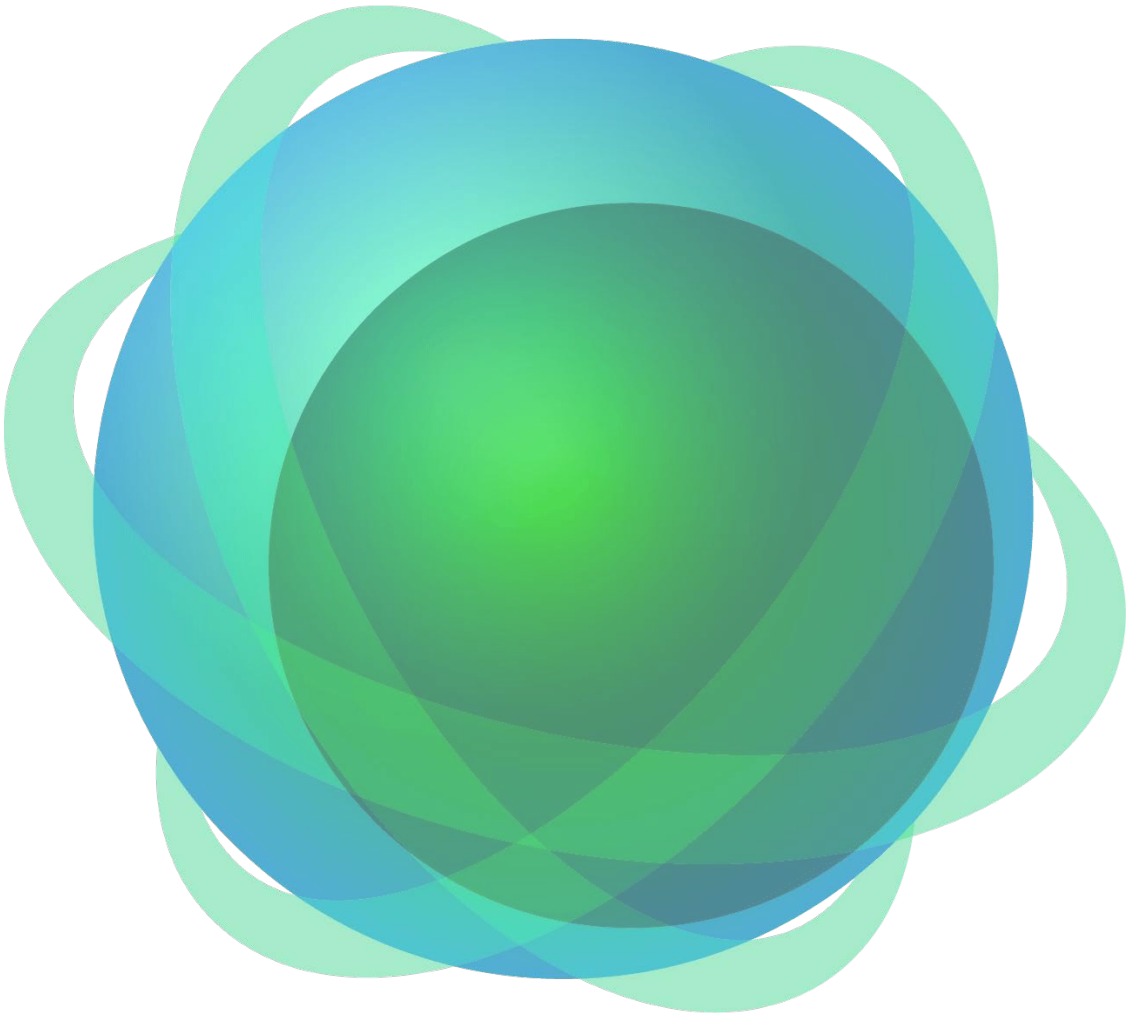
biosolids 2energy

New concept for energy self-sustainable wastewater treatment process and biosolids management

LIFE B2E4sustainable-WWTP LIFE16 ENV/GR/000298

After-LIFE Plan

December 2024



Technical University of Crete

DEVISE ENGINEERING S.A.

ΔΗΜΟΤΙΚΗ ΕΠΙΧΕΙΡΗΣΗ ΥΔΡΕΥΣΗΣ ΑΠΟΧΕΤΕΥΣΗΣ ΡΕΘΥΜΝΟΥ Δ.Ε.Υ.Α.Ρ.

CETENMA Centro Tecnológico de la Energía y del Medio Ambiente

KAPA engineering

Life

GREEN FUND

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1. General information about the project

Project title: New concept for energy self-sustainable wastewater treatment process and biosolids management

Project acronym: LIFE B2E4sustainable-WWTP

Project number: LIFE16 ENV/GR/000298

Project duration: 01/09/2017 – 31/12/2024

Total budget: 1,993,855 €

EU contribution: 58.85 % (1,162,004 €)

Coordinating beneficiary

Technical University of Crete, Greece

www.tuc.gr

Co-funding

With the contribution of the LIFE programme of the European Union and the Green Fund

Associated beneficiaries

DEVISE ENGINEERING S.A., Greece

www.devise.gr

CETENMA, Spain

www.cetenma.es

Water Sewerage Municipal Company of Rethymno, Greece

www.deyar.eu

KAPA ENGINEERING S.R.L., Italy

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2. Project Overview and Final Assessment

Project Overview

The LIFE B2E4sustainable-WWTP project developed and demonstrated a novel, energy-positive wastewater treatment and biosolids management process. This innovative approach integrates advanced thermal processes (gasification) to reduce sludge production and energy consumption, creating a pathway for sustainable wastewater management in Europe.

Key project goals included:

- Development of a pilot plant at the Rethymno WWTP (Greece) to demonstrate energy self-sufficiency and sludge reduction (Figure 1).
- Validation of environmental, socio-economic, and operational feasibility.
- Dissemination and replication of the demonstrated technologies across Europe.

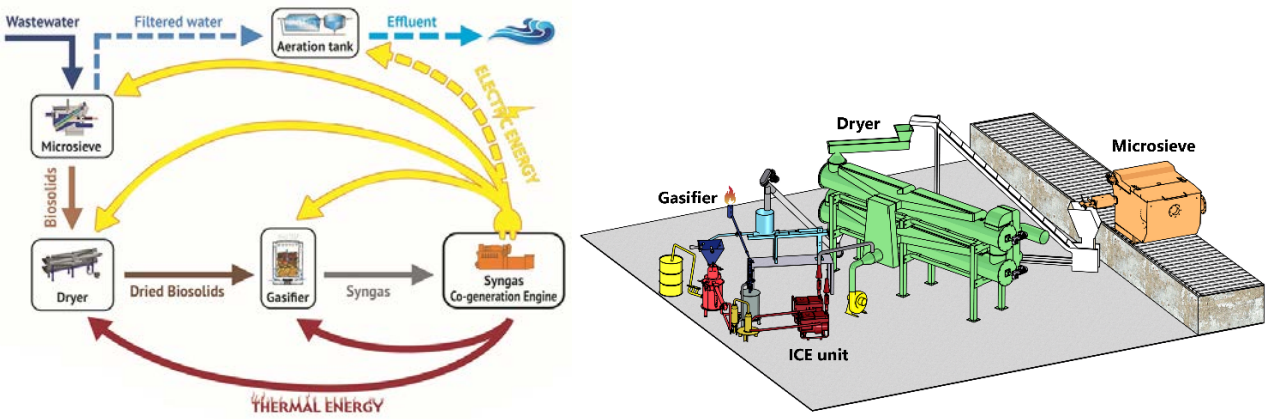

Figure 1. Flow diagram and 3D layout of the pilot plant.

Final Assessment

At the end of the project, the demonstration plant at Rethymno WWTP is fully operational and delivering tangible benefits:

1. **Environmental Impact:** Reduced sludge production and greenhouse gas emissions, aligning with EU Green Deal targets.
2. **Economic Feasibility:** Lower sludge management costs and improved energy efficiency, creating significant cost savings for WWTP operators.
3. **Stakeholder Engagement:** Strong partnerships with public and private entities laid the foundation for replicability and scalability.
4. **Technology Readiness:** The pilot plant demonstrated stable operation under real-world conditions, validating its robustness and applicability.

3. After-LIFE Objectives and Methodology

Objectives

The After-LIFE phase aims to:

1. **Sustain Results:** Ensure continued operation and monitoring of the pilot plant.
2. **Expand Adoption:** Facilitate the transfer of technologies to additional WWTPs in Europe and globally.

3. **Engage Stakeholders:** Foster partnerships to support replication and commercialization.
4. **Disseminate Results:** Maximize awareness and understanding of the project's innovations.
5. **Commercialize Technology:** Support market entry and further innovation based on project outcomes.

Methodology

- **Monitoring and Evaluation:** Maintain ongoing performance evaluation of the demonstration plant, with periodic reporting to stakeholders.
- **Dissemination Activities:** Execute a multi-channel communication strategy targeting wastewater managers, municipal authorities, and the public.
- **Replication and Scalability:** Apply the replicability and transferability plan to facilitate adoption in other facilities.
- **Resource Mobilization:** Identify funding sources and develop business models for sustained impact.
- **Stakeholder Collaboration:** Organize workshops, forums, and meetings to engage key industry and policy actors.

4. Actions to be Continued

Operation and Validation (Action B5)

- Continuous operation of the Rethymno WWTP pilot facility for at least three years.
- Focus on optimizing the process and validating long-term impacts on sludge management and energy efficiency.

Replication and Transferability (Action B6)

- Implement detailed plans to adapt the technology in two initial regions: Greece and Spain.
- Collaborate with stakeholders to identify additional sites for replication.

Monitoring Activities (Actions C1 and C2)

- **Environmental Monitoring:** Measure parameters such as sludge reduction, energy recovery, and emissions.
- **Socio-Economic Monitoring:** Evaluate public acceptance, cost savings, and employment impacts.

Dissemination and Networking (Action D1)

- Maintain and update the project website in three languages (English, Greek, Spanish) for at least five years.
- Organize webinars, publish newsletters, and actively engage audiences on social media platforms.
- Participate in major international events, including the IWA World Congress and AEAS Annual Congress.

After-LIFE Communication Plan (Sub-action E1.2)

- Disseminate results using articles, case studies, press releases, and industry journals.
- Target policy-makers, industry leaders, and environmental NGOs for strategic communication.

5. Dissemination and Awareness

Target Audiences

- **Industry Stakeholders:** WWTP operators, wastewater engineering firms, and biosolids management companies.
- **Policy Makers:** Regional, national, and EU-level decision-makers influencing environmental policy.
- **Academia and Researchers:** Universities and technical institutions interested in wastewater innovation.
- **Public Entities:** Municipalities and local authorities seeking sustainable solutions.
- **General Public:** Citizens interested in environmental sustainability.

Communication Channels

1. **Website:** Centralized portal for updates, publications, and resources.
2. **Social Media:** Regular updates through platforms like Twitter, LinkedIn, and Facebook.
3. **Technical Publications:** Disseminate findings in journals such as *Water Research Journal* and *Applied Energy Journal*.
4. **Events and Workshops:** Share insights through presentations at forums and organized training sessions.
5. **Networking:** Build connections with stakeholders through direct outreach and professional associations.

6. Technology Transfer and Commercialization

Technology Transfer

- Host workshops and training programs for municipalities and industry professionals.
- Develop comprehensive guidelines for integrating the technology into existing WWTPs.

Commercialization Strategy

- Finalize business models to support technology roll-out.
- Identify and engage with potential private-sector partners for co-financing and market expansion.
- File patents and protect intellectual property rights to secure competitive advantages.

Spin-Off Initiatives

- Collaborate with DEYAR and TUC to explore spin-off company creation, ensuring a structured approach to commercialization.

7. Funding Needs and Sources

Funding Needs

Funding is required for:

- Operational costs for the demonstration plant.
- Dissemination and networking activities.
- Development of replication and transfer projects.

- Commercialization efforts, including patent filings and market entry.
- Technology improvement and adaptation for new contexts.

Sources of Finance

- **European Union:** Horizon Europe, LIFE+, and regional development funds.
- **National and Regional Programs:** Support from Greek and Spanish governmental bodies.
- **Private Sector:** Partnerships with industry stakeholders and investors.
- **Public-Private Partnerships:** Engage municipalities and private entities to co-finance technology replication.
- **Revenue Streams:** Licensing and sales of patented technologies.

8. Resources and Responsibilities

Resource Allocation

- Project partners will allocate personnel and financial resources to sustain After-LIFE activities.
- Collaboration with stakeholders will ensure adequate resources for dissemination, replication, and commercialization.

Roles and Responsibilities

- **TUC:** Coordinate After-LIFE activities, manage dissemination, and oversee technology transfer.
- **DEYAR:** Operate the demonstration plant and lead outreach to municipalities and policymakers.
- **DEVISE, KAPA and CETENMA:** Provide technical expertise, contribute to replicability strategies, support dissemination, and assist in commercialization efforts.

9. Summary Table of After-LIFE Activities

Activity	Means of Achievement / Methodology	Time Schedule	Location	Partners Involved	Target Audience	Sources of Finance	Needed Finances
1. Operation of Pilot Plant	Continued operation, maintenance, and monitoring of the pilot plant.	3 years	Rethymno, Greece	DEYAR, TUC	WWTP operators, municipal authorities	Local municipal funds, LIFE+	€€
2. Monitoring Environmental Impact	Regular data collection and analysis on sludge reduction, energy recovery, and emissions.	3 years	Rethymno, Greece	TUC	Policy-makers, environmental agencies	LIFE+, regional funds	€€
3. Socio-Economic Impact Monitoring	Surveys, cost-benefit analysis, and public acceptance studies.	3 years	Rethymno, Greece	DEYAR, CETENMA	Public, municipalities, environmental NGOs	National programs, EU funds	€
4. Dissemination and Communication	Maintenance of website, publications, participation in conferences, social media outreach, and targeted networking.	5 years	Europe-wide	All partners	Industry, academia, policy-makers, general public	Project partners, EU funding, private sponsorships	€
5. Replicability and Transferability	Conducting workshops, feasibility studies, and direct outreach to stakeholders in target regions.	5 years	Greece, Spain	All partners	WWTP operators, municipalities, decision-makers	National and regional funds, private investments	€€
6. Technology Commercialization	Business model development, patenting, and engagement with private sector stakeholders for co-financing.	2-5 years	Europe-wide	All partners	Investors, technology providers, WWTP operators	Private investments, revenue from licensing	€€€

7. Spin-off Creation	Exploring and establishing a spin-off company to manage commercialization and technology transfer.	2-3 years	Greece	TUC, DEYAR	Industry stakeholders, municipalities	Private equity, regional and EU funds	€€€
8. Participation in Events	Attendance and presentations at conferences, industrial fairs, and R&D workshops (e.g., IWA Congress, AEAS events).	5 years	Europe-wide	All partners	Academia, industry professionals, policy-makers	Project partners, EU funding, sponsorships	€
9. Awareness Campaigns	Targeted outreach through media campaigns, newsletters, and local community engagement.	5 years	Greece, Spain	All partners	General public, municipalities, environmental groups	Public-private partnerships, EU programs	€
10. Funding for Future Projects	Actively seeking funding through proposals to EU programs, national initiatives, and private donors.	Ongoing	Europe-wide	All partners	Policy-makers, funding agencies	EU programs (Horizon Europe, LIFE+), private sector	€

Legend for Financial Estimates: €: Low cost (up to €50,000); €€: Moderate cost (€50,000–€200,000); €€€: High cost (above €200,000).

10. Future Outlook

The LIFE B2E4sustainable-WWTP project demonstrates the potential for transformative impacts in wastewater management. By sustaining and scaling its outcomes, the project aligns with Europe's goals for a greener and more sustainable future. Through strategic dissemination, funding, and stakeholder collaboration, this innovation is poised to revolutionize wastewater treatment across Europe and beyond.