



## MEMBER

ADVANCED **MEMBRANES** AND MEMBRANE ASSISTED PROC**ESSES** FOR PRE- AND POST-COMBUSTION CO<sub>2</sub> CAPT**URE**

**H2020 GRANT AGREEMENT NUMBER: 760944**

Start date of project: 01/01/2018

Duration: 4 years

### WP08 - Dissemination and communication

#### D8.3

### MEMBER dissemination activities/events M18

**Topic:** NMBP-2017: High-performance materials for optimizing carbon dioxide capture  
**Funding scheme:** Innovation action t  
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v0.1	22-08-2019r	First Release	HYGEAR TECNALIA	R. Makkus J.L. Viviente
v1.1	29-08-2019	Approved (feedback from partners)	TECNALIA	J.L. Viviente

Project funded by European Union's Horizon 2020 research and innovation programme (2014-2020)		
Dissemination Level		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	
<b>CON</b>	Confidential, only for members of the Consortium	

(\*) for generating such code please refer to the Quality Management Plan, also to be included in the header of the following pages

(\*\*) indicate the acronym of the partner that prepared the document



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## 1. EXECUTIVE SUMMARY

### 1.1. Description of the deliverable content and purpose



Among the task foreseen in the MEMBER project, dissemination and communication activities play a crucial role to spread the scientific knowledge and technological developments to the largest audience. This package of activities will increase visibility of both project and partners, and will guarantee its optimal acknowledgement and future exploitation, as they will address the main European forums and platforms on the project's topic.

The aim of this deliverable is to describe the different dissemination and communication activities carried out in the frame of the project MEMBER by Month 18. The dissemination and communication activities are based on the Dissemination and Communication Plan of the MEMBER project (see Deliverables D8.1 and D8.2). According to this plan the activities in the first and second year of the project are focus on:

- The implementation of the external and internal dissemination strategy and communication tools (i.e. public and private website, project communication material...).
- The internal and external disseminations with special focus on communicating with the external audience: i) internal dissemination between the WPs, ii) creating an effective network between all participants, iii) the update of the website. The public deliverable and presentation of international events as well as scientific workshops will be the other highlights of this stage. A key event in this stage will be the scientific workshop organized by TUE at M24.

### 1.3. Deviation from objectives

There was a delay in the drafting of the present deliverable due to the summer period. There is not impact on the other activities of the project

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## 2. Dissemination and communication tools

Actions have been undertaken to create awareness of the MEMBER project, its objectives and anticipated results. These actions have been carried on and will continue through the entire project duration. Main activities during the period are detailed in the next sections.

### 2.1. Project logo & public document templates

A project logo has been created as visual identity of the project.



In addition, templates for the general presentations of the project in poster and oral presentations have been drafted.

### 2.2. Websites

For safety reasons it was decided to keep the public website and the private platform separated. From the public website there is no link to the private platform.

#### 2.2.1. Private

The MEMBER internal project platform is available since February 23rd, 2016. It is based on Alfresco (<http://docs.alfresco.com/>) The Alfresco is an open source Enterprise Content Management (ECM) system that manages all the content within an enterprise and provides the services and controls that manage this content. The software has been initially updated for managing all the internal activities of the consortium related to MEMBER (i.e.; directories and subfolders related to the different WPs, documents such as deliverables, Periodic Reports, agendas, minutes of the meeting and presentations, etc). Further, modification will be included on request from the partners or for improving the use of the platform. This software is already used in our previous projects.

After login into Alfresco, the user can navigate between projects it has the rights to access. Once inside the website of MEMBER one can directly see who the users are and what are the latest contents added to the system. The user can now communicate with the other users or navigate the content of the website and add/modify elements inside the website.

#### 2.2.2. Public

A public web-site (<https://member-co2.com>) has been created during initial months of the project and it will be continuously updated with all the publishable information from the project partners. This web site is provided and managed by TECNALIA, and contains all public information about the project, organised in the following sections:

- Summary, which provides a short summary on the project including the general objective;
- Objectives, which provides more detailed information of the scientific and technical objectives together to an overview of the work package structure;
- Partnerships, which identifies the organizations involved in the project consortium;
- Workshops, which provides the information on the events organised by MEMBER

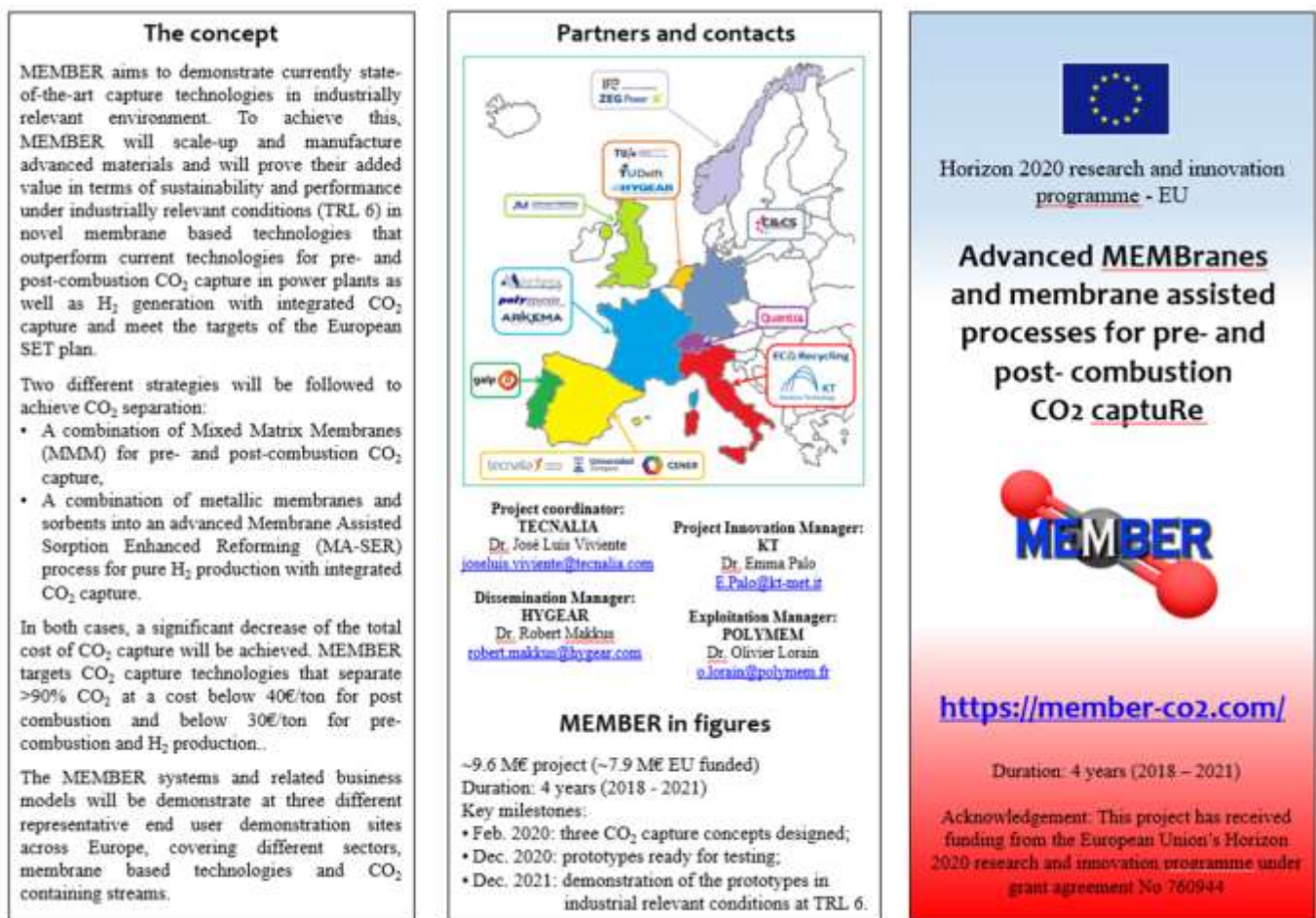
- Dissemination, with three subsections: Communication, Presentation and Publications; these parts will be continuously updated with any public documents generated at any time in the project;
- Events, which describes the list of events where the MEMBER project has been present somehow or that could be of interest for MEMBER partners; this will be also regularly updated;
- Contact, which provides access for contacting the coordinator.

The public website will be regularly updated with relevant news related to the activities of MEMBER and non-confidential documents.

### 2.3. Media campaign

In addition to the public website, different documents have been prepared for the dissemination of the project along the period: the non-confidential project presentation, the member poster, leaflet, video, newsletters, etc. The non-confidential presentation includes the objectives of the project and describes the partnership, overall approach and methodology and the expected results within MEMBER. At a later stage (throughout the project course) the presentation and/or poster will be advanced with project results that can be published without compromising or infringing confidentiality. The non-confidential presentation as well as the poster and leaflet can be used by all consortium members disseminating MEMBER at conferences, lectures etc. They can be downloaded from the public website at link: <https://member-co2.com/content/presentations>.

#### 2.3.1. Leaflet



#### The concept

MEMBER aims to demonstrate currently state-of-the-art capture technologies in industrially relevant environment. To achieve this, MEMBER will scale-up and manufacture advanced materials and will prove their added value in terms of sustainability and performance under industrially relevant conditions (TRL 6) in novel membrane based technologies that outperform current technologies for pre- and post-combustion CO<sub>2</sub> capture in power plants as well as H<sub>2</sub> generation with integrated CO<sub>2</sub> capture and meet the targets of the European SET plan.


Two different strategies will be followed to achieve CO<sub>2</sub> separation:

- A combination of Mixed Matrix Membranes (MMM) for pre- and post-combustion CO<sub>2</sub> capture,
- A combination of metallic membranes and sorbents into an advanced Membrane Assisted Sorption Enhanced Reforming (MA-SER) process for pure H<sub>2</sub> production with integrated CO<sub>2</sub> capture.

In both cases, a significant decrease of the total cost of CO<sub>2</sub> capture will be achieved. MEMBER targets CO<sub>2</sub> capture technologies that separate >90% CO<sub>2</sub> at a cost below 40€/ton for post combustion and below 30€/ton for pre-combustion and H<sub>2</sub> production.

The MEMBER systems and related business models will be demonstrate at three different representative end user demonstration sites across Europe, covering different sectors, membrane based technologies and CO<sub>2</sub> containing streams.

#### Partners and contacts




<b>Project coordinator:</b> <b>TECNALIA</b> Dr. José Luis Viviente <a href="mailto:jose.luis.viviente@tecnalia.com">jose.luis.viviente@tecnalia.com</a>	<b>Project Innovation Manager:</b> <b>KT</b> Dr. Emma Palo <a href="mailto:E.Palo@kt-sost.it">E.Palo@kt-sost.it</a>
<b>Dissemination Manager:</b> <b>HYGEAR</b> Dr. Robert Makkus <a href="mailto:robert.makkus@hygear.com">robert.makkus@hygear.com</a>	<b>Exploitation Manager:</b> <b>POLYMEM</b> Dr. Olivier Lorain <a href="mailto:o.lorain@polymem.fr">o.lorain@polymem.fr</a>


#### MEMBER in figures

~9.6 M€ project (~7.9 M€ EU funded)  
Duration: 4 years (2018 - 2021)  
Key milestones:

- Feb. 2020: three CO<sub>2</sub> capture concepts designed;
- Dec. 2020: prototypes ready for testing;
- Dec. 2021: demonstration of the prototypes in industrial relevant conditions at TRL 6.

  
Horizon 2020 research and innovation programme - EU

### Advanced MEMBRanes and membrane assisted processes for pre- and post- combustion CO<sub>2</sub> captuRe

  
<https://member-co2.com/>

Duration: 4 years (2018 – 2021)

Acknowledgement: This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760944

Figure 1. First leaflet.



## D8.3 MEMBER dissemination activities/events M18

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### 2.3.2. Poster



## Advanced MEMBRANES and membrane assisted processes for pre- and post-combustion CO<sub>2</sub> capture



### Summary and Concept

Currently, more than 80% of global primary energy use is fossil based. Over the last decade, 85% of the increase in global use of energy was fossil based. In the transition to a fully low-carbon economy, the Carbon Capture and Storage (CCS) technology is one of the key ways to reconcile the rising demand for fossil fuels, with the need to reduce greenhouse gas emissions. Globally, CCS is likely to be a necessity in order to keep the average global temperature rise below 2 degrees.

The main challenge of including CCS in power generation or other industrial sectors is related to the energy consumed by the separation processes needed to achieve low carbon emissions (e.g. heat for solvent regeneration). This energy requirement is the major reason for the reduced overall net efficiencies. The lower efficiency turns into higher fuel consumption and higher fuel cost. Together with the increased CAPEX, due to additional equipment (separation processes or chemical reactors), it determines the substantial increase of the cost of electricity or of an industrial product when CO<sub>2</sub> capture is included.

In order to reduce this energy penalty, MEMBER targets three advanced solutions based on: Innovative MOF-MMMs for pre- and post-combustion CO<sub>2</sub> capture in power plants, and an intensified reforming process combining high temperature solid CO<sub>2</sub> sorbent and dense Pd membranes for pure H<sub>2</sub> production with integrated CO<sub>2</sub> capture (MA-SER).

MEMBER aims to demonstrate state-of-the-art capture technologies in an industrially relevant environment. To achieve this, MEMBER will scale-up and manufacture advanced materials and will prove their added value in terms of sustainability and performance under industrially relevant conditions (TRL 6) in novel membrane based technologies that outperform current technologies for pre- and post-combustion CO<sub>2</sub> capture in power plants as well as H<sub>2</sub> generation with integrated CO<sub>2</sub> capture and meet the targets of the European SET plan.

In both cases, a significant decrease of the total cost of CO<sub>2</sub> capture will be achieved. MEMBER targets CO<sub>2</sub> capture technologies that separate >90% CO<sub>2</sub> at a cost below 40€/ton for post combustion and below 30€/ton for pre-combustion and H<sub>2</sub> production.

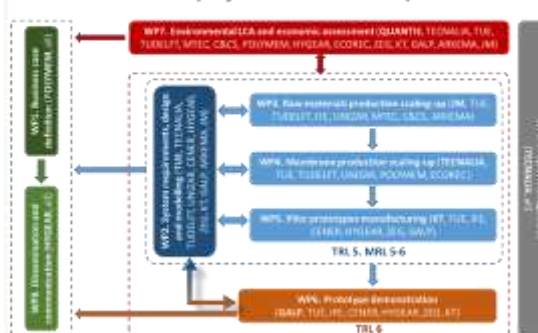
MEMBER has been built on the basis of the best materials and technologies developed in three former FP7 projects, ASCENT, M4CO2 and FluidCELL. In particular, special attention will be paid to the manufacturing processes scale up of key materials and products such as Metal Organic Frameworks (MOFs), polymers, membranes and sorbents.

#### Performance targets for the MEMBER prototypes

	Technology	CO <sub>2</sub> Capture [%]	Capture cost [€/ton]	Demo site
Pre-combustion (Power plant)	MMM	> 90	< 30	CENER
Post-combustion (Power plant)	MMM	> 90	< 40	GALP
H <sub>2</sub> with integrated CO <sub>2</sub> capture	MA-SER	> 90	< 30	IFE-HYNOR

### Project Objectives

#### MEMBER project structure work plan



- > Increase the manufacturing readiness level (from MRL 4-5 to MRL 6) of a portfolio of materials for the production of Mixed Matrix Membranes for pre- and post-combustion CO<sub>2</sub> capture in power plants (H<sub>2</sub>/CO<sub>2</sub> and N<sub>2</sub>/CO<sub>2</sub> separation).
- > Increase the manufacturing readiness level (from MRL 4-5 to MRL 6) of hydrogen membranes, reforming catalysts and CO<sub>2</sub> sorbents materials, and integrating them into an advanced Membrane Assisted Sorption Enhanced Reforming (MA-SER) process for pure H<sub>2</sub> production with CO<sub>2</sub> capture.
- > Develop a software tool to simulate MEMBER components, the processes and CO<sub>2</sub> capture energy performance.
- > Design and construct 3 prototypes for CO<sub>2</sub> capture for testing of the developed materials in relevant operating conditions at TRL6.
- > Demonstrate the MEMBER systems and related business models in 3 representative demonstration sites across Europe, covering different sectors, membrane based technologies and CO<sub>2</sub> containing streams:
  - Prototype A targeted for pre-combustion in a gasification power plant using MMM at the facilities of CENER (BIO-CCS).
  - Prototype B targeted for post-combustion in power plants using MMM at the facilities of GALP.
  - Prototype C targeted for pure hydrogen production with integrated CO<sub>2</sub> capture using (MA-SER) at the facilities of IFE-HyNor.
- > Quantify the environmental impacts of the proposed holistic solutions through life cycle assessment.
- > The exploitation of the results including the definition of a targeted and quantified development roadmap to bring the technologies to the market.
- > Overcome CCS market barriers with an ambitious set of CCS solutions.

### Project details

**Project details**  
Start Date: 1 January 2018  
Duration: 4 years  
Project Cost: 9,596,541 Euro  
Project Funding: 7,918,901 Euro

**Coordinator's contact:**  
Dr. José Luis Viviente  
TECNALIA  
Jose.luis.viviente@tecnalia.com

More information at: <https://member-co2.com/>

### Consortium

The consortium brings together multidisciplinary expertise on the entire value chain: material development (MOFs, polymers, sorbents and catalyst), membrane development (MMM, Pd based membranes); chemical and process engineering, modelling (from thermodynamics to unit operation modelling to system integration), membrane modules and reactors development, recycling, LCA and industrial study, innovation management and exploitation.

The consortium is composed of 17 partners from 9 countries: 6 RTQ/YES and 11 SMEs/INDEs (65%) it is an industrial oriented consortium, including 7 innovative SMEs (41%) and 4 Large industries (24%).

- |                        |                        |                         |
|------------------------|------------------------|-------------------------|
| 1 TECNALIA, Spain      | 7 HTEC, France         | 13 QUANTIS, Switzerland |
| 2 TUE, Netherlands     | 8 C&CS, Germany        | 14 KT, Italy            |
| 3 TUDELFT, Netherlands | 9 POLYMEM, France      | 15 GALP, Portugal       |
| 4 IFE, Norway          | 10 HYGEAR, Netherlands | 16 ARKEMA, France       |
| 5 UNIZAR, Spain        | 11 ECORC, Italy        | 17 JM, United Kingdom   |
| 6 CENER, Spain         | 12 ZEG, Norway         |                         |





#### Acknowledgement:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760944. Disclaimer: The present publication reflects only the author's views and the Union are not liable for any use that may be made of the information contained therein.



Insert event reference: Title, Date, Location, Country

Figure 2. First public poster.

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### 2.3.3. Project presentation




**Advanced MEMBranes**  
**and membrane assisted procEsses**  
**for pre- and post- combustion CO<sub>2</sub> captuRe**

**MEMBER**  
<https://member-co2.com/>

*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760944*

Duration: 4 years.                      Starting date: 01 January 2018  
Budget: € 9 596 541,50              EU contribution: €7 918 901

Contact: [joseluis.viviente@tecnalia.com](mailto:joseluis.viviente@tecnalia.com)

16/04/2018 Page 1                      The present publication reflects only the author's views. The Commission is not responsible for any use that may be made of the information contained therein.                      1\*\* Public presentation

**Figure 3. Public presentation.**

### 2.3.4. Newsletters

Two newsletters have been released along the period. They can be downloaded from the public website: <https://member-co2.com/content/communication>.

### 2.3.5. Video

Two different videos have been made. One addressing the general public (duration: 4 min) and another one using more technical terms that could be used as educational video at the university (duration: 5 min). Minor review is still necessary. They will be uploaded in YouTube and they will be also accessible at the public website in September 2019.

### 2.3.6. Public reports

- Deliverable D2.2: Industrial requirements (<https://member-co2.com/content/publications>)
- Deliverable D8.3: MEMBER dissemination activities/events M18 (this document)

### 2.3.7. Dissemination of the project in press and/or social media

MEMBER project activities and public documents has been advertised at the website of some consortium members as well as in different LinkedIn networks: Gas separation membranes (375 members) and Membrane reactors (251 members). Two other LinkedIn groups: Membrane separation (1303 members) and Global Hydrogen Ambassadors Network (2848 members) will be included in the dissemination channels of MEMBER. In addition to this, a first mailing lists have been created including contacts of the partners as well as from related EC projects and main associations on the field. The contact lists will be further updated along the project life and it will also take into account the market / customer analysis.



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### 3. Dissemination activities

List of the main dissemination activities (including participation to conferences or scientific papers publications) are detailed hereafter. We do not included the already detailed before but delivered in the MEMBER public web-site:

Type of activities	Main leader	Title	Date	Place	Type of audience	Estimated Number of persons reached	Countries addressed
Web-site	TECNALIA	MEMBER public web-site	2018	Own web-site	Scientific Community Industry General Public Policy makers Medias Investors Customers	1000	All
Web-site	KT	Description MEMBER plus link.	2018	KT website	Customers General public		All
Web-site	GALP	Description MEMBER	2018	GALP intranet	Internal		All
Web-site	C&CS	Short summary of MEMBER plus link	2018	C&CS webiste	Customers General public		All
Web-site	IFE	Description of the MEMBER project	2018	IFE intranet and web-site	Internal and customers		All
Presentation to different companies	IFE	SER technology status and associated development projects	2018-2019	IFE	Private companies		Norway
Social media	TECNALIA	Release MEMBER news and public documents	2018, 2019	LinkedIn group: Gas separation membranes	Scientific Community Industry General Public	375	All
Social media	TECNALIA	Release MEMBER news and public documents	2018, 2019	LinkedIn group: Membrane reactors	Scientific Community Industry General Public	251	All





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Social media	TECNALIA	Release MEMBER news and public documents	2019	LinkedIn group: Membrane separation	Scientific Community Industry General Public	1303	All
Social media	TECNALIA	Release MEMBER news and public documents	2019	LikedIn group: Global Hydrogen Ambassadors Network	Scientific Community Industry General Public	2848	All
Social media	TECNALIA	Release MEMBER news and documents	2019	LinkedIn profile of the Membrane Technology and Process Intensification Platform at TECNALIA	Scientific Community Industry General Public	-	All
Other	IFE	Display of MEMBER and associated partners logos on an information board at the IFE-HyNor center	2019	IFE-HyNor Center	General public, visiting companies		Norway
Participation to a conference	TECNALIA	Poster: MEMBER project. Advanced MEMBranes and membrane assisted procEsses for pre- and post-combustion CO2 captuRe.	July 9-13, 2018	Euromembrane 2018. Valencia, Spain	Scientific Community	200	All
Participation to a conference	TECNALIA	Poster: MEMBER project. Advanced MEMBranes and membrane assisted procEsses for	November 14th – 15th, 2018	17th Aachener Membran Kolloquium. Aachen, Germany	Scientific Community	200	All



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		pre- and post-combustion CO2 capture					
Exhibition	TUE	Hallway poster Chemical Engineering department to inform chemical engineering student about group projects	26-10-2018	Technical University Eindhoven	Scientific Community	50	All
Participation to a conference	TUE	Abstract on thermodynamic comparison of MA-SER and membrane assisted chemical looping reforming process with outlook to economic evaluation	8-7-2019	Technical University Eindhoven	Scientific Community	200	All
Participation to a conference / poster abstract submission	TUE	Abstract on internal membrane modelling using vacuum or sweep flow operation	8-7-2019	Technical University Eindhoven	Scientific Community	200	All
Participation to a conference	TECNALIA	Abstract ADVANCED MEMBRANES AND MEMBRANE ASSISTED PROCESSES FOR PRE- AND POST-COMBUSTION CO2 CAPTURE	8-7-2019	Technical University Eindhoven	Scientific Community	200	All
Participation to a conference	UNIZAR	Post-combustion gas separation by Mixed Matrix Membranes	16-6-2019	Lulea University of Technology	Scientific Community	200	All



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				International Zeolite Membrane Meeting 2019			
Participation to a conference	UNIZAR	Influence of the casting solution concentration on the morphology, thermal properties and CO <sub>2</sub> /N <sub>2</sub> separation performance of Pebax® 1657membranes	May 2019	XXXVII Reunión Bienal de la Real Sociedad Española de Química  San Sebastian (E)	Scientific Community	200	Spain
Participation to an event other than a conference or workshop	TUE	Presentation SYNGAS CLEANING SYSTEM DESIGN FROM BIOMASS GASIFICATION	29-3-2019	Internal TU/e	Scientific Community	50	Netherlands
Participation to a conference	JM (A. Deacon)	Abstract Developing efficient MOF scale-up routes for carbon capture applications	June 2019	ICCDU XVII Germany	Scientific Community	50	All
Participation to a conference	TECNALIA (O. David et al.)	Advanced membranes and membrane-assisted processes for pre- and post-combustion CO <sub>2</sub> capture (MEMBER project)	26-30 <sup>th</sup> May 2019	RSEQ meeting, San Sebastian	Scientific Community	50	Spain
Participation to a conference	TECNALIA (J.L. Viviente)	Abstract and Presentation: Advanced MEMBranes	June 18-19 <sup>th</sup> (2019)	10th Trondheim CCS conference	Scientific Community	200	All



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		and membrane assisted processes for pre- and post-combustion CO <sub>2</sub> capture					
Participation to a conference	TECNALIA (J.L Viviente)	Presentation Advanced MEMBRanes and membrane assisted processes for pre- and post-combustion CO <sub>2</sub> capture	July 8 – 11 2019	ICCMR-14 Eindhoven (NL)	Scientific Community	150	All
Participation to a conference	A.Deacon et al.	Poster: Developing efficient MOF scale-up routes for carbon capture applications	June 23-27, 2019	ICCDU XVII, Aachen Germany	Scientific Community	200	All
Participation to a conference	S. Pouw	Presentation: Thermodynamic comparison of MA-CLR and MA-SER process	July 8 – 11 2019	ICCMR-14 Eindhoven (NL)	Scientific Community	200	All
Web site	ECOREC	MEMBER summary and Ecorec activity within the project	2019	ECOREC web site	General Public, Customers		Italy



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**3.1. Scientific publications (This field is only for peer reviewed articles)**

Type of scientific publication	Title of the scientific publication	DOI	ISSN or eSSN	Authors	Title of the journal or equivalent	Number, date	Publisher	Place of publication	Year of publication	Relevant pages	Public & private participation	Peer-review	Is/Will open access provided to this publication
Article in journal	Poly(ether-block-amide) copolymer membrane for CO <sub>2</sub> /N <sub>2</sub> separation: The Influence of the casting solution concentration on its morphology, thermal properties and gas separation performance			Lidia Martínez-Izquierdo, Magdalena Malankowska, Javier Sánchez-Láinez, Carlos Téllez and Joaquín Coronas	Open Science Accepted, in press		RSQ		2019			YES	Gold open access