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Advanced 1

Case Study 1

STANDARDISATION
TRAINING ACADEMY

Topic:

**Unlocking new value
from urban biowaste
– VALUEWASTE & CWA
17866:2022**

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1 Introduction

Unlocking new VALUE from urban bioWASTE – VALUEWASTE is a Horizon 2020 project which lasts for four years, from November 2018 to October 2022. The Technology Centre for Energy and Environment (Centro Tecnológico de la Energía y del Medio Ambiente, CETENMA) , a private, non-profit business association founded in 2000, coordinated the project with 17 partners from Spain, Finland, Denmark, Belgium, France, and Sweden.

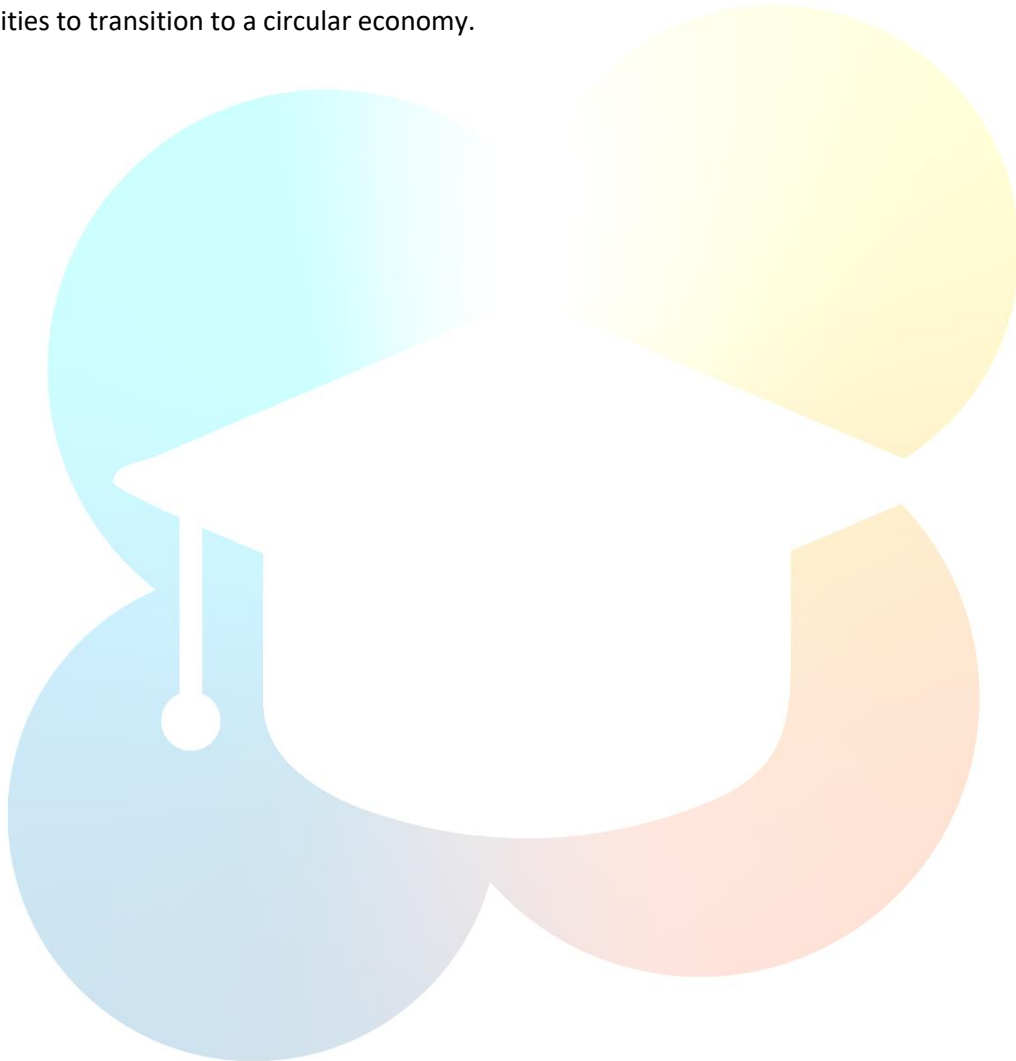
The project's main goal was to help answer the world's rising urban biowaste management challenges. The current situation with biowaste in the EU countries is that they produce 80 million tonnes of urban biowaste annually and import 77% of the required proteins for feed or food supplies. The VALUEWASTE project noticed that there are no sustainable and circular practices for handling biowaste in the EU and that there is a need to develop alternatives and sustainable sources of proteins and fertilisers. So, they concluded that there is a need to transition to a circular economy to handle biowaste in EU countries. VALUWASTE ran a pilot biowaste selective collection experience in Murcia (Spain) by the project's partner PREZERO (<https://prezero.es/es/>) in collaboration with Murcia city council, and three valorising lines were installed and validated in the relevant environment in Murcia and Kalundborg (Denmark).

VALUWASTE has achieved multiple results in addressing urban biowaste management and biowaste collection scheme challenges in EU countries. One of the primary project outcomes is identifying the critical factors for the successful implementation of the urban biowaste selective collection scheme, published in September 2022 as CEN Workshop Agreement 17866:2022 (cwa17866_2022.pdf (cencenelec.eu)). The following organisations and individuals developed and approved this CWA 17866:2022:

-  the characteristics required of a product including levels of quality, performance, interoperability, environmental protection, health, safety or dimensions, and including the requirements applicable to the product as regards the name under which the product is sold, terminology, symbols, testing and test methods, packaging, marking or labelling and conformity assessment procedures;
-  PREZERO, Mr. Pedro Gustavo Rodríguez – Chairperson
-  UNE – Spanish Association for Standardization, Ms Tania Marcos – Secretary
-  ITENE, Spain, Ms. Carla Bartolomé
-  CETENMA, Spain, Ms. Gemma Castejón and Mr. Martín Soriano
-  Balkan association of standard users, North Macedonia, Mr. Ljupcho Davchev
-  Zero Waste Latvia, Latvia, Ms Zane Gailite
-  Kalundborg Kommune, Denmark; Mr. Johan Ib Hansen
-  Zero Waste Latvia, Latvia, Ms Mairita Lūse
-  ECOGEOS, France, Ms. Marie-Amélie Marcoux
-  ENVAC IBERIA S.A., Spain, Mr. César Morais
-  Avfall Sverige, Sweden, Mr. Jon Nilsson
-  EUBIA - European Biomass Industry Association, Belgium, Mr. Giulio Poggiaroni

-  Latvian Standard (LVS); Latvia, Ms Guna Smilga
-  CETENMA; Spain; Mr. Martín Soriano
-  City of Murcia, Spain, Mr. Manuel Valls
-  ATEGRUS, Spain, Ms. Esther Vecino
-  FRITZ SCHÄFER GMBH, Germany, Dr. Armin Vogel
-  Wellness Telecom SL (Wellness TechGroup -WTG-), Spain, Mr Jose Antonio Cabo
-  Wellnesstech Sustainability Horizon, S.L., Spain, Mr. Javier Gutiérrez.

CWA 17866 gives recommendations for the implementation of biowaste selective collection schemes. This CWA is predetermined to be used by city managers and municipal waste managers interested in implementing the selective collection of urban biowaste. Standardisation of the critical factors for the successful implementation of urban biowaste selective collection schemes will help them to increase the quality of the selectively collected biowaste, which can be used in valorisation processes. Further, standardisation will deliver citizens' sorting and recycling efforts to improve the biowaste quality and create a way for cities to transition to a circular economy.






2 VALUEWASTE in a nutshell






2.1 The Challenges

Annually, 80 million tonnes of urban biowaste are produced in the EU. The current municipal biowaste management systems do not give a second life to the biowaste resources limiting the potential recovery of value-added products. The EU imports 77% of the required proteins for feed or food supplies, and 70% of known phosphate rock reserves for P-fertilisers are concentrated in Morocco. Therefore, there is a need to find alternatives and sustainable sources of proteins and fertilisers.

In this context, a transition to a circular economy is needed. VALUEWASTE proposed an integrated system for urban biowaste valorisation into essential strategic products for the EU through the implementation of three new value chains:

-  proteins for food & feed from bacteria that grow on biogas;
-  proteins for food & feed using insects;
-  recovery of nutrients (P, N) for the obtention of biobased fertilisers for agriculture.

During four years, VALUEWASTE partners have worked to develop circular, sustainable and efficient biowaste valorisation schemes for cities across Europe, trying to help answer the world's rising urban biowaste management challenges:

-  the biowaste collection scheme challenge. Current biowaste collection schemes do not respond to today's world sustainability & efficiency needs — poor selective collection (42%).
-  the technological challenge. Technological upscaling is expensive (low TRL) & there are few relatable experiences to learn from.
-  the regulatory challenge. Regulation is not adapting fast enough to current technological developments; then again, it is critical to pave the way to the market. Safety, standardisation & policy are core issues to tackle.
-  the feasibility challenge. Is a biowaste management solution ultimately feasible? Ensuring wide-scale application and replicability requires functional, sustainable and profitable business models.
-  the social challenge. Consumers show uncertainties about products coming from biowaste with whom they are unfamiliar.

2.2 The Main Results

VALUEWASTE ran a pilot biowaste selective collection experience in Murcia (Spain) by PREZERO in collaboration with the MURCIA city council, which ended with a total of 931 tons of biowaste collected and valorised in the project duration.

The three valorising lines have been installed and validated in a relevant environment in Murcia (Spain) and Kalundborg (Denmark).

- Value Chain 1 has been implemented and validated at TRL7 by UNIBIO in Kalundborg. The process has reached a productivity of 80 t/year biomass. The project goal of 5 Kg/m³/h of biomass has been surpassed at the pilot scale, while currently, 4.1 Kg/m³/h of biomass has been achieved at the demonstration scale. Downstream Process (DSP) and fractionation processes validated the production of a range of innovative feed and food products.
- Value Chain 2. The ENTOMO demo plant for insect production in Murcia has been validated at TRL8. The plant operated at total capacity, processing 1 ton of biowaste per day and studying factors such as feeding routines and feedstock composition. It has been demonstrated a production capacity of 14,500kg of dried larvae per year performing better than previous Research.
- Value Chain 3, led by NURESYS and EKOBALANS together with INDEREN, has been demonstrated at TRL7. The fertiliser production was validated, and recommendations for future experiences have been delivered.

The project has contributed to the creation of adequate market conditions for the acceptance, use and commercialisation of the new biobased products by working in the following areas:

- Safety:** GAIKER performed the safety trials in 16 microbial-derived and 35 insect-derived samples. Results obtained from in vitro assays evidence that it is possible to get safe products from the valorisation lines 1 and 2 developed in the project. In vitro tests show that the compounds obtained from value chain 3 comply with the limits for pathogens and heavy metals established by EU regulation on fertilising products. There are few studies on using biowaste to obtain safe compounds for food and feed applications. The results are relevant regarding the potential risks (chemical and biological hazards) associated with using biowaste streams and re-valorisation processes.
- Functionality:** CARINSA explored the functionality and market applications of the biowaste-derived products, demonstrating that compounds derived from biowaste (microbial and insect protein) are feasible to be included in fish diets and have the potential to be marketable as new ingredients in aqua diets. These novel compounds also represent a breakthrough in the urgent search for alternative protein sources to replace the current vegetable protein used in fishmeal (mainly soybean).
- Environmental Impact:** environmental-life cycle assessment (E-LCA) showed that the VALUEWASTE products represent a real alternative to reach the market from an ecological point of view.

- Proteins from BSF.
 - Lower impact than gluten and soybean meal proteins in 6 of the 7 studied impact categories.
 - Lower impact than fishmeal and sunflower meal proteins in 3 of 7 impact categories.
- SCP for feed applications.
 - Lower impact than gluten and soybean meal proteins in 4 of the 7 studied impact categories.
 - Lower impact than fishmeal and sunflower meal in 1 of 7 impact categories.
 - Biobased fertilisers. Better environmental performance than mineral fertilisers in the use of resources (non-energy). Less impact in the categories' water use' and 'mineral & metal use'.
- Social Impact:
 - The Social LCA (S-LCA) has given a better understanding of the VALUEWASTE solution from a social point of view to implement it at an urban level. Within the framework of the project, CETENMA participates as a national reference expert in the working group that is developing the new ISO standard on S-LCA (ISO 14075 Principles and framework for social life cycle assessment). Some exciting results obtained in S-LCA are:
 - Favourable results related to biowaste separation. However, low awareness regarding the benefits of biowaste separation and involvement in climate change mitigation actions (2.4 and 3.2 out of 5.0, respectively).
 - Anaerobic digestion requires a high quality of biowaste (> 95%). Overall, citizens' involvement in proper separation was high but not high enough to meet this demand.
 - Social responsibility. The environmental and social local suppliers' commitment was evaluated, providing a score of 3.3 out of 5.0. It indicates a neutral performance and, thus, ample room for improvement
 - The study of the social acceptance of bioproducts finished through two citizen surveys reaching more than 50,000 impacts through online and offline channels.
- New Circular Business Models:
 - Creation of new exploitation strategies for innovative biowaste valorisation schemes: VALUEWASTE project successfully developed the business models and commercialisation strategies for the three valorisation chains proposed in the project, including an exploitation map for the know-how acquired during the project customised for different customer segments.
- Scaling-up of technologies:
 - Development of blueprints for future large-scale plants and recommendations and suggestions about the potential future implementation of the VALUEWASTE solutions.

As per citizen awareness, the project has engaged in two communication campaigns:

- PREZERO and Murcia city council led the educational campaign. The aim was to support and engage homes, local markets, and citizens with the selective collection of urban biowaste started in parallel. The campaign impacted 6,420 citizens, 8 local markets and 21 restaurants.
- Kalundborg Kommune and Murcia city council led the Citizen's awareness campaign. The goal was to increase citizens' and children's awareness of the use of biobased products.
- The educational campaigns positively impacted the citizens since the quality of the collected waste improved in the areas with more presence of communication activities.

Contributing to standardisation development: National standardisation body of Spain UNE, PREZERO and CETENMA led the elaboration of an European pre-normative document with recommendations for implementing biowaste selective collection schemes (CEN Workshop Agreement 17866). CEN Workshop Agreement 17866 was published in September 2022 and adopted as a Spanish UNE standard.

Providing evidence-based support for EU policies: VALUEWASTE has promoted the creation of the joint policy initiative ROOTS together with other related projects HOOP, WaysTUP!, a SCALIBUR and CITYLOOPS. The main objective of the initiative is to promote innovative solutions for the circular bioeconomy and prevent regulatory barriers. The work done in this joint initiative ended with the publication of 2 policy position papers. After the publication of the final position paper (ROOTS POSITION PAPER), a high-level policy event was organised in the Committee of the Regions on September 2022 to maximise the impact of the policy recommendations generated from the initiative

2.3 The Key findings

The VALUEWASTE project has paved the way for efficiently implementing urban biowaste valorisation schemes into high-value products in the European Union. Key findings are summarised below:

- Identification of the key factors for the successful implementation of the urban biowaste selective collection scheme, published in September 2022 as CWA 17866. Key factors for the successful implementation of urban biowaste selective collection schemes | Zenodo
- Validation of the three different valorising lines at TRL7-8 and production of innovative products in real conditions, generating new market opportunities from biowastes. DSP and fractionation processes validated producing a range of innovative feed and food products
- Demonstration of the safety and functionality of the innovative products, setting the background for potential new safety regulations.
- Identification of potential improvements and up-scaling risks to define an up-scale design of the VALUEWASTE solution, including the incorporation of renewable energy systems to ensure the solution's sustainability

- Contribution to a better understanding of social and environmental impact through the completion of the E and S-LCA of the VALUEWASTE solution, with positive results
- Creation of business models, exploitation and commercialisation strategies for the valorisation lines, including a exploitation roadmap for the know-how acquired during the project.
- Increased understanding on the social acceptance of new bioproducts.
- Collection of evidence and experiences to inform policymakers about how to deal with urban biowaste and its valorisation.
- In terms of patent applications, the project has finalised with 8 patents filed by UNIBIO, and 2 Trademarks registered by UNIBIO and ENTOMO.

In summary, VALUEWASTE contributes to society, the environment and the economy in several ways: promoting the urban biowaste collection and its use as a local source of valuable materials, contributing to EU self-sufficiency on strategic resources, providing examples to other EU cities and regions to promote the full valorisation of urban biowaste, and facilitating the access of new biobased products to new markets which will result in the generation of jobs in Europe.

The future. The replication/continuation of the VAUEWASTE is already ensured through the HOOP (hoopproject.eu), FER-PLAY (FER-PLAY) and SOILUTIONS projects. The experience acquired during the project has allowed project partners to increase their market opportunities. Results have also benefited their existing collaborators through the state-of-the-art progress.

3 Developing CWA 17866 in a nutshell

What was the inspiration and rationale for VALUEWASTE to develop CWA 17866?

Gemma: VALUEWASTE counted with an Innovation Committee that monitored all potential exploitable results generated in the project. The work done and lessons learnt in WP1 related to the pilot experience of selective collection of urban biowaste in Murcia were found of great interest for replicability in other cities and regions that need to address the challenge of implementing urban biowaste selective collection schemes. The presence in our consortium of UNE, the Spanish Association of Standardisation, allowed us to know the steps to run a Workshop Agreement of the European Committee for Standardization (CEN) and the pre-normative work to be initiated with CEN to provide an international reference framework for improving the urban biowaste collection and management that can be used for future policies, public recommendations, or regulations in terms of urban biowaste management, driven from WP1 experience.

Can you describe the process of the CWA 17866 development? What was the experience with participating organisations and individuals who approved this CEN Workshop Agreement? Did their comments influence (being helpful or challenging) your solution?

Gemma: UNE established formal contact with selected International and European Technical Committees, providing them with relevant VALUEWASTE information. Expressions of interest were received, and it was confirmed that the proposed formula did not overlap with the scope of these related committees. Then, in July 2021, UNE made a formal request to CEN to establish a CEN Workshop "KEY-BIOWASTE" for the development of pre-standardisation work, to be coordinated by WP1 leader, PREZERO.

The proposed Workshop Project Plan, the call for experts and other support material prepared by CETENMA, PREZERO and UNE were made available on the CEN website during August and September 2021 for comments, together with the kick-off meeting announcement. Topic-related sister H2020 projects CITYLOOPS, SCALIBUR, HOOP and WaysTUP! were invited to join the CEN Workshop "KEY-BIOWASTE".




The CEN Workshop "KEY-BIOWASTE" was established on 5th October 2021 to debate on the experience and output of VALUEWASTE and agree on the guidance to be standardised, supported by sister projects and with participation of VALUEWASTE partners and experts of organisations from 8 European countries, the workshop issued a draft for 2 months of public comments (7th March to 6th May 2022). The final draft was approved on 17th June 2022. The comments received from participating organisations and individuals were very helpful, positive and aimed to improve the final document's wording and quality.

The process concluded with the publication of CWA 17866:2022 "Key factors for the successful implementation of urban biowaste selective collection schemes", developed under the CEN Workshop "KEY-BIOWASTE". Published by CEN on 7th September 2022 and available for free download at the CEN website: https://www.cencenelec.eu/media/CEN-CENELEC/CWAs/RI/cwa17866_2022.pdf

In addition, the document has been published as Spanish standard for further impact in Spanish-speaking countries. <https://www.une.org/encuentra-tu-norma/busca-tu-norma/norma/?c=N0070577>

How did you incorporate the work on developing CWA 17866 into your project activities? Do you have any advice for future projects?

Gemma: In our case, standardisation was already part of our project work plan within WP9. Our advice for future projects are:

-  Consider the benefits of standardisation as a way to exploit and maximise the impact of project results.
-  Establish mechanisms in the project to identify and monitor potentially exploitable results.
-  If the expert on standardisation is not a project partner, you will need to hire this service. Standardisation is a complex world if you are not an expert, but with the appropriate help, the way is very easy.

Many H2020 or HE projects claim timing is a significant problem. Having published CWA before the end of the project and the case of VALUEWASTE is a real success. How did you plan standardisation activities

in your project? When did you start to plan standardisation activities – in your submission, from the beginning or sometime else? Do you have any advice for future projects?

Gemma: As I already explained, we have a devoted task for standardisation in WP9 Task 9.2. Standardisation activities lasting from M1 to M48 of the project. We could start and end the process before the project ends thanks to the periodic assessment and monitoring of project activities, allowing us to identify this key exploitable project result with enough time. Also, the work done by UNE was crucial as they knew how to run the process and guided us during the different stages.

What is your expectation from CWA 17866? Can you describe what impact your solution in CWA 17866 can have on European cities, other actors, or maybe internationally?

Gemma: Implementing a selective collection of urban biowaste schemes is a real challenge for cities and regions all around Europe. Our expectation was to help any city currently addressing this challenge and maximise project results' replicability. According to the EU Waste Framework Directive, it will be mandatory by the end of 2023, so we are sure this document could help them.

How can you describe the whole experience of VALUEWASTE in developing CWA 17866?

Gemma: It has been a very positive experience in terms of learning, sharing, and improving our knowledge and, of course, highly positive in terms of maximising the impact and legacy of our project.

An echo of CWA 17866

The Balkan association of standard users, stated in North Macedonia, was represented by Mr Ljupcho Davchev at the workshop. The main motive for accepting the invitation to the workshop (sent to all CEN members) was that ecological problems are everywhere and omnipresent. The standardisation working groups and technical committees are a great place to learn and catch up with new technological advances. Mr Ljupčo Davchev writes columns in local newspapers related to ecology. His columns are devoted to standards and standardisation, aiming to make standardisation closer to the regional public. The new one, to be published next month, is related to CWA 17866.

4 Instead of conclusion

The journey of VALUEWASTE and their remarkable experience were worthy of use for educational purposes. There are plenty of lessons that can be learned from VALUEWASTE on how to manage biowaste. There are some lessons that can be learned from their experience with standardisation:

- 🔄 In science, business, and standardisation, networking has an enormous impact. Including different stakeholders in research project consortia and cooperation with other projects consortia can make critical mass for the success of the standardisation process (be aware that CWA is not a standard but can be the first step to one). VALUEWASTE invited topic-related H2020 projects CITYLOOPS, SCALIBUR, HOOP and WaysTUP! to join the CEN Workshop "KEY-BIOWASTE".
- 🔄 Partnering with researchers who are standardisation experts (VALUEWASTE has a national reference expert in the working group developing the ISO standard on S-LCA: ISO 14075 Principles and framework for social life cycle assessment) might contribute to recognising options for the contribution to the standard or the CWA in the project proposal.
- 🔄 Involvement in CWA activities during the project is perceived as a positive experience in learning, sharing, and improving knowledge.
- 🔄 It isn't easy to evaluate the impact of specific standards or CWA because there is no evidence of who and how they use standards. Saying so, having a published CWA has a signalling and reputation effect - it maximises the impact and legacy of the project.



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