An Artificial Leaf: a photo-electro-catalytic cell from earth-abundant materials for sustainable solar production of CO_2-based chemicals and fuels

Deliverable D7.9

Dissemination and Exploitation Plan Update

Lead Beneficiary	ICIQ
Delivery date	6th February 2018
Dissemination level	Public
Version	2.0

This Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 732840

Document Information

Grant Agreement Number	732840
Acronym	A-LEAF
Start date of project (Duration)	01/01/2017 (48 months)
Document due date	31/12/2017
Submission date	06/02/2018
Authors	ICIQ
Deliverable number	D7.9
Deliverable name	A-LEAF Dissemination and Exploitation Plan Update
WP	WP7 - Dissemination, Exploitation and Communication

Version	Date	Author	Reviewers	Approval	Comments
v.0	05/02/2017	ICIQ	ICIQ	ICIQ	Creation
v.1	06/02/2017	ICIQ	ICIQ	JR Galán-Mascarós (ICIQ)	Revision
v.2	06/02/2018	ICIQ	ICIQ	JR Galán-Mascarós (ICIQ)	Update

EXECUTIVE SUMMARY

This is the deliverable D7.9 Dissemination and Exploitation Plan (D&E Plan) Update of the H2020 FET-Proactive project **A-LEAF** (GA 732840). This work is carried out as part of WP7 Dissemination, Exploitation and Communication work package.

Dissemination and exploitation actions from **A-LEAF** aim at communicating project results to a wide audience, fostering the adoption of the new technology and its impact, facilitating the exchange of information and the interaction not only with other projects but also with activities in industry, academia, and society as a whole.

This second version of the D&E plan is an update of the original document (D.7.3. Dissemination and Exploitation Plan) for the **A-LEAF** project that sets the frame and scope for the **A-LEAF** D&E activities. The strategy and plan of dissemination and exploitation will be continually monitored, updated and reported during the project. In this sense, this is a living document that will develop through the project and it will change in accordance with the needs of the dissemination and exploitation process. This D&E plan will be updated again in M36 of the project.

Table of Contents

1. INTRODUCTION

The main objective of **A-LEAF** is the development and deployment of an efficient and economically viable solar-to-fuel technology based on an artificial leaf. The deployment of such a revolutionary and radically different technology requires the powerful combination of the best research and innovation and a large community of stakeholders willing to take the new developments to the next stage. One of the most ambitious aims of the project lies in bringing in additional players, arising scientific interest, industrial participation and reaching the critical mass needed for the future exploitation of our solar to fuels platform in the long term. In order to achieve this, a Dissemination and Exploitation Plan (D&E Plan) has been outlined. The Plan considers the target audiences as central elements, and defines dissemination and exploitation activities accordingly, to guarantee the achievement of the desired impact. Multiple venues will be selected depending on the nature and confidentiality of the results, and on the target audience.

The purpose of the present document is to present the exploitation and dissemination plans in detail, listing the foreseen activities. The Project Coordinator is responsible for ensuring that the different activities described herein are performed within the consortium.

2. OBJECTIVES

A-LEAF D&E Plan main objective is to disseminate the knowledge generated in this project to the largest extent and to develop exploitation strategies and activities to ensure a sustainable deployment of the technology. This includes the following objectives:

- Set up the most appropriate dissemination and exploitation mechanisms and strategies
- Expand the scientific community interested in the technology
- Perform targeted dissemination activities for different stakeholders
- Carry out dissemination activities to raise international awareness and interest in the project activities and achieved results
- Encourage cross-fertilization of ideas with other EU, regional and national projects to maximise the impact
- Start partnership with high potential actors in research and innovation and engage interested stakeholders
- Investigate different routes to ensure the successful deployment of the results

3. DISSEMINATION ACTIONS

Dissemination activities aim to establish critical mass and commitment from different stakeholders. Results from project activities will be disseminated to the widest possible community through various channels and instruments. External participation and knowledge sharing will be encouraged through networking activities and events aimed at increasing the impact potential and at enriching the scientific and industry contribution to the project.

3.1 Development of a dissemination strategy

A-LEAF dissemination strategy considers the target audiences as central elements and defines dissemination activities accordingly.

3.1.1 Scientific community – Objective: bring awareness about **A-LEAF** and dissemination of non-classified scientific results.

- Scientific Publications:

Journal articles are one of the most efficient dissemination tools to attract the interest of the scientific community in academia. The consortium partners commit to release at least 20 high impact scientific articles resulting from **A-LEAF** activities.

Publication of **A-LEAF** results in scientific journals will follow the Gold Open Access policy, ensuring full accessibility of results and ensuring their long lasting impact beyond project duration.

Preliminary list of potential titles of specific papers for scientific publications:

- Nature
- Science
- Nature Materials
- Nature Photonics
- Nature Nanotechnology
- Nature Energy
- Advanced Materials
- ACS Nano
- Nanoletters
- Journal of the American Chemical Society
- Angewandte Chemie
- Energy & Environmental Science
- Advanced Energy Materials

Publications will be available for downloading from the **A-LEAF** website (www.a-leaf.eu) and will be deposited in public repositories including ZENODO and OpenAire, as described in the Data Management Plan (DMP).

Gold Open Access payment:

The consortium agrees with the following distribution of costs for publication charges:

a) Consortium Publications:
   a. When a publication is authored by a single partner/institution this partner/institution will cover the costs of the publication (eligible cost in H2020 projects).
   b. When a publication is authored by more than one partner/institution, the charge for publication will be shared among the different co-authors according to the efforts devoted to achieving the results described in the publication. Normally, the percentage of contribution to achieving the results of a publication is declared to the editors when publishing a paper. The percentage of payment will be equal to the percentage of efforts declared to the editor.
b) Publications with members outside the consortium:
   Not many publications with external partners are foreseen in this consortium. However, in the case of a paper resulting from **A-LEAF** activities in collaboration with external members (partners/institutions not included in the **A-LEAF** consortium) the Gold Open Access costs will be agreed among the authors of the publication.
c) Publications outside the timeframe of the project:
   When a publication is sent for peer-review once the project has finished, the consortium will follow Green Open Access instead of Gold Open Access.

- Dissertations and Conferences:

Academic conferences or symposiums are ideal venues to present and discuss results. They provide an important channel for information exchange between researchers.

Partners of **A-LEAF** are committed to attend the most relevant conferences and promote the results of the project through oral talks and/or posters. Conferences will also be a vehicle to increase the networking with other partners and stakeholders interested in the technology.

Preliminary list of potential conferences relevant for **A-LEAF** consortium:

- IPS
- Materials Research Society Conference (MRS)
- Solar Fuels Conference
- American Chemical Society Conference (ACS)
- European Conference on Surface Science (ECOSS)

- ISF
- FET Conference

- Press releases:

A good method to promote the results **A-LEAF** project to the scientific community is through the publication of official press releases. **A-LEAF** consortium members are encouraged to write press releases to announce newsworthy results. Press releases will be published in the **A-LEAF** website and sent to general scientific magazines.

Preliminary list of potential scientific magazines relevant for **A-LEAF** consortium:

- Chemistry World
- Chemistry Views
- Chemical & Engineering News (C&EN)
- Research*eu
- Horizon: the EU research & Innovation Magazine

- Cross fertilization with related European projects and platforms:

Related EU projects will be monitored and, if appropriate, the consortium will establish contact with their coordinators to invite them to give talks or participate in discussions during **A-LEAF**'s meetings.

Preliminary list of potential external projects related to **A-LEAF**:

Project	Main Outcome related to A-LEAF
FOPS-WATER Fundamentals of Photocatalytic Splitting of Water, 2014-2019, ERC-StG, PI: Dr. Ellen Backus, MPI for Polymer Research, Germany	Utilization of surface sensitive spectroscopic technique sum-frequency generation (SFG) to determine the structure of water at the TiO_2 interface and to unravel the dynamics of the photodissociation process.
SUNFUELS Solar thermochemical production of fuels. ERC-AdG, 2013-2018, PI: Prof. Aldo Steinfeld, ETH, Switzerland	Thermodynamic and kinetic analyses of the pertinent redox reaction, solar reactor modelling, solar reactor prototypes for 5kW solar radiative power input to experimentally demonstrate efficient production of solar syngas and their suitability for large-scale industrial implementation.

DIACAT: Diamond materials for the photocatalytic conversion of CO_2 to fine chemicals and fuels using visible light. FETOPEN, 2015-2019, Coordinator: Prof. Anke Krueger, University Würzburg, Germany	Direct transformation of CO_2 into fine chemicals and fuels using man-made diamonds to generate solvated electrons upon visible light irradiation in solution (e.g. water and ionic liquids)
CO2toValue: Internal project at Siemens Corporate Technology (CT) Munich in collaboration with University of Lausanne and University of Bayreuth, PI: Prof. Maximilian Fleisher, Germany	Activating CO_2 and converting it into products (ethylene, CO). Currently the process uses electricity generated from renewable sources but the future goals are to use captured sun light and atmospheric CO_2
Electrochemical Conversion of CO2: EnCO2re project (eit-Climate KIC). COVESTRO participates in this project	Direct electrocatalytic conversion of CO_2 to CO using renewable electricity couples the electrolytic splitting of water into hydrogen and oxygen with re-use of CO_2. The coupling of the two reactions forms the basis for a promising future one-step process technology for reducing/re-using CO_2 emissions in waste gas streams, while delivering valuable chemical products.
Kopernikus projects - Power-to-X COVESTRO participates in this project	Low temperature Co-electrolysis

A-LEAF partners are also willing to contact any platform, network and public engagement or training actions at national and international scale to collaborate with them disseminating the main project activities and results. Some initiatives have already been identified and will be closely followed.

Preliminary list of European platforms/initiatives related to **A-LEAF**

Initiative	Description
AMPEA Advanced Materials and Processes for Energy Applications, Joint Programme from the Europan Energy Research Alliance (EERA)	The main goal of the Joint Programme is to coordinate and promote multidisciplinary joint research in basic science for energy (materials and processes). The coordinator (ICIQ), partner 8 (ICL) and partner 11 (JÜLICH) are members of AMPEA and participate in the General Assemblies and Brokerage Events, where **A-LEAF** results could be disseminated. AMPEA fully supports the development of this project (see letter of support).
FCH JU Fuel Cells and Hydrogen Joint Undertaking	Public Private Partnership formed by the European Commission, the Hydrogen Europe group (industrial) and the N.ERGHY (research grouping). Its main objective is to support research, technological development and demonstration (RTD) activities in fuel cell and hydrogen energy technologies in Europe. In addition, this platform launches its own project calls within the H2020 programme, so there might be funding opportunities for future activities within the consortium. Partners 1, 9 and 10 are members of the partnership. The coordinator, J. R. Galán-Mascarós is the ICIQ's representative at N.ERGHY and he is deeply involved in one of the taskforces working for the establishment of a Strategic reference Document and RoadMap.
UK Solar Fuels Network	The network aims at bringing together academic and industrial researchers in solar fuels and artificial photosynthesis in the UK. Partner 8 (Imperial College) leads this network as well as the Imperial's Artificial Leaf Initiative.
SOFI Solar Fuels Institute	The institute has been created to harness the intellectual firepower of global research institutes and connect them with leading industry partners with the goal of commercializing a liquid solar fuel. **A-LEAF** consortium could participate in their organized events to disseminate outcomes of the project and look for collaborations.
FET2RIN Supporting FET projects to reach out investors. FETOPEN-CSA, 2015-2018, Coordinator: META Group, Italy	The main aim of this project is to facilitate collaborations to set the ground for the take up of FET projects by overcoming obstacles related to market outreach and accessing business leaders. **A-LEAF** consortium will be in contact with this project and will participate in their organized activities, such as training workshops or investor meetings, to maximize **A-LEAF**'s dissemination and exploitation.

OBSERVE Observing Emergence. FETOPEN-CSA, 2015-2017, Coordinator: Fraunhofer ISI, Germany	The overarching aim of the project is to support Europe to grasp leadership early on in new and emerging technology areas that promise to renew the basis for European competitiveness and growth and that will make a difference for society in the decades to come. **A-LEAF** consortium will follow this project and might establish contact with their researchers for fruitful discussions, as advances in artificial photosynthesis will be very important for the energy sector in Europe.
FOTOFUEL Network of Excellence funded by the Spanish Ministry of Innovation and Competitiveness (ENE2014-52280-REDT)	FOTOFUEL is a collaborative national network, coordinated by IMDEA Energy Institute, which aims at promoting the development of materials and devices for the efficient production of solar fuels through the cooperation of several Spanish research groups with expertise in the fields of materials science, photocatalysis and simulation.
DFG Priority Program Solar H2: 2012-2018, Coordinator: Prof. Wolfram Jaegermann, TU Darmstadt	The main goal of the priority program is a merging of distinct research approaches and their results involving different disciplines and expertise: the preparation of photoactive semiconductors and adapted device structures, the synthesis and characterization of electro catalysts, and the fundamental analysis of the involved elementary processes and their theoretical simulation. 16 workgroups from national research institutions are cooperating in the priority program.

- A-LEAF workshops:

Two workshops will be organized to promote awareness of **A-LEAF** objectives and results. Seminars, oral presentations and poster sessions will be included to facilitate maximum sharing of knowledge. Researchers outside **A-LEAF** consortium and other important actors (industrial sector, policy makers and European Commission representatives) will be invited to attend.

The first workshop will take place at ICIQ (Tarragona) in month 24 and the second one in INSTM (University of Messina) in month 48.

- A-LEAF External Advisory Board:

The A-LEAF consortium will establish an External Advisory Board (EAB) in the next PAB meeting (M12).

The EAB will provide non-binding strategic and scientific advice to the consortium to maximise the potential of the results and will offer assistance and know-how when the consortium requires.

The EAB will be composed of accomplished experts offering innovative advice and dynamic perspectives. They will provide strategic direction, guide quality improvement and assess the

project execution effectiveness and they will be in a privileged position to receive (confidential) information on the project. They will be invited to attend the PAB meetings but will not have authority to vote on any consortium matters or bear fiduciary responsibilities.

3.1.2 Industrial sector - Objective: bring awareness about A-LEAF results and establish contacts for technology transfer

- A-LEAF Exploitation and Dissemination Committee (EDC):

The EDC is the consortium body in charge of defining and implementing the dissemination and exploitation plan, monitoring the assets generated during the project and taking the appropriate measures to exploit them.

The Exploitation and Dissemination Committee (EDC) will be chaired by the industrial partner, COV, and will comprise the MT and three other members, that were selected by the PAB in the **A-LEAF** kick-off meeting, as follows:

Members Exploitation and Dissemination Committee		
Chair	COV	Juergen Kintrup
Management Team	ICIQ	J. R. Galán Mascarós
3 Consortium Partners	INSTM	Siglinda Perathoner
	JÜLICH	Friedhelm Finger
	UM	Frédéric Jaouen

- Industrial fairs:

A-LEAF EDC and members will identify and participate in relevant industrial fairs, for instance: SSIS (smart systems industry summit), W3+FAIR, etc. Participation in industrial fairs will allow the consortium to promote the project's technology and establish contacts with companies and stakeholders to gather their feedback and attract their interest as potential investors, consumers or end users.

- Contact with FET Support Actions:

The coordinator will contact FET2RIN, a network focused on supporting other FET projects to reach out investors to increase our network of industrial/private contacts.

- White Paper:

As part of the Dissemination and Exploitation Plan, the consortium will write a white paper at the end of the project, summarizing the most relevant results providing a general overview on the impact of the use of this technology in EU. This white paper, drafted with the support of AMPEA and the JRC-IET, will be sent and presented to relevant policy makers.

3.2 Guidelines for intention of dissemination of results

As stated in the CA, any partner willing to disseminate results of the project by any of the means stated before or any other must give advance notice to the other beneficiaries of at least 21 days together with sufficient information on the results it will disseminate. A thorough summary on the results to be disseminated will be uploaded on the intranet under '*Documents for Dissemination Approval*' and the consortium members will be notified by an email.

Any other beneficiary may object within 21 days of receiving notification if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.

The information facilitated by the partner/partners willing to disseminate certain results will be carefully examined by the EDC. This information must contain sufficient details as to fully understand the extent of the results intended to be disseminated to be able to evaluate whether protection of the results is needed prior dissemination.

4. EXPLOITATION ACTIONS

As described in the Grant Agreement (GA), each beneficiary must — up to four years after the finalization of the project— take measures aiming to ensure 'exploitation' of its results (either directly or indirectly, in particular through transfer or licensing) by:

(a) using them in further research activities (outside the action);

(b) developing, creating or marketing a product or process;

(c) creating and providing a service;

(d) using them in standardisation activities.

Project partners will strive to identify the strongest project exploitation potential at the level of each partner and of the project partnership as a whole, in order to support the development of their current activities, and to possibly enable the launch of new ones.

4.1. Development of an Exploitation Strategy

For the exploitation strategy of this new developed technology the Technical Readiness Level (TRL) is considered as a guiding indicator. The TRL is used to assess the development status of a technology from a basic principle (TRL 1) up to a fully operational product (TRL 9).

The **A-LEAF** project is focused on low TRLs, especially during the first 3 years of the project. The consortium aims to achieve TRL 4, with a photo-electro-catalytic cell able to convert CO_2 and water into solar fuels (or other added-value products) validated in the lab at the end of the project.

Taking the actual and desired TRL into account as well as the background of the different partners, the exploitation strategy at the beginning of the project will focus on scientific exploitation of the results.

The scientific exploitation of **A-LEAF** results will be especially carried out by the academic partners through scientific publications and contributions to conferences. On the other hand **A-LEAF** is also used for scientific education by offering PhD theses and post-doctoral stays on **A-LEAF** topics.

Additional exploitation strategies will be further defined as the project progresses.

4.2 IPR Management

The research carried out during **A-LEAF** will generate significant intellectual property. In order to ensure further and extended industrial and commercial use of the results, the protection of intellectual property rights is a crucial task. This topic has been addressed by the establishment of the Exploitation and Dissemination Committee (see section 3.1.2).

The **A-LEAF** EDC will monitor and identify any sensitive data worthy to being protected, and then capture and prepare appropriate IP protection. COVESTRO has been nominated as the IP Manager to lead the EDC.

The IP management has been defined by the **A-LEAF** Consortium Agreement, which is based on the standard DESCA model.

Two or more beneficiaries own results jointly if: (a) they have jointly generated them and (b) it is not possible to: (i) establish the respective contribution of each beneficiary, or (ii) separate them for the purpose of applying for, obtaining or maintaining their protection (see Article 27).

The joint owners must agree (in writing) on the allocation and terms of exercise of their joint ownership (‘joint ownership agreement’), to ensure compliance with their obligations under this Agreement. Unless otherwise agreed in the joint ownership agreement, each joint owner may grant non-exclusive licences to third parties to exploit jointly-owned results (without any right to sub-license), if the other joint owners are given: (a) at least 45 days advance notice and (b) fair and reasonable compensation. Once the results have been generated, joint owners may agree (in writing) to apply another regime than joint ownership (such as, for instance, transfer to a single owner (see Article 30) with access rights for the others).

A specific report on patentability and IP protection strategies will be prepared (Deliverable 7.5, Month 42) towards the end of the project focused on the expected final outcome, a working device. The report will have into account the previous protected results and the final design, cost and functionality characteristics that can be protected and further exploited after the end of the project.

4.3 Knowledge Management and Protection Strategy

The most appropriate process of capturing, developing, sharing, and effectively using organizational knowledge will be defined by the **A-LEAF** Project Advisory Board according to the measures imposed by the pilot on Open Research Data.

The project's intranet will be a paramount tool for information sharing and knowledge management amongst the members of this consortium. The **A-LEAF** intranet is password protected and only the partners participating in this project have access to it.

The intranet will contain all the information and documents generated as a result of this action, including progress reports, deliverables, formal reports corresponding to each of the reporting periods, minutes of the PAB meetings, work package leaders meetings, etc.

The consortium members will be notified by e-mail when an important document is uploaded in the intranet.

5. INFORMATION ON EU FUNDING

Unless the Commission requests or agrees otherwise, or unless it is impossible, any dissemination of results (in any form, including electronic) must:

(a) display the EU emblem and

(b) include the following text:

"This project has received funding from the European Union's Horizon 2020 research and innovation programme *under grant agreement No 732840".*

When displayed together with another logo, the EU emblem must have appropriate prominence.

Applications for protection of results (including patent applications) filed by or on behalf of a beneficiary must — unless the Commission requests or agrees otherwise or unless it is impossible — include the following:

"The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme *under grant agreement No 732840".*

6. PARTNERS' RESPONSIBILITIES

All A-LEAF partners must contribute to disseminate and exploit the results of the project. Partners must use the project's logo and EU emblem in all their dissemination and exploitation activities.

ICIQ is the WP Leader of the WP7. Dissemination, Exploitation and Communication. Therefore, regarding the dissemination and exploitation actions, ICIQ will be in charge of:

- Collecting, archiving and depositing publications and uploading them in the A-LEAF webpage, ZENODO and OPENAIRE
- Collecting attendance to conferences and posters presented
- WP deliverables preparation
- Informing consortium members about important aspects related with this WP

In addition, each partner will have his/her own responsibilities:

- To prepare the 6-month progress reports where dissemination and exploitation activities will be included when relevant
- To inform and send the coordinator the A-LEAF posters presented by their institution in conferences, seminars or workshops
- To keep a fluent communication with the project coordinator and, whenever possible, provide information of any dissemination and exploitation activities developed within the framework of the project

List of major modifications:

- **Page 10 of 16**: *A-LEAF workshops*

Erratum: The first workshop will take place at ICIQ (Tarragona) in month 24 and the second one in INSTM (University of Messina) in month 48.

- **Page 10 of 16**: *A-LEAF External Advisory Board*

Modification: The A-LEAF consortium will establish an External Advisory Board (EAB) in the next PAB meeting (M12).

- **Page 11 of 16**: *A-LEAF Exploitation and Dissemination Committee (EDC)*

Change: The previous chair of the Exploitation and Dissemination Committee, André Rittermeier has been substituted by Juergen Kintrup.

- **Page 12 of 16**: *3.2 Guidelines for intention of dissemination of results*

Addition: A thorough summary on the results to be disseminated will be uploaded on the intranet under '*Documents for Dissemination Approval*' and the consortium members will be notified by an email.

- **Page 12 of 16**: *4.1. Development of an Exploitation Strategy*

Erratum: The numbering of the section is not correct. 5.1 has been changed to 4.1

- **Page 13 of 16**: *4.2 IPR Management*

Erratum: The numbering of the section is not correct. 5.2 has been changed to 4.2

- **Page 13 of 16**: *4.2 IPR Management*

Erratum: The referral to the section has been changed: 'This topic has been addressed by the establishment of the Exploitation and Dissemination Committee (see section 3.1.2)' instead of (see section 4.2.1)

- **Page 14 of 16**: *4.3 Knowledge Management and Protection Strategy*

Erratum: The numbering of the section is not correct. 5.3 has been changed to 4.3

- **Page 15 of 16**: *6. Partners' responsibilities*

New addition: A new section on partners' responsibilities