



Towards Sustainable Treatment and Reuse of Wastewater in the Mediterranean Region

Portfolio of Outreach Activities (Output 6.2)

31 October 2023

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Executive Summary

The **Portfolio of Outreach Activities** brings an overview of the different types of stakeholder engagement activities that were organized over the lifetime of the ENI CBC Med funded AQUACYCLE Project

A preliminary chapter brings a highly condensed summary overview, informing about the respective audiences that were targeted, as well as the key performance indicators and main outcomes achieved.

This is followed by a detailed description of the different types of outreach activities, which have been spread out over 10 individual chapters:

1. First Series of Stakeholder Workshops
2. Second Series of Stakeholder Workshops
3. Third Series of Stakeholder Workshops
4. Interviews with water stakeholders
5. Final Conference
6. Synergies and clustering events with ENI CBC Med funded projects
7. Synergies with other EU funded projects
8. Participation in brokerage and innovation events
9. AQUACYCLE meets up with junior high school students
10. AQUAYCLE in the media

Introductory overview of Outreach Activities

Table 1 brings an overview of the outreach activities that were organized during the lifetime of the AQUACYCLE project which ran from 1st September 2019 until 31 October 2023 (50 months), their respective target audiences and the related key achievements.

It is deemed especially noteworthy that the MedAPOC Charter (Output 6.3, final version) collects the feedback, viewpoints and expectations from farmers, local community representatives, policy- and decision makers at the national and local levels as well as of invited experts who joined in one or several of the workshops that were organized over the lifetime of the project.

The synergies that were developed with ‘sister’ projects funded under the Water Efficiency pillar of the ENI CBC Med Programme as well as those developed with other EU funded projects proved highly instrumental in supporting and promoting the cross-border sharing and exchange of knowledge and of project outcomes.

It should also be noted that although the engagement with junior high school students in Greece and Spain did not form part of the originally foreseen activities, this proved a worthwhile and highly successful activity.

Table 1: Overview of Outreach Activities, Target Audiences, Key Performance Indicators and Outcomes

Outreach Activity (originally foreseen target)	Target Audiences that were actively involved	Key Performance Indicators (KPIs) and Key Outcomes
1. First Series of Stakeholder Workshops (aggregate of 75 participants in Lebanon, Tunisia and Spain)	<ul style="list-style-type: none"> ➤ National, regional and local entities involved with water and sanitation in Lebanon and Tunisia ➤ Wastewater treatment plant operators and technicians, scientific community in Spain 	<ul style="list-style-type: none"> ✓ Aggregate of 123 participants; ✓ Formulation of a strategic vision for the water and sanitation sector in Lebanon, Spain and Tunisia
2. Second Series of Stakeholder Workshops (aggregate of 30 Active PGIS Users in Lebanon and Tunisia)	<ul style="list-style-type: none"> ➤ Local communities around the pilot demo sites in Lebanon and Tunisia ➤ Wastewater treatment plant operators and technicians, scientific community in Spain 	<ul style="list-style-type: none"> ✓ 57 Active PGIS Users in Lebanon and Tunisia; ✓ Demonstration that is perfectly feasible for local communities to have their say in the drawing up of actions plans for the reuse of treated wastewater
3. Third Series of Stakeholder Workshops (aggregate of 75 participants, 3 action plans for the reuse of 300.000 m ³ of treated wastewater per year)	<ul style="list-style-type: none"> ➤ National, regional and local entities involved with water and sanitation in Lebanon and Tunisia ➤ Wastewater treatment plant operators and technicians, scientific community in Spain 	<ul style="list-style-type: none"> ✓ Aggregate of 107 participants; ✓ 2 Local Action Plans for the Reuse of 300.000 m³ of Treated wastewater per annum in Lebanon and Tunisia; ✓ 1 Actual Reuse Plan of 12.5 million m³ of treated wastewater per annum in Murcia Region of Spain
4. Interviews with water stakeholders (15 Interviews with public and private entities in the water and sanitation sector)	<ul style="list-style-type: none"> ➤ Public and private entities involved with water and sanitation at the national and local level in Lebanon and in Tunisia ➤ Wastewater treatment plant operators in Spain 	<ul style="list-style-type: none"> ✓ 19 interviews with public and private entities in the water and sanitation sectors of Algeria, Lebanon, Spain and Tunisia ✓ Associated Partner, SEAL, of its own initiative, conducted four of these interviews in Algeria

<p>5. Final Conference (over 100 participants)</p>	<ul style="list-style-type: none"> ➤ Policy- and decision-makers in Lebanon’s water and sanitation sector ➤ Unions of Municipalities and other organized actors in Lebanon ➤ Wastewater treatment plant operators ➤ Scientific community 	<ul style="list-style-type: none"> ✓ 200 participants, i.e. double the originally foreseen number of participants joined the event ✓ Participation of high-level policy and decision-makers and of stakeholders in Lebanon’s water and sanitation sector ✓ Extensive coverage of event on National media
<p>6. Synergies with ENI CBC Med funded projects (Invited presentations and clustering events with 5 ‘sister’ projects)</p>	<ul style="list-style-type: none"> ➤ Water stakeholders around the Mediterranean ➤ Scientific community 	<ul style="list-style-type: none"> ✓ Initial effort by Dr. Konstantinos Plakas, CERTH to bring together the 5 projects funded under the ‘Water Efficiency’ Pillar, then continued under the coordination of JTS ✓ More than 15 invited presentations of sister projects in AQUACYCLE events and vice versa ✓ Clustering event of 5 sister projects at CEST2021 Conference, organized by CERTH as a Special Session with the theme <i>Sustainable Management of Water in the Mediterranean</i> ✓ Dr. Konstantinos Plakas, CERTH successfully submits MedWayCap proposal in response to ENI CBC Med Capitalization Call which brings together representatives of MEDISS, MENAWARA, NAWAMED, MAIA-TAQA, and AQUACYCLE
<p>7. Synergies with other EU funded projects’ (Horizon2020, Life, etc.)</p>	<ul style="list-style-type: none"> ➤ Scientific community ➤ Water stakeholders around the Mediterranean 	<ul style="list-style-type: none"> ✓ More than 15 presentations on AQUACYCLE in conferences and webinars organized by other EU funded projects
<p>8. AQUACYCLE at brokerage and innovation events (Participation in 1 expo or fair, and in 1 brokerage event)</p>	<ul style="list-style-type: none"> ➤ Investors ➤ Public and private entities involved in the water and sanitation sector ➤ Wastewater treatment plant operators and technicians ➤ Scientific community 	<ul style="list-style-type: none"> ✓ 2000 visitors at Ecological Construction and Innovation Days’ Fair in Tunisia ✓ 280 visitors to AQUACYCLE booth at Water-Energy-Food-Environment Nexus Innovation Week (online brokerage event)
<p>9. AQUACYCLE meets up with junior high-school students (Activity not originally foreseen)</p>	<ul style="list-style-type: none"> ➤ High School Students and their Teachers 	<ul style="list-style-type: none"> ✓ over 100 teenage students participated in the visits to 2 junior high schools in Greece, organized by the Lead Beneficiary, CERTH ✓ 50 teenage students visit booth with AQUACYCLE posters set up by CIEMAT-PSA in fair organized by the University of Almería
<p>10. AQUACYCLE in the media</p>	<ul style="list-style-type: none"> ➤ General public 	<ul style="list-style-type: none"> ✓ Extensive media coverage of AQUACYCLE on TV and Radio Channels

1. First Series of Stakeholder Workshops

The first series of stakeholder workshops was organized on the theme ‘**Changing the paradigm of wastewater reuse**’ and took place in each of the locations where the demonstration of the project’s eco-innovative wastewater treatment system - abbreviated to APOC wastewater treatment system - was foreseen, as illustrated in Fig. 1.



Figure 1: Planned locations for the APOC demonstration units

The target audience of the first series of stakeholder workshops were entities involved with the use of non-conventional water resources at national level, as well as those entities involved at regional and local level.

The main objective of the workshop was to collect **Stakeholders’ Expectations and Training Needs** from the novel domestic wastewater treatment technology, which were collected in Output 3.3. By and large, participants of the events reaffirmed the findings of the **Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis of the local governance framework** (Output 3.1) with respect to wastewater treatment and reuse that was presented for feedback. Thus, the **need for a new vision to address the poor sanitation situation in Lebanon**, and the **need for a revised strategy to encourage the use of treated domestic effluent in Tunisia**, were both soundly endorsed by the respective audiences. The low cost and ease of operation and maintenance of the APOC system were found to be of particular interest in both countries. Due to restrictions on travel, the event in Spain could not be organized as a physical event. However, as many as 70 participants joined the webinar that was organized instead. This achievement can be largely attributed to the inclusion on the agenda of keynote presentations on the latest advances in each of the components of the APOC system, i.e. anaerobic digestion, constructed wetland and solar disinfection. This had clearly drawn the attention of water treatment plant managers and technicians from around Spain. Hence, the webinar provided the opportunity to respond to the recommendation from the aforementioned SWOT analysis, i.e. **to share the region of Murcia’s high-level expertise to other regions in Spain**.

An aggregate of **123 participants joined the events**, comfortably exceeding the target of 25 participants at each event.

Table 2: Number of participants who joined the First Series of Stakeholder Workshops

Outreach activity	Lebanon	Spain	Tunisia
1.1 First Series of Stakeholder Workshops	25 participants	70 participants	28 participants

2. Second Series of Stakeholder Workshops

The second series of stakeholder workshops was targeted to the local communities around the foreseen pilot demonstration sites in Lebanon and in Tunisia (see Fig. 1), while in Spain it was moved to Tabernas municipality in Almería province, which is adjacent to the Region of Murcia, as shown in Fig 2. The latter was motivated by the fact that the level of treated wastewater reuse in Murcia is among the highest in Europe, whereas the level or reuse in the Almería province continues to be minimal.



Figure 2: View of Tabernas municipality as the selected venue for the workshop (left) and the location of Tabernas and of the Blanca pilot demo plant site in Spain (right)

The workshops had a dual purpose, i.e., (1) to enable the collection of bottom-up inputs towards the drawing up of reuse action plans of treated domestic wastewater, and (2) to collect the ‘voices’ and ‘aspirations’ with respect to reuse of treated domestic wastewater of local communities in Lebanon, Spain and Tunisia in a charter for the safe and sustainable reuse of treated domestic wastewater, i.e., the foreseen MedAPOC Charter. The overall aim was to bring about a much-needed paradigm shift in how the safe reuse of treated domestic wastewater should be looked at: **All water is too precious to waste!**

The workshops proved that is perfectly feasible for local communities to take an active part in the drawing up of action plans for the reuse of treated wastewater. This foremost conclusion corroborates the theme of the second series of stakeholder workshop: **‘Have your say in the drawing up of reuse action plans of treated wastewater’**. It supports and brings evidence that is perfectly feasible to democratize spatial decision-making in the water and sanitation sector.

This activity was facilitated through the setting up of Participatory GIS (PGIS) Landing pages for the respective sites in Lebanon, Spain, and Tunisia on google-my-maps. A detailed description of the process, which included the selection of thematic layers (e.g., surface water drainage network) and the addition of a layer depicting places of interest in the respective areas has been documented in ‘Online PGIS environment for participatory planning’ (Output 3.4). Full details on the outcomes of the workshops have been provided in Active PGIS Users (Output 5.1)

An aggregate of 57 active PGIS Users took part in Lebanon and in Tunisia, once again comfortably exceeding the original target of 30 PGIS Users, and 34 participants joined the event in Spain.

Table 3: Number of participants who joined the Second Series of Stakeholder Workshops

Outreach activity	Lebanon	Spain	Tunisia
1.2 Second Series of Stakeholder Workshops	20 participants	34 participants	37 participants

3. Third Series of Stakeholder Workshops

The third series of stakeholder workshops had a two-fold purpose:

- 1) To invite an appraisal of the project’s WebGIS to arrive at actions plans for the reuse of treated wastewater; and
- 2) To invite viewpoints on investment routes and opportunities for the implementation of action plans for the reuse of treated wastewater.

The workshop in Lebanon was joined mainly by representatives of Unions of Municipalities and councillors of municipalities. In Tunisia, it was joined mainly by policy- and decision-makers at the national level in the water and sanitation, agricultural and education sectors. Organized as a webinar in Spain, the event was joined mainly by wastewater treatment plant operators and technicians, as well as by entities involved in the planning and design of wastewater treatment projects, and research entities on wastewater treatment systems. Prior to the workshop, the partners in Lebanon and in Tunisia drew up actions plans for the reuse of treated wastewater with a target volume of 300.000 m³ per year, using the WebGIS functionality of the Irrigation Decision Support Tool developed by CERTH, and illustrated in Fig. 3.

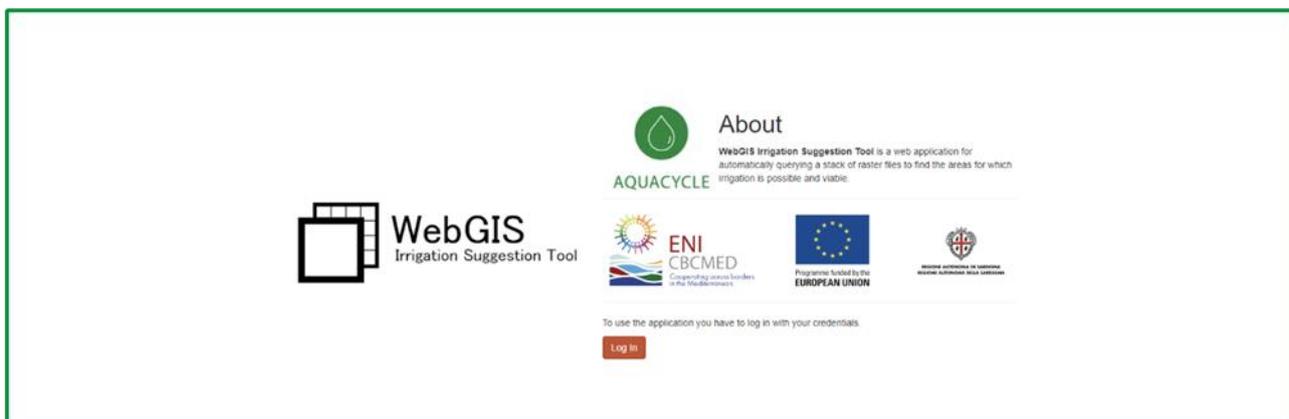


Figure 3: Access page to the online Irrigation Suggestion Tool (<http://web-gis-irrigation.iti.gr/>)

The feedback on these proposed action plans and on potential investment routes were collected in Local Action and Investment Plans (Output 6.1). The latter report also informs on how the deliberations during the workshop in Tunisia led to the drafting of a Memorandum of Understanding on the Treatment and Reuse of Wastewater. Key invited experts to the webinar in Spain shared their views on the action plans which Murcia and Almería are adopting to comply with the new EU Regulation on the Minimum Requirements for Water Reuse, which entered into force on 26 June 2023¹.

In similar fashion to the first and second series, also the third series of workshops were joined by an aggregate of **117 participants**, exceeding the originally foreseen target of 75 participants across the three workshops as illustrated in Table 4.

Table 4: Number of participants who joined the Third Series of Stakeholder Workshops

Outreach Activity	Lebanon	Spain	Tunisia
1.3 Third Series of Stakeholder Workshops	23 participants	55 participants	39 participants

¹ Regulation (EU) 2020/741 of the European Parliament and of the Council of 25 May 2020 on minimum requirements for water reuse (OJ L 177, 5.6.2020, pp. 32–55)

4. Interviews with water stakeholders

4.1 Interviews with public entities in the water and sanitation sector

Public entities involved with the use of non-conventional water resources were invited to take part in one-to-one interviews. An aggregate of **15 interviews** took place in Lebanon, Spain and Tunisia. The outcomes of these interviews, together with a review of available studies on the current status of wastewater treatment and reuse, enabled the formulation of strategies addressed to policy makers, which was reported in the SWOT Analysis of the Local Governance Framework (Output 5.1).

It merits special note that the Associated Partner SEAL took the (own!) initiative to **interview four entities in Algeria**.

The interviews organized by the Lebanese University in the AQUACYCLE Partnership were collected also in a dedicated video clip with subtitles, respectively [in English](#), and [in French](#).



Figure 4: Thumbnail of video clip bringing stakeholder interviews in Lebanon

5. Final Conference

5.1 Call to join Mediterranean Wastewater Reuse Alliance

The Final Conference of the ENI CBC Med funded AQUACYCLE project took place at the Chamber of Commerce, Industry & Agriculture in Tripoli, Lebanon during 23 to 24 June 2023. The event, organized by the Lebanese University (LU) under the Patronage and Presence of the Minister of Environment, Dr. Nasser Yassin, was joined by over 200 participants and received extensive media coverage, including Lebanon's national TV channel "TeleLiban" which can be accessed through [this link](#).

Snippets from the Final Conference were collected in this [short video clip](#) and the proceedings of the event can be found [in this report](#), both of which were prepared by the Lebanese University team.

The event foremost created the opportunity to invite everyone to sign up to the project's Charter, referred to as the MedAPOC Charter.



Figure 5: Cover image of news post on project website inviting water stakeholders and other interested parties to join the AQUACYCLE's project Mediterranean Wastewater Reuse Alliance

5.2 Press Release marking the successful conclusion of the AQUACYCLE Conference

Farmers around the Mediterranean, including farmers in Lebanon, have drawn our attention that they are having less and less access to freshwater. The AQUACYCLE project brings an eco-innovative solution in the form of a three-stage wastewater treatment system. Moreover, this system brings multiple benefits beyond what conventional treatment systems can offer.

The first stage known as anaerobic digestion additionally produces biogas and sludge that can be reutilized as fertilizer in agriculture. The second stage consists of one or more constructed wetlands which thrive as a biodiversity habitat, and thus bring a clear example of a climate change mitigation measure. Last but not least, the third stage of the treatment system is a raceway pond reactor. This component guarantees the disinfection of the treated effluent to a level that complies with the new EU regulation concerning the minimum requirements for the reuse of treated effluent.

This means that the eco-innovative wastewater system supplies a treated effluent that is safe for reuse in irrigated agriculture. These results have been validated at the pilot demonstration unit that has been constructed in the region of Murcia in Spain. A similar demonstration plant is being constructed in Deddeh Koura with a foreseen completion date by the end of August 2023. It is important to note that the use of nature-based solutions in the form of constructed wetlands and the use of solar energy for disinfection result in lower operation and maintenance costs as compared with conventional wastewater treatment systems.

The AQUACYCLE project is not just about technological advancements; it is also about fostering collaboration and sharing knowledge across borders. It encourages partnerships between governments, academia, private sector, NGOs, and local communities, facilitating the transfer of expertise and creating a global network of water stakeholders.

The AQUACYCLE project thus represents a pivotal moment in our collective journey towards sustainable development. It is an opportunity to reshape our relationship with water and leave a lasting positive impact on future generations. Let us join forces and embrace this project, as we strive for a world where water is cherished, conserved, and revitalized.

To this effect, the voices of farmers and of the rural local communities around the pilot demonstration units in Lebanon, Spain and Tunisia have been collected in a Charter. This Charter documents their growing concerns to sustain their livelihoods in the face of increased water scarcity and their expectations from the project's wastewater treatment system. Today, the participants at this Final Conference have been invited to join a Mediterranean Wastewater Reuse Alliance by signing up to this Charter.

The AQUACYCLE project brings together seven highly experienced research teams from Greece, Malta, Spain, Lebanon and Tunisia along with four associated partners from France, Greece, Algeria and Morocco. The AQUACYCLE project has been carried out with the financial assistance of the EU under the ENI CBC Mediterranean Sea Basin Programme. The project which started on 1st September 2019 with a foreseen duration of 48 months has a total budget of 2.8 million euros and an EU contribution of 2.5 million euros. Lebanon is represented in the AQUACYCLE project through the Lebanese University.

6. Synergies and clustering events with ENI CBC Med funded projects

6.1 A brief chronology of efforts towards establishing synergies with 'sister' ENI CBC Med projects

in November and December 2019, AQUACYCLE Project Manager, Dr. Konstantinos Plakas, communicated with Prof. Pier Paolo Roggero (Coordinator of MENAWARA), Dr. Alberto Carletti (MENAWARA) and Mr. Corrado Paternò Castello (Coordinator of PROSIM), proposing the establishment of a coalition between AQUACYCLE, MEDISS, MENAWARA, NAWAMED and PROSIM, in the form of a cluster with the indicative acronym "**MedWaterAlliance**". The cluster brought together **32 organizations** from 4 EU (Greece, Italy, Malta, Spain) and 4 Mediterranean Partner Countries (Jordan, Lebanon, Palestine, Tunisia), with the aim to exchange good practices and foster complementarities between the projects.

The Managing Authority of the ENI CBC Med Programme welcomed this initiative (email from Mrs. Silvia Cubadda, Programme officer, on December 6, 2019). However, it was stressed that the "formal" organization of clusters (to be coordinated by the MA in close cooperation with the National Authorities) would be organized after also the strategic projects would have been awarded ENI CBC Med funding, foreseen around the second half of 2020.

On 18 March 2020, the JTS organized an online meeting for the Lead Beneficiaries of the five ENI projects funded under the priority 'Water Efficiency'. This provided a follow-up to the initiative of Dr. Konstantinos Plakas, CERTH, who had initiated contacts with the 5 projects in November and December 2019.

The clustering initiative of the 5 projects was announced in the May-June 2020 EMWIS Flash no 150, inviting also other similarly oriented projects to "Join forces".

In response to the JTS announcing a Capitalisation Call, CERTH successfully coordinated the submission in July 2020 of a proposal, entitled "The MEDiterranean pathWAY for innovation CAPitalisation toward an urban-rural integrated development of non-conventional water resources (**MEDWAYCAP**)", which includes representatives of four sister ENI projects (MEDISS, MENAWARA, NAWAMED, MAIA-TAQA).

6.2 Timeline of specific activities undertaken with 'sister' ENI CBC Med projects

28 November 2019. Dr. Hamadi Kallali, CERTE and Dr. Rym Ben Ammar Guizani, CITET attended the MENAWARA kick-off meeting in Tunis.

25 July 2020. Dr. Yaser Abunnasr, AUB, on behalf of NAWAMED project, gave an invited talk in the Stakeholders Workshop organized by the Doctoral School of Science and Technology, Tripoli, Lebanon.

1 and 3 March 2021. Dr. Konstantinos Plakas and Dr. Vasilis Takavakoglou (CERTH) present AQUACYCLE in NAWAMED e-technical Workshop "Designing urban nature-based solutions for greywater reuse".

22 to 26 March 2021. Co-organization of a webinar by CERTE with colleagues in NAWAMED to celebrate the World Water Day, with the theme "Water recovery".

22 March 2021. Angeliki Fotiadou (CERTH) and Dr. Isabel Oller (CIEMAT/PSA) in joint video recording in celebration of World Water Day organized by NAWAMED.

29 July 2021. Prof. Ahmad El Moll (UL) presents "Treated Wastewater as NWCR and its potential role in Water Management in Lebanon", in NAWAMED's 2nd National Stakeholders' Meeting organized by the American University of Beirut.

2-3 September 2021. Presentation of project's results in the 17th International Conference on Environment, Science and Technology, in a Special Session co-organized by the Cluster of the five ENI CBC Med projects on the theme 'Water Efficiency'.

16-17 December 2021. Promotion of AQUACYCLE via the 3D model, flyers & roll-up banner, in the Kick-off meeting of the ENI CBC Med funded MEDWAYCAP Capitalization project in Thessaloniki, Greece.

3-5 October 2022. CERTH exhibited the APOC system (with the aid of the 3D model) in the MEDWAYCAP exhibition held in Syracuse.

3 October 2022. Dr. Plakas presented AQUACYCLE during the first day of the International Workshop organized by SVI.MED and EWA (NAWAMED and MEDWAYCAP partners).

13 January 2023. CERTE participated in the meeting of the sister ENI project GREEN BUILDING for Tunisia Green building cluster Creation.

22 March 2023. Presentation on AQUACYCLE by Mr. Pedro Simon (ESAMUR) in the programme of the event celebrating the World Water Day 2023, organized by ENI CBC Med and PRIMA programmes with the theme "Municipal Wastewater Treatment and Reuse".

3 April 2023. Follow up by CERTE with WES-MED sister project activities on "révision des directives sectorielles et des valeurs limites d'émission pour les activités industrielles au Liban".

29 June 2023. PSA-CIEMAT and ESAMUR presented AQUACYCLE in a workshop entitled "Water Reuse in Agriculture: A Vision from Andalusia!" organized in the framework of the ENI CBC Med funded sister project MENAWARA in Seville.

17-18 July 2023 TUNISTUDIO Company Team turns film sequences with farmers at Bent Saidane region and with CRDA Team (PP4) at their offices for the story-telling movie of AQUACYCLE project in the framework of MEDWAYCAP project.

22 June 2023. Mrs. Yesmin Cherni (CERTÉ) presented AQUACYCLE in the MEDWAYCAP workshop & B2B meeting on the theme: "Economic/professional opportunities related to the valorization of unconventional water (ENC) in the context of the circular economy!" held at Arab Institute of Business Leaders (IACE), Tunis.

18-20 September 2023. Participation of Dr. Yasmin Cherni (CERTÉ) in the MEDWAYCAP NCW Tour in Tunisia.

4 July 2023. Invited speech by Dr. Plakas, Project Manager, with the title "The AQUACYCLE APOC technology as an eco-innovative decentralized sanitation system for wastewater treatment and reuse in small and medium-sized communities", MENAWARA International Conference on sustainable water management: the use of non-conventional water in the Mediterranean countries, Sassari, Italy (hybrid).

6.3 Clustering event with 'sister' ENI CBC Med projects

During July and August 2021, the five projects addressed to the 'Water Efficiency' Thematic Priority of the ENI CBC Med Programme, prepared for the organization of a clustering event which took place on 2nd September 2021 as a Special Session with the theme Sustainable Management of Water in the Mediterranean, during the CEST2021 Conference.



Figure 6: Cover image of news post on project website announcing the clustering event that brought together the five ENI CBC Med project funded under the 'Water Efficiency Pillar'

7. Synergies with other EU funded projects

Valuable synergies with a multitude of other EU funded projects, such as Horizon 2020, Life, Erasmus+ as well as with ENI CBC Med funded projects under themes other than that of 'Water Efficiency' were established.

These took the form of invited presentations, presentations as conferences as well as informal meetings such as those organized at the very start of the project by the Lead Beneficiary, CERTH with the H2020 projects HYDROUSA (<https://www.hydrousa.org/>) and NAIADES (<https://naiades-project.eu/>).

A chronological timeline is presented below of these various synergies. In addition to contacts made by CERTH with Greek institutions coordinating/participating in two, additional actions are reported below:

August 2020. Mr. Fadhel M'Hiri, CITET, participated in a meeting with the ENI CBC Med funded Innovagrowomed & CLIMA projects.

5 and 26 February 2021. Dr. Inmaculada Polo and Dr. Isabel Oller (CIEMAT-PSA) presented AQUACYCLE in Horizon 2020 SolarTwins project webinar.

2-4 June 2021. Dr. Hamadi Kallali (CERTE) participates in online capacity building workshop on Web-based Pan-African Water and Sanitation Sector Monitoring and Reporting System (WASSMO).

10-13 June 2021. Ms Safaa Chaabane (CITET) presents AQUACYCLE at the 3rd Euro-Mediterranean Conference for Environmental Integration (EMCEI) in Tunisia

7 July 2021. Dirk De Ketelaere (IRMCo) presents use of Participatory GIS in Space for Climate Webinar organized by Eurisy and dotSpace

20-24 July 2021. Ms Safa Chaabane (CITET) presents "GIS-based multicriteria analysis for optimal siting of an eco-innovative wastewater system in Tunisia" in CEMEPE 2021 & SECOTOX Conference

4 November 2021. Presentation of AQUACYCLE in a workshop of the LIFE project PHOENIX with the theme Wastewater Regeneration: New Legislation, Innovative Technologies & Success Cases.

26 January 2022. Eng. Dirk De Ketelaere presented AQUACYCLE's approach to involve local communities in the drawing up of action for the reuse of treated wastewater in the International Seminar on Social Innovation & Inclusion, organized by the ENI CBC Med funded MEDTOWN project.

27 April 2022. Presentation of the latest results achieved with AQUACYCLE's APOC system & the treatment & reuse of wastewater in the region of Murcia, in a workshop of the LIFE project CleanUp.

12 May 2022. Promotion of AQUACYCLE in an awareness-raising workshop which brought together the promoters of additional two EU funded research projects in Lebanon: H2020 CLAIM project & Erasmus+ SWaTH project.

11 July 2023. Participation of CERTE Team in the stakeholders' workshop on the theme "Wastewater and Sludge treated by constructed wetlands and sustainable agricultural reuse: Producer and consumer Perceptions", organized by INRAT and CERTE, in the framework of TRESOR Project.

29 March 2023. Dr. Plakas gave an invited talk entitled "Combination of CWs with other treatment systems: case of the APOC system", Training Workshop on "Wastewater and Sewage sludge Treatment Using Constructed Wetlands and Planted Drying Beds", TRESOR project, Tunis, Tunisia (virtual presentation).

8. Participation in brokerage and innovation events

8.1 AQUACYCLE at Ecological Construction and Innovation Days in Tunisia



Figure 7: CITET's booth was manned by Khitem Mensi (to the bottom left), Safa Chaabane and Anis Ghattassi, who joined 25 exhibitors at the fair which attracted 2000 visitors

The theme of Ecological Construction and Innovation Days 'Eco-Construction, the future revolution in the construction and public works sector' in 2023, proved a most befitting venue to showcase AQUACYCLE's eco-innovative wastewater treatment system.

The display mounted by the **International Center for Environmental Technologies of Tunis (CITET)** in the **AQUACYCLE Partnership**, showcased the benefits that could be reaped from the project's eco-innovative **APOC** system. The display highlighted the system's ability to bring about improved sanitation management in decentralized areas in a highly cost-effective manner. To this effect, the display informed how the APOC system provides for an all-year-round reuse of treated domestic effluent that is safe for irrigation purposes, and permits the recovery of valuable substances from the treated wastewater such as fertilizer and biogas.

The main aim of the display was to convey why decentralized wastewater treatment systems provide a smart, green alternative solution for small to medium-sized rural communities. In addition to providing a cost-effective solution to address the impact of climate by augmenting conventional water resources, the APOC system sets a best practice example in relation to the transition to the Circular Economy. To this effect, the booth also showcased the design of a pilot demonstration unit of the wastewater treatment system. Its three components, i.e. an **Anaerobic digester**, **Constructed wetlands** and a **Photocatalytic Oxidation** driven solar raceway pond reactor are foreseen to be installed in the rural locality of Bent Saidane. The locality belongs to the Governorate of Zaghuan in the north-eastern part of Tunisia.

Organized under the patronage of the **Minister of Equipment and Housing, Sara Al-Zafarani al-Zanzari**, the event took place on 22 and 23 June 2022 at the International Convention Center of Tunis (CICT), which is the Headquarters of the Tunisian Federation of Industry and Commerce and Handicrafts (UTICA).

8.2 AQUACYCLE booth at WEFE Nexus Innovation Week



Figure 8: Cover image of news post on project website inviting visitors to join the AQUACYCLE stand at the Water, Energy, Food Nexus Innovation Week “Paving The Way Towards Entrepreneurship”

280 visitors were welcomed to the stand mounted by Dr. Hamadi Kallali (CERTE) at the WEFE Nexus Innovation Week, showcasing AQUACYCLE’s low cost, eco-innovative wastewater treatment technology. Besides a short description of the eco-innovative technology, the stand provided access to a range of promotional materials which included a video clip of a 3D miniature model, as well as a document that described the components of the treatment system and the benefits it offers as compared to conventional wastewater treatment technologies.

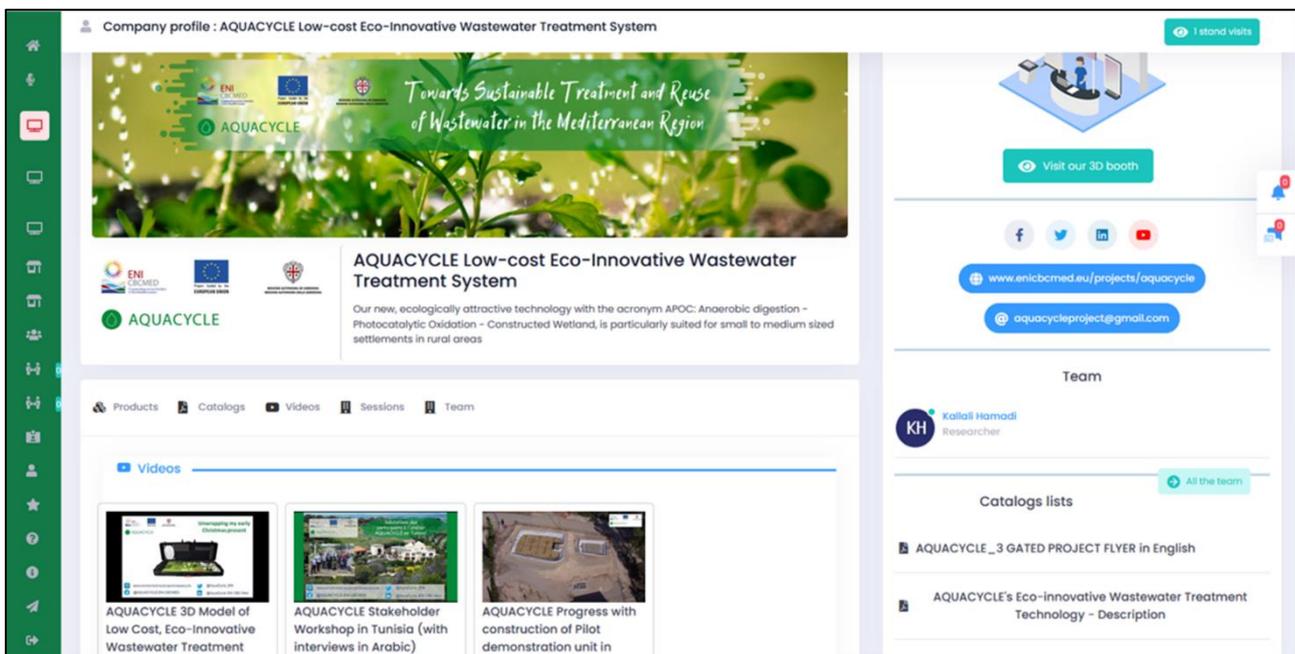


Figure 9: AQUACYCLE 3D Booth went in pitch style mode at Water-Energy-Food Nexus Innovation Week

9. AQUACYCLE meets up with junior high school students

9.1 AQUACYCLE left amazed by junior high school students in Greece



Figure 10: Cover image for news post on how junior school students in Greek took an active interest in AQUACYCLE's eco-innovative wastewater treatment system

University academics from the Centre of Research and Technology, Hellas (CERTH), and Junior high school teachers in Greece, were left amazed at how teenage students took to my eco-innovative wastewater treatment system design.

In a school visit to the Gymnasium - High School of Nikiforos in Drama, Greece, Dr. Konstantinos Plakas, started off by explaining about each of the various components that make up the design of AQUACYCLE eco-innovative wastewater treatment system.



Figure 11: Dr. Konstantinos Plakas introducing the AQUACYCLE wastewater treatment using a 3D miniature replica

Photo credit: Angeliki Fotiadou, CERTH

In the final session of the visit, the students were divided in teams and asked to piece together a puzzle with the image of AQUACYCLE’s eco-innovative wastewater treatment system.

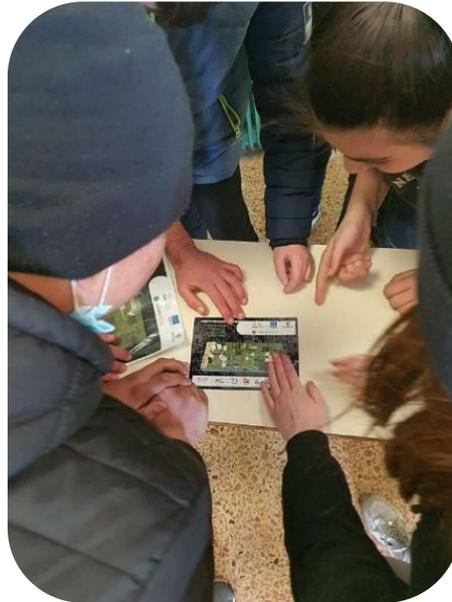


Figure 12: Piecing together AQUACLES wastewater treatment system components

Photo credit: Angeliki Fotiadou, CERTH

Encouraged by the outcomes, CERTH repeated the exercise at the Anatolia American College, in Thessaloniki, Greece, a private school with highly developed labs dedicated to the transfer of technology, Renewable Energy Sources and their systems and other related subjects.



Figure 13: Junior high school students at Anatolia American College, Thessaloniki, Greece

Photo credit: Virginia Arvaniti, STEM Administrative Assistant, Anatolia College

An aggregate total of more than 100 teenage students participated in both events. Conducted at the level of junior high, their curriculum ensures students have a basic knowledge about energy preservation, ecology and environment preservation, thus making them already acquainted with the overall subject matter that was presented to them.

9.2 AQUACYCLE meets up with junior high school students in Spain

Doctoral (PhD) students under the supervision of CIEMAT-PSA produced 2 posters on AQUACYCLE, which were presented to secondary school students from two different junior high schools in Almería, one from the village of El Ejido and the other from the village of Santa Maria del Aguila. Both events were joined by 25 students.

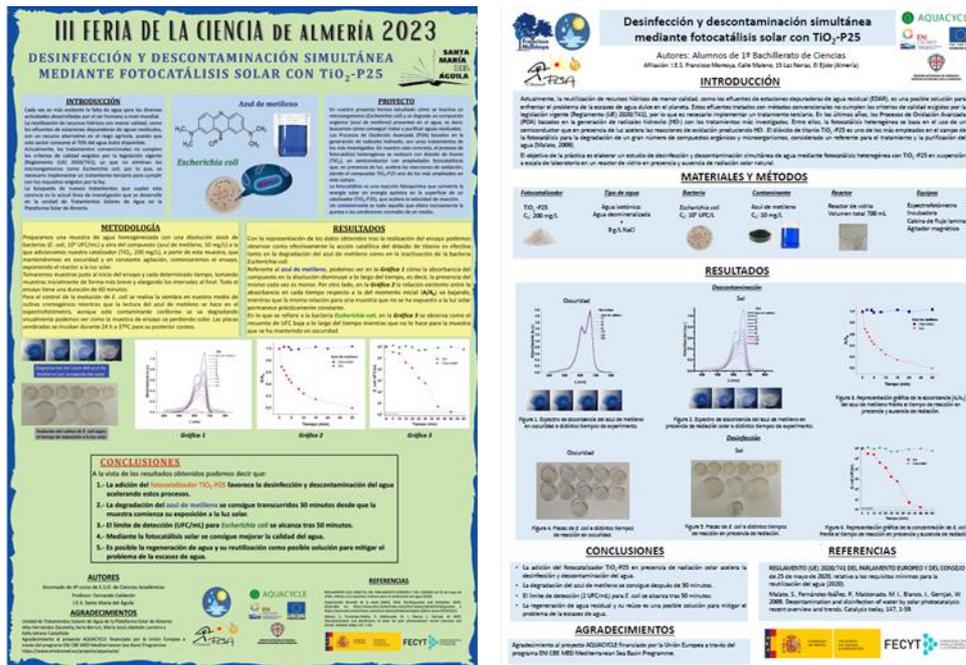


Figure 14: Poster prepared by PhD Students for presentation to junior high school students in Spain

The same posters were then also mounted on the occasion of a very well attended science fair organized at the University of Almería during 4 to 5 May 2023.



Figure 15: AQUACYCLE booth (to the left) mounted at the science fair at the University of Almería, Spain

10. AQUACYCLE in the media (TV and radio coverage)

The tables below bring a recapitulation of coverage of AQUACYCLE on respectively, TV and radio channels.

Table 5: AQUACYCLE Coverage on TV Channels

TV Channel	Topic/Context & Partner involved	Link to coverage & Date of broadcast
TVM Malta National TV Channel	Awards to Maltese entities AQUACYCLE award to IRMCo	https://www.tvm.com.mt/en/news/maltese-entities-presented-with-certificates-on-successful-european-funds/ 21/10/2019
ERT3 Greek National TV Channel	AQUACYCLE and MedWayCap project, CERTH	https://www.youtube.com/watch?v=zcfv68ojLks 16/12/2021
Tunisia National TV n°1	Second Stakeholder Workshop, CERTH	https://www.youtube.com/watch?v=JIEuF4Ucr5s&t=55s 06/01/2022
TeleLiban	AQUACYCLE Final Conference in Lebanon, UL	https://www.youtube.com/watch?v=i36k7Y5nhP0&t=1049s 16/7/2023

Table 6: AQUACYCLE Coverage on Radio Channels

Radio Channel	Topic/Context & Partner involved	Link to coverage & Date of broadcast
Radio Tunis Chaîne Internationale	First Stakeholder workshop, CERTE	https://www.youtube.com/watch?v=qWr3rij41BM&feature=youtu.be 22/09/2020
Radio Tunisie Culture	First Stakeholder workshop, CERTE	https://www.facebook.com/watch/live/?v=662039211108161&ref=watch_permalink
COPE	Scope of project in Region of Murcia, ESAMUR	https://www.cope.es/emisoras/region-de-murcia/murcia-provincia/murcia/la-manana-en-murcia/audios/esamur-20210202_1349519 02/02/2021
Radio Abaran	Project's eco-innovative treatment system, ESAMUR	https://radioabaran.com/la-comunidad-proyecta-en-blanca-un-sistema-avanzado-de-depuracion-a-traves-de-humedales-artificiales-y-tratamiento-solar/ 27/02/2021
COPE	ESAMUR presentation on AQUACYCLE, ESAMUR	https://www.cope.es/emisoras/region-de-murcia/murcia-provincia/murcia---san-javier/audios/esamur-cope-region-murcia-20211221_1672081 21/12/2021
Zitouna FM	Interview of CERTE on Third Stakeholder Workshop in Tunisia	https://www.facebook.com/taoufik.benabdallah.7/videos/778450080492580/ 14 May 2023