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**“Carbon4PUR - Turning industrial waste gases
(mixed CO/CO₂ streams) into intermediates for polyurethane
plastics for rigid foams/building insulation and coatings”**

Research and Innovation Action

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*Dissemination and Communication plans***

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Acronyms and Definitions

Acronym	Defined as
CCS	Carbon capture and storage
CCU	Carbon capture and utilisation
ETS	Emission Trading System
EU	European Union
FQD	Fuel Quality Directive
GHG	Greenhouse gas
KPI	Key performance indicator
LCA	Life cycle assessment
PUR	Polyurethane
Tbd	To be determined

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1. The Carbon4PUR project

Carbon4PUR aims at **turning industrial waste gases (flue gas streams of steel industry / mixed CO/CO₂ streams) into intermediates for polyurethane plastics for rigid foams/building insulation and coatings.**

The industrially driven, multidisciplinary consortium will develop and demonstrate a novel process based on direct chemical flue gas mixture conversion, **avoiding expensive physical separation**, thus substantially **reducing the carbon footprint**, and also **contributing to high monetary savings**. The interdisciplinary consortium consists of 14 partners from 7 European countries and across sectors: 5 industrial partners, 1 research organisation, 6 universities, and 1 industry association.

Both the consortium and the work are **organized along the full value chain** starting with the provision and conditioning of industrial emissions **from a steel** (*ArcelorMittal, Uni Gent*) **to a chemical company** (*Covestro*) in line with the **concept of industrial symbiosis** exemplarily at *Marseille Fos*, going through the transformation into **chemical building blocks** (*CEA, RWTH and COV*), which both will be further transformed **into polymer intermediates** (*RWTH, COV*) and flow into desired sustainable **polyurethane applications of rigid foams and coatings** (*Recticel, Megara*). **LCA and technology evaluation** will be done (*Uni Leiden, AVT RWTH, TU Berlin, South Pole group*) and **replication strategies** to transfer the technology to other applications will be elaborated (*Dechema, PNO, ICT*).

The distinctive feature of the developed process is avoiding resource-intensive separation of the gas components before the synthesis, and developing a chemo-catalytic process to deal directly with the gas mixture instead. The challenge and innovation is coming up with an adjustable process in terms of on-purpose and demand tailor-made production of required products, taking into account all variables at the same time: the available flue gases characteristic from the steel plant, material and process parameters, and the market requirements for the end product, thus flexibly involving the whole value chain with best results and possibly lower the prices.

1. Executive Summary

This deliverable describes the target audiences and planned dissemination and communication activities of the Carbon4PUR project as well as measures to evaluate the success of actually performed activities.

The relevant **industrial stakeholders** have been identified to be feedstock suppliers of CO/CO₂, technology suppliers for equipment, catalysts etc., chemical producers and end product manufacturers of polyurethane (PUR) rigid foams and coatings. For CO/CO₂, steel and iron manufacturing represents by far the largest source in Europe, but refineries and waste incinerators are likewise relevant. Given the amount of stakeholders, engagement with this group will therefore be restricted to feedstock providers that will most benefit from the developments in Carbon4PUR and identified replication opportunities. Engagement with equipment suppliers will be focused on technical requirements of the Carbon4PUR process and the communication of potential limitations observed for existing equipment, if such limitations are observed. The group of polyol producers is particularly suitable for market replication of the Carbon4PUR technology, but obviously dissemination has to pay attention to not disclosing IPR relevant knowledge created in the project to project partners' competitors. To engage with other chemical producers, Carbon4PUR will strive for joining forces with other relevant projects working on the utilisation of steel industry off-gases for chemical production or CO₂-based synthesis routes which could build on the process developed in Carbon4PUR. Engagement with manufacturers of end-products from polyol to resins and PUR foams, but also from the chemical building blocks also needs careful IP clearance within the consortium prior to dissemination. This group will be most interested in results from testing of the intermediates for the manufacturing of rigid foams and polymer dispersions by Recticel and Megara Resins. Material properties will therefore be part of case studies targeting downstream manufacturers. A detailed value chain and industrial stakeholders analysis is a separate task in WP8 and will be reported as deliverable 8.2 in M24.

Carbon4PUR will deliver substantial scientific output of high interest to an **academic target audience**. Main fields covered in the project include chemical reaction engineering, fluid process engineering, (model-based) chemical process design, catalysis and life cycle assessment. Academic groups active in the field of CO₂ and CO conversion are of particular relevance to dissemination and communication activities. These target audiences will be reached via traditional channels such as publications in scientific journals, presentations at conferences and participation in workshops. The latter might be relevant for the topic of

carbon footprint assessment, as the LCA community is actively working on methods for CO₂ utilisation. Further engagement can be leveraged via interactions with relevant networks such as CO₂Net in Germany and CO₂Chem in the UK, technology platforms such as SusChem and ESTEP and initiatives such as the European Cluster on Catalysis (ECC).

Carbon4PUR partners will also share insights on necessary framework conditions to enable the viability of CCU business cases with **policy makers** via participation in policy-related workshops and discussions on EU level.

Even if the **general public** is not a main target of the project, the consortium will deliver press releases on the achievement of technical milestones and articles that will also address general media. The partners will also communicate through their social media channels.

The dissemination strategy can be divided in three consecutive phases reflecting the project progress and availability of project results: **raising awareness** within a qualified community via press releases, website, flyers and conferences; **promote the project results** via website, newsletter, open-access publications, conferences and events; and **exploit the results** via validation in industrial applications, site visits, business cases and conferences.

Carbon4PUR partners will participate in and engage with all relevant **associations and multi-stakeholder initiatives**. For now, 27 such associations have been identified. The project will also seek to interact with relevant European and national funded projects, a list of 11 current projects has been compiled. A big part of the communication strategy is the participation in conferences, fairs and events, and the Carbon4PUR partners have already confirmed their presence at 25 such events.

Additionally, Carbon4PUR will organise several stakeholder **events**, open days, a mid-term event, a site visit and a final conference for different audiences, including industrial and academic stakeholders, students, journalists and the general public.

For all those events, **communication material** will be provided, especially flyers and roll-ups as well as a visual identity including a logo and templates for presentations.

All public information will also be available on the **website**. Digital versions of the flyers, an e-brochure and deliverables as well as newsletters and links to relevant events and publications will be added when available.

To ensure visibility within the scientific-technical target stakeholder communities, a pool of relevant **journals** has been sourced as potential channels for dissemination aligned with the target groups and the expected project outcomes. During the course of the project, at least

10 publications incl. a joint publication on accompanying research (WP6) will be prepared by the academic partners.

For the events, publications and online presence, **indicators** have been defined in chapter 4.9 to be able to evaluate the success of the dissemination and communication strategy. This evaluation will be reported in the deliverable D8.7 in M24.

2. Introduction

Carbon4PUR tackles two challenges of the EU process industry at the same time: i) reducing dependency on fossil carbon sources and ii) reducing GHG emissions. The project aims at transforming CO₂/CO containing flue gas streams of the energy-intensive steel industry into higher value chemical intermediates for market-oriented consumer products. The industrially driven, multidisciplinary consortium will develop and demonstrate a novel process based on direct chemical flue gas mixture conversion, avoiding expensive physical separation, thus substantially reducing the carbon footprint, and also contributing to high monetary savings.

Both the consortium and the work are organized along the full value chain starting with the provision and conditioning of industrial emissions from a steel to a chemical company in line with the concept of industrial symbiosis, going through the transformation into chemical building blocks, which both will be further transformed into polymer intermediates and flow into desired sustainable polyurethane applications of rigid foams and coatings. LCA and technology evaluation will be done and replication strategies to transfer the technology to other applications will be elaborated. The distinctive feature of the developed process is avoiding resource-intensive separation of the gas components before the synthesis, and developing a chemo-catalytic process to deal directly with the gas mixture instead. The challenge is to come up with an adjustable process in terms of on-purpose and demand tailor-made production of required products, taking into account all variables at the same time: the available flue gases characteristic from the steel plant, material and process parameters, and the market requirements for the end product, thus flexibly involving the whole value chain with best results and possibly lower the prices.

The objectives of WP8 “Exploitation and dissemination of project results” are:

- to promote the up-scale and use of the newly developed technology solution amongst specifically identified European and International companies as well as providing opportunities for these stakeholders to deliver feedback on the project results to identify future collaboration,
- to facilitate a short time to market of the project results,
- to design and execute an effective dissemination and communication strategy for the benefit of the European industry, the European research area, and the public at large.

In the context of the dissemination plan provided in this deliverable, Carbon4PUR will extract and process project results into tangible and accessible dissemination and communication

materials and efficiently communicate and disseminate these results to relevant target audiences. However, Carbon4PUR will not only convey technical project results but also aims at providing useful information and data on replication opportunities to the target process industries. In this context, two distinct features of Carbon4PUR shall be highlighted:

- the ambition to develop a best practice case for industrial symbiosis which is useful for replications or learnings for other industrial sites and CO₂/CO recycling projects in Europe;
- mapping of sources and industrial infrastructures and identification of preferable locations which would offer promising conditions for industrial symbiosis, combined with the potential assessment for replication of the investigated case to other sites in Europe.

Both of these points are addressed in WP7, and the role of WP8 is to disseminate the corresponding maps and results on the assessment of replication potentials.

A second important point to mention is that CO₂ utilisation and industrial symbiosis in conjunction with circular economy are highly dynamic topics with high policy attention and many research and innovation activities on both EU and national level. A number of R&I projects targets the same sort of industrial symbiosis as Carbon4PUR, i.e. utilization of steel industry off-gases for the production of chemicals. Even if the target products are very different, one can expect a number of common challenges, and it seems sensible to exchange on lessons learned and hurdles to overcome when tackling the complex issue of cross-sectorial business models.

This deliverable provides the plan for how communication and dissemination activities will occur during the duration of Carbon4PUR. The dissemination and communication plan is an evolving document and will be updated and supplemented throughout the project. It will constantly be adapted to latest developments in research, industry and policy.

3. Communication and dissemination target audiences

This section provides the target audiences for Carbon4PUR dissemination and communication activities. Table 1 provides an overview of the main target audiences with the corresponding key information for dissemination.

Table 1: Carbon4PUR Target audiences and key information for dissemination

Target audience	Characteristics	Information to be disseminated
Industrial	Feedstock (CO/CO ₂) suppliers	Mapping sources, industrial symbiosis and replication opportunities
	Technology suppliers	Technical specifications, equipment limitations
	Polyol producers	Case studies, replication opportunities, cost savings, energy demand
	Other chemical producers	Cost savings, energy demand, industrial symbiosis models, business drivers and hurdles (e.g. economic, policy, contractual)
	Manufacturers of end-products	Material tests and samples
Academic	Chemical engineers	Carbon4PUR process, process design, gas conditioning
	Chemists	Carbon4PUR synthesis routes and catalyst performance
	LCA community	LCA results and methodology
Other stake-holders	Policy makers, agencies	Framework conditions to enable CCU business cases
	General public	General information, CO ₂ as resource, advantages in carbon footprint and energy consumption

3.1 Industrial stakeholders

The value chain addressed in Carbon4PUR is depicted in Figure 1, and represents the groups of relevant industrial stakeholders along this value chain.



Figure 1: Carbon4PUR value chain

The number of stakeholders in some of these groups is high. For instance, the European Pollutant Release and Transfer Register (E-PRTR) identifies more than 2000 large point source emitters of CO₂ in Europe, which correspond to the **feedstock supplier group**. If smaller sources such as biogas plants, breweries or waste incinerators are included the number of sources exceeds 10000. For CO/CO₂, steel and iron manufacturing represents by far the largest source in Europe, but refineries and waste incinerators are likewise relevant. Given the amount of stakeholders, engagement with this group will therefore be restricted to feedstock providers that will most benefit from the developments in Carbon4PUR and identified replication opportunities. Mapping of CO₂/CO mixed and pure sources in Europe and matchmaking with chemical producers and existing infrastructures is subject of deliverable D7.1, due in M24. This will allow for engagement with these stakeholders in the last project year, when other main project results are available and promising replication sites can be highlighted.

Technology suppliers are a potentially large and heterogeneous group, comprising for instance equipment providers for e.g. gas conditioning, reactors, sensors and process control devices, but also engineering contractors, catalyst suppliers and infrastructure providers in chemical parks. While the stakeholders in this group are important enablers, engagement with them will be focused on technical requirements of the Carbon4PUR process and the communication of potential limitations observed for existing equipment, if such limitations are observed.

The number of **polyol producers** is limited, and mapping of them is straightforward. The group is particularly suitable for market replication of the Carbon4PUR technology, but obviously dissemination has to pay attention to not disclosing IPR relevant knowledge created in the project to project partners' competitors. Case studies and information on replication opportunities need careful IP clearance within the consortium prior to

dissemination. In addition, other chemical building blocks from CO/CO₂ will be taken into account in the context of mapping sources, chemical producers and infrastructures. To engage with these **other chemical producers**, Carbon4PUR will strive for joining forces with other relevant projects working on the utilisation of steel industry off-gases for chemical production or CO₂-based synthesis routes which could build on the process developed in Carbon4PUR. Knowledge exchange on business drivers and hurdles in industrial symbiosis models is also seen as mutually beneficial.

Finally, **manufacturers of end-products** represent the last industrial stakeholder group in the value chain. Engagement will focus on manufacturers of end-products from polyol to resins and PUR foams, but also from chemical building blocks. This group will be identified in the course of Task 8.3 “Market analysis, segmentation, targeting and positioning with business model”. Case studies and information on replication opportunities need careful IP clearance within the consortium prior to dissemination. This group will be most interested in results from testing of the intermediates for the manufacturing of rigid foams and polymer dispersions by Recticel and Megara Resins. Material properties will therefore be part of the case studies targeting downstream manufacturers. Another important dissemination means for this group are trade fairs.

A detailed value chain and industrial stakeholders analysis is a separate task in WP8 and will be reported as deliverable 8.2 in M24. The identified most important stakeholders along the value chain and their position towards the project’s results will be used for more targeted engagement strategies in the last project year, in which the major share of project results is to be expected with correspondingly higher intensity level of dissemination activities.

3.2 Academic stakeholders

Carbon4PUR will deliver substantial scientific output of high interest to an academic target audience. Main fields covered in the project include chemical reaction engineering, fluid process engineering, (model-based) chemical process design, catalysis and life cycle assessment. Academic groups active in the field of CO₂ and CO conversion are of particular relevance to dissemination and communication activities. These target audiences will be reached via traditional channels such as publications in scientific journals, presentations at conferences and participation in workshops. The latter might be relevant for the topic of carbon footprint assessment, as the LCA community is actively working on methods for CO₂ utilisation. Further engagement can be leveraged via interactions with relevant networks

such as CO₂Net in Germany and CO₂Chem in the UK, technology platforms such as SusChem and ESTEP and initiatives such as the European Cluster on Catalysis (ECC).

3.3 Other stakeholders

Apart from industrial and academic stakeholders, two other groups shall be mentioned: policy makers, agencies and the general public.

3.3.1 Policy makers

Carbon capture and use (CCU) increasingly creates awareness on policy level. Several EU DGs, including DG Research & Innovation, DG Energy and DG Climate, deal with CCU, but foresee different contributions of CCU to key EU policy goals, such as the transition towards a more circular economy, GHG mitigation, energy security, and the decarbonisation of transport sector. Correspondingly, CCU is mentioned in the SET plan and the Circular Economy Action Plan, it is addressed in the Fuel Quality Directive (FQD) and the proposal for a revised Renewable Energy Directive (REDII), and is currently discussed in the context of the revision of the EU Emissions Trading System (ETS). Proposing policy measures is out of scope of the Carbon4PUR project. However, the consortium acknowledges that current policy discussions around CCU are very dynamic, and results are likely to impact CCU business cases. Carbon4PUR partners will therefore share own insights on necessary framework conditions to enable the viability of CCU business cases with policy makers via participation in policy-related workshops and discussions on EU level.

3.3.2 General public

Public perception of the Carbon4PUR technology is an aspect which needs to be considered by the consortium. In Germany, public awareness of CCU technologies has been increasing in the last years, but this is not necessarily the case in other EU member states. Using CO₂ as feedstock for products is generally perceived as a positive technical solution, in contrast to CCS. With the polyol product cardyon™, Covestro and Recticel have access to direct customer feedback on first CO₂-based products. Some aspects of the Carbon4PUR technology, however, can lead to potential concerns among the general public: safety and security of CO₂/CO transportation, which potentially would be realised in pipelines. This aspect is considered in the project, but direct interaction with the general public or NGOs is not envisioned within the project, and the general public will not be a main target audience of Carbon4PUR dissemination and communication activities. Nevertheless, the consortium will deliver press releases on the achievement of technical milestones and articles that will also address general media and will communicate through the social media.

4. Communication and Dissemination Plan

4.1 General strategy

Carbon4PUR will conduct a wide set of dissemination and communication activities. While DECHEMA is in the lead of the strategy, the effective dissemination of project results to target audiences relies on the engagement of the entire consortium in the individual activities, and all partners have reserved budget and personnel to perform these activities. The dissemination strategy can be divided in three consecutive phases reflecting the project progress and availability of project results, as shown in Figure 2.

Phase	Objective	Mechanisms
Awareness-oriented	Raise awareness within a qualified community/ stakeholders about the project and its objectives	Kick-off press release, Website, flyers, e-brochure, social media, representation at conferences and AICHEMA 2018 1 st stakeholder event
Results-oriented	Promote project results, allow potentially interested parties to get to know achievements and related benefits of the project	Web-site with public deliverables, newsletter, open-access publications, Conferences, network events, mid-term event with related projects site visits and open days
Exploitation-oriented	Engage with specific stakeholders for exploitation-driven dissemination; replication opportunities	Conference presentations, 2 nd stakeholder event, site visits, Trade fair representation, case studies, economic final conference, final press release

Figure 2: Dissemination/communication phases with objectives and leveraged mechanisms

It is important to emphasize the strong connections and synergies between dissemination and exploitation activities, which will be leveraged to increase the potential impact of the project. Exploitation and dissemination activities will therefore proceed in parallel ways from the beginning of the project. This is visualised in Figure 3 together with the timing of activities. For dissemination, the depicted initial+mid, advanced and final stages roughly correspond to the phases in Figure 2.

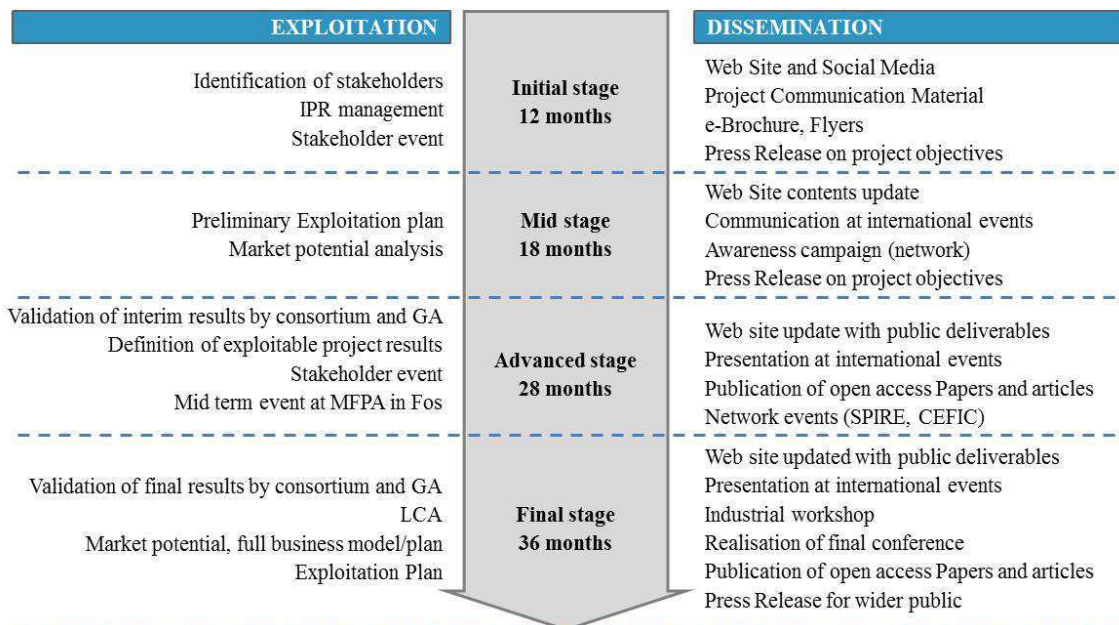


Figure 3: Carbon4PUR Exploitation and dissemination activities

4.2 Engaging associations and multi-stakeholder initiatives

Carbon4PUR will in particular engage target groups or consortia, where academia or industry partners, or both together, have joined in order to optimise joint efforts towards cooperation, dissemination and exploitation in specific areas of interest related to CO₂/CO utilisation, industrial symbiosis, catalysis and chemical processes. Associations and multi-stakeholder initiatives such as European Technology Platforms or the SPIRE PPP are of particular importance for Carbon4PUR as they can act as multiplier groups in stakeholder engagement and all communication and dissemination activities. Table 2 provides an overview of these associations and initiatives, which will be updated during the course of the project. Key members of the consortium with relations to these associations and initiatives will regularly provide information to these communities.

Table 2: Associations and multi-stakeholder initiatives

Association/initiative	Characteristics	Relations in Carbon4PUR
Associations CEPIC-European Chemical Industry Council	Chemical industry	COV – chairman of Programme Council Innovation, DECHEMA

	Eurofer – European Steel Association	Steel industry	Arcelor Mittal
	Europur – European association of flexible polyurethane foam blocks manufacturers	PUR foam producers	Recticel
	PU Europe	PUR insulation producers, raw material suppliers and component manufacturers	COV
	CO ₂ Value Europe	Association, process industries	DECHEMA
	Swisscleantech	Cleantech industries and associations	SPG is member
	RECS International	Energy market association	SPG is member
	Fedustria	Belgium textile and furniture association	Recticel
	AIVP – Association Intrenationale des Villes Potuaires	Association of port cities	MFPA
	VCI	German Chemical industry Association	DECHEMA, RWTH
	PIICTO	industrial association dealing with industrial symbiosis and innovation regarding new green business	MFPA as member, vice presedency
Federations/ Societies	European Federation of Chemical Engineering	Federation, chemical engineers, academic and industry	DECHEMA: General secretariat, UGent is member
	ISIE – International Society for Industrial Ecology		UL is member
	SETAC - Society of Environmental Toxicology and Chemistry		UL is member
PPPs and European Technology Platforms	SPIRE	PPP, Process Industries	COV, AMMR, CEA, DECHEMA, RWTH as A.SPIRE members, COV active in IRIAG advisory and working body

	SusChem	ETP, Chemical industry, biotechnology industry and academia	DECHEMA as founding and board member, COV as chairman
	European Steel Technology Platform (ESTEP)	ETP, Steel industry and academia	
	ECTP – European Construction Technology Platform	ETP, Committee on Energy & Efficient Buildings	
Initiatives and networks	European Cluster on Catalysis (ECC)	Initiative, Chemical Catalysis	UGent, TUB are members
	ERIC (European Research Institute for Catalysis)	Initiative	UGent is a member
	EnCO ₂ re– Enabling CO ₂ Reuse	Initiative, 12 industry and research partners	COV, TUB
	Eurokin	Consortium, industrial and academic on chemical reaction kinetics	UGent is a member
	SusChemSys2.0	Network, 6 industry and 7 research partners	RWTH is coordinator
	Catalisti	Flemish spearhead cluster for chemistry and plastics	UGent is a member
	CO ₂ Chem	Network, industry and academia on CCU, UK based	DECHEMA is member
	CO ₂ NET	Network, German industry and academia on CCU	Hosted by DECHEMA
	ICROA - International Carbon Reduction and Offset Alliance	NGO	SPG is member
	Unicat / Unisyscat	Berlin-Brandenburg cluster of excellence on catalysis research	TUB is speaker

4.3 Engaging European and national funded projects

The Carbon4PUR project will engage with and consider the results of relevant European and national recent and on-going projects, targeting the same sort of industrial symbiosis as Carbon4PUR, i.e. utilization of steel industry off-gases for the production of chemicals. Even if the envisioned products are different, one can expect a number of common challenges,

and it seems sensible to exchange on lessons learned and hurdles to overcome when tackling the complex issue of cross-sectorial business models. Where appropriate, even dissemination activities can be combined in joint events to mutually increase the impact and audience. This has to be discussed with the respective consortia on a case-by-case basis. Table 3 shows a list of projects that have already been identified.

Table 3: Preliminary list of European and national funded projects related to Carbon4PUR

Project	Description	Carbon4PUR partner involved?
FReSMe	From Residual Steel gases to Methanol; EU	
MefCO2	Methanol fuel from CO ₂ ; EU	
ULCOS	Ultra-low carbon dioxide steelmaking; EU	AMMR
BIOCONCO2	BIOTEchnological processes based on microbial platforms for the CONversion of CO ₂ from ironsteel industry into commodities for chemicals and plastics; EU	COV, AMMR, RWTH
ICO2CHEM	From industrial CO ₂ streams to added value Fischer-Tropsch chemicals; EU, Sister Project SPIRE 8 2017 call	
RECODE	Recycling carbon dioxide in the cement industry to produce added-value additives: a step towards a CO ₂ circular economy; EU; Sister Project SPIRE 8 2017 call	
Carbon2Chem	Use of steel flues gases for chemical production; Germany	COV, RWTH
Kopernikus-Projekt P2X	Storage of energy from renewable sources. National project, Germany	COV, DECHEMA, RWTH
Dream Polyols	Synthesis of polyols from formaldehyde and epoxides. Formation of intermediates for polyurethane production. National project, Germany	COV, RWTH
CATCO2RE	Conversion of CO ₂ to methane and methanol using solar energy; FWO SBO-project	UGent, AMMR
CO2PERATE	Development of catalytic technologies to convert CO ₂ into formic acid, using renewable electricity; Catalisti SBO-project	UGent, AMMR

4.4 Participation in targeted conferences, fairs and events

At least 12 national as well as international conferences, congresses and other events (fairs) will be attended from all partners in order to ensure a wider dissemination of the outcomes.

DECHEMA will coordinate the identification of the most relevant events, plan attendance and strive for the inclusion of satellite events where possible. Table 4 shows a list of already identified EU and International conferences and fairs that will be considered for dissemination. The list does not contain networking events like the annual SPIRE meetings and SusChem stakeholder events or the Knowledge for Innovation (K4I) European Innovation Summit, nor workshops and events that might be organized by the European Commission. Participation in such events will be ensured. The funding under Horizon2020 will be acknowledged in all presentations and publications.

Table 4: Preliminary list of conferences, fairs, events

Event	Type and character	Planned involvement
6th Conference on Carbon Dioxide as Feedstock for Fuels, Chemistry and Polymers, 15-16 March 2018, Cologne, Germany	Conference, predomin. Industrial	COV, presentation
Status conference of the German funding programme on CO₂ utilisation 17-18 April 2018, Berlin	Conference, Industry and academia	Organiser: DECHEMA COV, presentation
19th Annual Handelsblatt meeting Chemie 2018 24-25 April 2018, Düsseldorf	Conference, Industry and academia	COV, presentation
UTECH Europe, 29-31 May 2018, Maastricht	Intern. fair and conference for the polyurethanes industry	COV as exhibitor, presentation
Insulation Expo Europe 16-17 May 2018, Cologne	Trade fair on insulation materials, products and technologies	To be determined (Tbd)
ISCRE 25 - 25th International Symposium on Chemical Reaction Engineering, 20-23 May 2018, Florence	Scientific conference, chemical engineers	UGent
GPE - 6th International Congress on Green Process Engineering, 3-6 June 2018, Toulouse	Scientific conference, chemical engineers	Tbd
ACHEMA2018 11-15 June 2018, Frankfurt	Intern. fair and congress for the process industries	Organiser: DECHEMA; COV, key note (CCO) large CO ₂ utilisation booth and congress session COV, presentation

Rohstoffgipfel / Resource summit 25 June 2018, Berlin	Green chemistry innovation and start-up conference	Hosts: TUB, DECHEMA, COV
16th International Conference on Carbon Dioxide Utilization 27-30 August 2018, Rio de Janeiro	Conference, predomin. academic	DECHEMA, presentation TUB
ProcessNet Annual Meeting 2018 10-13 September 2018, Aachen	Conference	CO ₂ utilisation congress session COV, presentation
SETAC LCA Case Study Symposium 24-26 September 2018, Vienna	LCA community	UL
5th International Conference on Chemical Looping 24-27 September 2018, Park City, UT	Conference, industry and academia	UGent
AIChE Annual Meeting 28 October-2 November 2018, Pittsburgh	Conference, industry and academia	UGent
European Coatings Show 19-21 March 2019, Nuernberg	Trade fair for coatings, adhesive, sealants	Megara as exhibitor
PSE Europe 26-28 March 2019, Munich	International exhibition for polyurethane solutions	COV as exhibitor
26th North American Catalysis Society Meeting Jun. 23-28 2019, Chicago, IL, USA	Conference, industry and academia	UGent
METEC Trade fair 25-29 June 2019, Düsseldorf	Metallurgical Trade Fair with Congresses	AM
14th European Congress on Catalysis – EuropaCat 18-23 August 2019, Aachen	Scientific conference, catalysis community	Organisers: DECHEMA, UGent COV, presentation
ECCE12 - 12th European Congress of Chemical Engineering 15-19 September 2019, Florence	Scientific conference, chemical engineers	RWTH, TUB
K., 16-19 October 2019, Düsseldorf	Intern. trade fair for the plastics and rubber industry	COV as exhibitor
17th International Conference on Carbon Dioxide Utilization 2019, Germany	Conference, predomin. academic	Organiser: DECHEMA; TUB
ISIE conference 2019	Industrial ecology	UL

AIChE 2019	Organization for chemical engineering annual meeting	TUB
18th International Conference on Carbon Dioxide Utilization, 2020	International Conference on Carbon Dioxide Utilization	TUB
GHGT-15	International Conference on Greenhouse Gas Technologies	TUB
AIChE 2020		TUB, UGent

4.5 Organisation of Carbon4PUR events

Carbon4PUR will also organize a number of own events, which are listed in Table 5. DECHEMA will organize together with COV and PNO two stakeholder events (M12, M 26), with the aim of spreading the results of the project to relevant industrial stakeholders at different level. Apart from the dissemination, the aim will be to get involved into discussion and collect feedback from outside of the consortium.

The series of events started already with the kick-off meeting by inviting the representatives of key stakeholders. Having the kick-off in Brussels in colocation to the SusChem Board Meeting facilitated the proper endorsement of the project from the start with the representatives of SuchChem Board, A.SPIRE, Cefic (incl. Managers for CO₂ and catalysis working groups), EC Programme Officers for materials and processes, European Association dedicated to CO₂ Utilisation, a sister project funded within SPIRE-8-2017 call.

A mid-term event during the project (M18) will be organised by MFPA and DECHEMA, where related projects will be invited to jointly show the potential of CO₂ utilisation solutions and to exchange experience with fellow developers of potentially synergistic technologies. This event takes place at the industrial site in Fos. A final conference will be organized at M36 by COV, DECHEMA and PNO to disseminate the final results to interested stakeholders and potential users of the technologies.

2 open day events will be organised by MFPA to inform the public on the potential of Carbon4PUR project in using CO₂/CO for the production of value added chemicals. Further open door days will be organized by COV at the plant in Leverkusen and by Recticel. SPG organizes 1 open day (or site visit) at its offices for journalists.

Table 5: List of events organised by Carbon4PUR

Event	Target audience	Organisers
Kick-off, October 2017	Representatives of key stakeholder associations and networks	COV
1st stakeholder event, September 2018	Industrial stakeholders	DECHEMA, COV, PNO
Mid-term event, March 2019, Fos	Industrial and academic stakeholders	MFPA, DECHEMA, jointly with other projects
2nd stakeholder event, November 2019	Industrial stakeholders	DECHEMA, COV, PNO
Final conference, September 2020	Industrial and academic stakeholders	
Open door day	General public	COV
2 open days	Pupils and undergraduate students	MFPA
Open day	Students	Recticel
Site visit	Journalists	SPG

4.6 Dissemination and communication material

Initially, i.e. within the first 6 months, the following materials are provided:

- project logo and templates for Word Documents and PowerPoint presentations in uniform easily recognisable design
- project overview presentation; This presentation is prepared by Covestro for the kick-off event and given to all partners for their individual dissemination activities throughout the project lifetime;
- a project flyer describing the project objectives, ambitions, structure and partners; The flyer will be provided to all project partners and is to be distributed at any relevant events or meetings with interested stakeholders;

- an e-brochure providing more detailed information about the project to be placed on the website for download;
- four roll-ups to display the project at events.

All materials are prepared by DECHEMA with support of the other partners.

Other materials to be provided during the course of the project are the public deliverables listed in Table 6. Publication will occur via the website.

Table 6: List of public Carbon4PUR deliverables

Deliverable	Title	Due date
D8.1	Web site	M3
D8.3	Dissemination and Communication Plan	M6
D6.2	Baseline LCA on conventionally produced polyol/PUR and flue gas treatment	M7
D6.3	LCA of pilot/labscale versions of novel technologies	M16
D8.7	Dissemination and Communication report and update of plan	M18
D7.1	Mapping of CO ₂ /CO mixed and pure sources in Europe	M24
D7.2	Study including replication potentials and preferred sites for industrial symbiosis	M30
D6.4	Review of scenario techniques applied so far in ex-ante LCAs	M30
D5.5	Pilot scale rigid foam fulfilling rigid foam specifications	M36
D6.5	LCA of upscaled versions of novel technologies	M36
D6.9	Overall economic potential of CO/CO ₂ -based polymer technologies	M36
D8.8	Dissemination and communication report	M36
D8.9	Exploitation report	M36

Towards the end of the project a tangible and accessible case study document will be produced by DECHEMA, aimed at awareness creation on high management level of chemical and other process industry companies.

- The case study should contain the key achievements and USPs to be delivered by the project, e.g.:
- a new conversion process avoiding capture and separation by the direct use of mixed flue gas;

- realization of the synthesis/production process in an industrial symbiosis providing a cost effective and reliable, non-petrochemical feedstock to substitute up to 50% of current raw material for polyol production;
- cost competitiveness with existing solutions and suitability for large-scale production (up to -37% cost reduction for raw materials, and an expected reduction of energy demand up to -70%);
- new polyols based on alternative C1-building blocks can be seamlessly integrated into the value chain thanks to defined and superior material properties (various length chains and molecular weights);
- novel polymer intermediates are ready to substitute conventional intermediates for PUR mass market products (e.g. isolation boards, coatings) with a final product at same or even superior quality compared to advanced standards;
- final PUR products at end of life provide additional savings due to recyclability of incineration flue gas;
- new catalyst for conditioning of mixed flue gas expected to be used widely for syngas production storage of solar energy, and CO production by industry technology providers and gas producers and thus opens up new market opportunities far beyond the polyurethane industry.

4.7 Carbon4PUR website

The Carbon4PUR website serves as a tool to widely disseminate project information within general public and target audience.

The public Carbon4PUR website has been provided in M3, thereby fulfilling deliverable D8.1. It is available at www.carbon4pur.eu. The pages currently contain basic information about the project and partners, a “news and events” section, which will be updated regularly, a newsletter page, which allows subscription, and sections for public documents and project outcomes. The section of public documents includes links to already published press releases, whereas future project’s public documents like reports, presentations will be added in due time. Concerning the project outcomes webpage, it is empty thus far, given that project outcomes are pending. The header contains a search field and a link to the private website area, which serves as collaborative workspace restricted for consortium members. The footer of the website presents the acknowledgment that the project has received EU funding and two links for the disclaimer and the terms of conditions webpages. The website is based on Wordpress, which is used for updating its content.

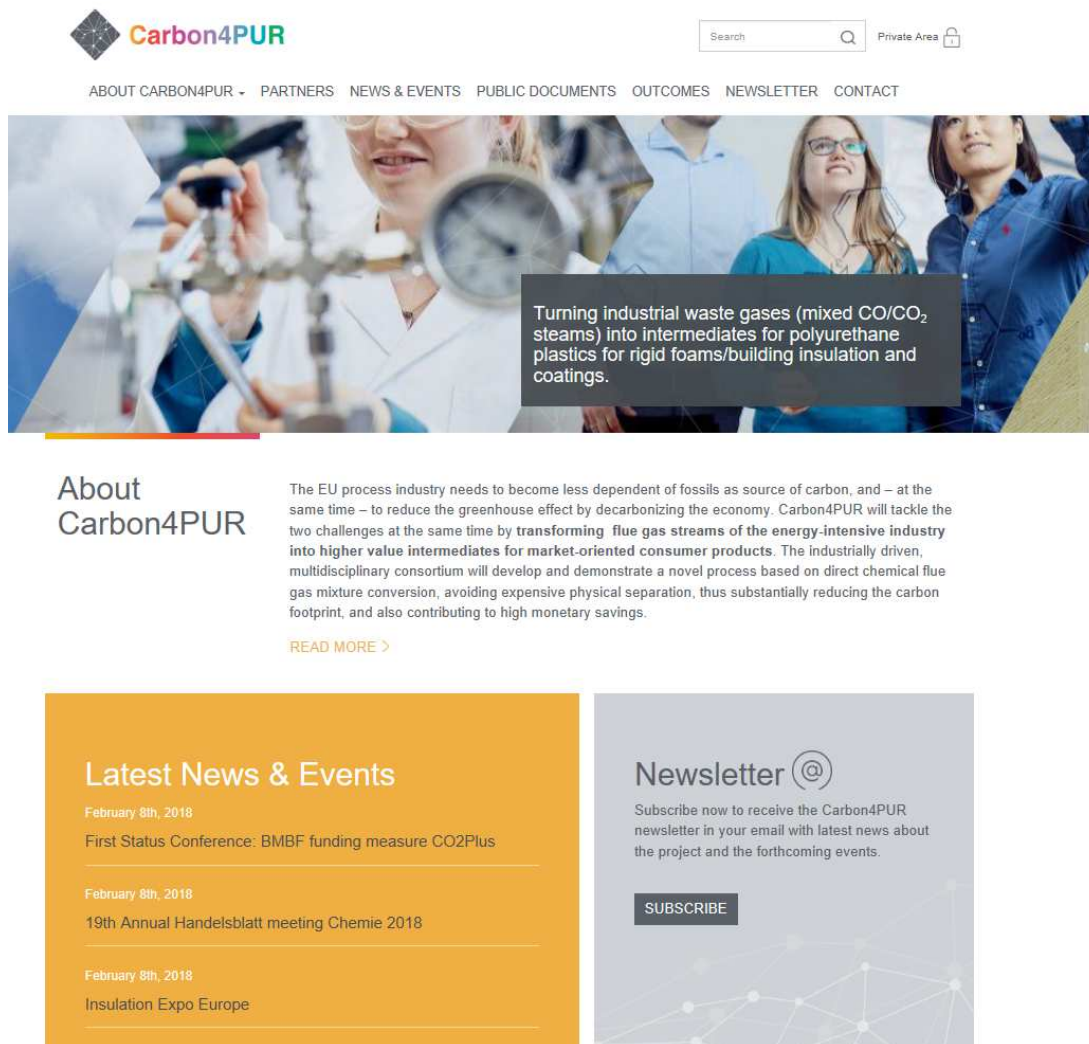


Figure 4: Screenshot Carbon4PUR Homepage

The private area of the Carbon4PUR website is linked to a workspace area with restricted access for the consortium partners, aiming to facilitate collaboration and Carbon4PUR management. The area is hosted at the Innovation Place (www.innovationplace.eu) platform developed by PNO, and it has been specifically set up for the management of R&D and innovation projects. It provides a secured documents repository area and a collaborative environment allowing information sharing through an advanced Document Management System. It also offers convenient tools for project management like a calendar, doodle, and polls.

4.7.1 Newsletters

The newsletter is a tool to inform relevant target audiences about key results of the project, events at which Carbon4PUR will be present, and to invite to stakeholder events, workshops, open days etc. News items will be issued regularly in order to continuously report about Carbon4PUR deliverables, meetings and events, important findings, etc.

The project newsletter will:

- provide a flexible structure with short key messages in the first 1-2 pages, with interactive links to the more detailed information;
- use a pdf format which allows to place it on the project website as downloadable pdf files and also for direct mailing;
- ensure a professional level of quality in terms of design;

Newsletters will be published twice a year. In addition, Carbon4PUR offers individual newsletter articles to other organisations and projects for publication, for instance in the SPIRE monthly newsletters, SusChem blogs or on project websites.

4.7.2 Social media

Further to the website and newsletter, Carbon4PUR partners will leverage their existing social media activities to continuously communicate about project progress, achievement of milestones and important events. Main channels are LinkedIn, Twitter and ResearchGate. Together, the social media accounts of COV, DECHEMA, Megara, SPG, UL, TUB, UGent, and RWTH Aachen have ~217,000 followers.

4.8 Publications in scientific and general technical journals

To ensure visibility within the scientific-technical target stakeholder communities, a pool of relevant journals has been sourced as potential channels for dissemination aligned with the target groups and the expected project outcomes. During the course of the project, at least 10 publications incl. a joint publication on accompanying research (WP6) will be prepared by the academic partners, e.g. for the journals listed in Table 7.

Table 7: List of selected journals

Gold open access	Green open access	Other or unknown
ACS Catalysis	Environmental Science & Technology (ES&T)	Nachrichten der Chemie
Applied Energy	Journal of Cleaner Production	C2W

Catalysis Science and Technology		Chemical & Engineering News
Chemical Engineering Journal		Chemistry World
CIT (Chemie Ingenieur Technik)		CIA Matters, Chemistry and Industry
Int Journal of LCA		Eisen und Stahl
Journal of Catalysis		European Chemical News (ECN)
Journal of Industrial Ecology		European Coatings Journal
Nature		IHS Chemical Week
Nature Communications		Maintenance Engineering, Power
Journal of the American Chemical Society		Metal Bulletin
Industrial & Engineering Chemistry Research		Paint and Coatings Industry
Applied Catalysis A: General		process.vogel.de
Applied Catalysis B: Environmental		Steel Construction
Journal of CO ₂ Utilization		Steel Times International
Environmental Science & Technology		The Chemical Engineer
Nature Catalysis		The Manufacturer
Angewandte Chemie		The Mechanical Engineer
Science		The Process Engineer
Journal of CO ₂ Utilisation		Hydrocarbon Processing
International Journal of Greenhouse Gas Control		
Energy Technology		
Industrial & Engineering Chemical Research		

Selection of appropriate journals is the responsibility of the partners preparing the papers. In any case, open access publication will be ensured fulfilling the stipulations in article 29.2 of the Grant Agreement. Where gold open access is not possible, DECHEMA provides a list of repositories and guidelines for author's agreements with the publisher for green open access.

4.9 Evaluation of communication and dissemination activities

Impact is measured through quantifiable indicators, often referred to as Key Performance Indicators (KPIs). Defined indicators are valuable in measuring impact of the communication and dissemination activities and should be revisited at important 'check points' to reflect outcomes as Carbon4PUR evolves. Coordination of activities is important to achieve this measurement.

The tables below provide the set of indicators chosen for Carbon4PUR, suitable also for reporting on dissemination and communication progress. Visual evidence includes screenshots (e.g. press clippings) and graphs (e.g. web stats).

The following metrics and KPIs have been defined to efficiently observe progress for the major dissemination and communication channels utilised in the project:

Table 8: metrics events

	Indicator
Means	Events: Organisation of conferences and workshops, site-visits, open days, active conference and network meeting participation Abstracts & Papers (all types of relevant events) Keynotes, presentations, demos, panel debates, chairing, moderation
Metrics	Number of abstracts and papers accepted per conference structure, number of events, number of participants at own events
Purpose	Draw attention to Carbon4PUR and engage with stakeholders, including showcasing achievements and added value
KPI targets	Representation in at least 12 conferences, at least 2 participations in SPIRE network events, at least 100 external participants (>25% industry) at final Carbon4PUR conference 1 workshop aligned to Subtask 6.3.3 (TUB), 2 stakeholder events (M12 and M26, DECHEMA, COV, PNO) Midterm event with other projects (M18, MFPA and DECHEMA)
Details	Type of event and target audience; link to relevant web pages, including news items/event announcements/slide shows; table of new contacts; photos and videos)

Table 9: metrics publications

	Indicator
Means	Publications: Scientific publications, articles in general journals, press releases and media briefings
Metrics	Type of publication (journal/periodical/general press), open access availability For press releases and media briefings: number and media coverage
Purpose	Disseminate scientific technical results, create awareness in wider communities and general public
KPI targets	At least 8 scientific papers in peer-reviewed journals (open access), at least 2 articles in general journals; press releases at kick-off, final conference and major milestone achievements, media briefings at all own public events
Details	Type of journal and target audience; European coverage

Table 10: metrics online

	Indicator
Mean	Website, newsletter, social media impact – web visits
Metrics	Total visits per month (analysis in a graph), page views and unique page views/month and 10 most popular pages/month, Number of newsletters and subscribers
Purpose	Monitor the impact of the website in terms of visits and stakeholder group extension
KPI targets	At least 6 newsletters At least one communication of project objectives, results and/or main achievements via social media per partner
Details	Graph of total and unique visitors per month and illustrated per quarter; table of most popular pages/month, reported bi-annually, feedback and requests via the contact page

5. Conclusion

With this deliverable the Carbon4PUR project provides a strategic communication plan that will enable targeted and efficient creation of awareness and engagement of stakeholders. Planned dissemination and communication actions will be evaluated against defined criteria to measure the success of actually performed activities. The plan will be updated regularly and reported again in deliverable D8.7 in M24.