

FuturEnzyme

Technologies of the FUTURE for low-cost ENZYMES for environment-friendly products



Meeting/event

Date



Project funded by the European Union's Horizon 2020
Research and Innovation Programme under grant agreement No [101000327]





Communication and dissemination material



- **Project visual identity:** project logo, colour palette, key messages, FuturEnzyme images, templates for deliverables and presentations
- **Offline communication material:** 4 brochures in English dedicated to the different target audiences, translated brochures dedicated to consumers
- **Online communication:** Social media, Project website, Newsletter
- **Events** (organized or assisted)
- **Publications** (scientific or divulgative)
- **Communication activities with other consortia**



Project brochures



See our brochures in other languages!



IT

GER

ES



IT

GER

ES

We translated the two brochures dedicated to consumers in Italian, German and Spanish

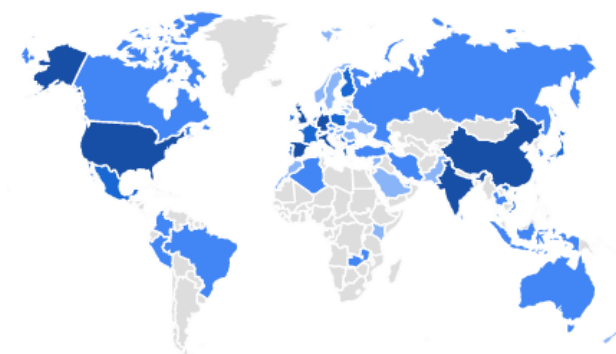
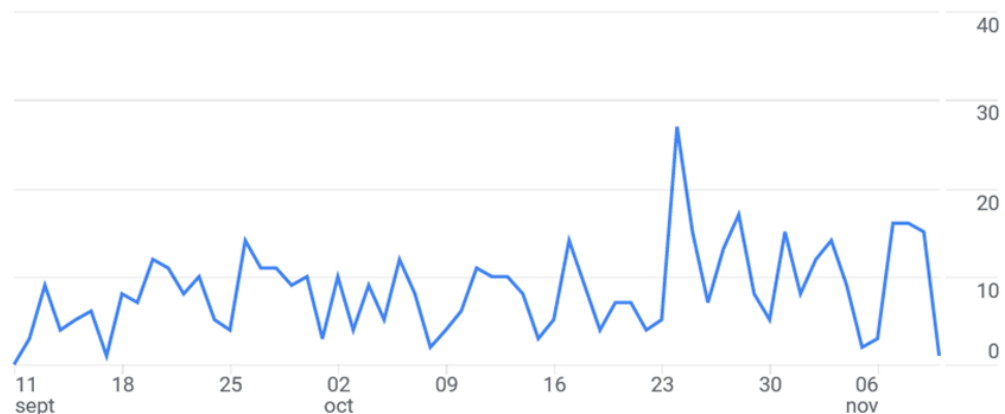


Project website



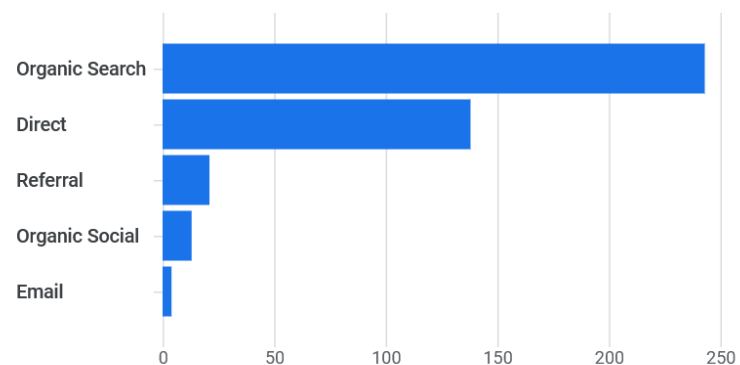
Users
420

Interaction time
(average)
1 min 42 s

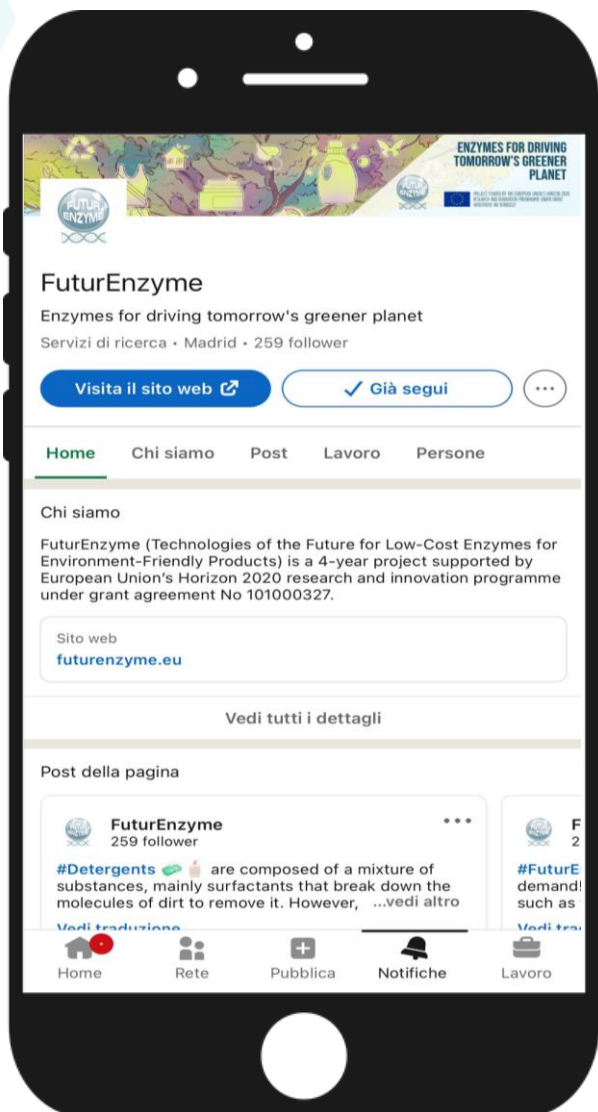


Country	Users
<u>United States</u>	66
<u>Germany</u>	53
<u>Spain</u>	52
<u>Italy</u>	35
<u>India</u>	26
<u>China</u>	19
<u>United Kingdom</u>	19

Acquisition



Social media



<https://www.linkedin.com/company/futurenzyme/>

354 Follower 58 Post

LIKES	SHARES	IMPRESSION	ENGAGEMENT	PROFILE VISITS
18	2	1100	57	39



@futurenzyme

771 Follower 56 Post

LIKES	SHARES	IMPRESSION	ENGAGEMENT	PROFILE VISITS
8	2	1299	47	6





Newsletter



Total audience: 46 subscribers

Every 12 months



Completed Campaign • Jun 30

FuturEnzyme - Issue#1

31 Recipients

Open Rate **74.2%**

Clicks Per Unique Open **26.1%**

Successful Deliveries **31**

Total Opens **68**

Total Clicks **12**

Orders **0**

Average Order Revenue **\$0.00**

Total Revenue **\$0.00**

Cluster on enzymes for greener products:

- all the latest information about enzymes and enzymology research for greener products, aimed at researchers and the industry.
- Every **3 months**
- Three issues already sent (the last one on Monday 24th October 2022)
- FuturEnzyme will be responsible for the issue in January 2022





Scientific publications

Submitted or to be submitted to specialised journals **UPDATED**



	Paper name	Partners involved	Published (Yes/No)	In Zenodo (Yes/No)	doi	Comments
1	Process development for benzyl alcohol production by whole-cell biocatalysis in stirred and packed bed reactors	IST-ID	Yes	Yes	10.3390/microorganisms10050966	Microorganisms
2	Metamorphosis of esterases into enantioselective chatecholases through bio-conjugation of a versatile metal-chelating inhibitor	CSIC, EUCODIS, FHNW	No	No		To be submitted
3	A Bacterial Transpeptidase Protein Scaffold for Artificial Metalloenzymes Design	FHNW, CSIC	No	No		Submitted, Chemical Sciences
4	Cultivation of a vampire: 'Candidatus Absconditococcus praedator'	CNR	Yes	Yes	10.1111/1462-2920.15823	Environmental Microbiology
5	Calm and Frenzy: marine obligate hydrocarbonoclastic bacteria sustain ocean wellness	CNR	Yes	Yes	10.1016/j.copbio.2021.09.015	
6	Design of pore-based nanoreactors for plastic depolymerization	BSC, CSIC	No	No		Submitted, Nature Catalysis
7	Enzymes adaptation to habitat thermal legacy explains the plasticity of marine microbiomes	CSIC, Bangor	No	No		Submitted, Nature Communications
8	Anaerobic carboxydutrophy in sulfur-respiring haloarchaea from hypersaline lakes	CNR, Bangor	Yes	No	10.1038/s41396-022-01206-x	ISMEJ
9	Cultivating marine bacteria under laboratory conditions: Overcoming the "unculturable" dogma	IST-ID	Yes	No	10.3389/fbioe.2022.964589	Front. Bioeng. Biotechnol., 10:964589.
10	Halapricum desulfuricans sp. nov., carbohydrate-utilizing, sulfur-respiring haloarchaea from hypersaline lakes	CNR	Yes	No	10.1016/j.syapm.2021.126249	Systematic and Applied Microbiology
11	Metagenomic mining for esterases in the microbial community of Los Ruedos acid mine drainage formation	CSIC, Bangor	Yes	Yes	10.3389/fmicb.2022.868839	Frontiers in Microbiology
12	A PluriZyme with transaminase and hydrolase activity catalyzes cascade reactions	CSIC, BSC	Yes	Yes	/doi.org/10.1002/anie.202207344	Angewandte Chemie Int Ed
13	Crystal structure of a family VIII β -lactamase fold hydrolase reveals the molecular mechanism for its broad substrate scope	CSIC	Yes	Yes	10.1111/febs.16554	The FEBS Journal
14	Thermophilic carboxylesterases from hydrothermal vents of the volcanic island of Ischia	Bangor, CSIC, CNR	No	No		
15	Cell free expression system	UHAM	No	No		
16	EP-pred: a machine learning tool for bioprospecting promiscuous ester hydrolases	BSC, CSIC	Yes	Yes	doi.org/10.3390/biom12101529	Pre-print en https://www.preprints.org/manuscript/202209.0100/v1 ; Published: Biomolecules 2022, 12(10), 1529
17	The mobility of the cap domain is essential for the substrate promiscuity of a family IV esterase from sorghum rhizosphere microbiome	Bangor, CSIC	No	No		
18	Xylan utilization by haloarchaea-nanohaloarchaea associations	CNR, Bangor, CSIC	No	No		
19	Plasmonic photothermal activation of an organosilica shielded cold-adapted lipase co-immobilised with gold nanoparticles on silica particles	FHNW	No	No		
20	The first archaeal PET-degrading enzyme belongs to the feruloyl-esterase family"	UHAM	No	No		
21	Design and characterization of in-one protease-esterase PluriZyme	CSIC, BSC	Yes	Yes	doi.org/10.3390/ijms232113337	Int. J. Mol. Sci. 2022, 23(21), 13337



Divulgative publications

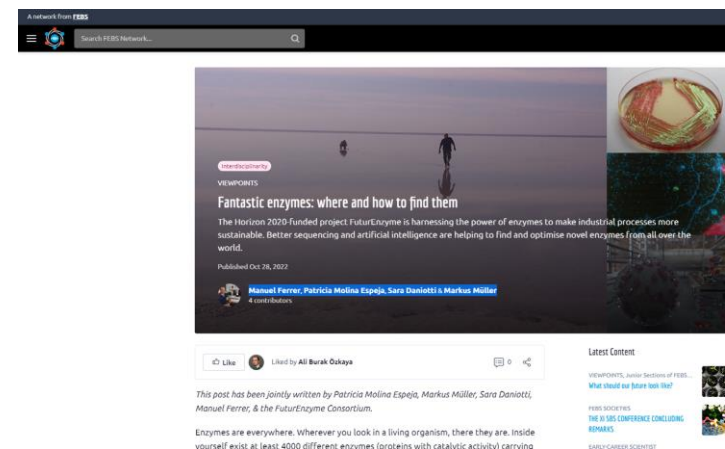


Divulgative journals **UPDATED**

3. Fantastic enzymes: Where and how to find them. Molina Espeja, Patricia; Daniotti, Sara; Müller, Markus; Ferrer, Manuel. FEBS Network, October 28th, 2021. <https://network.febs.org/posts/fantastic-enzymes-where-and-how-to-find-them>

2. Se buscan enzimas, razón: el medio ambiente. Ferrer, Manuel; Coscolín Galán, Cristina; Molina-Espeja, Patricia. The conversation, October 12th, 2021. <https://theconversation.com/se-buscan-enzimas-razon-el-medio-ambiente-169685>. [10.5281/zenodo.5566131](https://zenodo.org/record/5566131).

1. El uso de enzimas para conseguir productos de consumo diario más sostenibles. Ferrer, Manuel; Molina-Espeja, Patricia; Peñalver, Carolina. <https://sites.google.com/gl.miteco.gob.es/revistaambienta2/revista-128/innovaci%C3%B3n-128-enzimas-productos>. Ambianta Journal, [10.5281/zenodo.5384608](https://zenodo.org/record/5384608)





Events



Total organized or assisted events
22

	CSIC	Manuel Ferrer	La Nanotecnología llega al instituto ¡Nos vamos zumbando!	14.06.2021
	CSIC	Isabel Cea Rama	VII Simposio de Jóvenes Investigadores del IQFR-CSIC	18.06.2021
	CSIC	Manuel Ferrer	Technical Workshops TW3-TW4, Marie Curie ITN ImplantSens (H2020-MSCA-ITN-2018-813006)	28.06.2021
	UDUS	Karl-Erich Jaeger	3rd Aachen Protein Engineering Symposium AcES2021	01.09.2021
	IST-ID	Carla de Carvalho	International Microorganism Day 2021 @Tecnico	17.09.2021









Events



	CSIC	Cristina Coscolín	Seminar at Biotechnology Degree (Francisco de Vitoria University)	16.10.2021
	CSIC	Patricia Molina Cristina Coscolín Laura Fernàndez	Science Week – event for teenage students	03.11.2021
	CSIC	Patricia Molina Cristina Coscolín	Euquality at CSIC	17.11.2021
	CLIB INOFEA	\	Enzyme – the Multitool of Biotechnology (forum event)	17.11.2021
	CLIB CSIC SCHOELLER	\	Online fórum within the HiPerIn2.0 Project organized by CLIB – Catalysing Alliances for Greener Products	10.12.2021
	CSIC	Manuel Ferrer	Enzymes wanted, reason: the environment	15.12.2021






Events



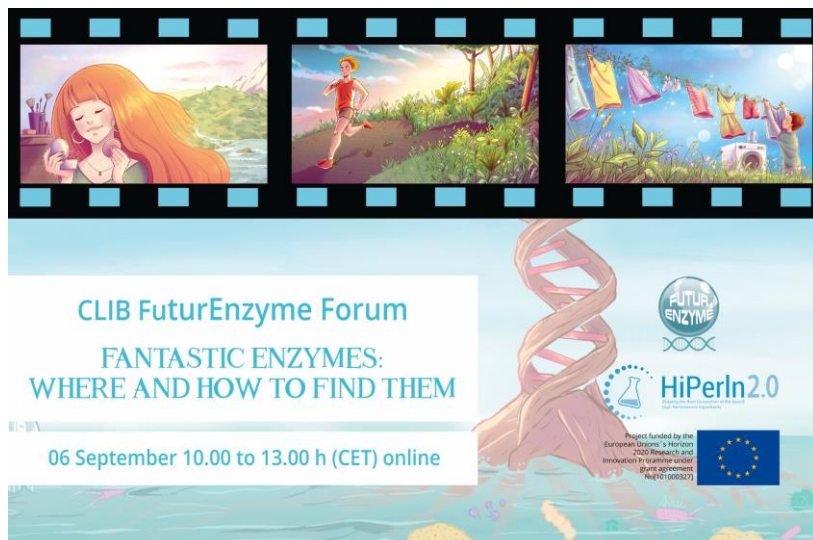
	CSIC	Cristina Coscolín Laura Fernàndez Patrica Molina Paula Vidal	International Day of Women and Girls in Science – lecture in Rafel Frubeck de Brugos Highschool	14.02.2022
	CSIC	Patricia Molina Manuel Ferrer Colleagues	4° ESO + company program – event with students	05.04.2022
	BSC	Ana Robles Rubén Muñoz	BSC: “Biocatalysis for the Biological Transformation of Polymer Science”	27.06.2022
	UDUS	Rebecka Molitor	Marine resources for polyester degrading enzyme - Biocatalysis for the Biological Transformation of Polymer Science Conference	28.06.2022
	IST-ID	Carla CCR de Carvalho	Marine bioprocesses with bacteria from the Portuguese coast - One Sustainable Ocean (UN)	01.07.2022
	BSC	Ana Robles Rubén Muñoz	Barcelona International Youth Science Challenge (BIYSC)	04-15.07.2022

Events



	CSIC	Manuel Ferrer	Bioeconomy Science Center) Symposium	23.08.2022
	UDUS	Fabienne Hilgers Stephan Thies	Day of curiosity – Open day for general public	23.08.2022
	HHU	Rebecka Molitor	10th International Congress on Biocatalysis	29.08.2022
	CLIB	Markus Muller Colleagues	Fantastic enzymes and where to find them	06.09.2022
	CSIC	Cristina Coscolín	Metagenomics: a useful tool for the discovery of novel enzymes with biotechnological applications - lectures	21.10.2022

Events: Fantastic enzymes and where to find them



Online platform: Teams

Questions platform: Slido


Networking platform: Wonder



CLIB forum event

Fantastic enzymes: Where and how to find them

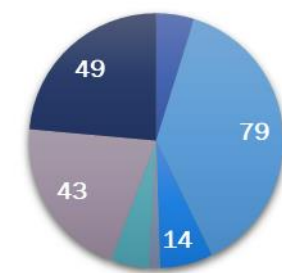
Tue, 06 Sep 2022 10.00 h - 13.00 h CET

10:00 h	Welcome & Introduction to HiPerIn2.0 and FuturEnzyme Markus Müller, CLIB - Cluster Industrial Biotechnology & Patricia Molina, CSIC - Consejo Superior de Investigaciones Científicas	 
10:10 h	Enzymes wanted, reason: the bioeconomy, the climate change and the consumer demands  Manuel Ferrer, CSIC - Consejo Superior de Investigaciones Científicas	
11:00 h	Short break	
11:20 h	In silico toolkit for enzyme bioprospecting and engineering: a current view  Sergi Rodà Llordés, BSC - Barcelona Supercomputing Center	
12:10 h	Mining the microbial diversity for esterases, lipases and plastic degrading enzymes  Jennifer Chow, University of Hamburg	
13:00 h	Final discussion	

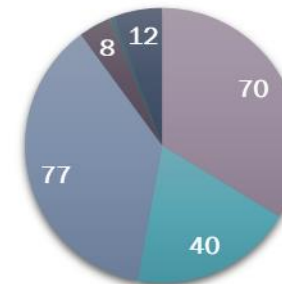


300 inscriptions

202 assistants 30% no show rate, in the average



■ Belgium ■ Germany ■ United Kingdom
 ■ Netherlands ■ Portugal ■ Spain
 ■ Others



■ Academia ■ Research ■ Company
 ■ Cluster ■ Consultancy ■ Others





Upcoming events for 2023



European Summer School on Industrial Biotechnology

- EVENT 4: Workshop, “Summer School on Metagenomics 2021”; **Hamburg** (M12). (Postponed to M26).
- 5th European Summer School on Industrial Biotechnology:
Functional metagenomics: from nature to biochemical functions
<http://www.essib.eu/index.php/view/home>
- Date: July 2023
- Place: University of Hamburg
- Who: training course for PhD students and postdocs, preferably (but not exclusively) from European countries with research projects in the fields of biotechnology, biochemistry, molecular biology, biochemical engineering, and bioinformatics
- Open it to all consortia



University of Hamburg (Hamburg)



Upcoming events for 2023



Workshop: Engineering enzymes for consumer products of higher environmental quality

- EVENT7: A theoretical-experimental course on “Engineering enzymes for consumer products of higher environmental quality” Barcelona (M24)
- A 1-2 day event
- Date: 2023
- Place: **Barcelona Supercomputing Center, Barcelona**
- Who: training course for PhD students and postdocs, from European countries with research projects in the fields of bioinformatics and computational studies
- Initial talks by industrial leaders to frame the problem
- Talks on molecular modeling, bioinformatics and machine learning techniques, and in their combination for enzyme engineering
- Hands on practical course, or in situ solving 1-2 problems
- **Open it to all consortia.**



New BSC building opened Summer 2021 (Barcelona)



Upcoming events for 2023



Exchange of good practice workshop

- Event9: Inter-consortia workshop to support good practices exchange between participants; place to be defined (M24).
- Date: 2023
- Place: **Madrid**
- Aimed at giving seminars related to Ethics in Science and Research
- Who: students, post-doc, etc.
- Open it to all consortia



Institute of Catalysis, Madrid

Workshop on European Green Deal Aligned with Rights, Ethics, Equality

- Event11: A public event, “European Green Deal Aligned with Rights, Ethics, Equality”; Madrid, in the frame of the International Day of Women and Girls in Science (M36).
- In the frame of the International Day of Women and Girls in Science
- Date: 2023
- Place: **Madrid**
- Who: students, post-doc, etc.
- Open it to all consortia



Upcoming events for 2023



An international biotech/bioeconomy conference

- Event10: An international biotech/bioeconomy conference; Düsseldorf (M36).
- The CIC (annual international conference) is open to the public, with attendance free for CLIB members.
- Note: External guests have to pay a fee; CLIB will check the possibility for promotional rate for FuturEnzyme and sister project members
- Date: 2024
- Place: **Düsseldorf**
- Who: academics, stakeholders, authorities, associations, industries
- Open it to all consortia



CLIB (Düsseldorf)



Upcoming events for 2023



Inter-consortia workshop (2024)

- Event12: Inter-consortia workshop (M36).
- Date: 2024
- Place: to be defined
- Inter-consortia workshop focused on fostering the dissemination and communication of results of all projects/initiatives
- Who: partners
- All consortia

Inter-consortia policy event (2025)

- Event16: Inter-consortia policy event; Madrid (M44).
- Date: 2024/2025
- Place: to be defined
- Inter-consortia workshop focused on fostering the dissemination and exploitation of results of all projects/initiatives
- Who: partners, broad audience
- Policy and consumer briefing,
- Evaluate to what extent the results of the Projects contribute to realizing the objectives of European policy initiatives;, and to create a transparent legal and policy framework in which to operate, exploit and disseminate synergies; to be published in Policy Briefs.
- Who: open to the public; all partners
- All consortia



Institute of Catalysis, Madrid



Upcoming events for 2023



Professional event on ‘Market Place and Policy’

- Event15: A professional event and roundtable on “Market Place and Policy” to show representatives of authorities, associations, policymakers, industries and end-users the FuturEnzyme results and products with pre-market value (M40);
- Date: 2024
- Place: **Milan**
- Who: authorities, associations, industries, consumer associations, and end-users
- Open it to all consortia



ItalBiotec (Milan)



Synergies with other consortia

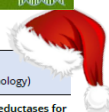


Events



Fri, 10 Dec 2021 09.30 h – 12.30 h CET

09:30 h	Welcome & Introduction (Markus Müller, CLIB – Cluster Industrial Biotechnology)
09:45 h	OXIPRO - Harnessing the power of novel oxidoreductases for greener consumer products (Gro Bjerga, NORCE – Norwegian Research Centre) Computational and structure-inspired engineering of thermostable enzymes (Marco Fraaije, University of Groningen)
10:15 h	FuturEnzyme - project overview (Manuel Ferrer, CSIC) Introducing Schoeller Textiles as industry partner for textile processing in the project FutureEnzyme (Nazanin Ansari, Schoeller Textiles)
10:45 h	Short break
10:55 h	EnXylaScope - Unleashing Xylan's Potential with Enzymes for a Scope of Consumer Products (Carolina PeñaLapiente, AITIIP Technological Centre) Unleashing Xylan's Potential with Enzymes for a Scope of Consumer Products (Lalitha Gottumukkala, CELIGNIS)
11:25 h	RADICALZ: harnessing enzymes for bio-based, greener consumer products (Aurelio Hidalgo, UAM - University Autónoma of Madrid) Combining AI and Bio-Product's 3DM: Shaping the future of Protein Engineering (Stephan Heijl, BIOP - BIO-PRODUCT)
11:55 h	Final discussion
12:15 h	Networking @Wonder
12:30 h	End of event



Newsletter



Common deposit platform for open science



Policy brief (draft)



Enzyme technologies: a greener, more sustainable future

Consumer concerns about the environment

Currently, 61% of European consumers are concerned about the state of the environment¹, and particularly their carbon emissions: according to a 2021 European Commission survey², 56% of EU consumers are paying attention to the environmental impact of goods and services. Eco-consumerism is on the rise globally, as are concerns about the impact of products such as household detergents, cosmetics, food, and clothes, and European consumers are willing to pay a higher price for consumer products that are more environmentally friendly.

To meet the need for the production and supply of greener, more sustainable products, scientists and industry are investigating and harnessing the power of enzymes.

The enzyme solution

Enzymes demonstrate significant potential to support sustainability, reduce environmental pollution, lower processing costs, and enhance product performance and functionalities. Growing environmental concerns have contributed to the rapid growth in the market for enzymes and their use in various industrial and specialty applications. Enzymes can be introduced in the processing phases and in the formulation of consumer products such as washing agents, textiles, personal care, cosmetics, and nutraceuticals.

A new European cluster: Enzymes for Greener Products

In 2021, the European Commission funded four research projects under the European Union's Horizon 2020 research and innovation programme FNR-16-2020 Cluster "Enzymes for greener products" (Figure 1), organised in cooperation with the European Research Executive Agency (REA). Comprising XXXX organisations from XXXX countries, the cluster is coordinating and synergising efforts to expedite and amplify the impact of each individual project.

The work of each cluster initiative will be informed by stakeholder consultations involving scientists, industry, end users, and policymakers, to identify needs and knowledge gaps, encourage uptake and growth of new production methods and technologies, support existing strategies, and inform future policies.

The aims of the cluster

- Develop and introduce new enzyme-based solutions for sustainability
- Formulate novel products that will lessen the impact of chemicals
- Reduce wastage of resources by diversifying the power of enzymes
- Reduce the climate adverse effects of products of concern
- Ensure that new products undergo rigorous risk, hazard and toxicity analyses
- Work with consumers to monitor their satisfaction with the novel products
- Demonstrate the value and efficacy of enzyme technologies for greener, more sustainable products now and for the future

1





Next deliverables



Deliverable Number¹⁴	Deliverable Title	WP number⁹	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D8.8	Newsdigest, posters, bulletins	WP8	1 - CSIC	Websites, patents filing, etc.	Public	36
D8.9	Report on public, intra-consortium, and inter-consortia 18-months events	WP8	4 - UHAM	Report	Confidential, only for members of the consortium (including the Commission Services)	18
D8.10	Report on public, intra-consortium, and inter-consortia 36-months events	WP8	1 - CSIC	Report	Confidential, only for members of the consortium (including the Commission Services)	36



Next deliverables



Deliverable Number¹⁴	Deliverable Title	WP number⁹	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D8.11	Report on public, intra-consortium, and inter-consortia 48-months events	WP8	8 - ITB	Report	Confidential, only for members of the consortium (including the Commission Services)	48
D8.12	Short promo video/ comic	WP8	1 - CSIC	Websites, patents filing, etc.	Public	24
D8.13	Two divulgative/ promotional articles in scientific magazines	WP8	1 - CSIC	Websites, patents filing, etc.	Public	40