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Reuse

Enzymatic CO_2 Capture in a Rotating Packed Bed and Electrocatalytic CO_2 Reduction to Useful Products

Grant Agreement: 101172954

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Table of contents

Executive Summary

This deliverable presents the key aspects of the project management plan. These include the following:

- The governance structure is outlined following the provisions of the signed Consortium Agreement and focusing on specific details regarding the roles and activities of the different bodies of the project.

- The key points of all the WPs are presented, including key objectives, roles of partners, timelines, subtasks, contributors to each subtask and to the corresponding deliverables and milestones. The presentation encodes in a clear and comprehensive manner the overall activities of the project.

- The reporting periods and requirements are set out clearly, followed by communication activities which are briefly presented for completeness, as they will be analysed in the communication plan of D7.1

- Resources are presented which can help the partners with information regarding management and administration procedures.

1. Governance structure

The governance structure of the project is illustrated in Figure 1. The function of the different boards is analyzed in the subsequent sections.

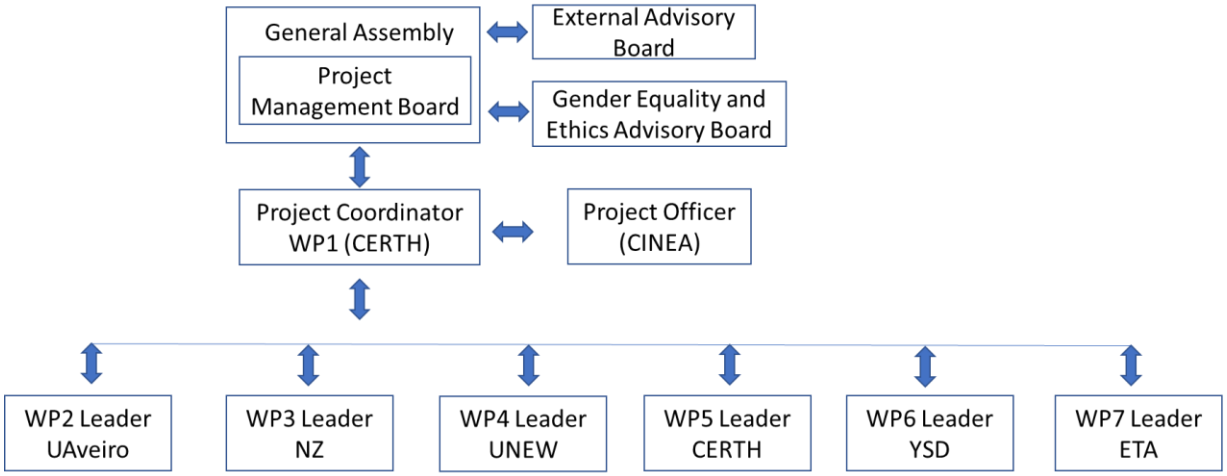


Figure 1: Governance structure

1.1 General Assembly (GenA) and Project Management Board (PMB)

The General Assembly comprises one representative from each partner (the main contact person as registered in the EU portal), while the Project Management Board embodies the Project Coordinator, and Work Package leaders. These two bodies are complementary and will undertake the overall project management and control. Their role will be to collate all technical and administrative issues regarding the project and make decisions on resolving any scientific, technical and administrative issues as well as planning the overall project strategy. These include (but are not limited to) the following activities:

- Monitor the overall direction of the project encompassing the discussion and proposal of major changes in the work plan in response to emerging problems or changes in situations;
- Approval of major modifications to project plans;
- Dealing with non-performing partners;
- Consideration of long-term exploitation issues, including licensing and patenting;
- Training aspects;
- Technical co-ordination and information exchange among work packages;
- Overall co-ordination and management of the project;
- Progress review;
- Control of planning and deliverables;
- Financial issues;
- Establishment of collaboration with other projects for knowledge exchange

1.2 Project Coordinator and WP leaders

Project Coordinator (PC)

The project coordinator will be responsible for the day-to-day coordination of the project, including consolidation of the project planning, organization of communication between the partners, and project progress control by direct link with the work package leaders and partner representatives.

The PC in particular will be responsible for the following tasks:

- Communicate to the EC the administrative and financial data;

- Prepare, update and manage the consortium agreement between the participants;
- Collect partner cost statements and perform their Quality Assessment before delivering them to the PO (project officer);
- Act as the sole direct interface between the Consortium and the PO;
- Coordinate at consortium level the technical activities in the project;
- Oversee the promotion of the gender equality in the project;
- Organize the project meetings every six months, including the kick off meeting and PMB/GenA meetings, following an agenda that will be proposed by the PC and agreed by participants based on the timeline described in the CA. Additional thematic WP meetings can be organized to discuss about progress issues;
- Collect the scientific contributions from WP leaders to be included in the progress reports;
- Consolidate, finalize and ensure the timely delivery of project technical deliverables, including the intermediate project reports and final report to be delivered to the PO;
- Coordinate at consortium level the knowledge management and the other innovation related activities;
- Coordinate the dissemination and technology transfer activities in the project.

Work package Leaders

Work package leaders will be responsible for the day-to-day scientific coordination of the WP tasks. The Work Package leaders in particular will be responsible for the following tasks:

- Coordinate the different tasks and activities covered by the work package and ensure effective communication among the participants;
- Collect the scientific parts of the project and send them to the project coordinator to be included in the progress reports
- Initiate corrective actions for deviations from agreed work plans;
- Identify areas of emerging risk;
- Organize communication between tasks and between the WPs and the project coordinator;
- Monitor the technical progress;
- Take final decisions on technical methods and equipment to be used;
- Ensure the well-timed availability of work package deliverables;
- Coordinate the interaction and collaboration with other work packages;
- Convene work package technical meetings, according to the specific needs of the WP, under the chairmanship of the WP leader;
- Arrange technical reviews as required by the PO;
- Represent the consortium at conferences and workshops and in all dissemination events related to the work package;
- Provide all necessary information to the dissemination and technology transfer board when requested.

1.3 External Advisory Board

The guidance from an external advisory panel consisting of representatives from potential users and interested third parties is anticipated. This panel will provide advice on user priorities that will guide PMB decisions on project direction, plans and exploitation. Members of the panel will be expected to attend the project workshops outlined in the dissemination plan, and invited to submit advisory feedback to the PC. The consortium members are reviewing potential stakeholders that can be invited as part of this board, who have relevant expertise on CO_2 capture and utilization.

1.4 Gender Equality and Ethics Advisory Board

The consortium will set-up a Gender Equality and Ethics Advisory Board (GEEAB). The consortium is committed to incorporate in the project the principles of gender equality by using the Gender Impact Assessment (GIA) framework – the official gender mainstreaming tool in the EU. REUSE is committed to promoting equal employment opportunities and aims to establish a program of actions contributing to making Horizon Europe gender and equality policy effective. It encourages a balanced participation of women and men at all levels in its teams of innovation, as well as in its management structure. Gender dimension will be treated within WP1. The Consortium will benefit from all the resources and knowledge that Gender Equality and Ethics Advisory Board (GEEAB) established in T1.4 may share.

The consortium has already established the first external member of the GEEAB committee. It is Ms. Juanita Hernández González (based in NL - 2518 GP The Hague). She currently serves as Relationship Manager for Major Donors at Amnesty International in Amsterdam, overseeing the management of significant individual donors who provide substantial financial support to the organization. Previously, she focused on developing consortia for European funding programs, primarily Horizon Europe and LIFE, where she managed and coordinated consortium partners and led proposal writing processes. Since 2022, she has also taken on the role of Ethics Manager in the SYMBIOREM project, a Horizon Europe initiative focused on bioremediation and biorevalidation, a position she will hold until 2026.

1.5 IPR management

We will ensure robust management and protection of intellectual property rights among all REUSE project participants, in line with the consortium agreement. The WP1 team will oversee the strategic safeguarding and management of developed intellectual property (IP), aiming to maximize the market impact and broader societal benefits of our innovations. Partners will actively monitor advancements in their respective fields and contribute updates biannually. These contributions will feed into a comprehensive collective IP registry, detailing innovations that qualify for copyright, patenting, or other forms of protection. The ownership and allocation of IP will be structured according to the Consortium Agreement (CA), based on each partner's contributions. To ensure the effective and strategic use of these assets, the Exploitation Manager (TBWR) will closely cooperate with the IPR management teams of our industrial partners. This collaboration will align protection measures with our overarching strategy, enabling both commercial and non-commercial (via scientific publications) exploitation opportunities that serve the project’s long-term goals.

- **IPR Management**: It will address the procedures for IP ownership transfers and establish joint ownership agreements to ensure equitable distribution and protection of research outputs.

Our approach focuses on preparing innovative processes for successful market adaptation, ensuring that research outcomes translate effectively into real-world applications and services. The following actions will be conducted according to WP1 schedule:

1. Conduct a comprehensive market analysis of continuous in-line or roll-to-roll advanced chemical manufacturing and synthesis processes for catalysis and other process materials. This will identify opportunities and barriers within both established and emerging industries as well as related SME, guiding strategic implementations.

2. Actively disseminate and communicate project results to increase awareness and understanding of these cutting-edge process techniques as well as socio-economic aspects regarding our clients and cooperting stakeholders. Engagement efforts will target key stakeholders across the mentioned sectors, facilitating knowledge transfer and fostering industry uptake.
3. Define robust business cases and exploitation strategies based on filled-in inquiries respectively pre-feasibilities for Reuse prototype processes and associated equipment.
4. Develop detailed and competitive implementation plans to guide industrial adaptation of these processes beyond the project's duration. This will support sustainable integration into industrial practices, reinforcing the long-term value (chains) of our research.

This will include pathways for commercialization and impact, ensuring that innovations are positioned for maximum relevance and success.

- **IP Identification and Evaluation**: A comprehensive IPR registry will be compiled, detailing both background and newly developed (foreground) intellectual properties.

The task will involve evaluating emerging innovations to determine their potential for IP protection, ensuring strategic alignment with the project's goals. The data collected within the REUSE project is diverse and varies quantitatively across the participating countries included in the given deliverable. An overarching analysis reveals strong interest among both internal and external stakeholders, along with connected networks, in innovative technological and socio-economic solutions. These solutions have the potential to lower costs in industrial processes at both the component and system levels, while simultaneously enhancing performance, functionality, and the development of new refined products and systems in accordance with the typical death-valley pathway from adapting industrial processes up to incubation of novel services and products (see Figure 2).

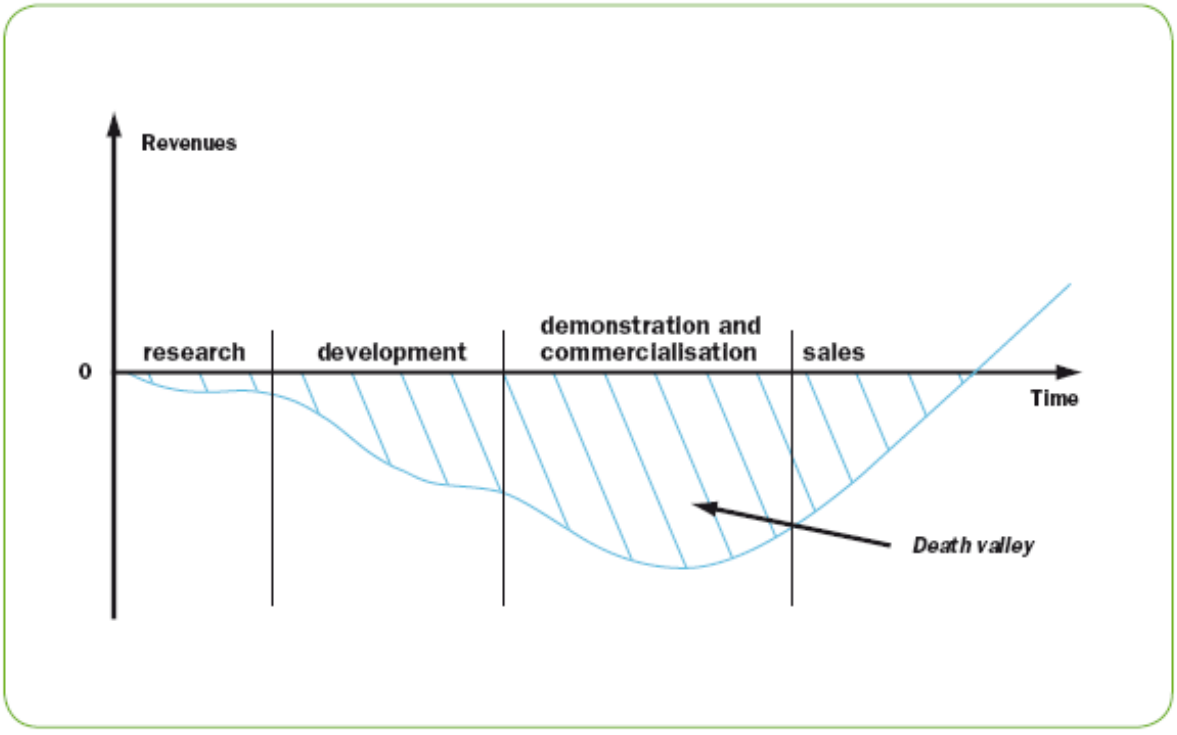


Figure 2: Usual death valley pathways towards incubation time among REUSE industrial partners

Service companies engaged through the REUSE project, often characterized by their localized focus and smaller operational scale, have shown greater enthusiasm for adopting cutting-edge technological

advancements over participating in collaborative scientific activities with research institutions. This underscores a crucial insight, the need for well-trained, highly qualified human resources capable of supporting novel industrial services is becoming increasingly apparent. Initial interactions with partner companies following our Kick-Off Meeting in Thessaloniki have confirmed this as a project priority to be considered.

- **IP Protection Measures**: Appropriate IP protection strategies will be identified, including patenting, copyright, and design rights.

The approach will be guided by principles of fairness, cost-effectiveness, and reasonableness to maximize the impact and commercial potential of project innovations. The REUSE team acknowledges the critical and invaluable nature of experimental data, committing to research data management in full alignment with the FAIR principles (Findable, Accessible, Interoperable, and Reusable). Our comprehensive D1.4 report will define standards for data storage and stewardship, facilitating adherence to FAIR principles. Upon dissemination, research data will be published in conjunction with corresponding scientific interpretations.

Leveraging repositories for the early and open dissemination of data and results will enable the consortium to engage effectively with the broader scientific community and society, at large. Data access restrictions will be applied according to intellectual property rights (IPR) standards as outlined in the Consortium Agreement, Grant Agreement (GA), and the Horizon Europe principles on open access research, maintaining the balance of being "as open as possible and as closed as necessary."

The management team will ensure that data exploitation and dissemination activities strictly follow the guidelines set forth in the GA, CA, and the plan for dissemination and exploitation. Research data suitable for publication will be prepared as scientific articles, targeting high-impact, open-access journals, in accordance with the European Commission's strategy for openly publishing research results.

2. Analysis of activities

This section outlines a detailed workplan of REUSE and provides a comprehensive work schedule to fully comply with the work plan in the GA. The work plan addresses the 6 technical WPs of the project and consists of detailed work-plan tables (Tables 2, 4, 6, 8, 10, 12), as well as Gant charts per WP (Figures 3, 4, 5, 6, 7, 8) and tables that show which partners contributes to each deliverable and milestone and with which role (Tables 1, 3, 5, 7, 9, 11). The work-plan tables contain detailed information regarding sub-Tasks for each task described in the GA, the partners that are involved, the activity of each partner and how different partners will collaborate, the schedule of each sub-Task, the dependencies of different tasks within a WP and between WPs and their output.

2.1 Analysis of WP2

Objectives

1) Select the best biomass blends;
2) Develop in-situ abatement strategies through catalytic activity;
3) Proceed with the experimental campaign at two scaled-sized reactors based on DoE and PoE approaches.

Roles

T2.1 UAVEIRO leader, ULEIC to support with biomass blend characterization

T2.2 ULEIC leader, UAVEIRO to define hydrodynamic configurations in experimental set-up, MMU to receive catalyst properties for numerical purposes

T2.3 UAVEIRO leader, CERTH to set specs for flue gas composition/quality, MMU to identify inputs for numerical development

T2.4 UAVEIRO leader, CERTH to receive data for flue gas composition/quality, MMU to get data for CFD simulations, ULEIC to tailor the use of catalyst and identify optimized parameters

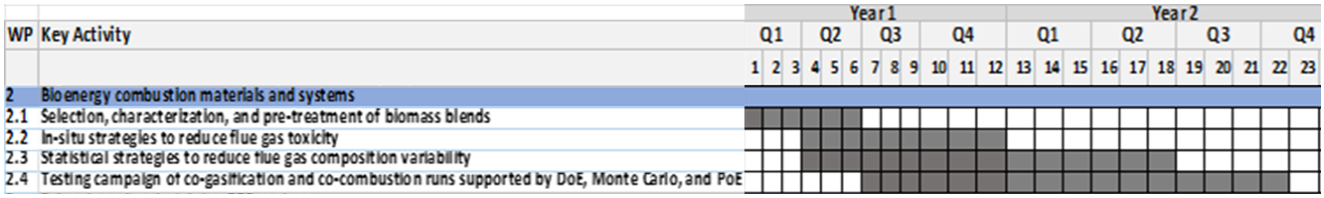


Figure 3: Gantt chart for WP2

Deliverables

D2.1 Catalyst development strategies (M12)- ULEIC

D2.2 Gasification/combustion runs (M15)- UAveiro

D2.3 Gasification/combustion runs - Update 1 (M22)- UAveiro

Milestones

M2 Biomass selected, pretreated, blended, and characterized (M6)- UAveiro

M3 Catalytic tar abatement testing campaigns concluded (M12)- UAveiro

M7 Gasification and combustion testing campaigns (TRL 5) completed (M22)- UAveiro

Table 1. Detailed contribution of each partner to the deliverables and milestones**.** D, M: Leader, the other partners (D, M) are mentioned based on their role, as noted in the corresponding task

	Due	CERTH	UAveiro	ULEIC	UNEW	NZ	CES	MMU	YSD	ETA	TBWR
D2.1	12		D	D				D			
D2.2	15	D	D	D				D			
D2.3	22	D	D	D				D			
M2	6	M	M	M				M			
M3	12	M	M	M				M			
M7	22	M	M	M				M			

Table 2. Detailed work break-down structure for WP2

WP2. Bioenergy combustion materials and systems						Lead partner: UAveiro	
Tasks	**Lead partner**	**Partners involved**	**Start Date**	**End Date**	**Task Dependencies** *(Task from which input is received)*	**Task output**	**Related Deliv.**
Task 2.1. Selection, characterization, and pre-treatment of biomass blends (M1-M6)							
SubT2.1.1 Selection pre-treatment	UAveiro	ULEIC	M1	M4	-	Biomass selected and prepared	D2.1 (M12)
SubT2.2.2 Characterization		ULEIC	M3	M6		Biomass with property data and ready to use	
Task 2.2. In-situ strategies to reduce flue gas toxicity (M4-M12)							
SubT2.2.1 Catalyst preparation and measurements (Development of the low-cost catalyst with oxidative treatments followed by thermal regeneration)	ULEIC	UAveiro	M4	M9	T2.1	Catalysts prepared and properties measured based on biomass from T2.1	D2.1 (M12)
SubT2.2.2 Used catalyst analysis (Characterization and Selection of the best Catalytic Performance)		UAveiro, MMU	M10	M12		Used catalyst properties assessed/ measured	
Task 2.3. Statistical strategies to reduce flue gas composition variability (M4-M18).							
SubT2.3.1 DoE on down-scaled reactor	UAveiro	CERTH, MMU	M4	M15	T2.1, T2.2	Optimum operating conditions for the reactors, using biomass and catalysts from the above tasks	D2.1 (M12), D2.2 (M15)
SubT2.3.2 DoE on pilot-scale reactor			M7	M18			
Task 2.4. Testing campaign of co-gasification and co-combustion runs supported by DoE and PoE (M7-M22)							
SubT2.4.1 Runs on lab-scale mode	UAveiro		M7	M15	T2.1, T2.2, T2.3	Tar and condensate characteristics under	D2.2 (M15),

SubT2.4.2 Runs on pilot-scale mode		CERTH, ULEIC, MMU	M11	M22		optimum operating conditions for biomass and catalysts from the above tasks	D2.3 (M22)

2.2 Analysis of WP3

Objectives:

1) Establish and characterize fixation/reuse methods for the immobilization of CA and integration with RPB reactor,

2) Measure the kinetics/equilibrium performance of the CA-doped material in the solvents.

Roles

T3.1 NZ leader, UNEW, CERTH to set requirements regarding use of new materials in RPB packing

T3.2 NZ leader, UNEW, CERTH to evaluate results

T3.3 CERTH leader, NZ to provide material for testing with the solvent, UNEW to receive data

T3.4 CERTH leader, NZ to provide material for testing with the solvent, UNEW to receive data

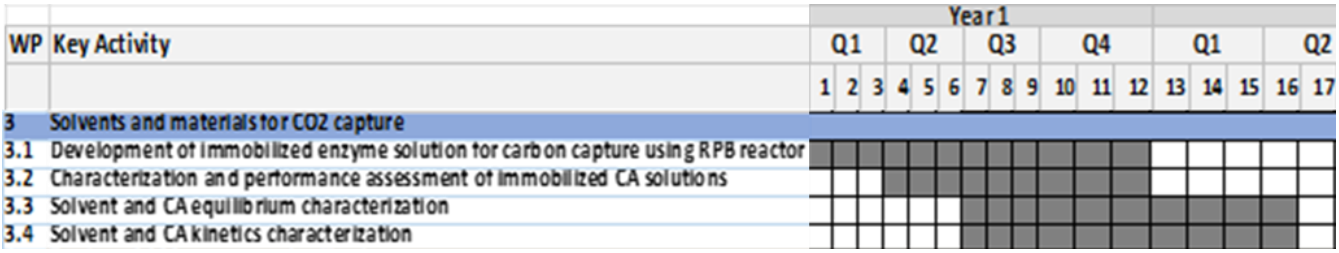


Figure 4: Gantt chart for WP3

Deliverables

D3.1 Immobilization methods (M12)- NZ

D3.2 New immobilized CA solution (M12)- NZ

D3.3 Kinetic and equilibrium assessment results (M16)- CERTH

Milestones

M4 CA-dopped fibers completed and characterized (M12)- NZ

M5 Kinetic and equilibrium solvent characterization completed (M16)- CERTH

Table 3. Detailed contribution of each partner to the deliverables and milestones. D, M: Leader, the other partners (D, M) are mentioned based on their role, as noted in the corresponding task.

	Due	CERTH	UAveiro	ULEIC	UNEW	NZ	CES	MMU	YSD	ETA	TBWR
D3.1	12	D			D	D					
D3.2	12	D			D	D					
D3.3	16	D			D	D					
M5	12	M			M	M					
M6	16	M			M	M					

Table 4. Detailed work break-down structure forWP3

WP3. Solvents and materials for CO_2 capture							Lead partner: NZ
Tasks	**Lead partner**	**Partners involved**	**Start Date**	**End Date**	**Task Dependencies** *(Task from which input is received)*	**Task output**	**Related Deliv.**
Task 3.1. Development of immobilized enzyme solution for carbon capture using RPB reactor (M1-M12)							
SubT3.1.1 Enzyme design, selection, and purification	NZ	-	M1	M3	-	Enzyme available and ready to use	D3.1 (M12)
SubT3.1.2 Establish immobilization test lab facility			M4	M6	-	Facility ready to use	
SubT3.1.3 Prototype development		UNEW, CERTH	M7	M9	-	Immobilization prototypes developed	
SubT3.1.4 Integration with RPB			M10	M12	Task 3.2	Immobilization prototype selected, meeting the RPB specs	
Task 3.2. Characterization and performance assessment of immobilized CA solutions (M4-M12)							
SubT3.2.1 Characterization and improvement of initial prototypes	NZ	UNEW, CERTH	M4	M7	Task 3.1	Assessment of initial data and improvements in design and/or lab facilities	D3.2 (M12)
SubT3.2.2 Characterization of final prototypes			M8	M12		Properties from final immobilized prototypes	
Task 3.3. Solvent and CA kinetics characterization (M7-M16)							
SubT3.3.1 Reference experiments	CERTH	NZ, UNEW	M7	M11	-	Data for reference solvents	D3.3 (M16)
SubT3.3.2 Experiments with CA-doped material			M12	M16	Task 3.2	Data for CA-doped solvents, improvements implemented (if necessary) on CA-doped material and re-testing	

Task 3.4. Solvent and CA equilibrium characterization (M7-M16)							
SubT3.3.1 Reference experiments	CERTH	NZ, UNEW	M7	M11	-	Data for reference solvents	D3.3 (M16)
SubT3.3.2 Experiments with CA-doped material			M12	M16	Task 3.2	Data for CA-doped solvents, improvements implemented (if necessary) on CA-doped material and re-testing	

2.3 Analysis of WP4

Objectives

1) Test CA-based packing and solvents;
2) To develop and assess catalysts and membranes for CO2R cell

Roles

T4.1 UNEW Leader, CERTH to evaluate data useful in the pilot plant, NZ to evaluate data regarding the fabric performance

T4.2 UNEW Leader, CERTH to evaluate data useful in the pilot plant, NZ to evaluate data regarding the fabric performance

T4.3 ULEIC Leader, MMU to develop some catalysts and perform some of the tests, CERTH to evaluate data in relation to membranes and to pilot plant

T4.4 CERTH Leader, MMU and ULEIC provide data and insights on the catalysts

T4.5 CERTH Leader, MMU and ULEIC provide data and insights on the catalysts, YSD attain data regarding the MEAs

T4.6 ULEIC Leader, CERTH will provide data for MEAs, MMU will perform modeling and YSD will evaluate model results

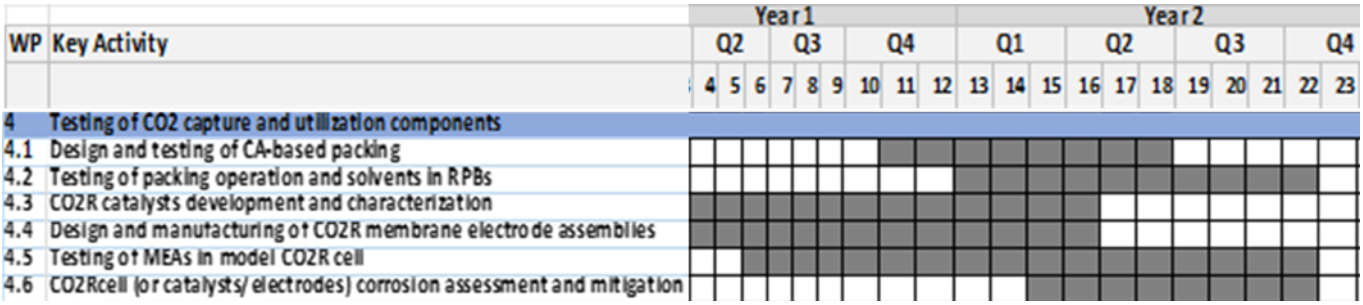


Figure 5: Gantt chart for WP4

Deliverables

D4.1 Development of rotating packed beds using immobilized enzymes (M22)- UNEW

D4.2 Development of novel catalysts/MEAs for CO2R cell (M16)- ULEIC

D4.3 Model CO2R cell test results (M22)- CERTH

Milestones

M6 CO2R catalysts and MEAs developed and characterized (M16)- CERTH

M8 RPB testing campaigns concluded (packing and solvents) (M22)- UNEW

M9 CO2R cell testing campaigns concluded (halfcell/full cell) (M22)- CERTH

Table 5. Detailed contribution of each partner to the deliverables and milestones. D, M: Leader, the other partners (D, M) are mentioned based on their role, as noted in the corresponding task

	Due	CERTH	UAveiro	ULEIC	UNEW	NZ	CES	MMU	YSD	ETA	TBWR
D4.1	22	D			D	D					
D4.2	16	D		D				D			
D4.3	22	D		D				D	D		
M6	16	M		M							
M8	22	M			M	M					
M9	22	M		M							

Table 6. Detailed work break-down structure forWP4

WP4. Testing of CO_2 capture and utilization components						Lead partner: UNEW	
Tasks	**Lead partner**	**Partners involved**	**Start Date**	**End Date**	**Task Dependencies** *(Task from which input is received)*	**Task output**	**Related Deliv.**
Task 4.1 Design and testing of CA-based packing (M11-M18)							
SubT 4.1.1 Design and fabrication of packing with NZ materials	UNEW	NZ, CERTH	M11	M13	Task 3.1, 3.2	Packing with CA-doped fibers	D4.1 (M22)
SubT 4.1.2 Testing of reference packing in RPB			M14	M18	Tasks 3.1, 3.2	Characteristics of reference packings without CA	
Task 4.2 Testing of packing operation and solvents in RPBs (M13-M22)							
SubT 4.2.1 Preliminary testing-identification of testing condition	UNEW	NZ, CERTH, YSD	M13	M15	Task 4.1.1	Conditions to perform tests	D4.1 (M22)
SubT 4.2.2 Testing at appropriate conditions and assessment			M16	M22	Task 4.1.2	Comparison of results with reference packing	
Task 4.3. CO2R catalysts development and characterization (M4-M16)							
SubT4.3.1 Development of CO2R catalysts (Development of Tin-based CO2R catalysts through electrodeposition and atmospheric pressure plasma enhanced chemical vapor deposition.)	ULEIC	MMU, CERTH	M4	M7	-	Tin-based catalyst available *(Tin-based CO2R catalyst)*	D4.2 (M16)
SubT4.3.2 Characterization of their performance (Assessment of Catalytic performance)			M8	M16	-	Results of their performance in FA formation *(Results of FA formation rate, faradic efficiency and morphological characteristics)*	

Task 4.4 Design and manufacturing of CO2R membrane electrode assemblies (M4-M16)							
SubT4.4.1 Catalyst integration into MEAs: Strategy with inks and characterization	CERTH	ULEIC, MMU	M4	M8	Task 4.3	MEAs with strategy 1 characterized	D4.2 (M16)
SubT4.4.2 Catalyst integration into MEAs: Strategy with electrodeposition and plasma and characterization			M9	M16		MEAs with strategy 2 characterized	
Task 4.5 Testing of MEAs in model CO2R cell (M6-M22)							
SubT4.5.1 Tests of MEAs in cell	CERTH	ULEIC, MMU, YSD	M6	M15	Task 4.4	Performance of materials characterized	D4.2 (M16), D4.3 (M22)
SubT4.5.2 Testing of selecting catalysts/MEAs in scaled-up cell			M16	M22		Performance of materials characterized in scaled-up cell	
Task 4.6 CO2R cell (or catalysts/electrodes) corrosion assessment and mitigation (M15-M22)							
SubT4.6.1 Corrosion assessment of catalysts (Corrosion assessment of tin (Sn)-base catalysts)	ULEIC	MMU, CERTH, YSD	M15	M18	Task 4.3	Data for corrosion of catalysts *(Corrosion performance of tin (Sn)-base coatings catalysts)*	D4.3 (M22)
SubT4.6.2 Corrosion assessment of selected MEAs			M19	M22	Task 4.4	Data for corrosion of MEAs	

2.4 Analysis of WP5

Objectives

1) To revamp pilot units,
2) To test individual units, and
3) To test continuous operation of the entire BCS-RPB-CO2R Plant

Roles

T5.1 CERTH Leader, UAveiro to support CERTH with design of setup needed to receive the gasifier, UNEW to provide input on the preparation of the packings, YSD to evaluate the P&IDs

T5.2 CERTH Leader, UNEW, NZ to get data or support with enzymes and packings, YSD to get data on RPB and cell performance, ULEIC and MMU to get data on catalyst performance

T5.3 CERTH Leader, UNEW, NZ to get data on or support with enzymes and packings, YSD to get data on all system performance, ULEIC and MMU to get data on or support with catalyst performance

T5.4 CES Leader, TBWR to support with data from industry, CERTH to provide data for the process

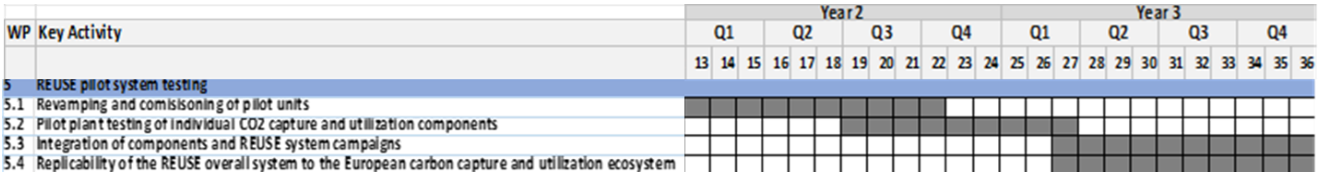


Figure 6: Gantt chart for WP5

Deliverables

D5.1 Test individual REUSE system components (M27)- CERTH

D5.2 Integrated REUSE system operation (M36)- CERTH

D5.3 Scalability guide (M36)- CES

Milestones

M10 REUSE pilot plant completed (M22)- CERTH

M11 REUSE individual units tested (M27)- CERTH

M12 Validation and optimization of overall REUSE pilot plant system (M36)- CERTH

Table 7. Detailed contribution of each partner to the deliverables and milestones. D, M: Leader, the other partners (D, M) are mentioned based on their role, as noted in the corresponding task.

	Due	CERTH	UAveiro	ULEIC	UNEW	NZ	CES	MMU	YSD	ETA	TBWR
D5.1	27	D	D		D				D		
D5.2	36	D		D	D	D		D	D		
D5.3	36	D					D				D
M10	22	M	M		M				M		
M11	27	M		M	M	M		M	M		
M12	36	M		M	M	M		M	M		

Table 8. Detailed work break-down structure forWP5

WP5. REUSE pilot system testing						Lead partner: CCSL	
Tasks	**Lead partner**	**Partners involved**	**Start Date**	**End date**	**Task Dependencies** *(Task from which input is received)*	**Task output**	**Related Deliv.**
Task 5.1 Revamping and commissioning of pilot units (M13-M22)							
SubT5.1.1 Modification of P&ID	CERTH	UAveiro, UNEW, YSD, NZ	M13	M15	-	New P&ID	D5.1 (M27)
SubT5.2.2 Plant revamping			M16	M22		Revamped plant available	
Task 5.2 Pilot plant testing of individual CO_2 capture and utilization components (M19-M27)							
SubT5.2.1 Testing with reference materials (solvents, packing, catholytes etc.)	CERTH	NZ, UNEW, YSD, MMU, ULEIC	M19	M22	Task 5.1	Performance results of components with reference materials	D5.1 (M27)
SubT5.2.2 Testing with proposed new materials (solvents, packing, catholytes etc.)			M23	M27	Tasks 4.1, 4.2, 4.3, 4.4, 4.5	Performance results of components with new materials	
Task 5.3 Integration of components and REUSE system campaigns (M27-M36)							
SubT5.3.1 Integration of gasifier	CERTH	UAveiro, ULEIC, MMU, UNEW, NZ, YSD	M27	M28	T2.4, T5.1, T5.2	Gasifier integrated and tests finished	D5.2 (M36)
SubT5.3.2 Testing of entire plant			M29	M36	-	Results from integrated operation	
Task 5.4: Replicability of the REUSE overall system to the European carbon capture and utilization ecosystem (M27-M36)							
SubT5.4.1 Draft of Scalability guide structure/approach	CES	CERTH, TBWR	M27	M30	-	Clear definition of the basis scalability guide structure in agreement with CERTH	D5.3 (M36)

SubT5.4.2 Elaboration of socio economics to be included in the scalability guide			M30	M36	Task 6.5	Output to be included in the overall scalability guide (Capex, OPEX, financial KPIs...)	

2.5 Analysis of WP6

Objectives

1) Develop numerical models for REUSE components and integrated system;
2) Define REUSE control and optimization strategies;
3) Create REUSE Observatory and determine socio-economic and SDG impacts in regions in transition from coal and other fossil fuels;
4) Deliver a full REUSE system analysis as well as LCA and TEA.

Roles

T6.1 MMU Leader, UAveiro simulations of gasifier, CERTH, YSD models for RPB, CO2R and FA downstream separation with support from NZ, ULEIC, UNEW to provide data n modeling wherever necessary

T6.2 YSD Leader, MMU to contribute models, CERTH to provide results from baseline studies with conventional PB capture systems

T6.3 YSD Leader, CERTH to support with definition of scenarios and simulations

T6.4 TBWR Leader, CES to support the elaboration of 3 case studies on regions in transition from coal and fossil fuels, ETA to support with data collection through dedicated events

T6.5 YSD Leader, CERTH to support with simulations, CES and TBWR to perform innovation analysis mapping of limitations, restrictions, and opportunity windows, NZ to provide data on enzyme costs

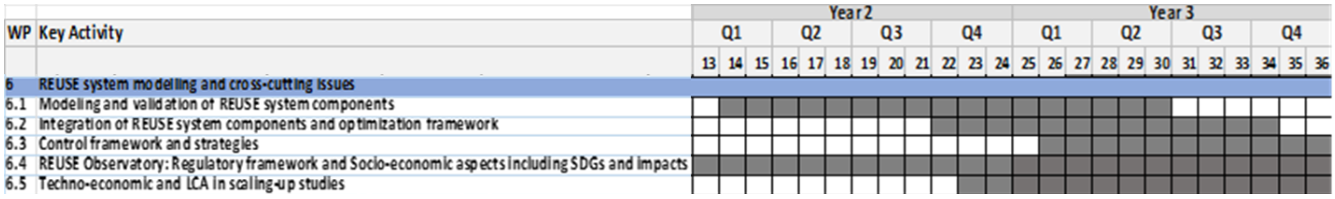


Figure 7: Gantt chart for WP6

Deliverables

D6.1 Numerical simulation of REUSE single systems- YSD (M30)
D6.2 Report on system modelling (M36)- YSD
D6.3 REUSE Observatory (M33)- TBWR
D6.4 Case studies on region in transition from coal and fossil fuels (M18)- TBWR
D6.5 Case studies on region in transition from coal and fossil fuels - Update 1 (M27)- TBWR
D6.6 Case studies on region in transition from coal and fossil fuels - Update 2 (M36)- TBWR

Milestones

M13 Recommendation guide for REUSE implementation in transition regions (M36)- TBWR
M14 Environmental, economic, and circularity assessment of REUSE concept concluded (M36)- YSD

Table 9. Detailed contribution of each partner to the deliverables and milestones. D, M: Leader, the other partners (D, M) are mentioned based on their role, as noted in the corresponding task

	Due	CERTH	UAveiro	ULEIC	UNEW	NZ	CES	MMU	YSD	ETA	TBWR
D6.1	30	D		D	D			D	D		
D6.2	36	D						D	D		
D6.3	33						D			D	D
D6.4	18						D			D	D
D6.5	27						D			D	D
D6.6	36						D			D	D
M13	36						M			M	M
M14	36	M					M		M		M

Table 10. Detailed work break-down structure forWP6

WP6. REUSE system modelling, and cross-cutting issues						Lead partner: YSD	
Tasks	**Lead partner**	**Partners involved**	**Start Date**	**End Date**	**Task Dependencies** *(Task from which input is received)*	**Task output**	**Related Deliv.**
Task 6.1 Modelling and validation of REUSE system components (M14-M30)							
SubT6.1.1 Bioenergy combustion system	MMU	Uaveiro	14	30	T2.2, T2.4	Combustion model	D6.1 (M30)
SubT6.1.2 RPB-CO2R		YSD, CERTH, ULEIC, NZ, UNEW	14	30	WP3, WP4	RPB-CO2R models	
SubT6.1.3 FA separation		YSD, CERTH	24	30	-	FA separation models	
Task 6.2 Integration of REUSE system components and optimization framework (M22-M34)							
SubT6.2.1 Integration of models	YSD	MMU, CERTH	22	29	Task 6.1	Integrated model	D6.2 (M36)
SubT6.2.2 Model results from optimization and comparison with reference results			30	34	-	Results from simulations	
Task 6.3 Control framework and strategies (M26-M36)							
SubT6.3.1 Development of control and operability strategies	YSD	CERTH	26	31	Task 6.2	Elaboration of strategies and framework	D6.2 (M36)
SubT6.3.2 Testing of strategies			32	36		Results from tests	
Task 6.4 REUSE Observatory: Regulatory framework and Socio-economic aspects including SDGs and impacts (M13-M36)							
SubT 6.4.1 Case study on first area in transition	TBWR	CES, ETA	13	18	-	Results from 1st case study	D6.4 (M18),
SubT6.4.2 Case study on second area in transition			19	27		Results from 2nd case study	D6.5 (M27),

SubT6.4.3 Observatory and case study on third area in transition			28	36		Results from observatory and 3rd case study	D6.3 (M33), D6.6 (M36)
Task 6.5: Techno-economic and LCA in scaling-up studies (M23-M36)							
SubT6.5.1 TEA studies	YSD	CES, CERTH, TBWR, NZ	23	36	Task 6.1, 6.2	Technoeconomic data	D6.7 (M36)
SubT6.5.1 LCA studies			28	36		Environmental performance data	

2.6 Analysis of WP7

Objectives

1) Exploitation, which aims at paving the way for results protection and further exploitation and commercialization of REUSE results,

2) D&C activities that aim at public disclosure of project results.

Roles

T7.1 ETA Leader, All

T7.2 CES Leader, All

T7.3 ETA Leader, All

T7.4 MMU Leader, All

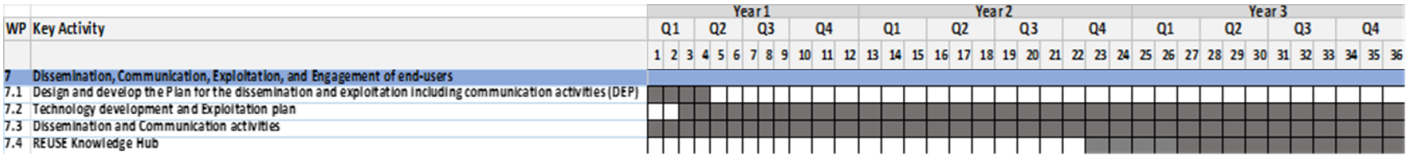


Figure 8: Gantt chart for WP7

Deliverables

D7.1 D&C Plan (M4)- ETA

D7.2 D&C Plan- Update 1 (M18)- ETA

D7.3 Exploitation plan (M24)- CES

D7.4 Exploitation plan - Update 1 (M36)- CES

D7.5 Knowledge hub (M36)- MMU

Milestones

M15 REUSE business and exploitation plan completed (M36)- CES

Table 11. Detailed contribution of each partner to the deliverables and milestones. D, M: Leader, the other partners (D, M) are mentioned based on their role, as noted in the corresponding task.

	Due	CERTH	UAveiro	ULEIC	UNEW	NZ	CES	MMU	YSD	ETA	TBWR
D7.1	4									D	
D7.2	18									D	
D7.3	24						D				
D7.4	36						D				
D7.5	36							D			
M15	36						M				

Table 12. Detailed work break-down structure forWP7

WP7. Dissemination, Communication, Exploitation, and Engagement of end-users						Lead partner: ETA	
Tasks	**Lead partner**	**Partners involved**	**Start Date**	**End Date**	**Task Dependencies** *(Task from which input is received)*	**Task output**	**Related Deliv.**
Task 7.1 Design and develop the Plan for the dissemination and exploitation including communication activities (DEP) (M1-M4)							
As above	ETA	All	1	4	-	Elaboration of communication and dissemination activities	D7.1 (M4), D7.2 (M18)
Task 7.2: Technology development and Exploitation plan (M3-M36)							
As above	ETA	All	3	36	-	Exploitation plan including technology development and roadmap plan and business models	D7.3 (M24), D7.4 (M36)
Task 7.3: Dissemination and Communication activities (M1-M36)							
As Above	ETA	All	1	36	-	Publications and all other activities reported in web-site	Publications and all other activities reported in web-site
Task 7.4: REUSE Knowledge Hub (M23-M36)							
SubT7.4.1 Design of Hub	MMU	All	23	28	-	Hub description	D7.5 (M36)
SubT7.4.2 Implementation and testing of Hub			29	36	-	Hub available and test results	

3. Reporting

3.1 EU reporting

The project involves 2 reporting periods, as shown below:

- P1: from month 1 to month 18
- P2: from month 19 to month 36

In period P1 the consortium will submit the periodic report. It will comprise the following:

Technical part

- Explanation of work carried out by partners
- An overview of the progress of work towards the objectives of the project, including achievements and attainment of any milestones and deliverables identified in Annex 1. Include the differences between work expected to be carried out (Annex 1) and that actually was carried out.
- A summary for publication by the funding agency. It must be prepared using the template available in the Portal Periodic Reporting tool

Financial part

- Individual financial statement from each partner (detailed eligible costs)
- Explanation of the use of resources
- Periodic summary financial statement created automatically (request for interim payment)
- For period P1 the report needs to be submitted up to 60 days after the end of the period. The review meeting will be held the month after the submission of the report.
- A certificate on the financial statement (partners with EC contribution > 430,000 euros)

In addition to the periodic report a final report must be submitted in P2, comprising the following:

Final technical report with a final publishable summary

- Overview of the results and their exploitation and dissemination
- The conclusions of the action
- The socio-economic impact of the action

b) Final financial report

- Final summary financial statement created automatically – request for payment of the balance
- A certificate on the financial statement (partners with EC contribution > 430,000 euros)

For P2, the report submission and final project review need to take place up to 60 days after the end of the period. The final periodic report would therefore need to be submitted up to 30 days after the end of the project. The payments will take place up to 90 days after the submission of the reports in all cases. The detailed timeline and dates are shown in Figure 9.

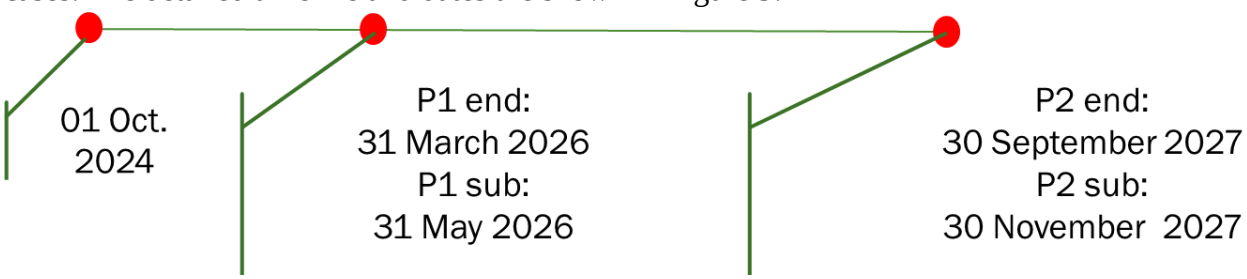


Figure 9: Timeline for EU reporting

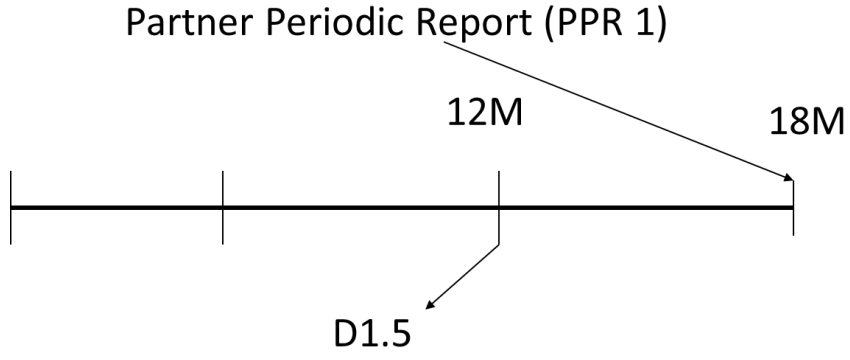
3.2 Intermediate reporting

The intermediate reporting procedures are necessary in order to ensure close monitoring of the partner activities and to facilitate the preparation of the reports during each reporting period. Each partner will

need to contribute to deliverables D1.5, D1.6 and D1.7 which represent intermediate reports. The contents of these reports will be used for the compilation of the Periodic Reports submitted to the EU (see section 3.1).

All these deliverables will include the following content:

- Summary of research activities (per task)
- Key attained results
- Percentage of completion for planned activities and tasks, considering milestones and deliverables
- Explanation of deviations from planned activities
- Corrective actions taken or planned
- Updating of risk table
- Data management details (data set description, standards and metadata, data sharing, data archiving and preservation)
- Dissemination and exploitation activities



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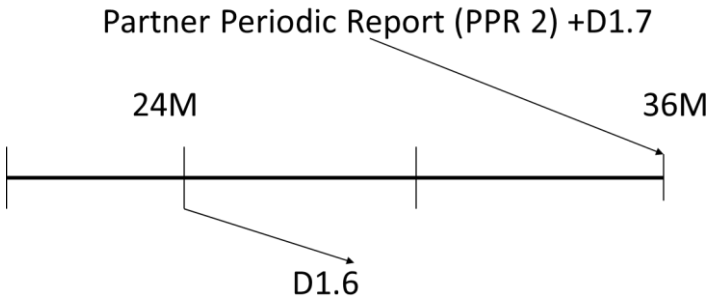

(b)

(c)

Figure 10: Timeline for reports in a) P1, b) P2

3.3 Deliverables and quality assurance

The preparation of the deliverables will include the following phases:

Phase 1: Lead partner coordinates the preparation of the deliverable based on input from partners, and then it is submitted to the coordinator. The contribution of each partner to the deliverables has been detailed in section 2. (Submission 20 days before due date).

Phase 2: The deliverable is made available for review by designated partners (revision requests submitted to lead partner 10 days before due date).
Phase 3: The lead partner submits the final version 5 days before the due date to the coordinator and WP leader.
Phase 4: The coordinator receives the final version and submits it in electronic form to the EC.
The deliverables should include an executive summary describing the main achievements and conclusions, that is 1-2 pages long.

4. Communication

The GenA and PMB will convene every 6 months for the evaluation of the current work status, for making appropriate decisions regarding future work and the facilitation of the work objectives. Additionally, the boards can convene at the request of any of the board leaders. Therefore, the boards will meet physically at least twice every year. In addition to these meetings, the GenA and PMB will exploit, when needed, tele-conferences through suitable electronic platforms.
The working language for communication written, electronic or oral is English. Project information will be exchanged through the electronic circulation of working papers, project meetings and tele-conferences. A secured web-based document repository has been set-up in Teams to assist partners to quick and easy access of all communication material, administration documents, scientific information relevant to the project for the effective execution of the project tasks. Physical meetings will be restricted to the minimum necessary but also viewed as a means to promote partner interaction and the selection of times and places will be strongly influenced by cost and convenience considerations. Even though representatives, each partner organization should attend each progress meeting, distant participation is possible through the Teams platform. Regular progress meetings will enable the distant participation of additional co-workers for the minimization of travel costs. Resource utilization will be carefully reviewed every 6 months at the meetings of the PMB. Additional teleconference meetings may take place between the PC and the WP leaders or GenA to discuss current issues related to the progress of the scientific and management work in order to early detect deviations from the work plan. All information like minutes of meetings, visit reports, WP reports, relevant publications and so forth will be communicated to the project co-ordinator, who will be responsible for passing information to the partners.
To this end a REUSE **dedicated web-site** for the project will be maintained by the partner ETA and updated with the assistance of all partners. The web site will be complementary to the Teams repository.

5. Resources

Web-sites

Web-site is due by Month 4
LinkedIn: https://www.linkedin.com/company/reuse-horizon-project/posts/?feedView=all

ECAS

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/myarea/projects
https://cordis.europa.eu/project/id/101172954

Model Grant Agreement

https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

Grant Agreement

ECAS and Teams repository

Meeting material and economics

Teams repository

HORIZON results platform

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform

Open science platform

https://www.openaire.eu/

Helpdesks

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/helpdesks;programCode=HORIZON