Towards Sustainable Treatment and Reuse of Wastewater in the Mediterranean Region

Mediterranean Wastewater Reuse Community

(Output 6.4)

31 October 2023

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The 2014-2020 ENI CBC Mediterranean Sea Basin Programme is a multilateral Cross-Border Cooperation (CBC) initiative funded by the European Neighbourhood Instrument (ENI). The Programme objective is to foster fair, equitable and sustainable economic, social and territorial development, which may advance cross-border integration and valorise participating countries' territories and values. The following 13 countries participate in the Programme: Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Malta, Palestine, Portugal, Spain, Tunisia. The Managing Authority (JMA) is the Autonomous Region of Sardinia (Italy). Official Programme languages are Arabic, English and French. For more information, please visit: www.enicbcmed.eu.

The European Union is made up of 28 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

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Executive Summary

The final output in AQUACYCLE is concerned with the setting up of a **Mediterranean Wastewater Reuse Community**.

The project's Final Conference in Lebanon during 23 to 24 June 2023, ran with the theme of inviting everyone to join AQUACYCLE's Mediterranean Wastewater Reuse Alliance. It was explained to the 200 participants at the event that by endorsing the Final Version of the MedAPOC Charter[1], they would automatically be joining this Alliance.

Earlier in the project, the Semi-Final Version of the MedAPOC Charter was placed on the project website to mark World Water Day in 2023[2], which aptly ran with the theme: 'Accelerating change to solve the water and sanitation crisis'. This created the opportunity to already start inviting water stakeholders from around the Region to read up on the Charter, and to invite them to endorse the Charter by filling their details on a google form[3], and thus become 'early members' of the Alliance. Well over 150 persons from around the Region signed up to this initial initiative. It is particularly noteworthy that the signatories bring a balanced mix of Partners in ongoing ENI CBC Med or other EU funded projects that bring synergies to AQUACYCLE, the Research community, in broader terms as compared to the aforementioned category, Local community representatives, including local decision makers and NGOs, Ministries and entities operating at European/Regional/International level, Public/private entities in charge of water treatment/sanitation and water supply, Water treatment plant operators and technicians. Also noteworthy is that 42% of these signatories are women. There is also a clearly interesting correlation between the date on which new signatories joined and the organization of outreach activities such as the second and third series of stakeholder workshops.

In terms of keeping this initiative 'alive' beyond the project duration, it is important to highlight the scope and functionality of the project's e-learning platform[4]. Indeed, aside from the training material, the platform offers users the possibility to communicate and network with other users, including experts on wastewater treatment plant operators and technicians, from around the world.

In present document focuses on the proceedings of the Final Conference during which the Final Version of the MedAPOC Charter was launched.

[1] https://www.enicbcmed.eu/aquacycle-shares-final-version-charter
[2] https://www.enicbcmed.eu/aquacycle-invites-stakeholders-join-mediterranean-wastewater-reuse-alliance
[3] https://docs.google.com/forms/d/1QdNwIAsMjWbswru1GR13H1GC_-xxrnbDV4n4PIx6eGU/edit
[4] https://www.enicbcmed.eu/aquacycle-launches-platform-e-training-and-more

1. AQUACYCLE Final Conference theme and venue

"Towards Sustainable Treatment and Reuse of Wastewater in the Mediterranean Region"

23rd – 24th June 2023

Chamber of Commerce, Industry & Agriculture

Tripoli, Lebanon

The conference is Organized by the Lebanese University and Under the Patronage and Presence of the Minister of Environment, Dr. Nasser Yassin

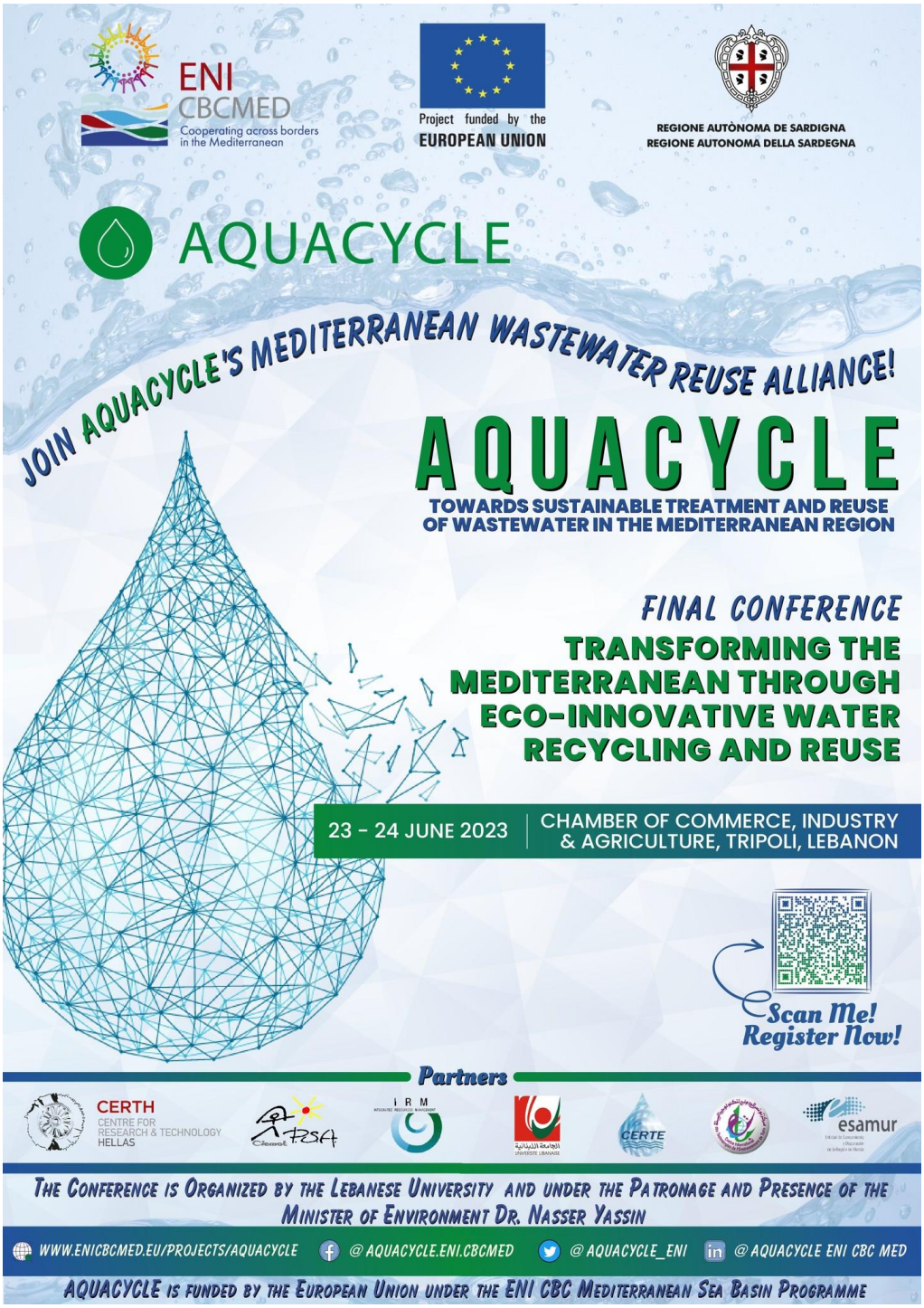


Figure 1: Roll-up banner produced for the AQUACYCLE Final Conference

2. AQUACYCLE Pre-Conference Field Excurion Programme

AQUACYCLE

Final Conference

22 – 24 June 2023, Tripoli, Lebanon

June 22, 2023: Pre-Conference Field Excursion Program

08.30-9.00	Welcoming and Reception at the AZM center in Tripoli
9h00-9h.30	Presentation of the AZM center & the AQUACYCLE final conference Program
10.00 - 11:30	Start the excursion to Akkar (45 Km from Tripoli)
11.30 - 12.30	Visiting Wastewater stations in Koubayat near Akkar atika (functioning) and in Akkar Atika (Not functioning, under construction)
12.30 - 13.30	Visiting the MARAMEDITERRA Living Lab (under construction)
13.30 - 15.00	Lunch in Nabh Chouh restaurant in Akkar Atika (Chouh Trees)
15.00 - 16.00	Exploring the possibility of implanting of APOC system in Akkar Atika
16.00 - 17.30	Return to Tripoli
17.30 - 18.30	Preparation for the AQUACYCLE final Conference in Tripoli

2.1 Visit to the AZM Laboratories

The AQUACYCLE Partnership was welcomed by Pr. Hiba Mawlawi Director of the Laboratory of Applied Biotechnology for Biomolecules, Pr. Monzer HAMZE, Head of the health and environment microbiology laboratory and Pr. Adnan Naja, Head of the Laboratory of Physics and Modeling with the AZM Center for Research in Biotechnology and its Applications within the Lebanese University in Tripoli.

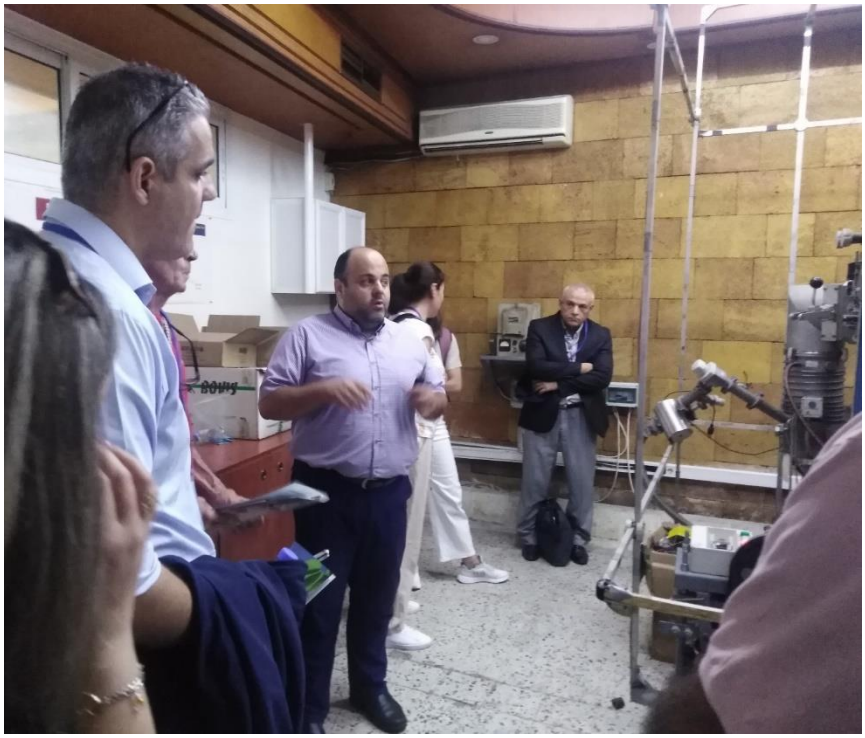
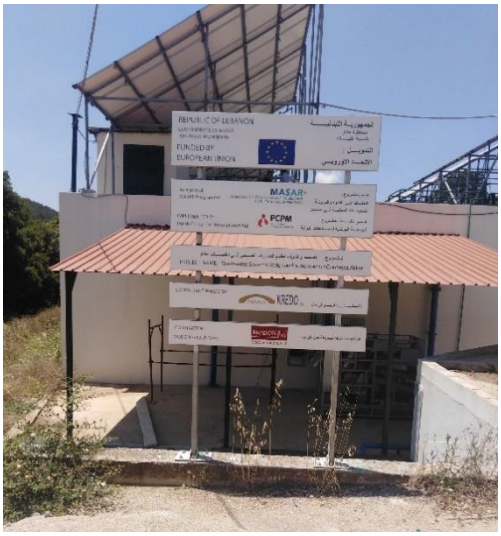
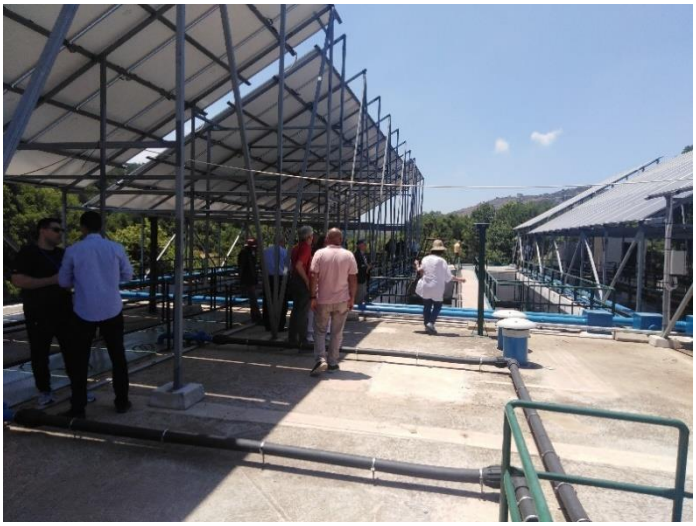
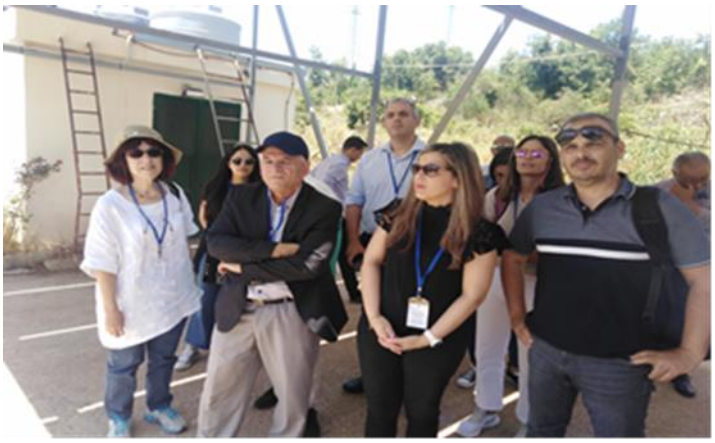


Figure 2: Pr. Adnan Naja, Laboratoire de Physique et Modélisation (LPM) - EDST - Lebanese University

2.2 Visit to Wastewater station in Koubayat, near Akar al-Atika (not functioning)







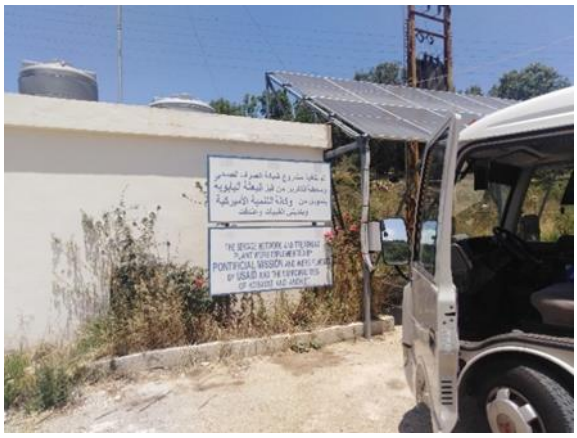


Figure 3: Visiting Wastewater station in Koubayat near Akkar al-Atika (not functioning)

2.3 Meeting with the Mayor of Municipality of Qoubayat and Eng. Youssef Antoun


Figure 4: Meeting with the Mayor of Municipality of Qoubayat and Eng. Youssef Antoun

Discussion with the Mayor of Koubayat focused on the possibility to convert the current, non-functioning station to a station based on the project's eco-innovative wastewater treatment system (the APOC system)

2.4 Meeting with the Union of Municipalities and councillors of Akkar al-Atika

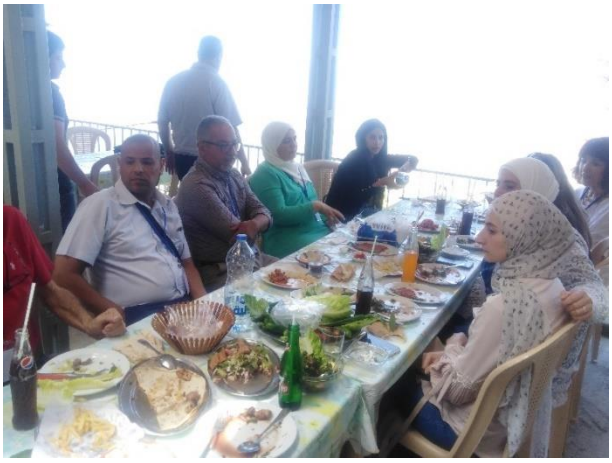
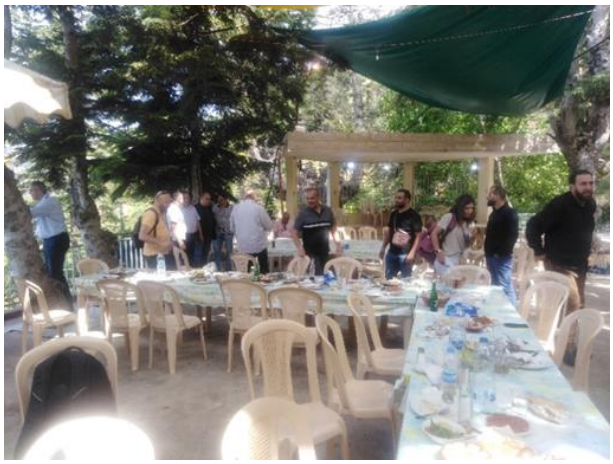
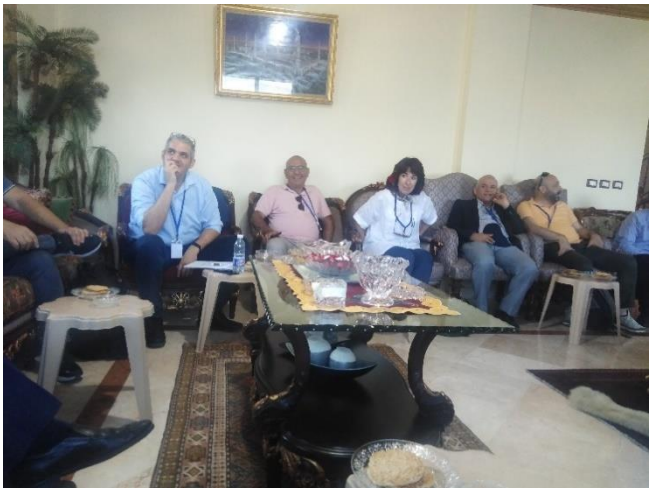



Figure 5: Meeting with the Union of Municipalities and councillors of Akkar al-Atika

The meeting with the Union of Municipalities and councillors of Akkar al-Atika served to introduce them to the content of the MedAPOC Charter. The meeting was organized over lunch served at the Nabh Chouh (Chouh Trees) restaurant.

2.5 Final preparations of the AQUACYCLE Final Conference



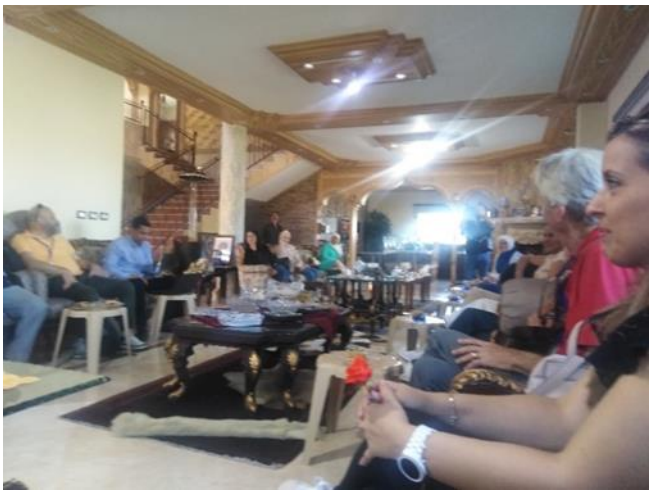
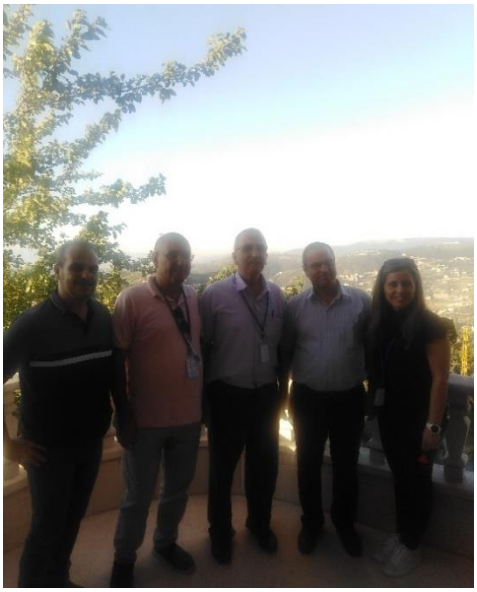


Figure 6: Meeting of AQUACYCLE partners to finetune the preparations of the AQUACYCLE Final Conference



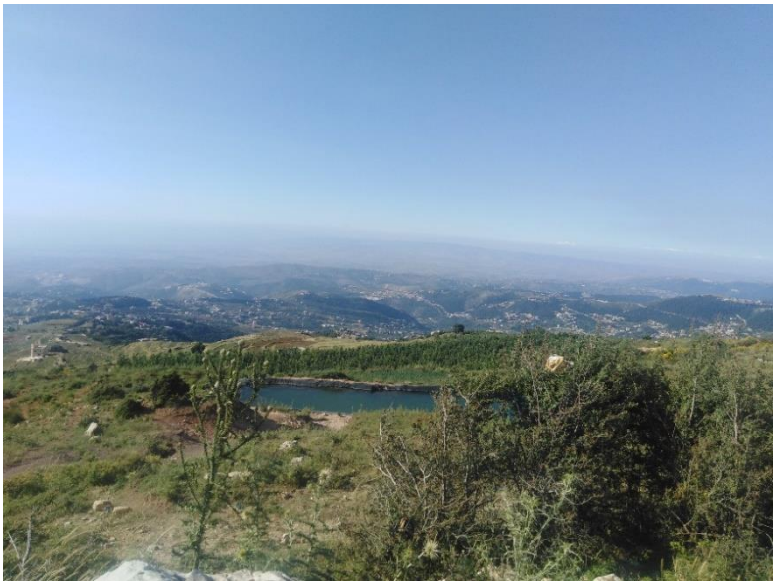


Figure 7: Enjoying the scenic beauty and warm hospitality of Akkar al-Atika

3. AQUACYCLE Final Conference – Opening session

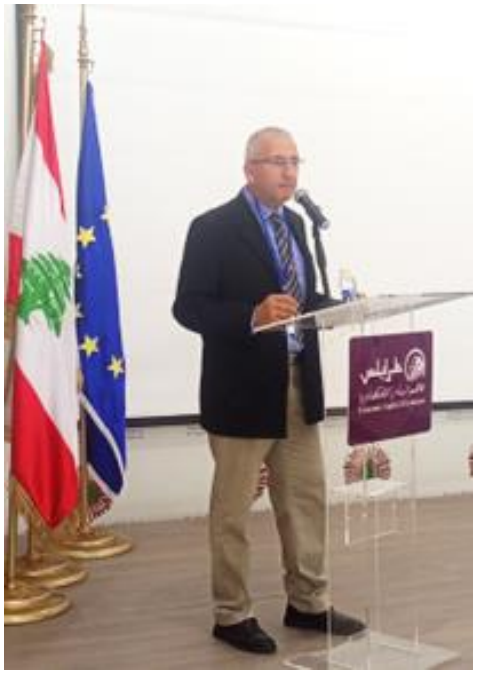
June 23, 2023: Opening session – Welcome addresses

Opening session – Welcome addresses

- Prof. Ahmad ElMoll, AQUACYCLE Project Team Leader, Lebanese University
- Dr. Konstantinos Plakas, AQUACYCLE Project Manager, CERTH, Greece
- Dr. Esmat Al-Karadsheh, Eastern Mediterranean Office, ENI CBC Med Programme
- Mr. Tawfik Dabboussi, President of Chamber of Commerce in Tripoli and north Lebanon
- Prof. Bassam Badran, President of the Lebanese University
- Prof. Nasser Yassine, Lebanon's Minister of Environment

3.1 Welcome address by Prof. Ahmad ElMoll, AQUACYCLE Project Team Leader, Lebanese University

Wastewater reuse within the circular economy: an innovative solution



Ladies and gentlemen,

Dear Colleagues, Hello everyone,

It is a great honor to welcome you to the Final conference of the AQUACYCLE project.

A combination of water stress, fast-growing populations and the climate emergency means many countries struggle to provide their people with sufficient clean water. Faced with this reality, reusing treated wastewater seems to be the most effective fortification against scarcity.

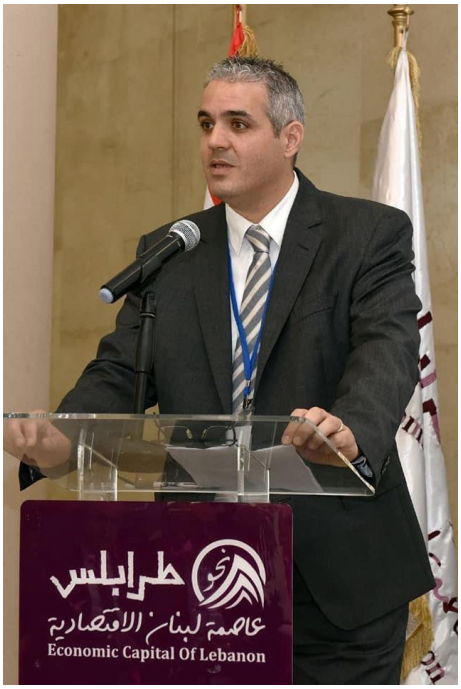
These global challenges cannot be addressed by a single institution or a single country. International synergy on scientific research, cooperation to provide solutions in collaboration with European partners to achieve water security in the Mediterranean region is much needed. In this context, this project aspires to change the current paradigm of considering wastewater as a hazardous effluent to that of a year-round abundant resource that has multiple uses.

Indeed, treated wastewater, derived from an eco-innovative technology, is the only resource that increases in step with economic growth. It is a solution that also protects nature by limiting the risks of pollution discharges into the environment. It is a circular economy model that strengthens countries' water self-sufficiency by giving them access to a reliable resource located within their territory.

Thank you to all the National, that is all stakeholders in Lebanon, and international colleagues, from Greece, Malta Spain, and Tunisia, and who have worked with us on this project for 48 months towards achieving the desired outcome.

We thank you for your support at all levels and wish to continue together towards a better future.

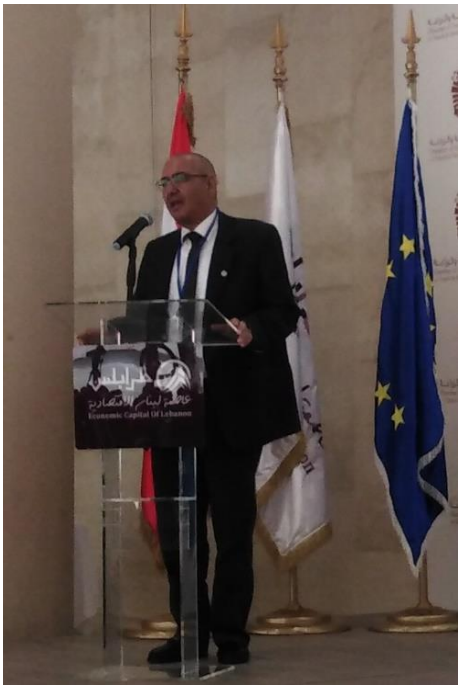
3.2 Welcome address by Dr. Konstantinos Plakas, AQUACYCLE Project Manager, CERTH, Greece



Farmers across the Mediterranean including those in Lebanon, face a growing challenge of limited access to freshwater. The AQUACYCLE project offers an eco-innovative solution in the form of a three-stage wastewater treatment system.

This system goes beyond conventional methods, by generating biogas and fertilizer through anaerobic digestion, creating biodiversity-rich constructed wetlands for climate change mitigation and ensuring disinfected effluent in compliance with the latest EU regulations. Validated already in Spain for its low-cost and a very high level of efficiency, another pilot is under construction in Deddeh, Koura, Lebanon.

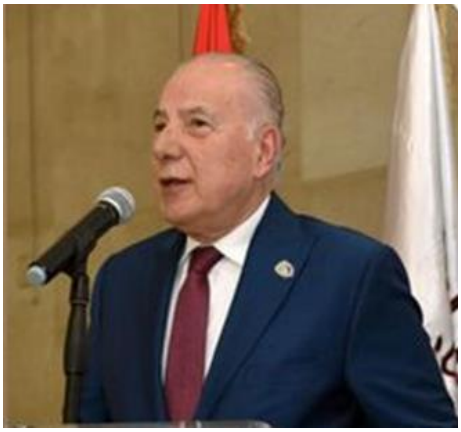
3.3 Welcome address by Dr. Esmat Al-Karadsheh, Eastern Mediterranean Office, ENI CBC Med Programme



I would like to highlight the crucial role of the European Union in supporting sustainable development projects. With an impressive portfolio of more than 100 projects funded by ENI CBC Med programme and 54 initiatives across Lebanon proving the EU's commitment.

Driven by a vision for change these projects encompass diverse areas, including the revival of Lebanon's salt industry, once revered as ***white gold***. The EU's unwavering support paves the way for a brighter, more sustainable future, leaving an indelible mark on Lebanon's development landscape.

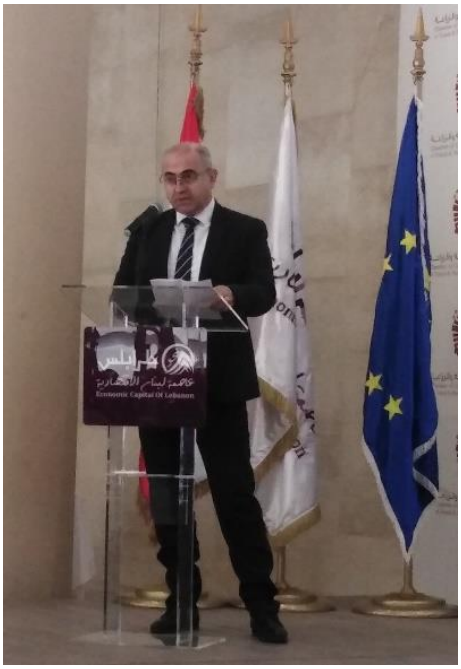
3.4 Welcome address by Mr. Tawfik Dabboussi, President of Chamber of Commerce in Tripoli and north Lebanon



There are many sources of wealth that characterize Tripoli, and indeed Lebanon is a land blessed with abundant riches, making it one of the most prosperous nations in the eastern Mediterranean.

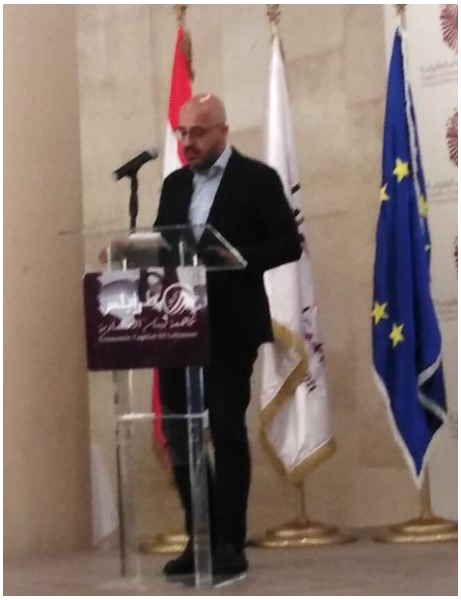
I would like to emphasize the presence of a hydroelectric station in northern Lebanon, an enduring legacy that dates back to the 1920s. These serve as a powerful testament to our visionary thinking, unwavering aspirations, and pivotal focus on the environment as the cornerstone of our progress.

3.5 Welcome address by Prof. Bassam Badran, President of the Lebanese University



Towards Sustainable Treatment and Reuse of Wastewater in the Mediterranean Region, AQUACYCLE project is a transboundary project involving Greece, Spain, Malta, Lebanon and Tunisia. In Lebanon, AQUACYCLE is a showcase to the transition to the circular economy by transforming wastewater into valuable substances, primarily biogas and fertilizer. The most important is the reach out of the project as it teams up on the same table municipalities, water utilities, Ministries responsible for planning, environment, water, agriculture and energy, national research centers, universities, agricultural services and civil society. We, in Lebanon, participate with Tunisia and Spain in the implementation of a demonstration unit of municipal wastewater treatment and reuse with a capacity of 5 cubic meter per day. This is an important deliverable of the project and the Lebanese University is committed in achieving this challenge to ensure that treated municipal water could be well exploited throughout our region. The demonstration unit is set to bring an eco-innovative wastewater treatment technology that will consist of anaerobic digestion, constructed wetlands and solar treatment for the cost-effective treatment of urban wastewater with minimal costs of operation and maximum environmental benefits.Beside the demonstration unit, AQUACYCLE project ensures investment plans for wastewater reuse potential, knowledge transfer of new wastewater treatment technology, human resource capacity building through training on the design, operation and maintenance of wastewater treatment, and finally and most important, Mediterranean networking for treatment and reuse of wastewater gathering public and private entities, educational and societal organizations. At the end, I would like to thank all the colleagues who invested very hard for the AQUAYCLE implementation in Lebanon and for the work they did to have this successful event. I wish a good stay for our guests and partners and thank you all for your valuable presence.

3.6 Welcome address by Prof. Nasser Yassine, Lebanon's Minister of Environment



I would like to underscore the pressing issue of environmental pollution as a chronic ailment plaguing Lebanon. Mismanagement and the lack of pollution control have disrupted ecosystems, our rivers, beaches and groundwater, creating an alarming environment predicament. Escaping this vicious cycle is imperative, as the consequences of inaction will be far worse.

We face a challenging situation demanding collaboration between the public and private sectors, along with a shared commitment to upholding environmental laws and regulations. I want to stress the utmost importance of revitalizing the Tripoli sewage plant (one of the twelve stations that Prime Minister Mikati is supporting for reactivation) and our collective efforts to bring about necessary changes to our laws since mitigating environmental costs is crucial to safeguarding public health.

4. AQUACYCLE Final Conference – Presentation of Awards

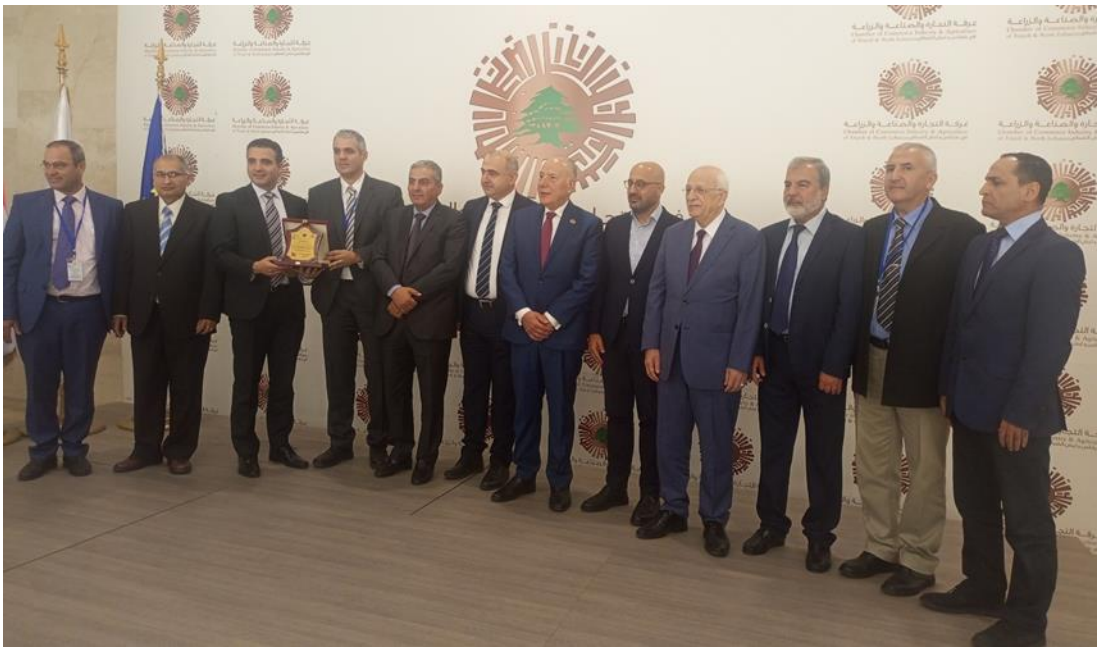


Figure 8: Presentation of Awards by the Lebanese University during the AQUACYCLE Final Conference

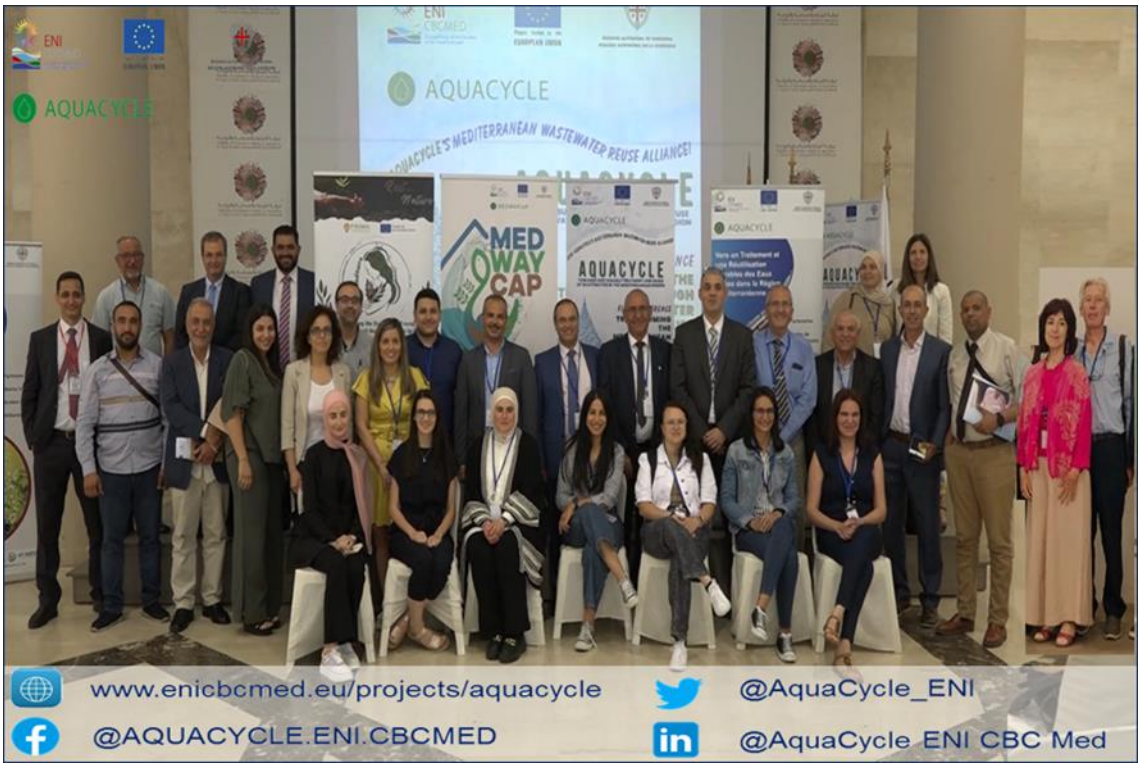


Figure 9: Group photo of the AQUACYCLE Partnership during the project's Final Conference

5. AQUACYCLE Final Conference – Press release

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.