SUSTAINABLE AND LOW ENERGY WATEWATER TREATMENT FOR WARM CLIMATES

AFTER LIFE COMMUNICATION PLAN

LIFE14 ENV/ES/000203

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LIFE CELSIUS

With the contribution of the LIFE financial instrument of the European Union

INTRODUCTION

This deliverable is part of Action E. Monitoring of the impact of the project actions, more specifically Action E.3. After LIFE Plan. The aim of this action is to set the planning to be carried out after the end of the project that assures the dissemination and communication of the project results in order to obtain an important impact in the target audience.

This report sets out how the consortium plans to **continue disseminating and communicating results** after the end of LIFE funding and indicates a set of detailed actions that will be carried out, when, by whom, the target audience of these actions and the origin of technical and economic resources to continue its implementation.

THE LIFE CELSIUS PROJECT

LIFE CELSIUS is a three-year project supported and financed by the European Commission under the LIFE programme with a budget of 732,049 € (EU contribution of 436,377 €), and led by ACCIONA Agua. This company has a top position within the field of water treatment worldwide. The other member of the project is the EFE Agency, whose functions include o provide wide information dissemination about the main themes of the project, contributing to the success of its objectives.

The main objective of the CELSIUS project, developed at the Wastewater Treatment Plant (WWTP) of Archena (Murcia, Spain) is to develop and demonstrate a wastewater treatment system characterized by low energy consumption for warm climate areas. The system proposed is the result of the combination of two innovative treatment processes: Anaerobic Membrane Bioreactor (AnMBR) and Partial Nitrification/Anammox Treatment. The first targets organic matter removal while the second focuses on nitrogen elimination.

The proposed approach involved experimentation with an AnMBR – Partial Nitrification/Anammox pilot plant.It was representative of full-scale conditions and was suited for treatment of wastewater originated in warm-climate areas with low availability of energetic resources or limited energy accessibility.

To fulfil this objective, the following specific objectives werer taken into account:

- To reduce the energy consumption of organic matter removal through the optimization of a mainstream anaerobic MBR. Compared to the conventional treatment processes, this process was expected to reduce 60% of the energy consumption for the organic matter removal.

- To reduce the energy consumption of nitrogen removal through the development of advanced control schemes and appropriate operational strategies for the partial

nitrification/anammox process. Compared to the conventional treatment, a reduction of 60% of the energy consumed for nitrogen removal was expected.

- To eliminate the pollution in terms of organic matter and nitrogen from the incoming wastewater, through the optimization of not only the individual processes, but also of the system as a whole.

- To evaluate the feasibility for full-scale application of the optimized system in warm-climate areas such as South America, India, Africa and in European countries in the Mediterranean basin.

- To transfer the acquired knowledge to stakeholders by means of specific education and dissemination strategies and platforms as well as recommendations to policy makers.

ACCIONA Agua and EFE Agency drew up a number of lines of action to achieve the goals of the LIFE-OFREA project.

Design and implementation of the pilot plant. The design and the implementation of the pilot plant were developed by ACCIONA Agua employees. The efforts focused on the construction of the partial nitrification / anammox treatment. This included the development of an aeration advanced control for partial nitrification.

Process startups and optimization: The next step was the startup and optimization of the overall treatment train. Optimization was subdivided into three tasks, related to the optimization of Anaerobic Membrane Bioreactor (AnMBR), partial nitrification and Anammox processes. These tasks were carried out by ACCIONA Agua R&D Department. During the optimization phase, limitations due to water quality were detected and a new scheme of the water treatment train was proposed: the replacement of the AnMBR by a high rateaerobic treatment.

Pilot plant demonstration: The novel technologies proposed in this project were demonstrated in the pilot plant. In this action, an analytical campaign was needed to test the effluent quality. Additionally, the energy consumption was[1]. At the end of the project, a full evaluation of the system will be carried out. This action also is being carried out by ACCIONA Agua.

Monitoring of the impact of the project action: The impact monitoring is divided into two actions, the first one to monitor the environmental benefits of the project and the second one, regarding the socioeconomic impact of the project. After an initial review of the situation, the follow up of the main indicators is being done along the project. Final conclusions regarding the impact of the project will be summarized by the end of the project.

Communication and Dissemination Actions: Project results were presented in different events. Moreover, detailed information on the project is publicly available in the project web page. To

[1] Also biogas production was expected to be assesed during this phase, however by then the AnMBR was already substitued by the high load aerobic system.

broaden the audience of these materials, the project is advertised in ACCIONA Agua's web page and announced by EFE/EFEverde in order to spread the project into the general public. The responsible of these actions are ACCIONA Agua's and EFE agency employees.

Project Management and Monitoring of the project progress: The project is counting with an adequate coordination and organisation, necessary to assure and establish communication flow and reporting to the EC, project follow-up, decision making procedures and networking and interaction with third parties.

RESULTS AND CONCLUSIONS

The CELSIUS project was expected to contribute to achieve the environmental objectives defined by the DG Environment, securing the Union's long term prosperity within ecological limits, based on a smart, sustainable and inclusive economy, improved quality of life and wellbeing of citizens and a healthy environment. This could be achieved thankd to elimination of 90% organic matter that took place in the pilot plant, together with more than 95% nitrogen removal from the incoming wastewater at the energy demands will be possible which was also achieved. For instance Figure 1shows the good results obtained by one of the two anammox systems, the biofilter. It achieved a nitrogen elimination rate over 6 kg N/m^3 day, which entail a total nitrogen in the influent of 5,5 mg/L. This will have a significant impact in terms of eutrophication and hypoxia prevention in the areas where the treatment system will be implemented.

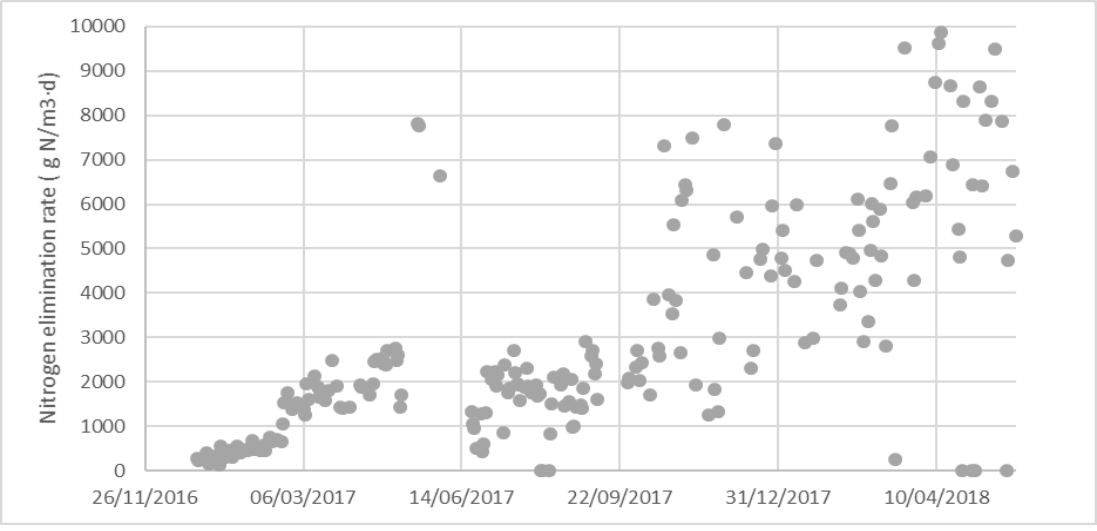

Figure 1 Nitrogen elimination rate normalized at 20°C of the Biofilter from March 2016 until -June 2018.

A full evaluation of the system is being carried out, in which the environmental outcomes accomplished are being assessed. This includes the energy yield of the technology, critical for considering the success of the project.

MAIN COMMUNICATION ACTIVITIES

The following communication and dissemination actions have been carried out by 06/2018:

- **Dissemination products** about the project have been distributed among target audience (see the following subsection).
- **Networking** was established with Administration and with other LIFE project, specially those with related topics. Moreover, a database with the main actors for networking has been created.
- **Attendance to congresses, conferences and workshops:**
  - LIFE kick-off Meeting (Amadora, Portugal, November 2015).
  - LIFE Water Platform Meeting (Manchester, UK, May 2016).
  - LIFE OFREA Final Workshop (San Pedro del Pinatar, Murcia, September 2016).
  - Technical Seminar on Advanced Processes for Wastewater Treatment and Post-Treatment (Santander, October 2016).
  - XI International AEDyR Congress (Valencia, October 2016).
  - V Conference on Water Cycle and Environmental Management (Murcia, February 2017).
  - MyBRM Workshop (Barcelona, June 2017).
  - LIFE STO3RE Workshop (Murcia, June 2017).
  - Conference on technological applications for the management, treatment and recovery of sludge (Madrid, July, 2017).
  - Workshop "Innovative water saving solutions" (Munich, Germany, September 2017).
  - Porto Water Innovation Week 2017 (Porto, Portugal, September 2017).
  - Granular Sludge Conference (Delft, Netherlands, March 2018).
  - LIFE RENEWAT Final Workshop (Madrid, October 2017).
  - Workshop "The challenge of wastewater treatment in the 21st century" (Madrid, April 2018).
  - LIFE RAMSES Final Workshop (Blanca, Murcia, May 2017).
  - XII International AEDyR Congress (Toledo, foreseen for October 2018).
- **Events organization:**
  - Workshop in SIGA Fair (Madrid, March 2017).
  - LIFE CELSIUS Open Day for educational institutions (Archena, November 2017)
  - LIFE CELSIUS Final Workshop (Madrid, foreseen for September 2018).

MAIN DISSEMINATION PRODUCTS

- **LIFE CELSIUS website:** Launched by February 2016. Details included in D.D.2.
- **Press articles releases:** Periodically, in specialized magazines (Futurenviro, www.aguasresiduales.info, Retema, iAgua) and newspapers.
- **Social media presence:** YouTube channel, facebook, Twitter, Linkedin.
- **Dissemination through EFE Agency's own channels:** Efeverde.com, EFE Agency Mobile App, radio program *EFE Mangas Verdes*
- **Brochures:** Two set of brochures were released and distributed on dissemination events as well by mailing to a number of stakeholders, and printed in English and Spanish.
- **Layman's report:** Launched in June, 2018.
- **Videos:** Some videos were released, all of them created by EFE Agency, and are published in the project website.
- **Project posters.**
- **Roll-up with project general information.**
- **Project logo launched by March 2017.**
- **Power Point presentations:** Presentations were created on purpose in order to disseminate the project in inmost of the previously mentioned events.
- **Notice boards**. Two different notices boards were performed. Details included in D.D.1.

THE AFTER-LIFE COMMUNICATION PLAN

The after-life plan of LIFE CELSIUS is scheduled for a 5 years period after the completion of the project (2018-2023).

MAIN GOALS

The main objectives of the After-LIFE Communication Plan are the following:

- To continue disseminating the project results in order to boost the implementation of the technology and to raise awareness especially among final end users.
- To reinforce those dissemination activities that have not achieved the expected results, either to reach the defined audience or to properly communicate the results.
- To develop a communication strategy for the actions continuing after the project.
- To identify pitfalls or new researching lines derived from the project.
- To identify future collaborations for R&D and demonstration projects.
- To bring LIFE CELSIUS closer to the citizens by showing the positive impact of the project on water availability in certain areas with warm climates.

ACTIVITIES

Future continuous communication actions are described in this section.

Dissemination of final results

The results of the project will be presented at national and international events and disseminated among the main water stakeholders. Partners will attend at professional meetings in order to publicize this LIFE project, where dissemination material will be distributed

- **When:** Periodical, once an organization announce it.
- **Who:** Consortium members' staff.
- **Preparation of support documents for conferences:** Dissemination products (brochures, poster, roll-up, etc.), Power Point presentations.
- **Resources:** Consortium own resources.

Creation of dissemination products

It is intended to distribute the dissemination products generated (including new brochures created after the end of the project) among associations, companies, environmental bodies, etc. Also, rather than updating the existing brochures ACCIONA Agua would include project results is other dissemination materials created for specific events such as the World Water Day, promotional material of the company, press releases, etc.

- **When:** Periodical, ACCIONA Agua has always dissemination products to distribute in their business promotion activities.
- **Who:** ACCIONA Agua.
- **Resources:** ACCIONA Agua own resources.

Publish the outcomes in scientific and trade magazines

It is expected to issue materials regarding the most relevant results for publication in scientific peer-reviewed journals and trade magazines, at regional, national or European levels, as well as in newspapers and paper and electronic magazines for the general public.

- **When:** Periodically.
- **Who:** Consortium members' staff.
- **Resources:** ACCIONA Agua own resources.

Maintenance of the project web site

The project website, accessible via www.lifecelsius.com has been used as an important management tool in Internet. Through this website, it is possible to access all the information related to the project and about the results obtained, Layman report, etc. The information will be available in Spanish and English to increase the potential number of readers interested in the project. The website will be kept alive after the end of the project, for at least five years, and it will be periodically updated with project results, events and possible post-LIFE news of interest related to the use of water management techniques that are environmentally friendly.

- **When:** Periodically updates, depending on the information available.
- **Who:** EFE Agency.
- **Resources:** EFE Agency own resources.

Visits to the LIFE CELSIUS pilot plant

Future users of the technology and/or technology developers and suppliers could be interested in visiting ACCIONA facilities in order to learn more about the pilot plant performance. The project participants will invite these entities to visit it, and will provide information about its performing on the site.

- **When:** Periodically, depending on the requests.
- **Who:** Consortium members' staff.
- **Resources:** ACCIONA Agua own resources.

Follow-up projects

The findings of LIFE-CELSIUS project will fundament future projects for better understanding of certain aspects of the technology developed, with own funds, but also under national and regional calls.

- **When:** Periodically, depending on the calls and the needs detected with the development of the technology. (STARNIT project started at the beginning of 2018 and it is focused on the improvement of partial nitrification control based in the use of Free Nitrous Acid. Funded by Spanish Government).
- **Who:** Consortium members' staff.
- **Resources:** ACCIONA Agua own resources, or regional, national or transnational funds.

Technology transfer activities

- Technology transfer in order to be able to scale-up the plant in a real application. First, internal technology transfer to the Commercial Department of ACCIONA Agua will be performed in order to make the bids for new plants with the technology developed within the project. Once the first tender with the technology is awarded, the Execution Dept. will construct the first full-scale plant advised by the R&D Dept.
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- **When:** After the end of the project, progressively. Collaboration with Aragon 8B WWTP's foreseen by 2019.
- **Who:** R&D Dept. in collaboration with the Technical and Execution Depts.
- **Resources:** ACCIONA Agua and potential partners resources.

TARGET AUDIENCE

The following target groups have been identified by partners in order to transfer the project results at regional, national and European level once the project is finished.

- **Administration and decision-makers** (central, regional, local), represented by ministries, departments, environmental and water agencies or municipalities. This target group includes the relevant authorities responsible of constructing public-owned sewer networks and treatment plants. They are also likely to be the relevant authorities granting planning permission for such operations if these are to be completed by the private sector. They are responsible for maintaining or improving the quality of fresh, marine, surface and underground water. They are also responsible of implementing maintaining and reinforcing the compliance of EC policies and legislation related to the water sector as well as providing guidance to affected sectors (industry, farming, and general public). Awareness of the novel technology by government agencies will accelerate its acceptance and implementation.

- **Research centres/institutes and universities:** They perform technical investigation about monitoring equipment and standards, environmental quality standards, toxicity assessments and water analysis, among others. To widespread project's outcomes among this target audience, main results and ideas of the innovative process will be disseminated in national and international scientific conferences.

- **Future users of the technology**, including water and sewerage providers or industries that use large amounts of water in their processing with noticeable nitrogen content, such us fisheries, tanneries, etc. They construct and operate water and waste water treatment plants. Both sub-groups will benefit from project results.

- **General public:** The presence of organic matter and nitrogen in water supplies poses a risk to public health and is also generating interest among the general public. Water shortages and water resources availability is one of the subjects of major interest for the general public. It is important to inform them that measures to guarantee water supply are being developed, as the novel technology developed and its beneficial impact to society.

Table 1. Audience targeted by the After-LIFE Communication Plan

Activities/Target audience	Administration and decision-makers	Research centres/institutes and universities	Future users of the technology	General Public

Dissemination of final results	✓	✓	✓	
Creation of dissemination products	✓	✓	✓	✓
Publish the outcomes in scientific and trade magazines	✓	✓	✓	
Maintenance of the project web site	✓	✓	✓	✓
Visits to the life Celsius pilot plant		✓	✓	✓
Technology transfer activities			✓	

COMMUNICATION CHANNELS

The communication channels that will be used to make the after LIFE communication plan a success are the following:

- **Mass media channels:** radio, World Wide Web and print media (magazines, scientific journals, etc.). Dissemination through mass media channels has the goal of reaching high-level institutional groups or the general public.
- **Specialist channels:** technical or research publications, trade journals, conferences, workshops, etc. This is the most suitable channel to reach the target group consisting of research centres and end-users of the LIFE CELSIUS technology.
- **Direct channels:** letter writing, networking, workgroups, direct contact with relevant decision-makers, etc.
- **Reference channels:** online or offline directories and catalogues.

Among the abovementioned, the partners envisage that the following channel might be the best methods of dissemination: website of the project, networking, conferences and seminars.

PLAN IMPLEMENTATION

The suitability of this communication plan as well as its effectiveness in implementation will be revised at least once a year.

Evaluation will be performed on the basis of the following key measuring indicators:

- Has the target group already been involved or contacted?: Yes, no or partially.
- Is there any other target group identified? If yes, it should be included in the plan describing its interest in the project results.
- Are the already established communication practices effective? If not, a new proposal should be described.
- Adequacy of communication products: adequate, not adequate, or partially adequate. In case of any of the two former options, a new proposal should be described.

If as a result of such evaluation a new version of the After LIFE communication Plan will be generated, it will be distributed between the partners.

PROJECT & PARTNERS DATA

GENERAL DATA	
PROJECT LOCATION	Archena (Murcia), Spain
PROJECT START DATE	01/10/2015
PROJECT END DATE	30/09/2018
TOTAL PROJECT DURATION	36 months
TOTAL COST	732,049.00 €
EC CONTRIBUTION	436,377.00 €
PROJECT WEBSITE	http://www.lifecelsius.com/
EMAIL	mariamar.mico.reche@acciona.com

PARTNERS DATA	
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