared for further modelling and simulation; preliminary assessments have been carried out (LCA); and reference framework is established to study the regulatory aspects related to the technology and the products, including contribution and participation in linked events and workshops. A strong interaction with the work carried out in WP1 has been and will be present in the work package.

## WP7 - COMMUNICATION, DISSEMINATION AND EXPLOITATION ACTIVITIES

The URBIOFIN representatives and project partners have done many communication activities in the last months.

The project partner VISUM presented the URBIOFIN project at the “All-island workshop on bio-based industries”, in Cork. IMECAL introduced the URBIOFIN project at the EU-policy workshop, “The Road to an Urban Bioeconomy: Barriers and Solutions to Closings the Loop of Bio-Resources”. Furthermore, URBIOFIN representatives from WUR and NATRUE introduced the project at the VIVANESS-International Trade Fair for Natural and Personal Care in Nuremberg, Germany. They explained the scope and status of the project and discussed market-opportunities for the natural and cosmetic sector. Moreover, URBIOFIN representatives from WUR and the BioEconomy Cluster were at the CLIB International Conference in Düsseldorf, where they depicted the scope and the status of the project.

During the past six months BCM has done many communication activities besides the announcements of conferences and workshops. Printed materials have been introduced to download on the URBIOFIN website and BCM has launched the URBIOFIN social media activities. The social media activities focus on Twitter and LinkedIn. The followers are capable to follow the URBIOFIN accounts to receive the latest news regarding the URBIOFIN project. In addition, the project has been added to the BioWatch-platform to enlarge the audience.

Until now, events and news have been published regularly on our website and the Twitter and LinkedIn social media account.

The next General Meeting will be hosted by AINIA in October/November 2018.

## PUBLICATIONS

“The Success of Integrated Biorefineries” by Ana Susmozas and Antonio David Moreno (CIEMAT) in VERTICES (CIEMAT’s magazine)

“A biorefinery to turn urban waste into biobased products” by Caterina Coll and Marcos Latorre (IMECAL) in the online magazine BE-Sustainable

## MEET URBIOFIN

Are you interested to meet our partners? The next international events where to learn more about the project are:

BIO World Congress on Industrial Biotechnology on 16 July – 19 July 2018, Philadelphia | U.S.,  
<https://www.bio.org/events/bio-world-congress>

1st PHA Platform World Congress on 4 – 9 September 2018, Cologne | Germany,  
<http://www.bioplasticsmagazine.com/en/events/1PHAWorldCongress/index.php>

Iberoamerican Congress on Biorefineries on 24 – 26 October 2018, Jaen | Spain,  
<http://ceaema.ujaen.es/4CIAB/home-2/>

32nd EFFoST International Conference 2018 on 6 – 8 November 2018, Nantes | France,  
<http://www.fffostconference.com/>

ECOMONDO on 6 – 9 November 2018, Rimini | Italy,  
<https://www.ecomondo.com/>

Please feel free to contact the coordinator for more information: [caterina@imecal.com](mailto:caterina@imecal.com)

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## PROJECT PARTNERS

