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BUENAS PRÁCTICAS

Actuaciones Cofinanciadas

INTEGRATED MANAGEMENT OF SLUDGE AND ORGANIC WASTE
MITLOP ACTION

Empresa Metropolitana de Abastecimiento y Saneamiento de Aguas de Sevilla (EMASESA)

**Programa Operativo
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GOOD PRACTICE REPORT ON THE INTEGRATED MANAGEMENT OF SLUDGE AND ORGANIC WASTE MITLOP ACTION

Empresa Metropolitana de Abastecimiento y Saneamiento de Aguas de Sevilla (hereinafter, EMASESA) presents as a Best Practice the action "**INTEGRATED MODEL FOR THE MANAGEMENT OF TREATMENT PLANT SLUDGE AND ORGANIC WASTE: MITLOP**".

The sludge generated in the treatment process of the Wastewater Treatment Plants (WWTP) is the main waste produced by EMASESA. The management of this sludge, under the principle of waste hierarchy, involves its energy recovery (production of biogas) and agricultural recovery (direct application to the soil for agricultural purposes or through composting).

As of 2018, a series of circumstances have arisen that make it necessary to readapt this management model to new requirements:

1. The entry into force of a new regional regulation, which requires the sanitisation of WWTP sludge for its direct application to agricultural land.
2. The environmental impact (odours) of the open composting process makes its development unfeasible in areas close to the population.
3. The strategic need to implement a model for the provision of urban water services under the circular and decarbonised economy approach.

To respond to these challenges, EMASESA proposes the **INTEGRAL MANAGEMENT MODEL FOR SEWAGE TREATMENT PLANT SLUDGE AND NON-HAZARDOUS ORGANIC WASTE (MITLOP)** project. This model incorporates a new design that provides a comprehensive solution to the management of WWTP sludge and water purification, including the management and possibility of recovery of other types of organic waste, such as vegetable biomass, which complies with and responds to the existing regulations at all times and eliminates or minimises to negligible values the possible environmental impact (odours, insects, noise, etc.) generated by the handling of this type of waste in the environment.

The MITLOP project has a budget of **18 million euros**, 64% of which is co-financed by the European Regional Development Fund (**€11,520,000**), through the Pluri-regional Operational Programme of Spain 2014-2020, thanks to the Line for the Promotion of Innovation from Demand (FID) of the Ministry of Science and Innovation.

This project has a direct benefit on a population of 1,100,000 people.



Picture 1. CPI actions: Advanced composting in the Copero Environmental Complex, Thermal Hydrolysis in Ranilla WWTP and Smart Platform for air quality control.

Criteria for being a good practice.

1. The action has been adequately disseminated to beneficiaries, potential beneficiaries, and the public.

Actions have been conducted with the aim of informing and publicising the project to the widest possible audience, disseminating it both at sectoral level and to the public. In all these communication and dissemination actions, the ERDF support has been adequately specified, in accordance with the requirements. They are listed below.

1. WEB information: EMASESA's website has a specific section containing information on the actions conducted with funding from the European Structural Funds (ERDF). This section includes information on MITLOP.



Picture 2. EMASESA website, section on European Projects and the MITLOP project.

Link: <https://www.emasesa.com/sostenibilidad/proyectos/proyectos-cofinanciados-con-fondos-estructurales/mitlop/>

In addition, there is a specific MITLOP project web page that clearly states its description, total amount, ERDF co-financing, as well as relevant information on its implementation.



Picture 3. MITLOP project specific website

Link: <https://mitlop.com/>

1. Placement of permanent plates: permanent plates with information about the project and ERDF have been fixed at EMASESA headquarters, as well as on the elements, installations and buildings financed within the framework of the project implementation.



Picture 4. Permanent posters in various locations

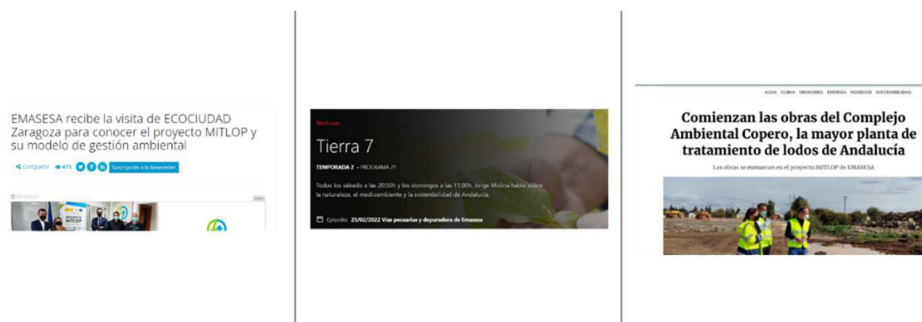
2. Temporary posters: Temporary posters have been placed at the sites where the actions that so required have been conducted (CPTI files 126/20 and 005/21)



Picture 5. Temporary posters placed at the location of the operation.

3. Dissemination in the general press (local and regional) and in general and sectoral media:

Throughout the implementation of the project, a continuous dissemination has been conducted, making it known to the public, highlighting its ERDF co-financing. This dissemination has been conducted in local and regional press and television, as well as in high impact specialised media: RETEMA, Aguasresiduales.info, iAgua or Industriambiente.



Picture 6. Examples of media coverage of the project.

4. Publication of informative videos: Three videos have been produced to explain what MITLOP is about, emphasising both the process of public procurement of innovation and the innovative elements of the project. These videos have been disseminated in the Aguasresiduales.info portal and through digital media of sectorial dissemination.

Link: <https://www.youtube.com/watch?v=I4npCJD2Vdw&t=4s>, https://www.youtube.com/watch?v=VMVKb23ZIZA_Y <https://www.youtube.com/watch?v=QRLheRy9zFQ>

5. Time-lapse videos of the works conducted through CPI files 126/20 and 005/21: To show the progress of the works from the start to completion and to be able to see how they have been developed; time-lapse videos have been made with the support of drone images. These videos are available to the public on EMASESA's website and the specific project website, as well as on EMASESA's YouTube channel.

Links: <https://www.youtube.com/watch?v=oGwmmAkRVOM>, https://www.youtube.com/watch?v=Kk27S64YxO0_y <https://www.youtube.com/watch?v=xQS9DEnyBZ8>

6. Specific events and workshops organised by EMASESA: various events and workshops have been organised with the aim of raising awareness of the project among different target audiences.

- Preliminary market consultations (June 2019): two informative workshops were held on the CPM process to encourage the participation of economic agents. In addition, a third information day was held to present the results of the process.
- Project presentation day (20/10/2022): under the title Water and Circular Economy, EMASESA presented the project as an innovative benchmark for the sector, with the participation of other public and private agents and from the R&D&I field, with 120 people attending in person and more than 700 online views.
- Day of results presentation of (27/06/2023): online day in which the results of MITLOP were presented and experiences in CPI were shared with other public agents in the water sector. The event was attended by 200 live participants and more than 100 live and recorded views.



Picture 7. Pictures of the CPM conference, Project presentation and results presentation day.

7. Presentation in sectoral forums: MITLOP has been presented at numerous sectoral events and conferences in the field of wastewater treatment, waste management, circular economy in urban

environments and innovation. A total of 12 forums and conferences have been attended, including the European Forum for Science, Technology, and Innovation (Transfiere); Greencities &S-Moving; the XXXVI AEAS National Congress; Conama Local 2023; and the Botin Foundation Conference on the new Wastewater Directive.



Picture 8. Different moments of participation in sectoral forums presenting MITLOP.

8. **Presentation of the actions to the neighbours of the project's areas of action:** an information day was held with the neighbourhood associations of the Fuente del Rey neighbourhood (Dos Hermanas) where the MITLOP Advanced Composting plant and its deodorisation system are located, to explain its innovative nature and the operating mechanisms that will minimise its environmental impact, also highlighting the support of the ERDF.
9. **Environmental Education Programmes:** a specific environmental education programme on water and circular economy has been conducted, focusing on MITLOP and its innovative nature, bringing its sustainable and innovative solutions closer to the school community in the region.



Picture 9. Pupils participating in the Environmental Education programme.

10. **Informative murals.** Large informative murals have been created on the exterior walls of the technical installations of the advanced composting unit, interpretation centre and auxiliary installations, with a high visual impact, to simply explain the management model, its benefits for the environment and the surroundings, as well as the innovative solutions through which the advanced composting process is developed, as the installations are not accessible to the general public.

2 . The action incorporates innovative elements

MITLOP is a Public Procurement of Innovation (PPI) (*Compra Pública de Innovación CPI*) project that aims to boost the circular economy in the water sector in Seville and its metropolitan area through an improved treatment process for the energy and agronomic recovery of WWTP sludge and other non-hazardous organic waste with a high organic load. This design requires solutions that are not currently fully implemented in the market, which have had to be implemented through innovative developments, for which it has been necessary to have the necessary technical infrastructures, such as the integration of thermal **hydrolysis in the sludge treatment line of the Ranilla WWTP, located in Barriada San José de Palmete quarter (Seville)**, under an innovative configuration consisting of its implementation, with a system that allows continuous operation, overcoming the limitations of existing technologies.

This innovative development integrates thermal hydrolysis in an inter-digestion configuration, which maximises its performance, increasing the percentage reduction of volatiles in the digestate, soluble COD and maximum post-digestion methanisation (biogas generation), all with the lowest energy requirement.

To achieve this, the use of pressure/temperature is optimised by heating the sludge to be hydrolysed with pressurised steam, which allows greater heating in a fast time, avoiding undesirable side reactions. Taking advantage of the high pressure and temperature of the hydrolysed sludge, a two-phase

decompression is conducted, which causes a sudden boiling and vaporisation of part of the water (steam explosion stage), increasing the physical breaking effect and reducing the volume. This not only improves the sanitation guarantee, but also allows for greater energy efficiency, as the energy required in the process can be provided partly by recirculation of the steam generated and the rest is produced by a boiler that uses the exhaust gases from the cogeneration engines installed for biogas utilisation.

In addition, the process operates under conditions that guarantee the sanitisation of the sludge and allows it to operate in a stationary regime (continuous process flow), unlike other configurations and overcoming the limitations of the Batch operation currently on the market.

On the other hand, at the **Copero Environmental Complex** (in Dos Hermanas, Seville) the elements have been arranged for the development of an innovative advanced composting system, in a large-scale confined space, which allows the process variables to be controlled, so that the reaction time required is reduced from 50 to 21 days. With a fully monitored tunnel configuration under glass, the innovative design allows the system to be operated and managed intelligently, shortening the process by up to 21 days and reducing the input of structural material (Smart compost).

The contaminated air is treated in an advanced biofilter, minimising the odour impact of the process. This air is extracted by centrifugal fans and conducted through a network of almost 2,000 m of polypropylene pipes, with a system of solenoid valves that are integrated into the control system for intelligent operation. The mechanism has sensors for measuring these volatile substances at the inlet and outlet of the biofilter, whose signals are incorporated into the integrated control system, allowing it to operate intelligently and optimising its performance according to the characteristics of the air to be treated, the external environmental variables and the necessary electricity consumption. The air renewal rate will be set intelligently according to the odour load detected by the integrated control system.

The environmental impact due to odours is controlled through a digital control and monitoring platform, capable of integrating different data and sources of information relevant to the management of emissions from the composting process (sensors, dispersion models, meteorological models, citizen perception, complaints, etc.) and providing advanced capabilities for decision making in the operation based on combined data analytics, as well as to optimise the deodorisation process of the advanced biofilter. One of its most innovative elements is the incorporation of social innovation and citizen science through the coupling of the NasApp platform with the Air Advanced Platform, thanks to the development of specific software that will allow the coupling of air quality models with citizen perception. This will make it easier to link the incidents reported by citizens with the modelling.

The process uses dry sludge from ETAP (conditioned by solar drying) as a structuring agent, which minimises the volume of the mixture to be composted and avoids the need for inputs.

MITLOP reinforces EMASESA's commitment to innovation to improve the provision of public urban water cycle services to the citizens of the metropolitan area of Seville, favouring the competitiveness of companies and generating value in the context of the circular economy.

Thus, starting from technologies with a certain degree of maturity (at the level of pre-competitive prototype or technologies that require final stages of development for their final implementation), MITLOP enables them to be successfully implemented in a real environment, consolidating them as proven technologies in a relevant, large-scale environment.

3 . Adequacy of the results obtained to the established objectives.

As indicated in the introduction, the objective of **MITLOP** is to provide a comprehensive solution to the management of the main waste generated by urban wastewater treatment and water purification, as well as other non-hazardous organic waste generated in the environment.

Specifically, the specific objectives of the project are as follows:

1. Treatment and recovery of all sludge generated by EMASESA from purification and drinking water treatment.
2. Advancing in the circular economy model: offering a local solution for the joint treatment of non-hazardous waste.

All this through an energy self-sufficient and low-carbon process.

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- The implementation of the innovative solutions developed within the framework of MITLOP makes it possible to: valorise 100% of the sludge produced at EMASESA's WWTPs, in strict compliance with the applicable regulations, guaranteeing the sanitisation of the entire production.
- To maximise biogas production (an increase of over 20% compared to a conventional process), achieving not only energy self-sufficiency at the WWTPs, but also complementing the advanced composting process.
- To develop a composting solution with a shorter process time, operated and controlled with an intelligent system, with zero environmental impact and energy neutral.
- To integrate into the process other organic waste generated in the metropolitan area, offering its producers (public and private) a nearby, low-impact solution for its valorisation.
- To develop value circuits around the circular economy.

New innovative goods or services on the market

Thanks to **MITLOP**, EMASESA can have a reference technical facility for the replication of the model in the sector, integrating novel solutions for its implementation in the market:

- An advanced composting unit, equipped with a deodorisation system and with an integrated intelligent control system, which allows it to operate in Smartcompost parameters on a large industrial scale (74 Tn/d).
- Advanced Thermal Hydrolysis installation, under a highly optimised configuration and operated in stationary regime.
- A smart platform for air quality and odour management, interoperating mathematical models with elements of social innovation and citizen science.

Public service improvements

The incorporation of new innovative solutions through the project represents a clear improvement in the provision of a public service, bringing greater social benefit to the territory, significantly reducing the environmental impact of the sludge management and treatment process, especially the effects on the surrounding population. It also guarantees the recovery of waste generated by third parties, creating value circuits within the framework of the circular economy at local level.

MITLOP reinforces EMASESA's commitment to innovation to improve the provision of public urban water cycle services to the citizens of the metropolitan area of Seville (more than one million), favouring the competitiveness of companies and supporting the transition to the circular economy.

4 . Contributing to the resolution of a problem or weakness detected in the territorial area of implementation.

In the territorial scope of EMASESA, three factors that can be considered important problems/weaknesses for the normal performance of its activity, which are solved with MITLOP, should be pointed out.

Firstly, the environmental impact of the composting process (mainly odours) makes its development in areas close to the population unfeasible. Due to the inconvenience caused to the public, EMASESA stopped operating its open-air composting facilities at the Copero Environmental Complex and had to outsource the composting of its sludge through a manager, which did not completely eliminate the odour impact (episodes in the transport process) and also entailed a higher cost and a higher CO₂ emission balance compared to a local (on-site) solution.

MITLOP makes it possible to eliminate or reduce the environmental impact due to odour to acceptable levels, which enables local recovery of the sludge and waste generated, through an environmentally more efficient and economically more viable solution.

On the other hand, the entry into force of the new regional regulations governing the direct application of WWTP sludge on agricultural land imposes health and hygiene requirements that could not be guaranteed with the conventional processes that EMASESA had been using. This prevented the direct recovery of this waste, which represents a problem/weakness for legal compliance, the provision of the public service under environmentally efficient principles, as well as entailing a high cost in the management of this waste, with the consequent risk of economic imbalance in the service, and the need to pass this higher cost on to the user.

MITLOP enables strict compliance with the new regulations and recovery through the elimination or reduction to acceptable levels of environmental impact, enabling its recovery through a more environmentally efficient solution.

Thirdly, the current social challenges impose the implementation of a model for the provision of urban water services under the circular economy approach, which entails the interrelation with other waste-producing sectors and actors and confers a leading role to the energy recovery of WWTP sludge in the progress towards energy neutrality and the decarbonisation of EMASESA's activity.

MITLOP enables progress to be made in the development of a circular economy model, offering a local, low-impact solution for the recovery of non-hazardous waste with a high organic load generated by the agri-food industry, which is predominant in the metropolitan area of Seville.

5 . High degree of coverage of the target population

The project fully covers the needs of Spain's fourth largest city in terms of population and economic (GDP) and its metropolitan area. Specifically, it serves 12 municipalities in the province of Seville (including the capital), which represents approximately 1,100,000 inhabitants, in addition to the 2.5 million tourists that the province receives annually, which increases the coverage of this project. Therefore, it is possible to confirm the high impact of **MITLOP** on the public of the province of Seville and, specifically, of the metropolitan area of the capital.

6 . Consideration of the horizontal criteria of equal opportunities and non-discrimination, as well as social responsibility and environmental sustainability.

This action has contributed to the environmental sustainability of the area by minimising the environmental impact of the sludge and other waste recovery process, and the actions have been conducted in accordance with the requirements established in the applicable regulations.

For the implementation of this project, the horizontal criteria of equal opportunities have been taken into account, as it benefits a large number of the population without any discrimination, and to this end, information activities have been organised (meetings with neighbourhood groups in the area) and awareness-raising activities (environmental education campaign aimed at schools) to disseminate the positive impacts derived from the development of the project.

MITLOP is a project that has been developed with the aim of contributing to the social and environmental well-being of the populations in which the new facilities are located. Within the framework of its 2030 Strategic Plan, EMASESA's objective is to contribute to the social comfort of the territory in which it conducts its activities. Likewise, the actions carried out in all phases of **MITLOP** contribute to the creation of new direct jobs, but also to the creation of indirect jobs, given that a product will be obtained (recovered sludge) that will be reintroduced into the production cycle, specifically in the primary sector, one of the most important in the province, thereby also returning the flow of resources to the environment and stimulating the development of circular urban models.

7 . Synergies with other policies or instruments of public intervention

MITLOP is aligned with the policies, strategies and regulations developed both at European level and in the national and regional framework.

1. European Green Pact: MITLOP is aligned with the objective of achieving climate neutrality by 2050, and more specifically it is aligned with the following action lines:

- Clean, affordable, and secure energy supply.
- Mobilising industry for a clean and circular economy.
- Towards zero pollution in a toxics-free environment.
- Preservation and restoration of ecosystems and their biodiversity.

2. Spanish Circular Economy Strategy Spain 2030: MITLOP contributes directly to the following

- strategic orientations from which the Strategy's action plans derive:
- Environmental protection.
- Effective application of the waste hierarchy principle.
- Awareness raising and communication.

- Employment for a circular economy

Furthermore, it is aligned with the measures envisaged in Axis 3 (Waste Management) and Axis 5 (Water Treatment and Reuse) and Action Lines 6 (Dissemination and Awareness Raising) and 7 (Promotion of Innovation) of the Circular Economy 21-23 Action Plan.

More specifically, **MITLOP** is particularly aligned with the measures included in *Axis 3.1 New Regulatory Framework on Waste*, which is specified through Law 7/2022, of 8 April, on Waste and Contaminated Land for a Circular Economy and *Axis 3.2. Revision of the Legal Regime of Key Waste Flows*, which includes, among its measures, a revision of Royal Decree 1310/1990, of 29 October, regulating the use of sewage sludge in the agricultural sector, which includes requirements relating to the sanitisation and stabilisation of sludge, as well as other requirements necessary to ensure the protection of human health and the environment.

Another Axis 3.2. measure with a particular link to **MITLOP** is measure 3.2.9 revising the Regulation of the use of organic matter from waste, which will address specific legislation on bio-waste and other organic waste, to define homogeneous criteria to determine the end of waste status for compost and digestate, and establish common criteria for the authorisation of the R10 waste recovery operation (treatment of soils resulting in a benefit to agriculture or ecological improvement of soils).

- 3. Law 3/2023, of 30 March, on the Circular Economy of Andalusia:** **MITLOP** contributes directly to achieving the transition towards a new economic model based on a circular economy, in which the rational use of resources is encouraged, the useful life of products is extended and waste generation is minimised, which is established as an objective of the Law, with which it also shares some of its guiding principles, which are, among others, efficiency, the integrated approach, the promotion of technical progress, promotion of education for sustainability, and coherence with policies to combat climate change.
- 4. Order of 6 August 2018 regulating the direct application of WWTP sludge on agricultural land:** this regulation provides for a 4-year moratorium for WWTP sludge producers to adapt to non-compliance with the regulation (August 2022), the innovative developments acquired in the framework of MITLOP allow EMASESA to be the first Andalusian operator to have effective means to adapt to such compliance.

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