

Call: HORIZON-JU-CLEANH2-2026
(HORIZON-JU-CLEANH2-2026)

Topic: HORIZON-JU-CLEANH2-2026-01-05

Type of Action: HORIZON-JU-RIA
(HORIZON JU Research and Innovation Actions)

Proposal number: 101343457

Proposal acronym: Ways2H-EU

Type of Model Grant Agreement: HORIZON Lump Sum Grant

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Administrative forms

Proposal ID 101343457

Acronym Ways2H-EU

1 - General information

Fields marked * are mandatory to fill.

Topic	HORIZON-JU-CLEANH2-2026-01-05	Type of Action	HORIZON-JU-RIA
Call	HORIZON-JU-CLEANH2-2026	Type of Model Grant Agreement	HORIZON-AG-LS

Acronym Ways2H-EU

Proposal title Sustainable validation of waste-to-hydrogen modular technology in European conditions

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &

Duration in months 36

Free keywords renewable hydrogen, biogenic waste, waste-to-hydrogen, modular reactor, vapolysis, thermochemical conversion, TRL5 validation, hydrogen purity, impurity management, techno-economic assessment, LCA, de

Abstract *

Ways2H-EU will validate an innovative modular waste-to-hydrogen technology under European operating conditions, using heterogeneous biogenic waste streams as feedstock and achieving integrated validation at TRL 5. The project addresses the need for sustainable hydrogen production pathways that reduce dependence on fossil-based hydrogen and complement electricity-intensive electrolysis in decentralised applications.

The project combines feedstock profiling, process optimisation, integrated reactor validation, and environmental and techno-economic assessment. It will define operating envelopes for representative European biogenic waste streams, optimise the interaction between vapolysis, high-temperature reforming, gas conditioning and purification, and implement a staged validation protocol delivering at least 1,000 counted operating hours in an industrially relevant environment. This will generate a robust dataset on hydrogen yield, gas quality, impurity management, system stability, availability, and carbon performance.

Using measured operating data, the project will carry out LCA and TEA analyses to assess greenhouse-gas intensity, CAPEX/OPEX drivers and the conditions under which competitive hydrogen costs may be approached in selected decentralised deployment cases. In parallel, Ways2H-EU will develop a concrete scale-up and exploitation pathway for future TRL 7-8 pilots, identifying the roles of waste holders, technology providers, system integrators and local hydrogen offtakers.

The project directly supports the objectives of HORIZON-JU-CLEANH2-2026-01-05 by advancing modular hydrogen production from biogenic waste, improving process integration and impurity management, and creating a credible pathway toward future industrial deployment in circular local hydrogen ecosystems.

Remaining characters 186

Has this proposal (or a very similar one) been submitted in the past 2 years in response to a call for proposals under any EU programme, including the current call? ☐ Yes ☒ No

Please give the proposal reference or contract number.

Previously submitted proposals should be with either 6 or 9 digits.

Administrative forms

Proposal ID **101343457**

Acronym **Ways2H-EU**

Declarations

Field(s) marked * are mandatory to fill.

- 1) We declare to have the explicit consent of all applicants on their participation and on the content of this proposal. * ☒
- 2) We confirm that the information contained in this proposal is correct and complete and that none of the project activities have started before the proposal was submitted (unless explicitly authorised in the call conditions). * ☒
- 3) We declare:
- to be fully compliant with the eligibility criteria set out in the call ☒
 - not to be subject to any exclusion grounds under the [EU Financial Regulation 2018/1046](#) ☒
 - to have the financial and operational capacity to carry out the proposed project. *
- 4) We acknowledge that all communication will be made through the Funding & Tenders Portal electronic exchange system and that access and use of this system is subject to the [Funding & Tenders Portal Terms and Conditions](#). * ☒
- 5) We have read, understood and accepted the [Funding & Tenders Portal Terms & Conditions](#) and [Privacy Statement](#) that set out the conditions of use of the Portal and the scope, purposes, retention periods, etc. for the processing of personal data of all data subjects whose data we communicate for the purpose of the application, evaluation, award and subsequent management of our grant, prizes and contracts (including financial transactions and audits). * ☒
- 6) We declare that the proposal complies with ethical principles (including the highest standards of research integrity as set out in the [ALLEA European Code of Conduct for Research Integrity](#), as well as applicable international and national law, including the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights and its Supplementary Protocols. [Appropriate procedures, policies and structures](#) are in place to foster responsible research practices, to prevent questionable research practices and research misconduct, and to handle allegations of breaches of the principles and standards in the Code of Conduct. * ☒
- 7) We declare that the proposal has an exclusive focus on civil applications (activities intended to be used in military application or aiming to serve military purposes cannot be funded). If the project involves dual-use items in the sense of [Regulation 2021/821](#), or other items for which authorisation is required, we confirm that we will comply with the applicable regulatory framework (e.g. obtain export/import licences before these items are used). * ☒
- 8) We confirm that the activities proposed do not
- aim at human cloning for reproductive purposes;
 - intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed), or
 - intend to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.
 - lead to the destruction of human embryos (for example, for obtaining stem cells)
- These activities are excluded from funding. * ☒
- 9) We confirm that for activities carried out outside the Union, the same activities would have been allowed in at least one EU Member State. * ☒
- 10) For Lump Sum Grants with a detailed budget table: We understand and accept that the EU lump sum grants must be reliable proxies for the actual costs of a project and confirm that the detailed budget for the proposal has been established in accordance with our usual cost accounting practices and in compliance with the basic eligibility conditions for EU actual cost grants (see [AGA - Annotated Grant Agreement, art 6](#)) and exclude costs that are ineligible under the Programme. Purchases and subcontracting costs must be done taking into account best value for money and must be free of conflict of interest. * ☒

The coordinator is only responsible for the information relating to their own organisation. Each applicant remains responsible for the information declared for their organisation. If the proposal is retained for EU funding, they will all be required to sign a declaration of honour.

False statements or incorrect information may lead to administrative sanctions under the EU Financial Regulation.

Administrative forms

Proposal ID 101343457

Acronym Ways2H-EU

2 - Participants

List of participating organisations

#	Participating Organisation Legal Name	Country	Role	Action
1	INSTITUTO POLITÉCNICO DE PORTALEGRE	Portugal	Coordinator	
2	Clean Energy Enterprises SAS	France	Partner	
3	Associação Promotora da Rede Dinâmica XXI	Portugal	Partner	
4	NORDIC WELLBEING ACADEMY	Denmark	Partner	
5	PRF-GAS TECNOLOGIA E CONSTRUCAO SA	Portugal	Partner	
6	hydrogen ventures portugal	Portugal	Partner	
7	AGENTIA PENTRU DEZVOLTARE REGIONALA CENTRU	Romania	Partner	
8	UNIVERSITY OF CYPRUS	CY	Partner	

Organisation data

PIC	Legal name
949379741	INSTITUTO POLITÉCNICO DE PORTALEGRE

Short name: INSTITUTO POLITÉCNICO DE PORTALEGRE

Address

Street	Praça do Municipio
Town	PORTALEGRE
Postcode	7300-901
Country	Portugal
Webpage	www.ipportalegre.pt

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is **not an SME** (small- and medium-sized enterprise) for the call.

SME self-declared status	24/02/2014 - no
SME self-assessment	unknown
SME validation	unknown

Administrative forms

Departments carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Links with other participants

Type of link	Participant
--------------	-------------

Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

Fernando

Last name*

Gaspar

E-Mail*

fernando.gaspar@apredin.eu

Position in org.

Representative

Department

INSTITUTO POLITÉCNICO DE PORTALEGRE

☒ Same as organisation name

☒ Same as proposing organisation's address

Street

Praça do Municipio

Town

PORTALEGRE

Post code

7300-901

Country

Portugal

Website

Please enter website

Phone

+XXX XXXXXXXXXX

Phone 2

+XXX XXXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Paulo	Brito	pbrito@ipportalegre.pt	+XXX XXXXXXXXXX

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier
Dr	Catarina	Nobre	Woman	Portugal	catarina.nobre@i pportalegre.pt	Category B Senior resea	Team member	0000-0001-5733- 902X	Orcid ID

Administrative forms

Role of participating organisation in the project

Project management	<input checked="" type="checkbox"/>
Communication, dissemination and engagement	<input type="checkbox"/>
Provision of research and technology infrastructure	<input checked="" type="checkbox"/>
Co-definition of research and market needs	<input type="checkbox"/>
Civil society representative	<input type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input type="checkbox"/>
Research performer	<input checked="" type="checkbox"/>
Technology developer	<input type="checkbox"/>
Testing/validation of approaches and ideas	<input checked="" type="checkbox"/>
Prototyping and demonstration	<input type="checkbox"/>
IPR management incl. technology transfer	<input type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input checked="" type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)
Publication	<i>Luís Carmo-Calado, Paulo Brito, Manuel Jesús Hermoso-Orzáez, Julio Terrados-Cepeda, Comparative evaluation of biomass and waste gasification in fixed and fluidized beds: Influence of operating conditio</i> Guilhermino, A., Lourinho, G., Brito, P., Almeida, N. (2018) "Assessment of the Use of Forest Biomass Residues for Bioenergy in Alto Alentejo, Portugal: Logistics, Economic and Financial Perspectives," <i>Waste and Biomass Valorization</i> ,volume 9, pages739–753. https://doi.org/10.1007/s12649-017-9830-3
Publication	<i>Beatriz Corrêa Thomé de Deus, Luís Filipe do Carmo Calado, Raul Pereira Micena, Simone Jaqueline Cardoso, Paulo Sérgio Duque de Brito, From waste to renewable energy: Exploring the co-gasification of cashew nutshells and plastic waste, International Journal of Hydrogen Energy 139 (2025) 47–61</i> https://doi.org/10.1016/j.ijhydene.2025.05.240
Publication	<i>Rey, J.R.C.; Mateos-Pedrero, C.; Longo, A.; Rijo, B.; Brito, P.; Ferreira, P.; Nobre, C., Renewable Hydrogen from Biomass: Technological Pathways and Economic Perspectives. Energies 2024, 17, 3530.</i> https://doi.org/10.3390/en17143530
Publication	<i>Rauch, R.; Kiro, Y.; Engvall, K.; Kantarelis, E.; Brito, P.; Nobre, C.; Santos, S.M.; Graefe, P.A., Hydrogen from Waste Gasification. Hydrogen 2024, 5, 70–101.</i> https://doi.org/10.3390/hydrogen5010006
Publication	<i>Lourinho, G.; Alves, O.; Garcia, B.; Rijo, B.; Brito, P.; Nobre, C., Costs of Gasification Technologies for Energy and Fuel Production: Overview, Analysis, and Numerical Estimation. Recycling 2023, 8, 49.</i> https://doi.org/10.3390/recycling8030049

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)
H2Exelence -EDU-2022-PEX-COVE - 10110444	<i>The H2Excellence Online Learning Platform is a European hub for sharing knowledge, best practices, and building skills in green hydrogen and fuel cell technologies. It offers flexible training programmes, career development resources, and practical tools to support innovation and workforce growth across the hydrogen sector. By connecting educators, industry professionals, and stakeholders, H2Excellence fosters collaboration and joint solutions that drive progress toward a sustainable energy futu</i>
PYRAGRAFE - EU HE 101114608	<i>The PYRAGRAF project aims to create a mobile, all-in-one system to showcase the conversion of agricultural and forestry waste into valuable products through pyrolysis.</i>
HYFUELUP	<i>HYFUELUP (Hybrid Biomethane Production from Integrated Biomass Conversion) is a project funded by the European Union's Horizon Europe Research and Innovation Programme. This ground-breaking project aims to develop and advance technology for biomethane production using gasification and methanation. The biomethane produced will be liquified and used for the decarbonization of long-distance road freight transport and maritime transportation.</i>
Waste2H2 - Waste to Hydrogen	<i>It aims to strengthen the capacity of IPPortalegre researchers in the implementation of cleaning and gas conversion technologies for hydrogen production, taking advantage of existing knowledge in pilot equipment that already synthesize gases from different biomass residues, acquiring skills and knowledge with partners of the project, in synthesis gas production techniques (DOI: 10.3030/952593).</i>

Administrative forms

<i>RESIST (Grant number 101093968)</i>	<i>RESIST is a project focused on making regions more resilient to climate change. RESIST is testing climate adaptation pathways in four EU regions, including Central Portugal, addressing challenges like fires, floods, droughts, and soil erosion. By engaging civil society, businesses, policymakers, and scientists, RESIST offers insights into diverse climate impacts, which will inform NITROMAX's wildfire-focused research.</i>
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Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)
<i>Industrial dryer</i>	<i>The rotary dryer with a capacity of 3 m3/h, basically consists of a rotating cylindrical drum where heat is introduced through a biomass boiler and material to dry, in concurrent.</i>
<i>Biodigester</i>	<i>The equipment with a treatment capacity of 2 m3, allows the control of temperature, pressure, and agitation. In addition to the bioreactor, the equipment also includes two tanks: one allows the removal of the sample from the equipment and the other tank allows it to be fed.</i>
<i>Fixed Bed Gasification and Energy Production Unit</i>	<i>The gasification unit (Power Pallet 20) produces electricity through the thermal gasification of fuels from different sources, where forest, domestic and industrial by-products stand out. It has a production capacity of up to 15 kW of electrical energy with a consumption of about 20 kg/h of biomass.</i>
<i>Bi Fuel Engines (Otto and Diesel)</i>	<i>The Otto and Diesel engines make possible to study, with the partial or total addition of syngas, biogas and hydrogen, the behavior and emitted emissions of these types of engines.</i>
<i>Industrial mill</i>	<i>Industrial hammer mill with a processing capacity of 500 kg/h.</i>
<i>Industrial pelletizing unit</i>	<i>Industrial pelletizing unit with a processing capacity of 300 kg/h.</i>

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☐ Yes

☒ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
- **Training:** Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers.
- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

Administrative forms

PIC	Legal name
865997765	Clean Energy Enterprises SAS

Short name: Clean Energy Enterprises

Address

Street	9 rue de Condé
Town	Bordeaux
Postcode	33000
Country	France
Webpage	www.cleanenergy.enterprises

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	no
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	24/02/2026 - yes
SME self-assessment	unknown
SME validation	unknown

Administrative forms

Departments carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Links with other participants

Type of link	Participant
--------------	-------------

Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

Jean Louis

Last name*

Kindler

E-Mail*

jlkindler@gmail.com

Position in org.

Representative

Department

Clean Energy Enterprises SAS

☒ Same as organisation name

☒ Same as proposing organisation's address

Street

9 rue de Condé

Town

Bordeaux

Post code

33000

Country

France

Website

Please enter website

Phone

+XXX XXXXXXXXXX

Phone 2

+XXX XXXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Hardik	Desai	hdesai@ways2h.com	+XXX XXXXXXXXXX
Jean Louis	Kindler	jlkindler@cleanenergy.enterprises	+XXX XXXXXXXXXX

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier

Administrative forms

Role of participating organisation in the project

Project management	<input checked="" type="checkbox"/>
Communication, dissemination and engagement	<input checked="" type="checkbox"/>
Provision of research and technology infrastructure	<input checked="" type="checkbox"/>
Co-definition of research and market needs	<input checked="" type="checkbox"/>
Civil society representative	<input type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input type="checkbox"/>
Research performer	<input checked="" type="checkbox"/>
Technology developer	<input checked="" type="checkbox"/>
Testing/validation of approaches and ideas	<input checked="" type="checkbox"/>
Prototyping and demonstration	<input checked="" type="checkbox"/>
IPR management incl. technology transfer	<input checked="" type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)

Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☐ Yes

☒ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
- **Training:** Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers.
- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

Administrative forms

PIC	Legal name
900882845	Associação Promotora da Rede Dinâmica XXI

Short name: APREDIN

Address

Street	Avenida Portugal, 216 A
Town	Carcavelos
Postcode	2775-396
Country	Portugal
Webpage	www.apredin.eu

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is **unknown** (small- and medium-sized enterprise) for the call.

SME self-declared status	unknown
SME self-assessment	unknown
SME validation	unknown

Administrative forms

Departments carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Links with other participants

Type of link	Participant
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Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

Fernando

Last name*

Gaspar

E-Mail*

fernandoacgaspar@yahoo.com

Position in org.

Representative

Department

Associação Promotora da Rede Dinâmica XXI

☒ Same as organisation name

☒ Same as proposing organisation's address

Street

Avenida Portugal, 216 A

Town

Carcavelos

Post code

2775-396

Country

Portugal

Website

Please enter website

Phone

+XXX XXXXXXXXXX

Phone 2

+XXX XXXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Fernando	Mota	fernando.mota@apredin.eu	+XXX XXXXXXXXXX

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier
Prof	Fernando	Gaspar	Man	Portugal	fagaspar@iscal.ipl.pt	Category A Top grade re	Leading	0000-0002-0533-8129	Orcid ID

Administrative forms

Role of participating organisation in the project

Project management	<input checked="" type="checkbox"/>
Communication, dissemination and engagement	<input checked="" type="checkbox"/>
Provision of research and technology infrastructure	<input type="checkbox"/>
Co-definition of research and market needs	<input checked="" type="checkbox"/>
Civil society representative	<input checked="" type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input type="checkbox"/>
Research performer	<input type="checkbox"/>
Technology developer	<input type="checkbox"/>
Testing/validation of approaches and ideas	<input checked="" type="checkbox"/>
Prototyping and demonstration	<input type="checkbox"/>
IPR management incl. technology transfer	<input checked="" type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input checked="" type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input checked="" type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)

Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☐ Yes

☒ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
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- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

Administrative forms

PIC	Legal name
883355721	NORDIC WELLBEING ACADEMY

Short name: NORDIC WELLBEING ACADEMY

Address

Street	BISKOP SVANES VEJ 29B
Town	BIRKEROED
Postcode	3460
Country	Denmark
Webpage	www.wellbeingacademy.dk

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	09/02/2023 - no
SME self-assessment	unknown
SME validation	unknown

Administrative forms

Departments carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Links with other participants

Type of link	Participant
--------------	-------------

Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Mr

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

Lars

Last name*

Münter

E-Mail*

lars@wellbeingacademy.dk

Position in org.

Representative

Department

NORDIC WELLBEING ACADEMY

☒ Same as organisation name

☒ Same as proposing organisation's address

Street

BISKOP SVANES VEJ 29B

Town

BIRKEROED

Post code

3460

Country

Denmark

Website

www.wellbeingacademy.dk

Phone

+4561262621

Phone 2

+XXX XXXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Nina	Sønderberg	nina@wellbeingacademy.dk	+45281802097

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier
Mr	Lars	Münter	Man	Denmark	lars@wellbeingacademy.dk	Category A Top grade re	Leading	0000-0002-0043-4883	Orcid ID
Ms	Nina	Sønderberg	Woman	Denmark	nina@wellbeingacademy.dk	Category D First stage r	Team member	0000-0001-5345-7846	Orcid ID

Administrative forms

Role of participating organisation in the project

Project management	<input type="checkbox"/>
Communication, dissemination and engagement	<input checked="" type="checkbox"/>
Provision of research and technology infrastructure	<input type="checkbox"/>
Co-definition of research and market needs	<input type="checkbox"/>
Civil society representative	<input checked="" type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input type="checkbox"/>
Research performer	<input type="checkbox"/>
Technology developer	<input type="checkbox"/>
Testing/validation of approaches and ideas	<input type="checkbox"/>
Prototyping and demonstration	<input type="checkbox"/>
IPR management incl. technology transfer	<input type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input checked="" type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input checked="" type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)
Publication	<i>Søvold L (and Münter L) et al. (2020) — Prioritising Mental Health and Wellbeing of Healthcare WorkFrontiers in Public Health, open access, 1,000+ citations. Published at a critical moment of systemic stress in health systems across Europe, this paper demonstrates NWA's capacity to produce timely, high-impact science communication that crosses disciplinary and institutional boundaries and reaches policymakers, practitioners, and the public simultaneously. DOI: 10.3389/fpubh.2021.679397</i>
Other achievement	<i>WHO Europe Digital Health Panel — Featured Speaker 2024 [Other achievement] Lars Münter participated as a featured speaker at the WHO Europe event "How can the Nordic approach prepare European health systems for an equitable digital future for all?" (October 2024), alongside the President of the European Federation of Medical Informatics. This demonstrates active engagement at WHO-level policy fora and direct access to the European institutional audiences.</i>
Other achievement	<i>Danish Lighthouse Life Science — Trust and Transformation Reports NWA co-produced two reports for the Danish Life Science Cluster (2025): the Foundation of Lighthouse Life Science, mapping the architecture of a 700+ member public-private partnership, and A New KPI Model for Collaboration and Change. Both demonstrate NWA's capacity to translate complex multi-stakeholder processes into accessible policy and communication tools directly applicable to stakeholder management.</i>
Other achievement	<i>CHi Award — Best European Campaign 2019 The European Self-Care Initiative, co-founded by Lars Münter in 2017, won the CHi Award for Best European Campaign in 2019. The initiative mobilised health professionals, policymakers, and citizens across Europe around a reframed narrative of individual and collective health responsibility — demonstrating award-winning capacity to design and deliver large-scale European behaviour-change communication campaigns.</i>
Other achievement	<i>CSR-LINK (2014–2019) was a Danish NGO co-founded by Lars Münter that convened 40+ national and international conferences on corporate policy for sustainable futures. It built structured dialogue between the private sector, civil society, and policymakers on sustainability transformation — demonstrating NWA's capacity to facilitate cross-sector engagement on industrial responsibility and green transition, directly relevant to stakeholder co-creation and policy communication tasks.</i>

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)
<i>Forgotten Fish (Erasmus+ 2024-2026)</i>	<i>Erasmus+ KA220-VET project exploring entrepreneurship, sustainable food systems, and circular blue economy in coastal island communities adapting to climate change. NWA leads dissemination and mindset-change components. forgottenfish.com</i>
<i>MentaStress (Erasmus+ 2023-2026)</i>	<i>MentaStress (Erasmus+ KA220-VET, 2023–2026) addresses the mental health and stress resilience of first responders across Europe. Led by a 9-partner consortium from 7 EU countries, it develops augmented reality (AR) tools to simulate high-stress crisis scenarios, a psychosocial support training MOOC, and a stress management guidebook. NWA leads dissemination and contributes expertise in mentalisation-based approaches to psychological resilience. mentastressproject.eu</i>

Administrative forms

Viaticum 2 (Erasmus+ 2024-2026)	<i>Viaticum 2 (Erasmus+ KA220-VET, 2024–2026) modernises training for volunteer rescuers across Europe through a 7-partner consortium from 6 countries. It expands the European Volunteer Rescuers Manual, develops a Pocket Rescue Manual for operational reference, and introduces VR-based Urban Search and Rescue (USAR) simulation training. NWA contributes dissemination and community awareness expertise, supporting preparedness in contexts increasingly shaped by climate-related emergencies. viaticum2.eu</i>
Nordic Health 2030 Movement (2019-)	<i>Nordic Health 2030 Movement (ongoing, since 2019) is a pan-Scandinavian multi-stakeholder initiative driving the transition from sick care to preventive, personalised, and participatory health across the Nordic region. Built on 30+ partner organisations, it creates cross-sector knowledge-sharing platforms at EHiN, EU Health Union, and WHO Europe events. Lars Münter serves as Communication Lead, connecting the movement's evidence base to EU and WHO health policy agendas. nordichealth2030.org</i>
WHO Public Health Innovation Platform (2026-2028)	<i>Lars Münter serves as Chair of the WHO Europe Working Group on Public Health Communication and Trust (2026–2028), part of the WHO Public Health Innovation Platform. This appointment confirms NWA's internationally recognised expertise in building the trust architectures and communication frameworks through which complex, unfamiliar technologies achieve public legitimacy — directly applicable to WP7 public acceptance, societal impact framing, and EU-level policy outreach.</i>

Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☐ Yes

☒ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
- **Training:** Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers.
- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

Administrative forms

PIC	Legal name
892749880	PRF-GAS TECNOLOGIA E CONSTRUCAO SA

Short name: PRF

Address

Street	ESTRADA NACIONAL 356/1 KM 5.8
Town	ALCOGULHE
Postcode	2400-821
Country	Portugal
Webpage	www.prf.pt/en/

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	no
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	31/12/2019 - yes
SME self-assessment	31/12/2019 - yes
SME validation	unknown

Administrative forms

Departments carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Links with other participants

Type of link	Participant
--------------	-------------

Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Mr

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

Paulo

Last name*

Ferreira

E-Mail*

pauloferreira@prf.pt

Position in org.

CEO

Department

PRF-GAS TECNOLOGIA E CONSTRUCAO SA

☒ Same as organisation name

☒ Same as proposing organisation's address

Street

ESTRADA NACIONAL 356/1 KM 5.8

Town

ALCOGULHE

Post code

2400-821

Country

Portugal

Website

Please enter website

Phone

+XXX XXXXXXXXXX

Phone 2

+XXX XXXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
José	Dias	josedias@prf.pt	+351914737694
Inês	Neves	inesneves@prf.pt	+35191071197

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier

Administrative forms

Role of participating organisation in the project

Project management	<input checked="" type="checkbox"/>
Communication, dissemination and engagement	<input checked="" type="checkbox"/>
Provision of research and technology infrastructure	<input type="checkbox"/>
Co-definition of research and market needs	<input type="checkbox"/>
Civil society representative	<input type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input type="checkbox"/>
Research performer	<input type="checkbox"/>
Technology developer	<input checked="" type="checkbox"/>
Testing/validation of approaches and ideas	<input checked="" type="checkbox"/>
Prototyping and demonstration	<input checked="" type="checkbox"/>
IPR management incl. technology transfer	<input type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)

Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☒ Yes

☐ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
- **Training:** Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers.
- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

Administrative forms

PIC	Legal name
864907970	hydrogen ventures portugal

Short name: hydrogen ventures portugal

Address

Street	campo grande 28 . 9 B
Town	1700 049 Lisboa
Postcode	1700-049
Country	Portugal
Webpage	mobigreen.pt

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	no
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	01/04/2026 - yes
SME self-assessment	unknown
SME validation	unknown

Administrative forms

Departments carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Links with other participants

Type of link	Participant
--------------	-------------

Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

Carlos

Last name*

Rato

E-Mail*

carlosrato@mobigreen.pt

Position in org.

Representative

Department

hydrogen ventures portugal

☒ Same as organisation name

☒ Same as proposing organisation's address

Street

campo grande 28 . 9 B

Town

1700 049 Lisboa

Post code

1700-049

Country

Portugal

Website

Please enter website

Phone

+XXX XXXXXXXXXX

Phone 2

+XXX XXXXXXXXXX

Other contact persons

First Name	Last Name	E-mail	Phone
Alexandra	Monteiro	alexandramonteiro@mobigreen.pt	+XXX XXXXXXXXXX

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier

Administrative forms

Role of participating organisation in the project

Project management	<input type="checkbox"/>
Communication, dissemination and engagement	<input type="checkbox"/>
Provision of research and technology infrastructure	<input type="checkbox"/>
Co-definition of research and market needs	<input type="checkbox"/>
Civil society representative	<input type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input type="checkbox"/>
Research performer	<input type="checkbox"/>
Technology developer	<input type="checkbox"/>
Testing/validation of approaches and ideas	<input checked="" type="checkbox"/>
Prototyping and demonstration	<input type="checkbox"/>
IPR management incl. technology transfer	<input type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input checked="" type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input checked="" type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)

Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☐ Yes ☒ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
- **Training:** Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers.
- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

Administrative forms

PIC	Legal name
999550954	AGENTIA PENTRU DEZVOLTARE REGIONALA CENTRU

Short name: THE REGIONAL DEVELOPMENT AGENCY ADR CENTRU RDA CENTRU

Address

Street	STRADA DECEBAL 11
Town	ALBA IULIA
Postcode	510093
Country	Romania
Webpage	www.adrcentru.ro

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is unknown (small- and medium-sized enterprise) for the call.

SME self-declared status	unknown
SME self-assessment	unknown
SME validation	unknown

Administrative forms

Departments carrying out the proposed work

No department involved

Department name

Name of the department/institute carrying out the work.

☒ not applicable

☐ Same as proposing organisation's address

Street

Please enter street name and number.

Town

Please enter the name of the town.

Postcode

Area code.

Country

Please select a country

Links with other participants

Type of link	Participant
--------------	-------------

Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

Simion

Last name*

Crețu

E-Mail*

office@adrcentru.ro

Position in org.

General Director

Department

AGENTIA PENTRU DEZVOLTARE REGIONALA CENTRU

☒ Same as organisation name

☒ Same as proposing organisation's address

Street

STRADA DECEBAL 11

Town

ALBA IULIA

Post code

510093

Country

Romania

Website

www.adrcentru.ro

Phone

+40258818616

Phone 2

+40358401276

Other contact persons

First Name	Last Name	E-mail	Phone
Simona	Caba	ovidia.caba@adrcentru.ro	40740175204

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier

Administrative forms

Role of participating organisation in the project

Project management	<input type="checkbox"/>
Communication, dissemination and engagement	<input type="checkbox"/>
Provision of research and technology infrastructure	<input type="checkbox"/>
Co-definition of research and market needs	<input type="checkbox"/>
Civil society representative	<input checked="" type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input checked="" type="checkbox"/>
Research performer	<input type="checkbox"/>
Technology developer	<input type="checkbox"/>
Testing/validation of approaches and ideas	<input type="checkbox"/>
Prototyping and demonstration	<input type="checkbox"/>
IPR management incl. technology transfer	<input type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)

Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☐ Yes

☒ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
- **Training:** Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers.
- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

Administrative forms

PIC 999835843	Legal name UNIVERSITY OF CYPRUS
-------------------------	---

Short name: UCY

Address

Street	AVENUE PANEPISTIMIOU 2109 AGLANTZI
Town	NICOSIA
Postcode	1678
Country	Cyprus
Webpage	www.ucy.ac.cy

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	18/02/2022 - no
SME self-assessment	unknown
SME validation	14/08/2008 - no

Administrative forms

Departments carrying out the proposed work

Department 1

Department name	Department of Computer Science	<input type="checkbox"/> not applicable
	<input checked="" type="checkbox"/> Same as proposing organisation's address	
Street	AVENUE PANEPISTIMIOU 2109 AGLANTZI	
Town	NICOSIA	
Postcode	1678	
Country	Cyprus	

Links with other participants

Type of link	Participant
--------------	-------------

Administrative forms

Main contact person

This will be the person the EU services will contact concerning this proposal (e.g. for additional information, invitation to hearings, sending of evaluation results, convocation to start grant preparation). The data in blue is read-only. Details (name, first name and e-mail) of Main Contact persons should be edited in the step "Participants" of the submission wizard.

Title

Prof.

Gender

☐ Woman

☒ Man

☐ Non Binary

First name*

George Angelos

Last name*

Papadopoulos

E-Mail*

papadopoulos.george@ucy.ac.cy

Position in org.

Professor

Department

Department of Computer Science

☐ Same as organisation name

☒ Same as proposing organisation's address

Street

AVENUE PANEPISTIMIOU 2109 AGLANTZI

Town

NICOSIA

Post code

1678

Country

Cyprus

Website

https://www.cs.ucy.ac.cy/seit/

Phone

+357 22892693

Phone 2

+357 22892685

Other contact persons

First Name	Last Name	E-mail	Phone
Christos	Mettouris	mettouris.g.christos@ucy.ac.cy	+357 22892684

Page 58 of 69

Last saved 16/04/2026 06:35

This proposal version was submitted by **Fernando Gaspar** on **15/04/2026 13:41:27** Brussels Local Time. Issued by the Funding & Tenders Portal Submission System.

Administrative forms

Researchers involved in the proposal

Title	First Name	Last Name	Gender	Nationality	E-mail	Career Stage	Role of researcher (in the project)	Reference Identifier	Type of identifier
Dr	George Angelos	Papadopoulos	Man	Greece	george@ucy.ac.cy	Category A Top grade re	Leading	0000-0001-9250-4916	Orcid ID
Dr	Christos	Mettouris	Man	Cyprus	mettouris.g.christos@ucy.ac.cy	Category B Senior resea	Team member	0000-0002-5486-8767	Orcid ID
Dr	Alexandros	Yeratziotis	Man	Cyprus	yeratziotis.alexandros@ucy.ac.cy	Category B Senior resea	Team member	0000-0003-2874-416X	Orcid ID
Dr	Thomas	Fotiades	Man	Cyprus	fotiadis.f.thomas@ucy.ac.cy	Category B Senior resea	Team member	0000-0002-4319-0436	Orcid ID
Dr	Savvas	Savvides	Man	Cyprus	savvides.savvas@ucy.ac.cy	Category B Senior resea	Team member	0000-0002-2971-0933	Orcid ID
Mrs	Evangelia	Vanezi	Woman	Cyprus	vanezi.evangelia@ucy.ac.cy	Category B Senior resea	Team member	0000-0003-1958-5574	Orcid ID

Administrative forms

Role of participating organisation in the project

Project management	<input type="checkbox"/>
Communication, dissemination and engagement	<input type="checkbox"/>
Provision of research and technology infrastructure	<input checked="" type="checkbox"/>
Co-definition of research and market needs	<input type="checkbox"/>
Civil society representative	<input type="checkbox"/>
Policy maker or regulator, incl. standardisation body	<input type="checkbox"/>
Research performer	<input checked="" type="checkbox"/>
Technology developer	<input checked="" type="checkbox"/>
Testing/validation of approaches and ideas	<input checked="" type="checkbox"/>
Prototyping and demonstration	<input checked="" type="checkbox"/>
IPR management incl. technology transfer	<input checked="" type="checkbox"/>
Public procurer of results	<input type="checkbox"/>
Private buyer of results	<input type="checkbox"/>
Finance provider (public or private)	<input type="checkbox"/>
Education and training	<input checked="" type="checkbox"/>
Contributions from the social sciences or/and the humanities	<input type="checkbox"/>
Other If yes, please specify: (Maximum number of characters allowed: 50)	<input type="checkbox"/>

Administrative forms

List of up to 5 publications, widely-used datasets, software, goods, services, or any other achievements relevant to the call content.

Type of achievement	Short description (Max 500 characters)
Publication	A. Achilleos, C. Mettouris, A. Yeratziotis, J. Starosta-Sztuczka, S. Moza, A. Hadjicosta, S. Georgiou, C. Theodorou, C. T. Loizou, K. Pecyna, K. S. Lazic, S. Parker and G. A. Papadopoulos, 'Lessons Learned from Older Adults Fusing of an Augmented Reality Assisted Living and Social Interaction Platform', <i>SN Computer Science, Springer, Vol. 4, No. 4, article 378, May 2023, pp. 1-22</i>
Publication	C. Mettouris, A. Yeratziotis, L. Fixl, S. Parker, J. Starosta-Sztuczka, V. Clarke, G. Rosenauer, W. Daxberger, S. Koumou, M. Panayides, G. Zampa, C. Theodorou and G. A. Papadopoulos, 'eSticky: An Advanced Remote Reminder System for People with Early Dementia', <i>SN Computer Science, Springer, Vol. 4, No. 4, article 334, April 2023, pp. 1-19.</i>
Publication	C. Mettouris, E. Vanezi, L. Cammerlander, P. Schober, A. Hadjicosta, S. Moza, M. Rohringer, I. Zemaitaityte, J. Kellerer, E. Schulc, R. Bardauskiene, P. Zaramella, A. Maistrello and G. A. Papadopoulos, 'Tools for Identifying and Preventing Loneliness in Older Adults', <i>Sixteenth International Conference on Computational Collective Intelligence (ICCCI 2024), Leipzig, Germany, 9-11 September 2024, CCIS 2166, Springer, pp. 338-350</i>
Publication	K. S. Lazic, A. Achilleos, S. Parker, C. Mettouris, A. Yeratziotis, G. A. Papadopoulos, C. Theodorou and K. Pecyna, 'GUIDed: An Augmented Reality Assisted-Living and Social Interaction Platform for Older Adults', <i>First International Conference on ICT for Health, Accessibility and Wellbeing (IC-IHAW 2021), Larnaca, Cyprus, 8-9 November 2021, CCIS 1538, Springer, pp. 66-79.</i>
Publication	Christos Mettouris, Achilleas Achilleos, Georgia M. Kapitsaki and George A. Papadopoulos, 'An MDD Framework Towards the Automated Development of Ubiquitous Context-Aware Recommender Systems for Commerce', <i>SN COMPUTER SCIENCE, SpringerNature, Volume 6, 370, 2025.</i>

List of up to 5 most relevant previous projects or activities, connected to the subject of this proposal.

Name of Project or Activity	Short description (Max 500 characters)
AsTeRICS FP7 Project	AsTeRICS developed a platform for realising user driven assistive technologies by combining emerging sensor techniques, such as Brain-Computer Interfaces and computer vision with basic actuators. The University of Cyprus was mainly involved in the development of the design of a modular middleware architecture that manages devices such as sensors and actuators that facilitate the operation of the AsTeRICS platform.
Prosperity4All FP7 Project	The project aimed to develop the infrastructure, tools and ecosystem that facilitate accessibility mainly through assistive technologies and allow for a ubiquitous auto-personalization of interfaces and materials, based on user needs and preferences. The University of Cyprus was mainly involved in the development of the Integrated Runtime Development, designed to offer adaptive user interfaces, AT Middlewares and remote sensor management in distributed environments. UCY was leading this task.
AAL GUIDed	The main target areas of the GUIDed smart kit and platform are smart home control features, safety enhancement, outdoor navigation, health improvement and socialisation/communication. The end-users (older adults) are guided with a tablet-based Augmented Reality (AR) tutoring service to simplify smart kit use and optimise usability. UCY was responsible for the socialisation/communication service that brings together older adults with family and friends over video conferencing.
AAL eSticky Notes	eSticky Notes aimed to support people with memorization problems to maintain their autonomy of life. The target group were people with age-related obliviousness, early stages of dementia and early Alzheimer's disease. A set of networked graphical displays (eSticky Notes) assist the person having memory problems by presenting important information including scheduled events, medication reminders etc. UCY was responsible for the development of the middleware for eSticky notes management.

Administrative forms

<i>PaaSageFP7 Project</i>	<i>PaaSage FP7 delivered a development and deployment platform, with an accompanying methodology, with which developers of enterprise systems can access services of cloud platforms in a technology neutral approach that abstracts the technical details while guiding them to configure their applications for best performance. PaaSage was developed as an open source integrated platform to support both design and deployment of Cloud applications.</i>
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Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work.

Name of infrastructure of equipment	Short description (Max 300 characters)
<i>Servers</i>	<i>Servers to host web platforms and tools</i>
<i>Laptops/Mobile devices</i>	<i>Mobile devices available for testing and piloting</i>
<i>Internet of Things equipment</i>	<i>Equipment such as sensors, actuators and special purpose customised devices</i>
<i>High Performance Computing (HPC) System</i>	<ul style="list-style-type: none">- Includes hardware and software for parallel processing of time-consuming and complex tasks, including the training of LLM models.- Offers high computational power from 3,000 processor cores- Supports a wide range of software that can cover all scientific fields.

Gender Equality Plan

Does the organization have a Gender Equality Plan (GEP) covering the elements listed below?

☒ Yes

☐ No

Minimum process-related requirements (building blocks) for a GEP

- **Publication:** formal document published on the institution's website and signed by the top management
- **Dedicated resources:** commitment of human resources and gender expertise to implement it.
- **Data collection and monitoring:** sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators.
- **Training:** Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers.
- **Content-wise, recommended areas** to be **covered** and addressed via concrete measures and targets are:
 - o work-life balance and organisational culture;
 - o gender balance in leadership and decision-making;
 - o gender equality in recruitment and career progression;
 - o integration of the gender dimension into research and teaching content;
 - o measures against gender-based violence including sexual harassment.

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3 - Budget

No	Name of Beneficiary	Country	Role	Requested grant amount	Income generated by the action	Financial contributions	Own resources	Total estimated income
1	Instituto Politécnico De Portalegre	PT	Coordinator	255 750.00	0	0	0	255 750.00
2	Clean Energy Enterprises Sas	FR	Partner	1 362 398.44	0	0	0	1 362 398.44
3	Associação Promotora Da Rede Dinâmica Xxi	PT	Partner	237 000.00	0	0	0	237 000.00
4	Nordic Wellbeing Academy	DK	Partner	187 500.00	0	0	0	187 500.00
5	Prf-gas Tecnologia E Construcão Sa	PT	Partner	576 476.56	0	0	0	576 476.56
6	Hydrogen Ventures Portugal	PT	Partner	97 500.00	0	0	0	97 500.00
7	Agentia Pentru Dezvoltare Regionala Centru	RO	Partner	70 500.00	0	0	0	70 500.00
8	University Of Cyprus	CY	Partner	212 875.00	0	0	0	212 875.00
	Total			3 000 000.00	0	0	0	3 000 000.00

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4 - Ethics & security

Ethics Issues Table

1. Human Embryonic Stem Cells and Human Embryos		Page
Does this activity involve Human Embryonic Stem Cells (hESCs)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does this activity involve the use of human embryos?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
2. Humans		Page
Does this activity involve human participants?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does this activity involve interventions (physical also including imaging technology, behavioural treatments, etc.) on the study participants?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does this activity involve conducting a clinical study as defined by the Clinical Trial Regulation (EU 536/2014) ? (using pharmaceuticals, biologicals, radiopharmaceuticals, or advanced therapy medicinal products)	<input type="radio"/> Yes <input checked="" type="radio"/> No	
3. Human Cells / Tissues (not covered by section 1)		Page
Does this activity involve the use of human cells or tissues?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
4. Personal Data		Page
Does this activity involve processing of personal data?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does this activity involve further processing of previously collected personal data (including use of preexisting data sets or sources, merging existing data sets)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Is it planned to export personal data from the EU to non-EU countries?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Is it planned to import personal data from non-EU countries into the EU or from a non-EU country to another non-EU country?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does this activity involve the processing of personal data related to criminal convictions or offences?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
5. Animals		Page
Does this activity involve animals?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
6. Non-EU Countries		Page
Will some of the activities be carried out in non-EU countries?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
In case non-EU countries are involved, do the activities undertaken in these countries raise potential ethics issues?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
It is planned to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Is it planned to import any material (other than data) from non-EU countries into the EU or from a non-EU country to another non-EU country? For data imports, see section 4.	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Is it planned to export any material (other than data) from the EU to non-EU countries? For data exports, see section 4.	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does this activity involve low and/or lower middle income countries , (if yes, detail the benefit-sharing actions planned in the self-assessment)	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Could the situation in the country put the individuals taking part in the activity at risk?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
7. Environment, Health and Safety		Page

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Does this activity involve the use of substances or processes that may cause harm to the environment, to animals or plants.(during the implementation of the activity or further to the use of the results, as a possible impact) ?

☒ Yes☐ No

5

Does this activity deal with endangered fauna and/or flora / protected areas?

☐ Yes☒ No

Does this activity involve the use of substances or processes that may cause harm to humans, including those performing the activity.(during the implementation of the activity or further to the use of the results, as a possible impact) ?

☒ Yes☐ No

17

8. Artificial Intelligence

Page

Does this activity involve the development, deployment and/or use of Artificial Intelligence-based systems?

☐ Yes☒ No

9. Other Ethics Issues

Page

Are there any other ethics issues that should be taken into consideration?

☐ Yes☒ No

I confirm that I have taken into account all ethics issues above and that, if any ethics issues apply, I will complete the ethics self-assessment as described in the guidelines [How to Complete your Ethics Self-Assessment](#)

☒

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Ethics Self-Assessment

Ethical dimension of the objectives, methodology and likely impact

The project does not involve human participants, personal data, animals, human tissues, non-EU country activities or AI-based systems. The ethics-relevant issues are limited to environment, health and safety aspects inherent to the technical validation activities.

Ways2H-EU includes the design, integration, commissioning and operation of a modular waste-to-hydrogen validation system at TRL 5. As described in Part B (pp. 17–18, 24), the methodology involves high-temperature process units, pressurised combustible gases including hydrogen and syngas, oxygen handling, gas cleaning and conditioning steps, and alkaline scrubbing media. These activities may create risks for workers and, if not properly managed, potential environmental impacts during implementation.

The project addresses these issues through a safety-by-design approach embedded in WP3 and WP4, including defined operating envelopes, battery limits, leak testing, controlled commissioning, monitored validation procedures, and risk mitigation measures for hydrogen/syngas handling and related process hazards. The project's likely impact is therefore not to create unusual ethical concerns, but to ensure that these industrial validation activities are implemented responsibly and under controlled conditions.

Ways2H-EU includes the design, integration and operation of a modular thermochemical waste-to-hydrogen validation system at TRL 5. The activities involve high-temperature process units, combustible and pressurised gases (including hydrogen and syngas), oxygen handling, gas cleaning and conditioning steps, alkaline scrubbing media such as NaOH, and process streams that may present environmental or occupational safety risks if not properly managed. These risks may arise during installation, commissioning, operation, maintenance, shutdown and restart activities, as well as in the future use of the project results for pilot-scale deployment.

The project does not pursue objectives that create ethically problematic impacts on vulnerable groups or fundamental rights. The relevant ethical dimension is therefore to ensure that the methodology and operational setup minimise risks to workers, the local environment and surrounding communities. This will be addressed through a safety-by-design approach embedded from the start of the project, especially in WP3 and WP4. The project will define ex ante operating envelopes, battery limits, acceptance criteria, monitored variables, and go/no-go rules for validation activities. It will also implement leak-testing, hazard prevention measures, controlled handling procedures for hazardous substances and gases, and documented emergency and incident-response procedures.

Any environmental and occupational risks associated with the validation activities will be managed under controlled industrial and laboratory conditions, with trained personnel, restricted access where needed, appropriate protective equipment, and supervision by the responsible technical partners. The project's likely impact is therefore not to create new ethical concerns beyond those inherent to the safe management of industrial hydrogen-related processes, but to generate evidence, protocols and engineering knowledge that reduce uncertainty and improve safety in future deployment.

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1708

Compliance with ethical principles and relevant legislations

The project will comply with applicable EU, national and institutional requirements on occupational health and safety, environmental protection, chemical handling, gas systems, pressure equipment and pilot-scale industrial operations. All validation activities will be carried out only after the relevant site-level safety checks, technical approvals and internal authorisations are in place.

As described in Part B (pp. 17–18, 24), the consortium will apply a safety-by-design methodology throughout engineering, integration and validation. This includes risk identification and mitigation, safe operating procedures, personnel training, restricted access where necessary, inspection and maintenance routines, emergency preparedness, and incident-response procedures. Particular attention will be given to hydrogen and syngas handling, oxygen supply, hot surfaces, high-temperature equipment, compressed gases and alkaline scrubbing media.

No activities involving humans, personal data, animals, human tissues or non-EU country fieldwork are planned. The consortium therefore considers that the ethics dimension of the project is manageable and adequately addressed through standard industrial and research safety practice.

The consortium will apply a safety-by-design methodology throughout the engineering, integration and validation phases. This includes risk identification and mitigation during design, safe operating procedures, personnel training, access control, inspection

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and maintenance routines, emergency preparedness, and documented incident-response protocols. Particular attention will be given to hydrogen and syngas handling, oxygen supply, hot surfaces and high-temperature equipment, compressed gases, and caustic scrubbing media.

The project will also comply with relevant legislation and standards concerning worker protection, industrial safety, waste handling, emissions control and environmental management. Where applicable, activities will be implemented in accordance with recognised European and national Regulations, Codes and Standards relevant to hydrogen systems, gas handling infrastructure and laboratory/ industrial pilot operation.

No activities involving humans, personal data, animals, human tissues, or non-EU country fieldwork are planned. If, during dissemination or societal-readiness activities, any personal data were exceptionally to be collected in the future, this would be limited to the minimum necessary, handled in compliance with GDPR and institutional procedures, and reflected accordingly in the project documentation.

Overall, the consortium considers that the ethics dimension of the project is manageable and primarily related to responsible implementation of technically hazardous but well-controlled industrial validation activities.

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Security issues table

1. EU Classified Information (EUCI) ²		Page
Does this activity involve information and/or materials requiring protection against unauthorised disclosure (EUCI)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does this activity involve non-EU countries which need to have access to EUCI?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
2. Misuse		Page
Does this activity have the potential for misuse of results?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
3. Other Security Issues		Page
Does this activity involve information and/or materials subject to national security restrictions? If yes, please specify: (Maximum number of characters allowed: 1000)	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are there any other security issues that should be taken into consideration? If yes, please specify: (Maximum number of characters allowed: 1000)	<input type="radio"/> Yes <input checked="" type="radio"/> No	

Security self-assessment

No security issues have been identified for this project. The action does not involve EU classified information, information or materials subject to national security restrictions, or items requiring specific export-control measures beyond standard civil research and industrial safety compliance.

Remaining characters 4703

²According to the Commission Decision (EU, Euratom) 2015/444 of 13 March 2015 on the security rules for protecting EU classified information, “European Union classified information (EUCI) means any information or material designated by an EU security classification, the unauthorised disclosure of which could cause varying degrees of prejudice to the interests of the European Union or of one or more of the Member States”.

³Classified background information is information that is already classified by a country and/or international organisation and/or the EU and is going to be used by the project. In this case, the project must have in advance the authorisation from the originator of the classified information, which is the entity (EU institution, EU Member State, third state or international organisation) under whose authority the classified information has been generated.

⁴EU classified foreground information is information (documents/deliverables/materials) planned to be generated by the project and that needs to be protected from unauthorised disclosure. The originator of the EUCI generated by the project is the European Commission.

Proposal template Part B: technical description

Ways2H-EU - Sustainable validation of waste-to-hydrogen modular technology in European conditions

List of participants

Participant No. *	Participant organisation name	Country
1 IPP	Politecnico Portalegre	Portugal
2 CEE	Clean Energy Enterprises SAS	France
3 APREDIN	Associação P. Rede Dinâmica XXI	Portugal
4 NWA	Nordic Wellbeing Academy	Denmark
5 PRF	PRF	Portugal
6 MG	MobiGreen	Portugal
7 RDAC	RDA Centru	Romania
8 UCY	University of Cyprus	Cyprus

1. Excellence

1.1 Objectives and ambition

1.1.1 Overall and Specific Objectives

The overall objective of Ways2H-EU is to validate, optimise and de-risk an innovative modular waste-to-hydrogen technology under European operating conditions, using purely biogenic and heterogeneous waste-derived feedstocks and achieving integrated validation at TRL 5. The project is designed not only to demonstrate technical feasibility, but to determine the validated operating envelope, quantified performance limits and residual bottlenecks of the system under realistic conditions relevant to future pilot deployment.

To achieve this overall objective, the project pursues five specific objectives (SOs), each of which is measurable, verifiable and directly linked to the topic requirements.

SO1: Validate the integrated process chain with representative heterogeneous biogenic feedstocks, demonstrating stable hydrogen production under experimentally relevant and auditable operating conditions.

SO2: Improve modular reactor design and process integration by optimising the interaction between vapolysis, high-temperature reforming, gas cleaning, water-gas shift and downstream conditioning within a modular TRL 5 architecture.

SO3: Define and verify the operating envelope for heterogeneous European biogenic waste streams by quantifying how moisture, ash content and contaminant precursors affect process stability, gas quality, reliability and repeatability.

SO4: Quantify technical, environmental and economic performance through a structured evidence package combining KPI verification, measured mass and energy balances, lifecycle assessment and scenario-based techno-economic analysis.

SO5: Translate TRL 5 validation results into pilot-oriented deployment evidence by identifying residual

bottlenecks, scale-up implications, customer profiles, integration roles and plausible first-adopter use cases for a future TRL 7–8 action.

Taken together, these objectives ensure that the project delivers more than a standalone technical demonstration. They are structured to produce a validated operating envelope, a robust 1,000 counted operating-hour dataset, and scenario-based deployment evidence that clarifies under which conditions the concept becomes technically credible and worth scaling in Europe.

1.1.2 Ambition and innovation beyond the state of the art

The project addresses a clear gap in the European hydrogen innovation landscape: the lack of sufficiently validated, modular and integrated process architectures for hydrogen production from heterogeneous biogenic waste under relevant European operating conditions. While literature reports promising results for advanced thermochemical conversion routes, most available evidence is generated under controlled laboratory conditions, with homogeneous feedstocks, short operating windows or limited insight into impurity management, repeatability and deployment-relevant economics. Ways2H-EU is designed to move beyond this evidence gap by validating an integrated modular architecture at TRL 5 using real heterogeneous biogenic waste streams and a structured operating protocol.

Recent literature suggests that, under favourable assumptions, advanced thermochemical systems may approach attractive hydrogen cost and emissions profiles. In this proposal, such literature values are used as benchmarking references rather than assumed project outcomes. Likewise, published results on syngas purity, gas-energy conversion efficiency and hydrogen yields serve as state-of-the-art comparators, not as claims of equivalent TRL 5 performance. The project will therefore use literature not to overstate maturity, but to define a transparent benchmark against which measured validation results can be interpreted.

The project tackles two gaps that remain insufficiently addressed in the current state of the art. First, there is still very limited structured evidence on how variable moisture, ash content and contaminant precursors in heterogeneous biogenic feedstocks affect continuous modular reforming under realistic operating conditions. This impurity-management gap is particularly important for decentralised European use cases, where feedstock heterogeneity is not a side issue but a defining feature of the application context. Second, while decentralised modular systems are often discussed as promising, there is still weak evidence on the conditions under which modularity improves or constrains economic performance once logistics, utilisation, maintenance and offtake assumptions are included. This modular-deployment gap limits the transition from laboratory promise to credible pilot planning.

Ways2H-EU responds to these gaps through a distinct innovation logic. Technically, the project combines a continuous Screw Vapolyser, a High-Temperature Reformer, downstream gas conditioning, sulfur removal, water-gas shift and final hydrogen purification in an integrated modular architecture designed for continuous operation. Scientifically, it links technical validation to explicit KPI verification, including hydrogen output, gas quality, GECE, carbon yield, reliability and availability under a validated operating envelope. Methodologically, it combines this technical evidence with scenario-based LCA and TEA, so that performance is interpreted together with logistics, utilisation, cost and deployment assumptions rather than in isolation.

The project also differs from previous EU-funded work in a relevant way. Earlier projects have contributed important knowledge on biomass-based hydrogen concepts, integrated reforming, syngas cleaning or waste valorisation pathways, but they have not fully addressed the specific combination of features proposed here: modular reactor innovation, integrated validation of the full process chain, quantified handling of heterogeneous impurities, and a direct bridge from proof-of-concept performance to pilot-oriented deployment evidence. Ways2H-EU therefore does not duplicate previous work; it occupies the specific innovation space between laboratory validation and decision-ready preparation for future TRL 7–8 action.

The ambition of the project is not to claim commercial readiness prematurely, but to determine under which technical and operational conditions this modular architecture performs credibly in Europe. In this sense, the project's innovation lies not only in the process configuration itself, but in the quality of the evidence it will generate: a validated operating envelope, quantified performance limits, explicit bottlenecks, and scenario-based deployment conditions. This is particularly important for a topic that requires strong evidence on modular hydrogen

production from biogenic waste, impurity management, technical performance and future scale-up relevance.

This directly addresses the topic's need for modular hydrogen production from biogenic waste with stronger evidence on impurity management, technical performance and future deployment conditions.

Furthermore, a critical review of recent literature reveals two severe bottlenecks that this project will directly solve:

1. **The Impurity Management Gap:** Current studies provide minimal explicit discussion and quantitative data on moisture and ash management methods for highly heterogeneous biogenic feedstocks. Our SO3 and WP2 directly tackle this by defining strict operating envelopes for European biogenic waste streams.
2. **The Modular IRR Gap:** While centralized gasification models benefit from economies of scale, their financial viability is highly sensitive to feedstock costs, and there is a total lack of data on how modularity affects the Internal Rate of Return (IRR) in decentralized systems. WP6 will deliver a pioneering financial model bridging this exact knowledge gap.

To robustly benchmark our technology, we analyzed the latest literature on biomass reforming. Recent studies on cascaded catalytic reforming achieve a Gas Energy Conversion Efficiency (GECE) of 75.65% and syngas purities of 89.47 vol% (H₂ + CO) under controlled laboratory conditions. The Ways2H-EU Validate project pushes beyond these laboratory boundaries by physically validating an integrated, continuous architecture designed to maintain these high efficiencies while processing real-world, heterogeneous biogenic waste streams, building upon an established hardware baseline of 110 kg fuel-cell grade H₂ per dry ton. Furthermore, a critical review of recent literature reveals two severe bottlenecks that this project will directly solve:

1. **The Impurity Management Gap:** Current studies provide minimal explicit quantitative data on moisture and ash management methods for highly heterogeneous biogenic feedstocks. Our project directly tackles this by defining strict operating envelopes for European biogenic waste streams.
2. **The Modular IRR Gap:** While centralized gasification models benefit from economies of scale, their financial viability is highly sensitive to feedstock costs, and there is a scarcity of dynamic techno-economic assessments on how modularity affects the Internal Rate of Return (IRR) in decentralized systems. WP6 will deliver a pioneering financial model bridging this exact knowledge gap.

Downstream Gas Purification and Conditioning Sequence Following the core thermochemical conversion in Skids 1 and 2, the raw syngas undergoes a rigorous downstream conditioning sequence. First, the gas passes through a Waste Heat Boiler & Economiser which cools down the syngas and uses its high-temperature enthalpy to generate steam for the process. In sequence, a Gas Scrubber neutralises acidic gases (HCl, H₂S) and removes heavy metals or particulates. An Induced Draft (ID) fan creates negative pressure to maintain continuous flow, pushing the gas into the Syngas Compressor. The pressurised gas enters a Sulfur Removal unit, drastically reducing sulfur compounds to up to 5 ppb. Afterwards, it feeds into the Water-Gas Shift Reactor (WGSR) to convert remaining CO into CO₂ and additional H₂, improving overall yields. The CO₂ is subsequently sequestered via a NaOH-CO₂ Scrubber Tower (converting CO₂ into NaHCO₃). Finally, the gas reaches the Hydrogen Separator (PSA), which is designed to enable hydrogen purification toward the quality requirements of the intended end-use pathway; the achieved hydrogen quality will be measured and reported during WP4 under the relevant operating conditions.

Overcoming State-of-the-Art Bottlenecks: Recent comprehensive reviews on thermochemical production of hydrogen from biomass identify waste pre-treatment, technology maturity, and syngas conditioning as the primary barriers to scalability (Shahabuddin et al., 2019). While conventional technologies such as plasma gasification can break down feedstocks into syngas at 10,000°C, they suffer from extreme energy penalties and complex slag management (Brito et al., 2022). Conversely, recent laboratory-scale studies on cascaded catalytic reforming of biomass report promising Gas Energy Conversion Efficiencies (GECE) of 75.65% and syngas purities up to 89.47 vol% (Yang et al., 2022). The *Ways2H-EU Validate* project pushes beyond these laboratory boundaries. By replacing conventional gasification with a steam-induced Vapourlysis reactor coupled with an in-line High-Temperature Reformer (1200°C), we eliminate the need for thermal media and direct incineration. This architectural leap aims to maintain state-of-the-art GECE (>75%) while robustly handling heterogeneous biogenic waste at a continuous TRL 5 scale, with hydrogen quality measured against the relevant purity requirements for the

intended end use.

Table 1 Ways2H-EU Quantitative Targets vs. Clean Hydrogen JU Call 01-05 Requirements

Performance Indicator	Call 01-05 Minimum Target / SoA	Ways2H-EU Validated Target (TRL 5)
Hydrogen Yield	≥ 110 kg H ₂ / ton of dry feedstock	≥ 110 kg H ₂ / ton (proven at TRL 4, validated at TRL 5)
Gas Energy Conversion Efficiency (GECE)	$> 75\%$	Targeted validation level: up to 75.65%, subject to verification under the validated operating envelope
System Carbon Yield	> 0.22 kg H ₂ / kg C	Targeted validation level: > 0.22 kg H ₂ / kg C, subject to verification under continuous operation
Hydrogen Purity	ISO 14687 compliance	Hydrogen quality to be measured against the relevant purity requirements for the intended end use; target performance $>99.97\%$ under suitable operating conditions
Direct CO ₂ Emissions from Feedstock	$\geq 80\%$ reduction vs. benchmarks	Scenario-based target: $>80\%$ reduction versus relevant fossil reference pathways, subject to LCA assumptions and validated operating data

KPI logic and benchmarking assumptions. The project will use a transparent KPI hierarchy distinguishing between (i) baseline evidence already obtained at laboratory proof-of-concept level, (ii) validation targets to be verified during the project, and (iii) benchmark values drawn from literature or conventional reference pathways. This distinction is essential because the project is not claiming that all target values are already demonstrated at TRL 5; rather, it will verify under which operating conditions they can be achieved, maintained or approached when processing real European biogenic waste streams.

Accordingly, the values reported for hydrogen yield, GECE, carbon yield, hydrogen purity, lifecycle emissions and LCOH are used as validation targets and benchmarking references, not as guaranteed outcomes. For each KPI, the project will document the underlying assumptions, system boundaries, feedstock basis, data source and comparison baseline. In particular, TEA and LCA results will be reported with sensitivity ranges and scenario assumptions covering feedstock moisture, ash content, transport distance, electricity and oxygen costs, system availability, and plant utilisation rate. This will allow evaluators and future adopters to distinguish clearly between measured TRL 5 performance, modelled scale-up performance and literature benchmarks.

This directly addresses the topic's need for modular hydrogen production from biogenic waste with stronger evidence on impurity management, technical performance and future deployment conditions.

1.1.3 Positioning with respect to prior EU-funded projects We build upon, but distinctly depart from, previous Horizon projects. The consortium has carefully benchmarked **Ways2H-EU** against prior EU-funded work to ensure our approach is highly innovative, non-duplicative, and complementary:

- **UNIH2Y:** While this project successfully developed a thermochemical hydrogen production concept from biomass, it did not address the integrated validation logic proposed here. Specifically, it lacked a focus on modularity, the management of highly heterogeneous impurities (moisture and ash), and the specific vapour reforming architecture underpinning our project.
- **BIONICO:** Highly relevant as it developed and demonstrated a novel reactor concept integrating hydrogen production and separation. However, it was heavily centred on biogas-related reforming rather than the

thermochemical conversion of solid, heterogeneous biogenic waste feedstocks.

- **WASTE2H2:** Focused on strengthening scientific and institutional capacity around syngas cleaning and hydrogen production. Its main objective was capacity-building and knowledge transfer, rather than the physical validation of an integrated modular reactor architecture at TRL 5.
- **WASTE2ROAD:** Relevant regarding the valorisation of biogenic residues and waste fractions, but it targeted advanced biofuels rather than clean hydrogen production. It highlights the importance of widening Europe’s portfolio of waste valorisation routes, making our focus highly complementary.

Taken together, these projects confirm that the thermochemical field is active and strategically relevant, but they also show that a critical gap remains. There is still a pressing need for a project that combines modular reactor innovation, integrated validation of the full process chain, robust handling of feedstock variability, and a clear bridge between proof-of-concept and future pilot deployment. This is the precise innovation space occupied by **Ways2H-EU**.

The Ways2H-EU process fundamentally departs from conventional partial-oxidation gasification. While traditional gasification burns a fraction of the feedstock to sustain temperatures—leading to gas dilution, tar formation, and thermal efficiencies limited to ~50%—our technology utilizes a true vapolysis approach. The solid feedstock undergoes thermal cracking (>850°C) in the total absence of injected free dioxygen. Instead, closed-loop combustion of a small H2 fraction with pure O2 generates direct, high-temperature steam that drives the endothermic reforming reactions seamlessly.

By benchmarking against the latest state-of-the-art, this project sets highly ambitious KPIs. Recent literature on advanced in-line cascaded catalytic reforming of biomass reports maximum syngas purities of **89.47 vol% (H2 + CO)** and a gas energy conversion efficiency (GECE) of **75.65%** under controlled laboratory settings (Yang et al., 2022). Other recent studies on steam reforming of biomass gasification gas achieved hydrogen purities of up to 52.7% and yields of 61.8% (Brito et al., 2023). The Ways2H-EU architecture pushes beyond these laboratory boundaries by physically validating an integrated continuous system designed to maintain these high efficiencies while handling real-world biogenic waste streams, building upon an established hardware baseline of 110 kg fuel-cell grade H2 per dry ton.

Crucially, a critical review of recent literature (2022-2024) reveals a major blind spot: there is almost no quantitative data on how highly heterogeneous feedstock impurities (variable moisture and ash) affect continuous modular reforming. Our WP2 and WP4 directly fill this innovation gap.

Table 2 Alignment between Call Expected Outcomes and Project Objectives

Call Topic Requirements (HORIZON-JU-CLEANH2-2026-01-05)	Ways2H-EU Project Response	Work Package (WP)
Sustainable hydrogen production from biogenic waste sources (excluding natural gas/fossil)	SO1: Exclusive validation with biogenic fractions and heterogeneous organic waste, ensuring zero fossil dependency.	WP2, WP4
Innovative modular reactor design and process intensification	SO2: Integrated architecture (Vapolysis + High-Temp Reforming + WGS) with internal thermal integration to maximize yield and modularity.	WP3, WP4
Feedstock impurity management	SO3: Advanced characterisation and quantification of moisture and ash impacts on gas quality and process stability.	WP2, WP4
Demonstration of technical, environmental, and economic performance (KPIs)	SO4: Rigorous benchmarking against the state-of-the-art (SMR and Electrolysis), focusing on costs (<\$2.5/kg) and lifecycle emissions (<2kg CO2eq/kg).	WP5

Clear pathway toward future higher-TRL demonstration	SO5: Creation of a scale-up roadmap and a pioneering financial model focusing on the impact of modularity on the Internal Rate of Return (IRR) in decentralized systems.	WP6
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1.1.4 R&I maturity and TRL positioning

The project is well aligned with the scope of a Research and Innovation Action (RIA) under Call HORIZON-JU-CLEANH2-2026-01-05, which expects activities to start at least at TRL 3 and achieve TRL 5 by the end of the project. We do not start from scratch, nor do we overpromise commercial readiness. The core technology currently stands at a robust TRL 4 (technology validated in a lab).

This baseline is evidenced by the Ways2H "Working Model", a semi-automated lab-scale version of the RefHynery processing 1 kg of feedstock per hour. This system successfully completed a physical proof-of-concept in India in September 2024. During these tests, the core process (integrating the Vapolyser and the High-Temperature Reformer) operated stably, yielding an equivalent of 110 kg of fuel-cell grade H₂ per ton of dry feedstock.

However, achieving TRL 5 (technology validated in a relevant environment) requires overcoming the significant gap between processing controlled laboratory samples and managing continuous operation with real, highly heterogeneous European biogenic waste streams. The *Ways2H-EU* project will fund this critical scale-up. The EU funding will specifically de-risk the integrated continuous operation under realistic operational stress, focusing on dynamic impurity management (ash and moisture), closed-loop thermal integration, and process wastewater validation (e.g., gas scrubber blowdown).

Furthermore, the overall engineering risk is substantially mitigated because the mechanical core of the system, the Screw Vapolyser, is already commercially proven and in use in other industrial sectors, processing several hundred tons of feedstock per day.

Throughout the proposal, target values are presented as validation objectives to be tested under defined operating conditions, not as outcomes assumed in advance. This is particularly important for TRL 5, where the project's added value lies in demonstrating measured performance, identifying the validated operating window, and documenting the residual bottlenecks that must still be addressed before pilot-scale deployment.

1.2 Methodology

1.2.1 Overall methodological approach

The methodology of Ways2H-EU is designed to bridge the gap between a successful laboratory proof-of-concept at TRL 4 and an integrated, continuously operating process at TRL 5 under relevant European conditions. The project's core methodological assumption is that this transition cannot be demonstrated through isolated conversion results alone. It requires a structured validation approach that combines feedstock realism, integrated process operation, explicit impurity management, auditable KPI verification, and scenario-based interpretation of environmental and economic performance.

To achieve this, the project follows a five-layer methodology in which each layer produces evidence needed by the next one.

Feedstock profiling and operating-envelope definition (WP2). The project begins from real heterogeneous biogenic waste streams rather than from uniform model feedstocks. Representative European waste fractions, including agricultural, forestry and selected municipal biogenic streams, will be characterised in terms of moisture, ash content and contaminant precursors. These data will be used to define the admissible operating envelope of the system, including the feedstock conditions under which stable operation can be expected and the thresholds above which process instability, gas-quality deterioration or excessive operational stress are likely to occur.

Integrated modular engineering, safety and digital monitoring (WP3). On the basis of the operating envelope defined in WP2, the project will optimise the integrated physical architecture of the modular system. This includes

the interaction between the Screw Vapolyser, High-Temperature Reformer, downstream gas handling and conditioning units, and the digital monitoring layer. Safety-by-design is embedded from the outset, particularly for hot surfaces, pressurised combustible gases, oxygen handling and gas-cleaning operations. In parallel, the digital monitoring architecture will translate process and control data into an operational dashboard capable of supporting traceability, anomaly detection and validation monitoring during the TRL 5 campaigns.

Structured TRL 5 validation under relevant operating conditions (WP4). The central methodological layer of the project is a staged validation protocol at the 1–10 kg H₂/h scale. The project will accumulate at least 1,000 counted operating hours in an industrially relevant environment, distributed across baseline operation, controlled feedstock-variability testing and restart/repeatability sequences. A test hour will count only when the system operates within the predefined battery limits and with a complete monitoring dataset. This ensures that the project produces a validated operating envelope and a decision-useful evidence package rather than simply a long operating campaign. The validation logic is designed to determine not only what performance can be reached, but under which conditions it can be maintained, repeated and interpreted as relevant for future pilot planning.

KPI verification and scenario-based performance interpretation (WP4-WP5). The project will verify technical KPIs through measured operating data, including hydrogen output, gas quality, GECE, carbon yield, reliability and availability. These results will then be interpreted through a cradle-to-gate LCA and a scenario-based TEA. The methodology therefore distinguishes clearly between measured TRL 5 evidence and projected deployment scenarios. This is important because the project's purpose is not to claim universal competitiveness, but to assess under which assumptions and in which decentralised use cases the concept may become environmentally and economically credible.

Scale-up and deployment decision logic (WP6). The final methodological layer translates validation results into pilot-oriented deployment evidence. Technical bottlenecks, scale-up implications, customer profiles, integration roles, local host conditions and offtake cases will be mapped into a follow-on TRL 7–8 roadmap. This ensures that the project ends not only with a validated technical dataset, but with a structured basis for deciding whether, where and how the concept should move toward future pilot deployment.

The methodology is therefore cumulative and decision-oriented. WP2 defines what can be fed into the system; WP3 defines how the integrated architecture can operate safely and traceably; WP4 determines the validated operating envelope through 1,000 counted operating hours; WP5 interprets the resulting performance through environmental and economic scenarios; and WP6 converts that evidence into deployment-relevant conclusions. Taken together, these layers ensure that the project generates auditable TRL 5 evidence first, and scenario-based deployment decisions second.

The 1-10 kg H₂/h validation unit is designed across distinct modular 'Skids', establishing clear physical and operational battery limits between the core technology provider (CEE) and the gas handling engineering expert (PRF):

- **Upstream & Core Thermochemical Conversion (CEE Battery Limits):** CEE is responsible for Skid 1 (incorporating the continuous Screw Vapolyser operating at 850°C) and Skid 2 (housing the High-Temperature Reformer operating at 1200+°C to crack complex hydrocarbons). A key aspect of this module's *process intensification* relies on closed-loop thermal management: a small fraction of the generated H₂ is combusted with oxygen to directly generate high-temperature steam () for the reforming stage, ensuring precise temperature control without external combustion emissions.
- **Downstream Gas Conditioning & Compression (PRF Battery Limits):** PRF will lead the integration of the downstream infrastructure encompassing Skid 4 (Oxygen PSA and Air compressors) and Skid 5. Skid 5 includes the Syngas Compressor, Sulfur Removal (reducing sulfur compounds to <5 ppb), Water-Gas Shift Reactor (WGSR), NaOH-CO₂ Scrubber, and the final Hydrogen Separator to enable downstream purification toward the relevant hydrogen quality requirements for the intended end use.

Scientific Benchmarking and Lifecycle Methodology: The environmental and economic validation in WP5 will employ rigorous Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) methodologies to evaluate the environmental footprint and the Levelized Cost of Hydrogen (LCOH). Current life cycle thinking-based

assessments demonstrate that biomass gasification significantly reduces the global warming potential compared to conventional incineration, but widespread adoption remains constrained by economic and supply chain logistical barriers (Wijayasekera et al., 2022). Furthermore, while the technical viability of thermochemical conversion is proven, dynamic techno-economic analyses (TEA) highlight that capital and operational costs per tonne are highly sensitive to feedstock variability (Gabbar et al., 2021). *Ways2H-EU* will bridge this exact knowledge gap. By cross-referencing IPP's empirical mass/energy balances with Mobigreen's supply chain logistics, the project will generate one of the first structured datasets linking modular process performance, feedstock logistics and deployment assumptions in a European context. These data will be used to assess whether, and under which conditions, a modular approach can move toward competitive LCOH levels and low greenhouse-gas intensity in selected decentralised use cases. Results will be reported as scenario-based findings grounded in measured operating data and explicit modelling assumptions. They will be used to assess whether a modular approach can suppress the LCOH below the 2.5 USD/kg target and reduce GHG emissions below 2 kg CO₂eq/kg H₂, significantly outperforming conventional SMR baselines.

Key Challenges and Mitigation Strategies:

- Challenge: *Feedstock heterogeneity causing process instability and tar/ash accumulation*. Mitigation: WP2 will pre-define safe operating envelopes, and the unique mechanical mixing of the Screw Vapolyser (CEE) will prevent cluster formation while managing ash extraction dynamically.
- Challenge: *Safety and control of high-temperature hydrogen/syngas operations*. Mitigation: PRF brings 35+ years of industrial expertise in gas infrastructure and control systems, ensuring that all prototypes meet stringent European safety standards and Regulations, Codes, and Standards (RCS).

Taken together, these layers ensure that the project generates a validated operating envelope through 1,000 counted operating hours, and converts that evidence into scenario-based deployment evidence for future pilot decisions.

1.2.2 Interdisciplinarity and Integration of Social Sciences and Humanities (SSH)

While the core of the project is highly technical, overcoming deployment barriers requires deep interdisciplinarity. SSH disciplines are fundamentally integrated into WP6 and WP7 through NWA, APREDIN, and SW Oltenia RDA. By pairing techno-economic models with psychosocial behavioural-change methodologies and regional policy alignment (RIS3), the project is designed to ensure that the technology is not only engineered correctly but also assessed in terms of investability, social acceptance and deployment feasibility across European municipalities.

The consortium has been deliberately streamlined to guarantee a highly interdisciplinary yet strictly complementary approach. The project merges:

- Thermochemical & Mechanical Engineering: CEE (reactor design) and PRF (gas handling, safety, and integration).
- Environmental & Chemical Sciences: IPP (biomass characterisation, LCA, mass/energy balances).
- Information Technology (IT): UCY (digital control logic and monitoring tools).
- Social Sciences, Humanities (SSH) & Economics: APREDIN and RDA Centru. While the core project is highly technical, SSH disciplines are deeply integrated into WP6 and WP7. RDA Centru will analyse the alignment of decentralised waste-to-hydrogen hubs with regional Smart Specialisation Strategies (RIS3) and local job creation.

This interdisciplinary approach is designed to enable that the technology is not only engineered correctly but is also economically viable and socially acceptable for European municipalities.

1.2.3 Gender dimension

While the core thermodynamic reactions (vapourisation and reforming) do not inherently involve biological sex

differences, the gender dimension is actively integrated into the project's socio-economic research and innovation content. During the exploitation and scale-up mapping (WP6/WP7), the project will assess how decentralised green hydrogen hubs affect local employment patterns, specifically evaluating opportunities to promote gender-inclusive job creation in the predominantly male-dominated energy and waste-management sectors. Furthermore, ergonomic and inclusive design principles will be applied when developing operational manuals and safety protocols (WP3/WP4). All participating public/academic bodies (e.g., IPP, UCY) enforce strict Gender Equality Plans (GEPs).

Integration of the Gender Dimension in R&I Content While the fundamental thermodynamic reactions of thermochemical hydrogen production are strictly physicochemical and gender-neutral, the *Ways2H-EU Validate* project actively integrates the gender dimension in two critical methodological layers:

1. Digital Twin and Human-Machine Interface (WP3): The ICT dashboards and anomaly detection alerts developed by UCY for the pilot plant operators will undergo usability testing to ensure ergonomic and cognitive accessibility for all genders, mitigating historical male-centric design biases in heavy-industrial control rooms.

2. Societal Readiness and Citizen Engagement (WP7): Research indicates that risk perception regarding hydrogen safety and waste-to-energy infrastructure (NIMBYism) often exhibits gendered variations. The community engagement campaigns and Living Labs led by NWA and APREDIN will collect gender-disaggregated data to tailor the communication strategies.

This ensures that the social legitimacy models and the final deployment roadmap account for the diverse concerns and priorities of all citizens equally.

1.2.4 Open science practices and Data Management

The project fully embraces Horizon Europe's Open Science mandate, adopting a "as open as possible, as closed as necessary" approach. A comprehensive Data Management Plan (DMP) will be delivered by M6 and updated regularly, ensuring that generated datasets adhere to the FAIR principles (Findable, Accessible, Interoperable, Reusable).

To maximise scientific impact and transparency, non-proprietary data—such as the behaviour of different European biogenic waste streams, impurity profiles, and the environmental LCA/TEA benchmarks—will be openly published in peer-reviewed journals and repositories like Open Research Europe or Zenodo. Pre-registration of environmental impact protocols will be utilised to ensure reproducibility. Conversely, the specific mechanical and thermal IP associated with the core Vapolyser and Reformer architecture (CEE) will be strictly protected to guarantee future commercial exploitation, managed through a clear IPR strategy defined in the Consortium Agreement.

In strict adherence to the Horizon Europe mandate of 'as open as possible, as closed as necessary', the **Ways2H-EU Validate** project implements a dual-track data management strategy. Fundamental empirical data—such as LCA and TEA results, feedstock impurity behaviour, and hydrogen purity datasets—will be made publicly available (PU) under FAIR principles (Findable, Accessible, Interoperable, Reusable) to accelerate Open Science and support EU standardisation bodies (e.g., EHSP). Conversely, the proprietary engineering blueprints of the Vapolyser and Reformer integration, the Digital Twin source code, and the commercial IRR models will be classified as Sensitive (SEN). This rigorous protection of Foreground IP ensures that the industrial SMEs (CEE, PRF, and Mobigreen) retain their competitive edge for the future commercial scale-up (TRL 7-8), perfectly balancing scientific transparency with European industrial leadership.

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2. Impact

2.1 Project's pathways towards impact

The Ways2H-EU project is designed to deliver impact through a first-adopter logic rather than through a generic long-term market narrative. Its central contribution is to generate decision-useful evidence on whether modular waste-to-hydrogen can become technically, environmentally and economically credible in selected decentralised European deployment contexts. By validating a modular vapourlysis and high-temperature reforming architecture at TRL 5, the project addresses a strategic need for hydrogen production pathways that use biogenic waste as feedstock, reduce dependence on fossil-based hydrogen, and complement electricity-intensive electrolysis in local circular-economy settings.

The project's primary host environments are municipalities, regional waste-management actors and comparable local stakeholders that control access to biogenic waste streams and can provide a stable site and feedstock basis. This is important because the viability of decentralised hydrogen production depends not only on conversion efficiency, but also on feedstock heterogeneity, transport distance, plant utilisation rate, operating stability and the ability to manage impurities under realistic conditions. Ways2H-EU therefore links technical validation directly to the conditions under which a decentralised waste-to-hydrogen system could be credibly deployed in practice.

The project's first industrial deployment logic is centred on a clearly defined value chain. Waste holders and public utilities are treated as feedstock owners and potential site hosts. Technology providers and industrial engineering actors are responsible for system integration, operation and future pilot delivery. Local hydrogen users, especially depot-based fleet operators and comparable controlled-demand applications, are treated as early offtakers with predictable consumption profiles. This configuration is intentionally prioritised because it reduces exposure to both feedstock transport risk and hydrogen distribution risk, and because it creates a more credible route to first deployment than an open merchant-hydrogen model.

The project will not claim competitiveness in abstract terms. Instead, it will determine under which conditions the concept becomes commercially credible and for whom. This will be done through four interlinked evidence packages: (i) a validated operating envelope for heterogeneous European biogenic waste streams, (ii) a TRL 5 technical dataset generated through at least 1,000 counted operating hours, (iii) scenario-based LCA and TEA results linking measured performance to greenhouse-gas intensity, CAPEX, OPEX and LCOH, and (iv) a pilot-oriented deployment roadmap identifying customer profiles, integration roles, offtake cases and residual bottlenecks for TRL 7–8 follow-on action.

The project's expected economic and technological contribution lies in reducing uncertainty around decentralised waste-to-hydrogen deployment. Recent assessments show that the competitiveness of decentralised biomass conversion is highly sensitive to logistics, utilisation rate and local operating conditions. Ways2H-EU addresses this directly by integrating MobiGreen as a bridge between feedstock logistics and hydrogen offtake modelling. Upstream, the project will assess how logistics and feedstock handling affect the feasibility of operating the system under realistic European conditions. Downstream, it will test whether depot-based mobility and other controlled local demand profiles represent plausible early use cases for the validated hydrogen output. In this way, the project connects technical validation with clearly defined deployment scenarios rather than with generic market assumptions.

The project's environmental contribution lies in assessing whether hydrogen production from 100% biogenic waste can achieve low lifecycle greenhouse-gas intensity relative to relevant fossil-based and electrolytic reference pathways. This assessment will not rely on abstract claims, but on scenario-based LCA using measured operating data, explicit system boundaries and transparent assumptions regarding transport, utilities, by-product handling and plant utilisation. The project's scientific contribution lies in generating one of the first structured TRL 5 datasets on impurity management, gas quality, stability and repeatability for modular hydrogen production from highly heterogeneous biogenic waste streams.

The target groups that will benefit most directly from the project are: municipal and regional waste-management actors seeking alternatives to landfilling, incineration and long-distance transport of biogenic residues; industrial integrators and engineering actors interested in modular hydrogen systems for controlled local deployment; depot-based fleet operators and comparable hydrogen users that can provide predictable first-demand profiles; and investors, regional development bodies and public authorities assessing whether decentralised circular-hydrogen infrastructure can become investable under defined local conditions. Standardisation, safety and policy actors will also benefit from the operational evidence generated by the project on gas quality, risk management and deployment conditions.

The primary target groups that will immediately benefit from the project's pathways to impact include:

1. **Waste Management Authorities & Municipalities:** Gaining an evidence-based alternative to landfilling, incineration and long-distance transport for selected biogenic municipal, forestry and agricultural residues, with the potential to improve environmental performance under suitable local conditions.
2. **Transport & Logistics SMEs:** Benefiting from a predictable, localized supply of fuel-cell grade hydrogen for heavy-duty and fleet mobility, modeled directly by Mobigreen.
3. **Local Communities:** Benefiting from the creation of green jobs in decentralized energy hubs and improved air quality through the eradication of local waste incineration.
4. **Unique contribution to economic and environmental outcomes:** Current Life Cycle Assessment (LCA) benchmarks indicate that conventional Steam Methane Reforming (SMR) emits an average of 11 kg CO₂eq/kg H₂. In contrast, High Temperature Steam Electrolysis (HTSE) yields life cycle emissions between 3 and 20 kg CO₂eq/kg H₂, with production costs ranging from \$2.5 to \$5/kg H₂. By validating the process with 100% biogenic waste, Ways2H-EU will assess under which conditions the concept can move toward competitive production costs and low lifecycle emissions relative to relevant fossil-based and electrolytic reference pathways.
5. **Direct impact on Heavy-Duty Logistics:** The deployment of decentralized hydrogen hubs directly addresses the needs of sustainable logistics. A benchmark heavy-duty refuse collection vehicle consumes approximately 6 kg H₂ per 100 km. The 1-10 kg/h validation capacity will be used to assess whether regional waste-collection and service fleets represent plausible early offtake cases, thereby testing the conditions under which local waste-to-hydrogen systems can support circular municipal logistics models.
6. Overall, the project's pathway to impact is based on moving from technical promise to scenario-based deployment evidence. By the end of the action, Ways2H-EU will not simply have demonstrated a modular waste-to-hydrogen system at TRL 5; it will have clarified the validated operating envelope, the performance conditions, the first-adopter use cases and the investment-relevant logic needed to prepare a credible transition toward TRL 7–8 pilot deployment.

The project therefore moves from technical promise to scenario-based deployment evidence for clearly defined first-adopter contexts.

2.2 Measures to maximise impact - Dissemination, exploitation and communication

To ensure that the technical breakthroughs of Ways2H-EU translate into broad market uptake and societal acceptance, the consortium has designed a comprehensive Dissemination, Exploitation, and Communication (DEC) plan. This plan distinguishes clearly between scientific/technical dissemination, commercial exploitation, and

societal engagement, tailoring the message to each target group.

a. Dissemination (Targeting Scientific Community, Industry, and Policymakers) The dissemination strategy focuses on sharing the non-confidential validation data regarding feedstock impurity management and integrated modular reforming.

- **Open Science:** In strict compliance with Horizon Europe mandates, all peer-reviewed scientific publications detailing the environmental (LCA) and thermodynamic mass/energy balances will be published via immediate Open Access (e.g., Open Research Europe). Datasets concerning the behavior of European biogenic waste streams will be made FAIR (Findable, Accessible, Interoperable, Reusable).
- **Contribution to Standards (RCS) and Safety:** As explicitly requested by the Clean Hydrogen JU, the project will share operational safety data and "safety-by-design" protocols with the European Hydrogen Safety Panel (EHSP). Findings on hydrogen purity and process wastewater will be disseminated to standardisation bodies (CEN/CENELEC) to support Pre-Normative Research (PNR) for modular waste-to-hydrogen systems.

b. Exploitation and IP Management (Targeting Investors, SMEs, and Municipalities) Exploitation is strictly driven by the commercialisation pathway of the modular reactor, ensuring results bridge the gap between academia and real-world application.

- **Intellectual Property (IP):** The core process architecture (Vapolyser and High-Temperature Reformer integration) is based on proprietary know-how of CEE. Background IP will be ring-fenced, and new Foreground IP generated regarding process intensification and automated control logic will be protected via patents before any public disclosure.
- **Commercial Exploitation & Ecosystem Integration:** APREDIN will leverage its extensive expertise in "quadruple helix" innovation models to act as the intermediary bridging the academic outputs with non-academic environments. Together with RDA Centru, APREDIN will translate technical KPIs into an investment-oriented scale-up roadmap, integrating the technology into regional Smart Specialisation Strategies (RIS3). APREDIN will also implement Living Labs to systematise stakeholder engagement, ensuring the long-term uptake of project results by SMEs, startups, and public bodies. Mobigreen will exploit the logistics and supply-chain models, offering specialized consulting for municipalities seeking to deploy circular hydrogen hubs for heavy-duty transport.

The project's primary post-project business case is a decentralised "waste-holder to hydrogen-user" configuration in which a municipality or regional waste utility provides the feedstock base and host site, the technology provider and system integrator deliver and operate the modular plant, and a local fleet operator acts as an anchor offtaker under a predictable daily demand profile. This configuration is intentionally prioritised because it reduces transport exposure on both the feedstock side and the hydrogen side, improves plant-utilisation planning, and creates a clearer route to investment than merchant hydrogen sales. The project will therefore assess competitiveness not in abstract terms, but against specific local use cases where controllable feedstock access and depot-based hydrogen consumption can support a credible first commercial rollout.

c. Communication, Societal Readiness, and Citizen Engagement The consortium recognizes that the core barrier to the clean energy transition is no longer primarily technological, but human—relying on mental frameworks, trust, and local acceptance. To overcome the "Not In My Back Yard" (NIMBY) syndrome, the project deploys a highly specialized communication taskforce:

- **Nordic Wellbeing Academy (NWA):** NWA will lead the Societal Readiness (SR) strategy to facilitate the acceptance of this difficult transition. Grounded in the insight that technology alone does not create change, NWA will deploy proven methodologies to help municipalities, communities, and civil society actors move from skepticism or indifference to genuine co-ownership of the transition.
- **EU-Wide Policy Reach & Dissemination:** NWA will anchor the project's communication in high-level EU policy ecosystems. The project will leverage NWA's active presence in the European Health Futures

Forum (spanning 25+ countries), the Nordic Health 2030 Movement (30+ Scandinavian partners), and partnerships with WHO Europe. The project will frame decentralised hydrogen hubs within a “Just Transition” narrative, with the aim of making technical evidence more understandable and relevant to civic society and local stakeholders, and of supporting informed discussion around the social acceptability of waste-to-hydrogen deployment.

2.3 Summary

KEY ELEMENT OF THE IMPACT SECTION

SPECIFIC NEEDS	EXPECTED RESULTS	D & E & C MEASURES
<p><i>What are the specific needs that triggered this project?</i></p> <ol style="list-style-type: none">1. Lack of validated modular technologies to convert highly heterogeneous biogenic waste into hydrogen meeting the relevant purity requirements for the intended end use.2. Need to drastically lower the lifecycle emissions and production costs of decentralized hydrogen compared to SMR and Electrolysis.3. Requirement for high Societal Readiness and local acceptance of waste-to-energy infrastructure.	<p><i>What do you expect to generate by the end of the project?</i></p> <ol style="list-style-type: none">1. A validated integrated modular waste-to-hydrogen process at TRL 5, supported by measured technical performance data generated under European operating conditions and across at least 1,000 counted operating hours.2. A validated operating envelope for heterogeneous European biogenic waste streams, including quantified evidence on how moisture, ash content and contaminant precursors affect process stability, gas quality, reliability and repeatability.3. A scenario-based environmental and techno-economic evidence package assessing under which conditions the concept can move toward competitive and low-emission deployment in selected decentralised use cases.4. Scenario-based deployment evidence for future TRL 7–8 action, including residual bottlenecks, customer profiles, integration roles, host-site conditions and plausible first-adopter offtake cases.	<p><i>What dissemination, exploitation and communication measures will you apply to the results?</i></p> <p>Exploitation: Patenting of the intensified process integration (CEE); development of commercial deployment roadmaps for municipalities (APREDIN/RDAC).</p> <p>Dissemination: Open Access FAIR datasets on waste behavior and LCA; direct contribution to EU standardisation (CEN) and safety panels (EHSP).</p> <p>Communication: NWA-led "mindset-change" campaigns for societal acceptance; NWA-led youth entrepreneurship hackathons to build circular economy awareness.</p>

TARGET GROUPS

Who will use or further up-take the results of the project? Who will benefit from the results of the project?

1. Municipal waste-management authorities and regional public utilities that need alternatives to landfilling, incineration and long-distance waste transport.
2. Industrial integrators and engineering companies able to deploy, package and operate modular waste-to-hydrogen systems in a controlled local setting.
3. Fleet operators and hydrogen offtakers in heavy-duty mobility, municipal services and local logistics that can absorb predictable daily hydrogen volumes under a depot-based refuelling model.
4. Investors, regional development actors and public authorities assessing the investment case for decentralised circular-hydrogen infrastructure.
5. Standardisation, safety and policy actors interested in validated evidence on operating envelopes, gas quality, risk management and deployment conditions.

OUTCOMES

What change do you expect to see after successful dissemination and exploitation of project results to the target group(s)?

1. A validated TRL 5 operating dataset showing under which technical and feedstock conditions a modular waste-to-hydrogen system can deliver stable hydrogen production over at least 1,000 counted operating hours.
2. A deployment logic with identified waste holders, technology providers, system integrators and hydrogen offtakers, clarifying the value-chain roles required for future decentralised hydrogen hubs.
3. Decision-ready TEA/LCA models enabling municipalities, investors and industrial partners to assess where the concept is competitive, under which assumptions, and for which offtake profiles.
4. A clearer route toward a TRL 7–8 pilot with identified buyers, integrators, priority use cases and residual engineering bottlenecks.

IMPACTS

What are the expected wider scientific, economic and societal effects of the project contributing to the expected outcomes outlined in the respective work programme topic?

Scientific: generation of one of the first structured TRL 5 datasets on impurity management, stability and gas-quality performance for modular hydrogen production from heterogeneous biogenic waste streams.

Economic and technological: reduction of uncertainty for future pilot investments by linking measured process data to realistic CAPEX/OPEX, logistics and offtake assumptions; clarification of the deployment cases in which decentralised waste-to-hydrogen can become commercially credible.

Societal and environmental: support for circular local waste valorisation, lower lifecycle emissions than fossil-based hydrogen pathways in the validated scenarios, and improved evidence for municipalities and local communities considering decentralised hydrogen infrastructure.

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3. Quality and efficiency of the implementation

3.1 Work plan and resources

The work plan is structured into 7 highly interconnected Work Packages (WPs) spanning 36 months. The lump-sum distribution reflects the technical reality of a hardware-intensive TRL 5 validation action. Resources are concentrated in WP3 and WP4 because these WPs cover the engineering, assembly, commissioning and extended operation of the integrated modular system, including the core thermochemical units, downstream gas-handling skids, inspection and safety-related activities, and the consumables needed to generate the validation dataset. By contrast, WP5 and WP6 are more focused on data interpretation, modelling, exploitation and deployment planning, and are therefore appropriately lighter in direct capital intensity.

The internal consistency between effort, tasks and budget has been designed so that each major cost block maps to a concrete implementation output: WP2 defines the admissible feedstock envelope and logistics assumptions; WP3 delivers the integrated system architecture and safety-by-design package; WP4 generates the auditable TRL 5 validation dataset; WP5 converts measured data into LCA/TEA/LCOH evidence; and WP6 translates those results into a deployment and exploitation pathway. This traceability is particularly important in a lump-sum action, where evaluators need to see that the requested resources are both necessary and proportionate to the work performed.

- **WP1 (Management)** ensures smooth governance and risk mitigation.
- **WP2 (Feedstock) and WP3 (Reactor Design)** run in parallel during the first year to define the operational envelope and the engineered architecture (hardware and digital twin).
- **WP4 (Integrated Validation)** represents the core physical action, running extended campaigns at TRL 5.
- **WP5 (TEA/LCA)** runs iteratively, feeding off WP4 data to quantify environmental and economic KPIs.
- **WP6 (Exploitation) and WP7 (Dissemination/Communication)** translate the technical validation into societal acceptance and an investment-oriented roadmap for future TRL 7-8 scale-up.

WP No	Work Package Title	Lead	Y1 - S1 (M1-6)	Y1 - S2 (M7-12)	Y2 - S3 (M13-18)	Y2 - S4 (M19-24)	Y3 - S5 (M25-30)	Y3 - S6 (M31-36)
WP1	Project Management and Coordination	IPP	[■] M1	[■]	[■] M2	[■]	[■]	[■] M5
WP2	Feedstock Envelopes and Logistics	IPP	[■]	[■]	[■]			
WP3	Modular Reactor Design & Optimisation	CEE	[■]	[■]	[■]	[■] M3		
WP4	Integrated Experimental Validation	CEE		[■]	[■]	[■]	[■]	[■] M4
WP5	LCA, Carbon and Techno-Economic Asses.	IPP			[■]	[■]	[■]	[■]
WP6	Scale-Up, Exploitation & Roadmap	APREDIN				[■]	[■]	[■]
WP7	Communication & Societal Readiness	NWA	[■]	[■]	[■]	[■]	[■]	[■]

S = Semester; M1 = Kick-off & DMP; M2 = Feedstock Envelopes defined; M3 = Reactor & Digital Twin architecture locked; M4 = TRL 5 Validation completed; M5 = Scale-up Roadmap delivered.

The work plan is structured to generate auditable validation evidence first, and investment-relevant deployment decisions second.

3.2 Capacity of participants and consortium as a whole

Critical Skills & Expertise required	IPP (PT)	CEE (FR)	APREDIN (PT)	NWA (DK)	PRF (PT)	MG (PT)	RDAC (RO)	UCY (CY)
Thermochemical Eng. & Reactor Design	S	L			S			
Gas Safety, Handling & High-Pressure		S			L			
Biomass & Waste Characterisation	L	S				S		
Digital Twin, IoT & Control Logic	S	S						L
LCA, TEA & Environmental Validation	L	S	S			S		
Green Logistics & Supply Chain	S					L		
Business Modelling & Stakeholder Engag.			L			S	S	
Societal Readiness & Public Acceptance			S	L			S	
Regional Policy & Smart Specialisation			S				L	

L = Lead Expertise; S = Supporting Expertise.

Consortium Complementarity and Value Chain Coverage The **Ways2H-EU** consortium consists of 8 carefully selected partners from 6 European countries (Portugal, France, Denmark, Cyprus, and Romania), perfectly matching the project's ambition to validate a modular waste-to-hydrogen architecture. The consortium covers the entire value chain from waste logistics and fundamental R&I to technology scale-up, industrial safety, and societal adoption:

1. **Clean Energy Enterprises SAS (CEE)**, established in Bordeaux (France) in 2025, serves as the European hub for advancing and commercialising its proprietary waste-to-hydrogen thermochemical conversion technology. CEE brings critical expertise in reactor architecture and process intensification. The core team includes CEO Jean-Louis Kindler, bringing over 30 years of global experience in scaling clean technologies and waste-to-energy systems; Hardik Y. Desai (Senior Engineer), a key technical contributor and co-author of the foundational scientific work on carbon-negative hydrogen production via steam-induced vapolysis; and Gerianne K. Daniels, serving as Administration and Finance Director to ensure robust financial management of the scaling operations.
2. **Scientific Validation & Digital Integration: IPP (PT)** provides the rigorous academic framework for feedstock characterisation, mass/energy balance validation, and Lifecycle/Techno-Economic Assessments (LCA/TEA), utilizing their existing biodigester and thermal laboratories. **UCY (CY)**, through its SEIT Lab, complements the physical engineering by developing the software architecture for digital monitoring and the Digital Twin, translating chemical data into robust IT informational and interactive interfaces in the form of Dashboards without overlapping into process chemistry.
3. **Logistics & End-Use Off-take (Bridge to Market): MobiGreen (PT)**, an SME focused on green logistics, ensures the upstream viability of highly heterogeneous biogenic waste supply chains and models the downstream commercial off-take for heavy-duty hydrogen fleets, guaranteeing commercial relevance.
4. **Social Sciences, Humanities (SSH) & Open Science:** A unique strength of this consortium is the deep integration of SSH to ensure Societal Readiness. **APREDIN (PT)** leads the quadruple-helix engagement and Living Labs to create investment-oriented scale-up roadmaps. **NWA (DK)** brings unparalleled

expertise in psychosocial behavioral change and European policy reach (e.g., Nordic Health 2030, European Health Futures Forum), deploying targeted methodologies to tackle local NIMBY resistance, build trust, and transform the pilot into a communicable, socially legitimized replication blueprint for European municipalities". Finally, **RDA Centru (RO)** ensures that the project's business models align with regional public policies and Smart Specialisation Strategies (RIS3). Operating as a node of the Enterprise Europe Network (EEN) and recently selected by the European Commission for the prestigious **Regional Innovation Valleys (RIVs)** label, RDA Centru brings unparalleled capacity to transfer best practices, bridge the innovation divide, and disseminate the project's advanced technologies to Eastern European municipalities and SMEs.

Access to Critical Infrastructure The partners have direct access to the required infrastructure to reach TRL 5. CEE brings the blueprint of the existing 1 kg/h "Working Model" and the engineering capacity to scale it. IPP provides access to advanced analytical laboratories for biomass and syngas characterisation (e.g., gas chromatography, industrial rotary dryers). PRF provides industrial testing grounds and gas-skid manufacturing facilities in Portugal, essential for the final integrated validation.

Optimized Resource Allocation and Rapid Site Commissioning The validation site at IP Portalegre is pre-equipped with the necessary industrial electrical grid and physical footprint, ensuring zero delay in the installation of the TRL 5 skids. By adopting a highly modular architecture—where upstream conversion, downstream purification, and control panels are fully pre-integrated into standard 20-foot and 40-foot containerized Skids prior to site delivery—the consortium drastically eliminates on-site construction risks and civil engineering sunk costs. This plug-and-play physical configuration ensures that the requested EU budget is exclusively optimized for core technology demonstration rather than basic site preparation, enabling rapid commissioning and an immediate transition to the continuous testing phase.

The consortium structure is intentionally role-specific. CEE leads the core process technology and validation logic; PRF leads downstream gas handling, safety engineering and industrial integration; IPP leads feedstock characterisation and performance assessment; UCY provides the digital monitoring layer; Mobigreen anchors the upstream and downstream logistics assumptions; APREDIN and RDAC convert technical results into investable deployment pathways; and NWA supports societal readiness and communication. This role allocation avoids duplication, keeps the technical core concentrated where the know-how resides, and ensures that non-technical partners are linked to clearly defined exploitation and deployment outputs rather than peripheral activities.

For each work package, the level of requested resources is linked to a concrete output or evidence package rather than to generic participation. This is particularly relevant for the capital-intensive activities in WP3/WP4 and for the modelling activities in WP5/WP6, where the consortium has sought to maintain a proportionate balance between engineering effort, validation effort and exploitation effort.

Tables for section 3.1

Table 3.1a: List of work packages

Work package No	Work Package Title	Lead Participant No	Lead Participant Short Name	Person-Months	Start Month	End month
WP1	Project Management and Coordination	1	IPP	35	M1	M36
WP2	Feedstock Envelopes and Logistics	1	IPP	29	M1	M18

WP3	Modular Reactor Design and Process Optimisation	2	CEE	61	M1	M24
WP4	Integrated Experimental Validation (TRL 5)	2	CEE	56	M12	M34
WP5	Environmental, Carbon and Techno-Economic Assessment	1	IPP	28	M18	M36
WP6	Scale-Up, Exploitation and Future Demonstration Roadmap	3	APREDIN	38	M20	M36
WP7	Communication , Dissemination and Societal Readiness	4	NWA	48	M1	M36

Table 3.1b: Work package description

For each work package:

Work package number	1
Work package title	Project Management and Coordination

Objectives

- Ensure effective overall governance, technical coordination, and decision-making.
- Manage financial, administrative, and legal aspects of the consortium in compliance with the Horizon Europe Lump Sum model.
- Monitor project progress, mitigate critical risks, and ensure timely delivery of milestones.
- Act as the primary liaison between the consortium and the Clean Hydrogen JU.

Description of work

- **Task 1.1: Project governance and technical coordination (Lead: IPP; Contributors: All)**
Establishment of the Project Management Board (PMB) and coordination of technical workflows between engineering, academic, and societal partners. Organisation of periodic review meetings.
- **Task 1.2: Financial and administrative management (Lead: IPP; Contributors: All)** Day-to-day administrative management, consolidation of cost justifications, distribution of EU funds, and resolution of legal or IP-related conflicts through the Consortium Agreement.
- **Task 1.3: Risk monitoring and Data Management (Lead: IPP; Contributors: UCY, CEE)**
Continuous tracking of the critical risk matrix. Generation and regular updating of the project's Data Management Plan (DMP) to ensure Open Science and FAIR data principles are respected.
- **Task 1.4: Reporting and liaison with Clean Hydrogen JU (Lead: IPP; Contributors: WP Leaders)** Preparation and submission of all mandatory periodic technical and financial reports. Maintenance of continuous communication with the Project Officer at the Clean Hydrogen JU.

Resource justification: Standard travel and subsistence costs for all partners to attend the mandatory Kick-off Meeting, periodic technical consortium gatherings, and official Review Meetings with the Clean Hydrogen JU in Brussels.

Work package number	2
Work package title	Feedstock Envelopes and Logistics

Objectives

- Identify, sample, and characterise priority biogenic and heterogeneous waste streams.
- Define strict acceptable operating windows (moisture and ash limits) for the Vapolyser.
- Optimise local supply-chain logistics to reduce cost and emissions exposure and to support the assessment of competitive hydrogen production in selected decentralised deployment cases.

Description of work

- **Task 2.1: Waste stream profiling and sampling (Lead: IPP; Contributors: CEE)**
Physicochemical characterisation of highly heterogeneous European biogenic waste fractions (e.g., agricultural, forestry, organic MSW). Analysis of initial moisture, ash content, and potential contaminant precursors.
- **Task 2.2: Definition of operating envelopes (Lead: IPP; Contributors: CEE)** Translation of the analytical profiles into safe physical boundaries for the Screw Vapolyser (e.g., establishing maximum acceptable % of moisture and ash) to avoid internal clustering or tar accumulation.
- **Task 2.3: Supply chain and logistics optimisation (Lead: MG; Contributors: IPP)** Mobigreen will apply routing models and real-world fleet data to design an intelligent, low-cost supply chain for collecting and transporting the selected biogenic wastes, keeping Scope 3 emissions under control.
- **Task 2.4: Pre-processing and handling strategies (Lead: PRF; Contributors: IPP, CEE)**
Definition of required shredding, drying, and mechanical handling protocols before the waste enters the reactor, establishing the "battery limits" of the core process.

Mobigreen will optimize the collection logistics and supply chain routes for the heterogeneous biogenic waste streams feeding the pilot. By actively mitigating transport costs—often cited as the main financial bottleneck for biomass valorisation—Mobigreen's operational models will support the project's assessment of whether competitive hydrogen production costs can be approached in the most favourable local deployment scenarios.

Work package number	3
Work package title	Modular Reactor Design and Process Optimisation

Objectives

- Optimise the physical architecture of the integrated Screw Vapolyser and HT Reformer.
- Ensure industrial-grade "Safety-by-Design" for gas handling and pressurised operations.
- Develop a Digital Twin software interface for real-time monitoring and anomaly detection.

Description of work

- **Task 3.1: Vapolyser and Reformer scale-up engineering (Lead: CEE; Contributors: IPP)**
Detailed physical and thermodynamic engineering of the 1–10 kg H₂/h core system. Focus on process intensification by optimising internal thermal loops (closed-loop combustion of H₂/O₂) to generate direct high-temperature steam.
- **Task 3.2: Gas handling, integration and Safety-by-Design (Lead: PRF; Contributors: CEE)**
Drawing on 35+ years of gas infrastructure expertise, PRF will design the downstream gas cooling, purification, and compression skids. This task implements stringent Safety-by-Design protocols, establishing safety parameters compliant with EU Regulations, Codes, and Standards (RCS).
- **Task 3.3: Software architecture and Digital Twin (Lead: UCY; Contributors: CEE, IPP)** Based exclusively on the thermodynamic datasets and control logic equations provided by CEE and IPP, the SEIT Lab (UCY) will develop the ICT software architecture for a Digital Twin and monitoring dashboard, allowing real-time visualisation of the reactor's stability.

The data management task led by UCY will focus on the integration of pre-installed industrial sensors into a centralized gateway, ensuring that its allocated effort (18 PMs) is strictly dedicated to cloud-based software development, maximizing resource efficiency without overlapping with the reactor's hardware requirements.

Resource justification: An allocation of €10,000 in WP3 is required for CEE to conduct regular manufacturing progress meetings. This covers travel between France and PRF's manufacturing facilities in Portugal to ensure seamless physical and digital integration between the core reactor skids (CEE) and the downstream purification skids (PRF) prior to site delivery.

Work package number	4
Work package title	Integrated Experimental Validation (TRL 5)

Objectives

- Validate the integrated process chain at meaningful experimental scale (1–10 kg H₂/h) at TRL 5 under relevant European operating conditions.
- Generate a robust technical evidence package on hydrogen output, gas quality, GECE, carbon yield, reliability and repeatability using heterogeneous biogenic waste streams.
- Determine the validated operating envelope of the integrated system by assessing how feedstock variability, operational transients and impurity-related stress affect performance and stability.
- Assess hydrogen quality against the relevant purity requirements for the intended end use, and evaluate the overall mechanical, thermal and operational reliability of the modular architecture.

Description of work

- **Task 4.1: Experimental set-up, commissioning and baseline testing (Lead: CEE; Contributors: PRF)**

Physical assembly, integration, leak testing and commissioning of the modular validation system, including the Vapolyser, High-Temperature Reformer, downstream gas-handling units and relevant control interfaces. Baseline tests will be performed using reference feedstocks and nominal operating conditions to verify functional readiness before the start of the structured validation campaigns.

- **Task 4.2: Structured validation campaigns and operating-hour accumulation (Lead: CEE; Contributors: IPP, PRF, UCY)**

Execution of a staged TRL 5 validation programme at the 1–10 kg H₂/h scale using the heterogeneous biogenic waste streams defined in WP2. The campaigns will accumulate at least 1,000 counted operating hours under industrially relevant conditions, distributed across three validation blocks: (i) baseline operation under nominal feedstock conditions, (ii) controlled robustness testing under variations in moisture and ash content within the defined operating envelope, and (iii) repeatability and availability testing after shutdown/restart sequences. The purpose of this task is to determine not only which performance levels can be reached, but under which conditions they can be maintained, repeated and interpreted as relevant for future pilot deployment.

A test hour will count only when the system is operating within the agreed battery limits and when the complete monitoring package required for KPI verification is available. For each validation block, the consortium will record mass and energy balances, hydrogen output, gas composition, impurity levels, equipment availability, downtime events, restart performance and the causes of interruptions. This will ensure that the project produces a decision-useful validation dataset rather than a simple record of accumulated operating time.

- **Task 4.3: KPI verification, gas-quality assessment and impurity-management analysis (Lead: IPP; Contributors: CEE, PRF)**

Analytical verification of technical KPIs using the monitored data generated during Task 4.2. The task will assess hydrogen output, gas quality, GECE, carbon yield, sulfur-removal performance, impurity carry-over, gas-conditioning effectiveness and the effect of feedstock heterogeneity on operating stability. Hydrogen quality will be measured against the relevant purity requirements for the intended end use, and results will be reported together with the operating conditions under which the target specifications are met or approached. The task will therefore determine the validated operating envelope of the integrated system and quantify the conditions under which technical performance remains stable and credible.

- **Task 4.4: Reliability, availability and residual-bottleneck assessment (Lead: CEE; Contributors: UCY, PRF)**

Assessment of the mechanical, thermal and operational reliability of the integrated modular system during the extended campaigns. This task will analyse start-up behaviour, restart performance, unscheduled downtime, mechanical stability of the screw-mixing system, ash-management effectiveness, robustness of the downstream skids and the repeatability of operation across the different validation blocks. The result will be a verified reliability profile identifying both the validated operating window and the residual bottlenecks that must be addressed before a future TRL 7–8 pilot.

Resource justification (consumables): The consumables allocated to WP4 are directly linked to the execution of the staged TRL 5 validation protocol. They cover the extended operating window required for commissioning, baseline testing, feedstock-change sequences, maintenance intervals, troubleshooting events and the accumulation of at least 1,000 counted operating hours used for KPI verification. These consumables include oxygen for the closed-loop combustion system, NaOH for gas-scrubbing and conditioning, process water, and other operating inputs needed to generate a complete and auditable validation dataset under industrially relevant conditions.

The hydrogen produced during the TRL 5 validation campaigns will also be used as an empirical basis for assessing plausible early-use applications in controlled local demand environments. Rather than assuming

market readiness in advance, the project will use the WP4 dataset to inform the scenario-based deployment analysis in WP5 and WP6, especially for depot-based and other predictable local offtake profiles.

Acceptance criteria for WP4 will be defined ex ante and will include, at minimum: completion of the required counted operating hours; successful execution of the three validation blocks; availability of a complete monitored dataset; verification of hydrogen output, gas-quality and efficiency indicators under the validated operating envelope; and a documented list of deviations, downtime events and residual bottlenecks. This makes the transition from commissioning to validation, and from validation to deployment analysis, fully evidence-based.

Work package number	5
Work package title	Environmental, Carbon and Techno-Economic Assessment

Objectives

- Quantify the environmental, carbon and economic performance of the concept using measured operating data generated in WP4.
- Assess lifecycle greenhouse-gas intensity against relevant fossil-based and other reference pathways through scenario-based LCA grounded in validated operating conditions.
- Assess the economic competitiveness of the concept through transparent, scenario-based TEA and LCOH modelling linked to feedstock logistics, utilisation rate, operational performance and deployment assumptions.
- Translate measured TRL 5 evidence into decision-useful environmental and economic conclusions for future pilot deployment.

Description of work

- **Task 5.1: Mass and energy balance validation (Lead: IPP; Contributors: CEE)** Consolidation and verification of the raw technical data generated in WP4 in order to establish the definitive mass and energy balance of the integrated system under the validated operating conditions. This task will quantify the measured thermodynamic performance of the process, including hydrogen output, GECE and carbon yield, and will provide the evidence base required for subsequent LCA and TEA tasks.
- **Task 5.2: Life Cycle Assessment (LCA) and carbon performance (Lead: IPP; Contributors: MG, CEE)** Execution of a cradle-to-gate LCA based on measured WP4 operating data and the logistics data generated in WP2. The assessment will quantify the greenhouse-gas intensity of hydrogen production under the validated operating envelope and compare it with relevant reference pathways, including fossil-based hydrogen and decentralised electrolysis scenarios where appropriate. The analysis will explicitly state system boundaries, feedstock assumptions, transport distances, utility consumption, by-product handling and allocation choices. Results will be reported as scenario-based ranges rather than as single-point claims, so that the environmental performance of the concept is interpreted transparently and in context.
- **Task 5.3: Techno-economic assessment (TEA), LCOH and competitiveness conditions (Lead: IPP; Contributors: CEE, MG, APREDIN)** Translation of the WP4 technical dataset into a transparent TEA model quantifying CAPEX, OPEX and Levelised Cost of Hydrogen (LCOH) across several deployment scenarios. The model will distinguish clearly between the economics of the TRL 5 validation unit and the projected economics of a follow-on TRL 7–8 pilot, so that measured evidence is not conflated with future commercial assumptions. Sensitivity analyses will cover feedstock logistics, plant utilisation, oxygen demand, maintenance, labour, financing assumptions and hydrogen offtake profile. The purpose of this task is not to claim a universal cost outcome, but to determine under which assumptions and in which decentralised use cases the concept may move toward competitive hydrogen production.
- **Task 5.4: Circularity and resource-efficiency assessment (Lead: IPP)** Assessment of the circularity implications of the concept, including zero-landfill effects, resource-efficiency gains and the possible secondary valorisation of extracted ash and carbon-based by-products generated during the vapolysis process. This task will complement the LCA and TEA by clarifying the broader resource-performance implications of the concept beyond the core hydrogen metrics.

WP5 is structured as the interpretation layer of the project. It converts the technical evidence generated in WP4 into environmental and economic conclusions that can support deployment decisions. In this sense, the work package is not intended to prove competitiveness in abstract terms, but to clarify the conditions under which the validated modular concept can become environmentally and economically credible in selected decentralised European use cases.

Work package number	6
Work package title	Scale-Up, Exploitation and Future Demonstration Roadmap

Objectives

- Translate validation results into a robust pathway toward future pilot deployment (TRL 7-8).
- Formulate a novel financial and IRR model tailored for decentralized, modular systems.
- Develop a concrete exploitation, IP strategy, and commercial deployment roadmap.

Description of work

- **Task 6.1: Scale-up engineering logic and bottleneck analysis (Lead: CEE; Contributors: APREDIN, PRF)** Identification of the technical limits and necessary engineering modifications to scale the 1-10 kg H₂/h validation system up to commercial pilot capacities (e.g., hundreds of kg/day).
- **Task 6.2: Business-case modelling, CAPEX/OPEX drivers and IRR scenarios (Lead: APREDIN; Contributors: RDAC, IPP, MG)** Development of a decision-oriented business model for decentralised waste-to-hydrogen hubs based on the measured WP4 and WP5 results. The task will identify the main value drivers and cost drivers, including feedstock gate-fee logic, transport distance, system utilisation, maintenance, utilities, labour, financing assumptions and hydrogen selling price. The output will not be a generic one-size-fits-all business case, but a set of scenario-based IRR and payback cases for clearly defined local deployment contexts.
- **Task 6.3: Industrial implementation pathway, buyers, integrators and offtake logic (Lead: APREDIN; Contributors: CEE, PRF, MG, RDAC)** Definition of the post-project industrialisation pathway by assigning clear roles to the main actor groups in the future value chain. Waste holders and municipalities are treated as feedstock owners and potential site hosts; CEE and PRF as technology provider and system-integration/industrial-engineering actors; Mobigreen and comparable fleet operators as anchor hydrogen offtakers for depot-based mobility use cases; and RDAC/APREDIN as facilitators of regional deployment, investment packaging and stakeholder alignment. The task will translate the validated 1–10 kg H₂/h system into concrete pilot replication cases, identifying who would buy the system, who would integrate and operate it, and under which local supply-and-offtake conditions the concept becomes investable.
- **Task 6.4: Pilot deployment roadmap and exploitation package (Lead: RDAC; Contributors: APREDIN, CEE, PRF, MG)** Preparation of a investment-oriented roadmap for a follow-on TRL 7–8 pilot in which the technical scope, industrial partners, target customer profile, candidate use cases, permitting logic, regional-policy fit and investment rationale are brought together in one coherent deployment package. The roadmap will prioritise near-term applications where hydrogen demand is local, predictable and depot-based, such as municipal fleets, refuse collection logistics, local service vehicles and other controlled mobility ecosystems. It will also define the exploitation routes for foreground results, including technology licensing, engineering integration, site-development support and future pilot consortium building.

In WP6, Mobigreen will model the commercial off-take scenarios for the decentralised hydrogen production. The generated 1-10 kg /h will be evaluated for direct use in local heavy-duty logistics fleets, closing the circular economy loop and assessing the business case of modular 'Hydrogen Hubs' for urban and industrial mobility.

Although recent literature confirms the technical viability of thermochemical conversion, there is a critical gap in quantifying the financial impact of modularity on the Internal Rate of Return (IRR) for decentralised waste-to-hydrogen systems. The *Ways2H-EU Validate* project will directly fill this gap. In WP5 and WP6, APREDIN and UCY will develop a pioneering financial model that quantifies the scalability, OPEX savings, and IRR of modular biorefineries, providing an investment-oriented evidence package for regional investors, municipalities and future pilot partners.

The project will not treat “future deployment” as an abstract scale-up aspiration. Instead, WP6 will identify a short list of realistic post-project pilot configurations, each with a named customer profile, integration model, hydrogen offtake profile, feedstock basis and investment rationale. This will allow the consortium to move from a generic roadmap to a replication package that can support concrete follow-on pilot preparation.

WP6 therefore converts the validated operating envelope and the WP5 assessment into scenario-based deployment evidence for follow-on pilot preparation.

Work package number	7
Work package title	Communication, Dissemination and Societal Readiness

Objectives

- Ensure effective dissemination of scientific results, operational evidence and Open Science outputs generated by the project.
- Reduce deployment risk for future waste-to-hydrogen pilots by addressing local acceptance, stakeholder trust, societal readiness and policy-alignment barriers.
- Translate technical validation results into forms that are understandable, credible and actionable for municipalities, regional actors, industrial stakeholders and potential pilot partners.
- Support future uptake by linking project evidence to standardisation, safety dialogue, public communication and regional innovation ecosystems.

Description of work

WP7 is designed as a deployment-enabling work package that reduces non-technical barriers to future pilot uptake. Its role is not limited to communication in the narrow sense; it is to ensure that the technical evidence generated by the project can be understood, trusted and used by the stakeholders who will influence future deployment decisions, including municipalities, public utilities, regional innovation actors, industrial partners, local communities and standardisation or safety-related bodies.

- **Task 7.1: Scientific dissemination and contribution to standardisation (Lead: IPP; Contributors: PRF, NWA)** Publication of peer-reviewed results, delivery of FAIR datasets and dissemination of non-confidential evidence on feedstock behaviour, gas quality, safety-by-design and environmental/economic performance. The task will also support dialogue with standardisation and safety-related actors, including the European Hydrogen Safety Panel (EHSP) and relevant standardisation bodies such as CEN/CENELEC, so that the project's technical evidence can contribute to future pre-normative discussion around modular waste-to-hydrogen systems.
- **Task 7.2: Societal readiness and local acceptance strategy (Lead: NWA; Contributors: APREDIN)** Development and implementation of a societal-readiness strategy focused on reducing local legitimacy and acceptance risks relevant to future pilot deployment. The task will identify the main non-technical concerns likely to arise around decentralised waste-to-hydrogen systems, including trust, perceived safety, local relevance and public understanding of the technology. On this basis, the project will develop targeted communication approaches that help municipalities, communities and civil-society actors engage with the project evidence in a more informed and constructive way. The purpose is not to "market" the technology, but to reduce non-technical barriers that could otherwise hinder future pilot uptake.
- **Task 7.3: Living Labs and stakeholder engagement for future uptake (Lead: APREDIN; Contributors: NWA, RDAC)** Organisation of regional Living Labs, dialogue workshops and engagement activities in Southern and Eastern Europe to test how the project's technical evidence is received by potential adopters and enabling actors. These activities will focus on municipalities, SMEs, regional development actors, innovation intermediaries and local ecosystem stakeholders who may influence host-site selection, partnership-building, or future pilot design. This task will therefore function as a bridge between technical validation and ecosystem readiness, helping the consortium identify where and under which conditions future pilot replication may be socially and institutionally feasible.
- **Task 7.4: Policy ecosystem communication and uptake support (Lead: RDAC; Contributors: NWA, APREDIN)** Synthesis of project findings into policy-relevant and uptake-oriented formats, including briefs, stakeholder packages and targeted outreach materials for regional authorities, innovation ecosystems, public actors and potential follow-on partners. Drawing on RDAC's role within the Enterprise Europe Network (EEN) and related regional innovation structures, this task will support wider visibility of the project results while also helping align the validated concept with regional development priorities, smart specialisation strategies and potential pilot-enabling ecosystems.

Resource justification: Travel and outreach resources allocated to NWA, APREDIN and RDAC are linked to concrete deployment-enabling activities, including Living Labs, regional engagement workshops, societal-readiness actions and ecosystem dialogue in selected European regions. These activities are intended to reduce non-technical deployment risk, strengthen future pilot uptake conditions and ensure that the project's technical evidence is communicated in ways that are relevant to both local stakeholders and future implementing actors.

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Table 3.1c: List of Deliverables

Number	Deliverable name	Short description	Work package number	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
D1.1	Project Handbook & Risk Framework	Governance structure, PMB establishment, and initial risk mitigation matrix.	WP1	IPP	R	SEN	M3
D1.2	Data Management Plan (DMP)	Mandatory plan outlining how research data will be handled to ensure FAIR principles.	WP1	IPP	DMP	PU	M6
D2.1	Feedstock Profiling & Operating Envelope	Definition of maximum moisture and ash limits for the biogenic waste streams.	WP2	IPP	R	PU	M12
D2.2	Supply Chain and Logistics Model	Optimised routing models for local waste collection and fleet off-take.	WP2	MG	R	SEN	M18
D3.1	Process Integration & Safety Design Package	Finalised physical architecture for the Vapolyser/Reformer and Safety-by-design protocols.	WP3	CEE	R	SEN	M12
D3.2	Digital Twin Software Architecture	ICT dashboard and control logic for real-time monitoring of the modular reactor.	WP3	UCY	OTHER	SEN	M24
D4.1	Integrated TRL 5 Validation Dataset	Raw and processed experimental datasets from the heterogeneous feedstock campaigns.	WP4	CEE	DATA	PU	M32
D4.2	Hydrogen Quality Validation Report	Analytical assessment of hydrogen quality against the relevant purity requirements for the intended	WP4	IPP	R	PU	M34

		end-use pathway, including the operating conditions under which target specifications are met.					
D5.1	LCA and Carbon Performance Report	Scenario-based environmental assessment of greenhouse-gas intensity under the validated operating envelope, including comparison with relevant fossil-based and decentralised hydrogen reference pathways.	WP5	IPP	R	PU	M35
D5.2	Techno-Economic Assessment (TEA)	Scenario-based techno-economic assessment of CAPEX, OPEX and LCOH, identifying the conditions under which the concept can move toward competitive hydrogen costs in selected decentralised deployment cases.	WP5	IPP	R	PU	M36
D6.1	Scale-up Engineering & Pilot Concept	Technical bottleneck analysis and architectural design for a future TRL 7-8 pilot.	WP6	CEE	R	SEN	M30
D6.2	Exploitation Strategy & Deployment Roadmap	Investment-oriented deployment scenarios, IRR/payback modelling and commercial exploitation plan for decentralised waste-to-hydrogen hubs.	WP6	APREDIN	R	SEN	M36
D7.1	Plan for Dissemination, Exploitation & Communication	Mandatory initial DEC plan outlining scientific, societal, and market outreach.	WP7	RDAC	DEC	PU	M6
D7.2	Final Outreach	Summary of	WP7	NWA	DEC	PU	M36

	& Policy Ecosystem Package	Hackathons, EHSP standardisation inputs, and societal readiness campaigns.					
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Table 3.1d: List of milestones

Milestone number	Milestone name	Related work package(s)	Due date (in month)	Means of verification
M1	Project Governance and Baseline Established	WP1, WP7	3	Consortium Agreement signed; Project Management Board (PMB) established; Kick-off meeting minutes and initial DEC (Dissemination, Exploitation & Communication) strategies approved.
M2	Operating Envelopes and Safety Design Locked (Go/No-Go)	WP2, WP3	12	Go/No-Go decision to start physical validation campaigns. Verified by the approval of the maximum moisture/ash limits for feedstocks and the finalisation of the Safety-by-Design protocols.
M3	Commissioning of the Integrated TRL 5 System	WP3, WP4	18	Physical assembly and leak-testing of the modular reactor (Vapolyser + HT Reformer + downstream skids) completed. System is "up and running" for continuous heterogeneous waste testing.
M4	1,000 h Validation Campaign Completed and KPI Dataset Locked	WP4	34	Successful completion of the staged TRL 5 validation protocol, including at least 1,000 counted operating hours under industrially relevant conditions. Verified by the locked validation dataset, test logbooks, event and downtime records, analytical reports on gas composition and hydrogen quality, and the preliminary KPI verification report covering yield, GECE, carbon yield, stability and availability.
M5	Competitive Deployment Cases and Exploitation Package Finalised	WP5, WP6	36	Final project review supported by the delivery of the definitive LCA/TEA package, scenario-based LCOH results, IRR/business-case modelling for priority deployment contexts, and the approval of the TRL 7–8 pilot deployment roadmap with clearly identified customer profiles, integrator roles and anchor offtake cases.

Table 3.1e: Critical risks for implementation

Description of risk (indicate level of (i) likelihood, and (ii) severity: Low/Medium/High)	Work package(s) involved	Proposed risk-mitigation measures
Risk 1: Extreme feedstock heterogeneity causing process instability. Highly variable moisture and ash levels in biogenic waste may cause internal clustering, tar accumulation, or reactor downtime during continuous TRL 5	WP2, WP3, WP4	Mitigation: WP2 will pre-define strict "acceptable operating envelopes" for moisture/ash limits. Mechanically, CEE's Screw Vapolyser uses automated internal mixing to prevent clustering. Digitally, UCY will implement real-time anomaly

operation <i>(Likelihood: Medium / Severity: High)</i>		detection via the cloud-based Digital Twin (WP3), allowing dynamic feed adjustment before critical thresholds are breached.
Risk 2: Supply chain delays and "Made in EU" competitiveness impact. Global supply chain bottlenecks for high-temperature components could delay assembly and penalise the project's EU industrial leadership score <i>(Likelihood: Medium / Severity: High)</i>	WP1, WP3, WP4	Mitigation: Fast-track procurement initiated in M1. The Bill of Materials (BOM) is strategically distributed: core IP and safety skids are manufactured in Europe (PRF/CEE), while select non-critical parts leverage global vendors to stay within the 3M€ budget. WP6 ensures the final TRL 7-8 scale-up roadmap targets a 100% EU supply chain.
Risk 3: Safety hazards in high-temperature hydrogen/syngas handling. Pressurised operations at 850°C–1200°C present flammability and explosive risks, potentially failing to meet strict EU Regulations, Codes, and Standards (RCS) <i>(Likelihood: Low / Severity: High)</i>	WP3, WP4	Mitigation: Strict Safety-by-Design implementation led by PRF, leveraging 35+ years of industrial gas infrastructure expertise. Compliance with ATEX directives and European Hydrogen Safety Panel (EHSP) guidelines will be guaranteed. A preliminary hydrogen safety planning and management plan will be established early in the project.
Risk 4: Upstream logistics compromising environmental and economic KPIs. High costs and Scope 3 transport emissions associated with collecting dispersed biogenic waste could push the final LCOH above 2.5 USD/kg and lifecycle emissions above 2 kg CO ₂ eq/kg. <i>(Likelihood: Low / Severity: High)</i>	WP2, WP5, WP6	Mitigation: MobiGreen will apply advanced supply chain routing models and real-world green fleet data to minimise collection distances and costs. WP5 (IPP) will conduct iterative Techno-Economic (TEA) and LCA assessments during the campaigns to dynamically course-correct and ensure targets are met.
Risk 5: Public resistance and "NIMBY" syndrome limiting market replication. Future deployment of decentralised waste-to-hydrogen hubs may face local community resistance ("Not In My Back Yard"), blocking the transition to TRL 7-8 and market uptake. <i>(Likelihood: Medium / Severity: Medium)</i>	WP6, WP7	Mitigation: NWA will deploy targeted "Societal Readiness" campaigns grounded in Just Transition narratives, leveraging their European Health Futures Forum network to shift local mindsets from skepticism to co-ownership. Simultaneously, APREDIN will utilise "quadruple-helix" Living Labs to engage local citizens and SMEs, framing the hubs as drivers of circular economy and local jobs.

Table 3.1f: Summary of staff effort

Participant Number/ Short Name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total Person-Months
1 IPP (PT)	12	15	5	10	20	3	4	69
2 CEE (FR)	8	2	27	33	4	2	4	80
3 APREDIN (PT)	8	1	0	0	2	15	8	34
4 NWA (DK)	1	0	0	0	0	2	21	24

5 PRF (PT)	1	3	15	10	0	4	2	35
6 MG (PT)	1	8	0	0	2	4	2	17
7 RDAC (RO)	1	0	0	0	0	8	5	14
8 UCY (CY)	3	0	14	3	0	0	2	22
Total Person-Months	35	29	61	56	28	38	48	295

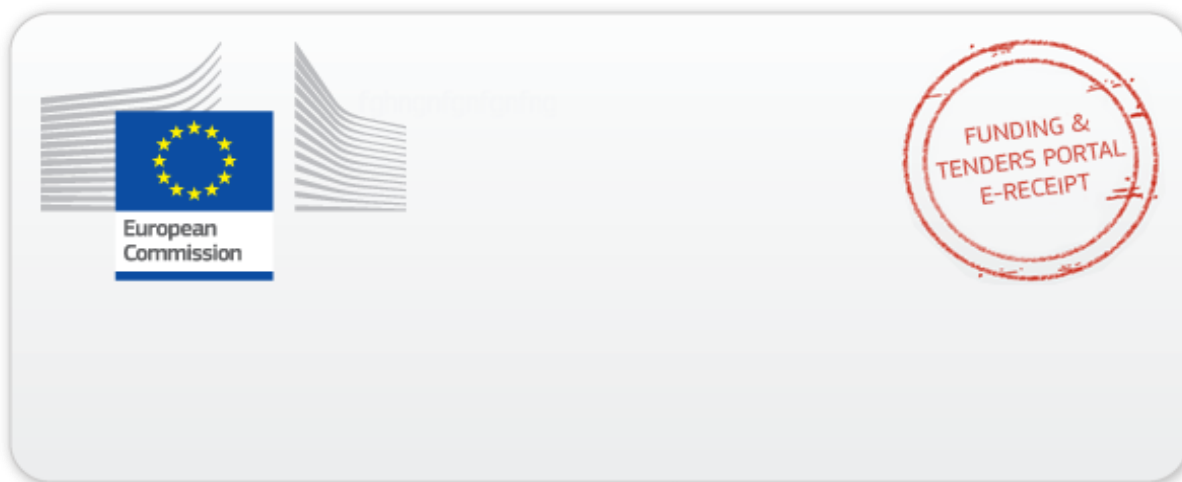
Table 3.1g: ‘Subcontracting costs’ items

Participant Number/Short Name		
	Cost (€)	Description of tasks and justification
Subcontracting		
1 IPP	15,000	WP1 (Audit): Certificate on the Financial Statements (CFS) required by Horizon Europe rules at the end of the project. WP2 (Lab analysis): Specific outsourced standardized lab tests for tracing heavy metals in ash, requiring ISO-certified external facilities not available in-house.
3 APREDIN	12,000	WP6/WP7 (Media & Web): Subcontracting of professional web-design, video production, and graphic design for the project's brand identity, Living Labs materials, and the final Exploitation Roadmap design.
2 CEE	20,000	WP3/WP4 (Certification/Inspection): External Notified Body / Third-party inspection services for ATEX and CE-marking preliminary safety compliance checks on the integrated modular reactor.

Table 3.1h: ‘Purchase costs’ items (major equipment costs)

Participant Number/Short Name	Cost (€)	Justification
2 CEE	587.218,75	WP3/WP4: Engineering, manufacturing, and assembly of the 1-10 kg/h Screw Vapolyser (Skid 1) and High-Temperature Reformer (Skid 2) core units. The total CAPEX/manufacturing cost for this industrial prototype is €2,350,000.00. However, in compliance with standard accounting practices, CEE is only charging €587,218.75 to the project as eligible depreciation costs for the 36-month validation period. The remaining €1,762,781.25 will be absorbed by CEE as private co-funding and investment. Justification for Equipment Costs exceeding 15% of Personnel Costs: The <i>Ways2H-EU Validate</i> project is a highly capital-intensive hardware validation action aiming to achieve TRL 5. Because the project focuses on continuous physical validation of heavy industrial skids rather than theoretical research, the imputed equipment depreciation costs (€587,218.75) inherently and necessarily exceed CEE's personnel effort. This reflects a highly efficient, CAPEX-optimized allocation of EU funds strictly towards physical technology demonstration.

5 PRF	293.081,25	<p>WP3/WP4: Manufacturing of the downstream gas handling skids, including cooling, purification, and compression modules (Skids 4 and 5). The total CAPEX of these industrial units is €1,116,500.00. In compliance with Horizon Europe rules and Portuguese accounting standards (Decreto-Regulamentar n.º 25/2009, applying a blended 12.5% annual depreciation rate), the standard 36-month depreciation value is €418,687.50. However, to maximise cost-effectiveness within the call's budget limits and demonstrate strong leverage of private investment, PRF is charging only €293,081.25 to the project. The remaining capital costs and depreciation will be absorbed by PRF as private co-funding.</p> <p>Justification for Equipment Costs exceeding 15% of Personnel Costs: These customized skids are critical for enforcing Safety-by-Design and ensuring the syngas reaches fuel-cell grade purity (ISO 14687) prior to downstream off-take. As this is a highly hardware-intensive TRL 5 validation action, the imputed equipment depreciation costs inherently exceed the personnel effort required to design and integrate them, reflecting a CAPEX-optimized allocation of EU funds strictly towards physical technology demonstration.</p>
8 UCY	8,000	<p>WP3: Cloud hosting subscription services and specific IoT gateway hardware required exclusively to process the real-time datasets and host the Digital Twin anomaly detection models, ensuring compliance with strict university IT security protocols.</p>



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