



# LIPOR | Open Market Consultation

09 April 2024



The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000836



# Agenda

**01.** Project HOOP overview

**02.** Innovation Procurement Strategy and Open Market Consultation goals

**03.** LIPOR

Who we are

Biowaste management

Innovation strategy & Product development

**04.** LIPOR's innovation challenge: solutions for nutrient recovery from liquid digestate

**05.** The state of the art: advanced commercial solutions and relevant R&D&I projects in the field

**06.** Q&A



# 01 Project HOOP overview

Vitalise Europe's Urban Bioeconomy

*Miguel Ángel Suárez,  
CETENMA (Region of Murcia, Spain)*

**cetenma**

Centro Tecnológico  
de la Energía y del  
Medio Ambiente



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Circular  
Cities & Regions  
Initiative

CCRI Project

An initiative  
of the





# Who we are?



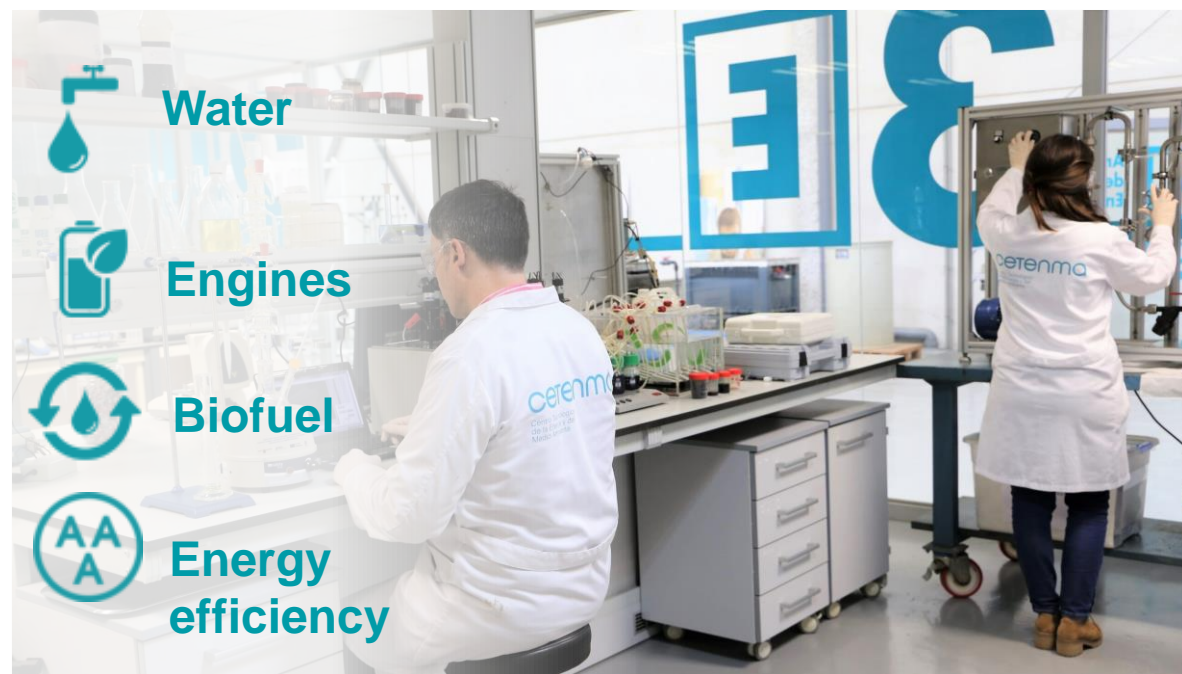
**cetenma**

Centro Tecnológico  
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The Technology Centre for Energy and the Environment, **CETENMA** (Cartagena, Spain), is a private, non-profit Business Association, which was set up to support companies with technological research, development and innovation in all areas related to Energy and the Environment, thereby assisting them in becoming more competitive.

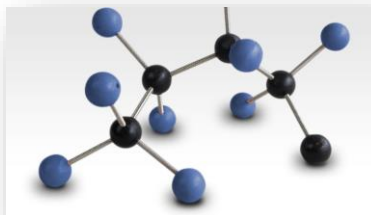




# HOOP is about Urban Circular Bioeconomy: why?

## Concerns

**Scarcity of raw materials**



**Excess of waste**





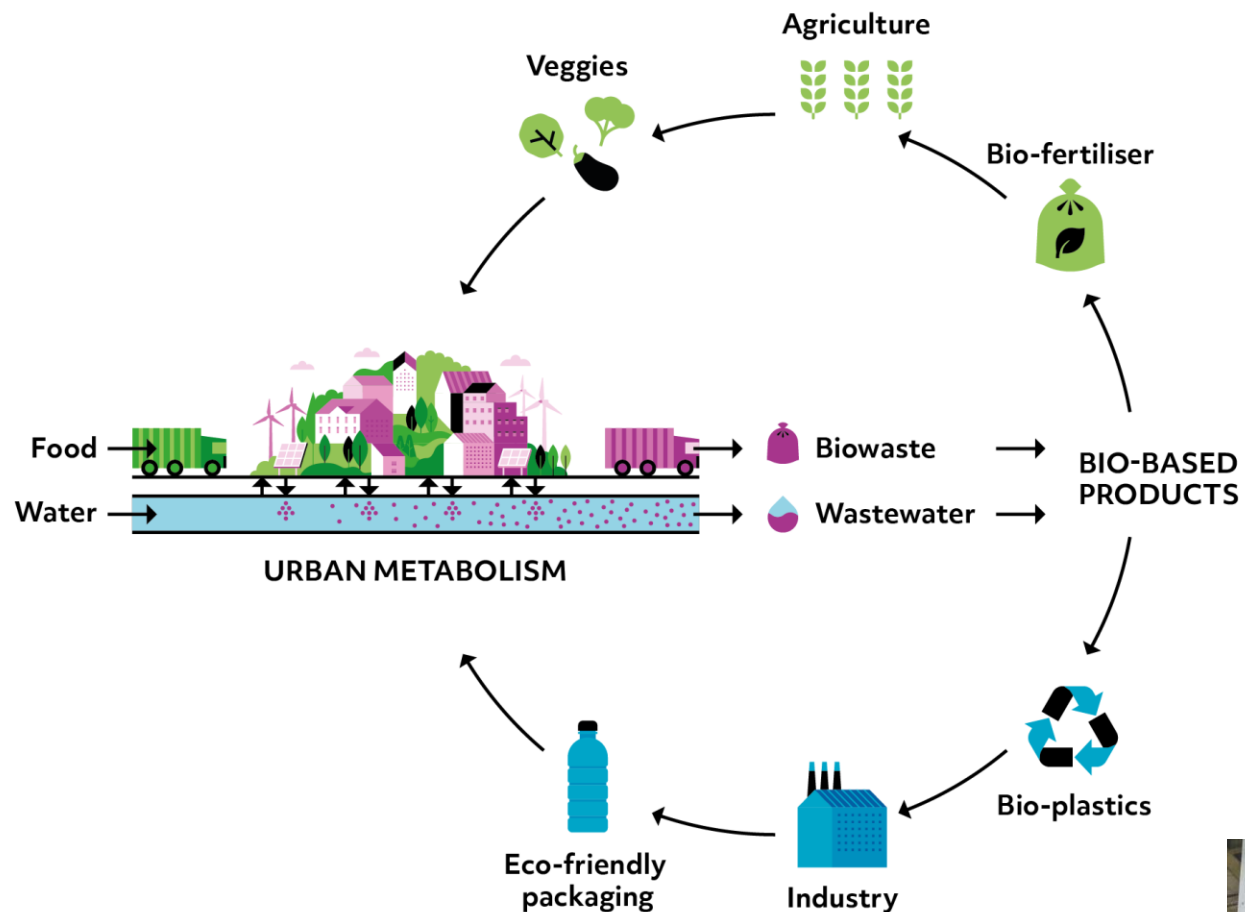
# HOOP is about Urban Circular Bioeconomy: why?

Concerns  
**OPPORTUNITIES**





# Urban Circular Bioeconomy: the concept



Chemistry



Biopolymers



Cosmetics



Construction



Textile



Nutrition



Agriculture



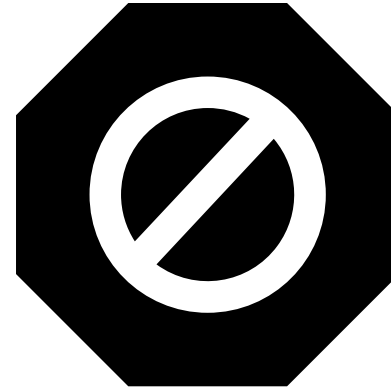
# Urban Circular Bioeconomy: the problem

Very necessary, very good,  
great idea

**BUT**

**A challenge on full  
scale**

*¿Why?*



- Funding
- Regulatory barriers
- Scale-up
- Market for bioproducts
- Etc...



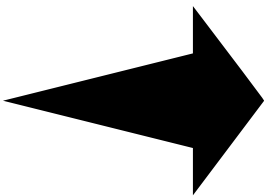
# The HOOP Solution

- ¿What? Unlock investments in urban circular bioeconomy
- ¿How? Providing project development assistance (PDA)
- ¿To whom? To projects in our 8 HOOP Lighthouses
- Scope: Valorisation OFMSW/sludge into bioproducts

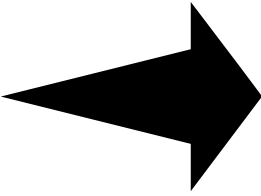


22 partners  
9 countries

9 M€  
Budget



51.7M€  
Commitment



142 M€  
Induced

Technological, Business Models  
and Environmental Assessment

Financial Engineering  
and Public Procurement

Networking, Communication, Social  
Science, Stakeholder Involvement



Oct  
2020



Apr  
2024

Oct  
2024



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 **8 HOOP Regional Partners**  
Lighthouse Cities and Regions

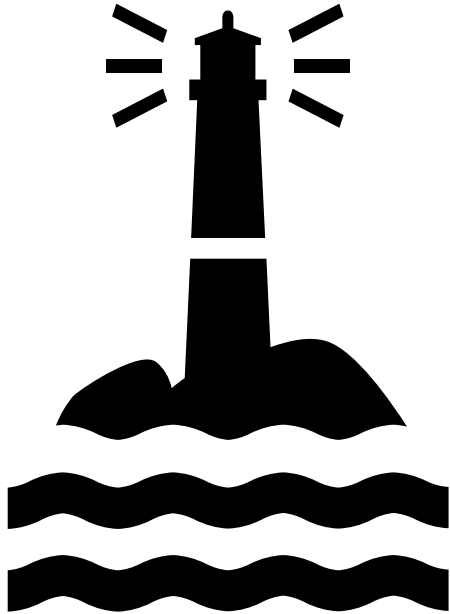


+ HOOP Network of  
Cities and Regions



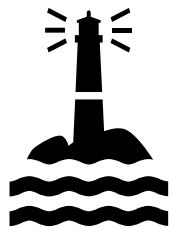


# HOOP: the city/region as protagonist

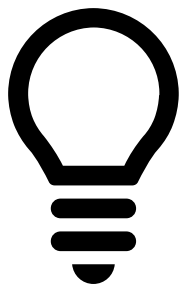


- The focus is the city/region, not the technology
- Understanding the context → urban metabolism analysis
- Urban Circular Bioeconomy projects oriented to solve challenges of the city/region
- Tailor-made assistance
- Public procurement as catalyst for the implementation of the Urban Circular Bioeconomy and innovation

# Project Development Assistance: How to arrive?



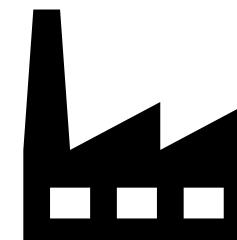
Lighthouse Cities  
and Regions



Projects in plan



hoop  
PDA



Projects done



Project  
developers

PDA elements



Local context &  
urban metabolism



Circular business  
models



Technological and  
environmental  
assessments



Innovative financial  
engineering &  
procurement



Innovation public  
procurement



Stakeholder  
engagement &  
mobilisation

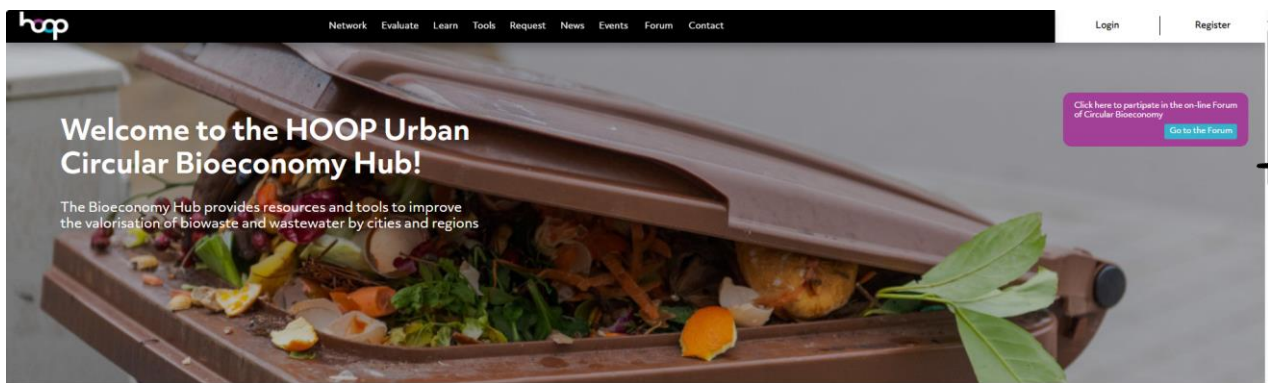
Technical, economic, financial and legal expertise to  
develop concrete investments.



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# HOOP Replicability: Urban Circular Bioeconomy Hub



**Network**

with Municipalities and waste and wastewater management companies around Europe

Join the HOOP Network →

**Evaluate**

the progress of your city or region towards biocircularity and the circular valuation and maturity level of your projects

Try our valuation tools →

**Learn**

about state-of-the-art technologies, strategies and best practices

Browse our Virtual Academy →

**Get support**

from project developers and investors to get technical support and mobilise green financing

Get support →

## Virtual Academy

The Virtual Academy provides resources related to the implementation of Urban Circular Bioeconomy solutions. This includes handbooks, manuals, factsheets and videos on technologies and financial engineering for circular bio-economy projects.

Filter: **Implement and develop** Collect and valorise Engage stakeholders Evaluate and improve

Search by keyword: Filter by topic:

**D4.1 Novel Circular Business Models applied in the value chain of bio-waste valorisation**

Author: DRAXIS ENVIRONMENTAL S.A.

Circular business models, Circular strategies

HOOP project\_Novel Circular Business Models applied in the value chain of bio-waste valorisation

This report focuses on the identification of Circular Business Models for bio-waste valorisation.

**Investment Package Manual for European Cities and Regions**

VOLUME III

National and Regional investment package on

Circular business models, Financing, Investment, OPREKH, Wastewater

HOOP project\_ Investment Package Manual for European Cities and Regions (Volume III)

The Volume III of the Investment Package Manual presents a selection and inventory of funding and financing schemes, programmes, instruments and tools for investment projects on circular bioeconomy and bioenergy at National and Regional levels.

**Investment Package Manual for European Cities and Regions**

VOLUME II

European investment package on circular bioeconomy and bioenergy at European level

Financing, Incentives, Legislation, Procurement

HOOP project\_ Investment Package Manual for European Cities and Regions (Volume II)

The Volume II of the Investment Package Manual guides the reader through the selection and inventory of funding and financing schemes, programmes, instruments and tools for investment projects on circular bioeconomy and bioenergy at European level.

## HOOP Network of Cities and Regions

**Bio-circularity Label**

The HOOP Circularity Label tool is an instrument to understand the current performance of a city/region regarding the implementation of bio-circular measures

HOOP Circularity Label →

**Circular Valuation Method**

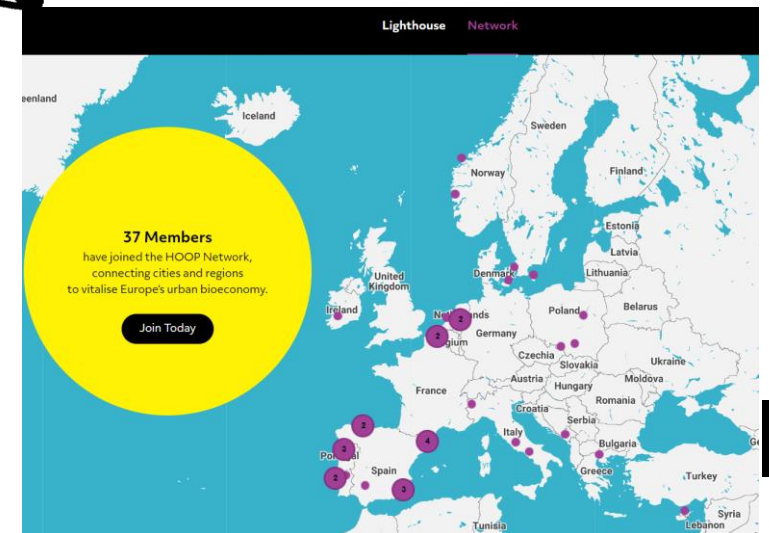
The Circular Valuation method is a clear and simple method for companies and public bodies to assess whether circular projects are financially attractive

Circular Valuation Method →

**Project Maturity Level**

The HOOP Project Maturity Level is a tool that evaluates the level of maturity of the projects in order to improve their maturity and bankability to mobilise green financing and funding

Project Maturity Level →



## HOOP City and project evaluation tools



# HOOP in other initiatives

- HOOP is a projects part of the [Circular Cities and Regions Initiative](#) (CCRI)
- Member of 2 CCRI working groups:
  - Bioeconomy
  - Industrial symbiosis
- HOOP is one of the projects part of ROOTS policy initiative



Circular  
Cities & Regions  
Initiative

CCRI Project

An initiative  
of the



Brussels - Room JDE52

The screenshot shows a video conference interface. On the left, a blue banner contains the HOOP logo, the title 'Vitalise Europe's Urban Circular Bioeconomy: The HOOP project', the date '27th September 2022, ROOTS Policy Conference', the Cerenma logo, and the name 'Martin Soriano, PhD, HOOP Project Coordinator'. On the right, a video feed shows a man in a grey suit sitting at a desk with a laptop and microphone. Behind him are several European Union flags and logos. At the bottom of the screen, a disclaimer states: 'This conference will be audio-recorded & may be web-streamed, video-recorded & photographed. The Committee may use the material thus collected for internal & external communication purposes. Personal data will be processed in compliance with Regulation (EU) 2018/1725.'

## Circular Policies for changing the biowaste system



TUESDAY 27 SEPTEMBER 2022 - 09:30 - 17:00



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## 02 Open Market Consultation

Innovation Procurement Strategy and Open Market Consultation goals

*Sara Bedin, HOOP*

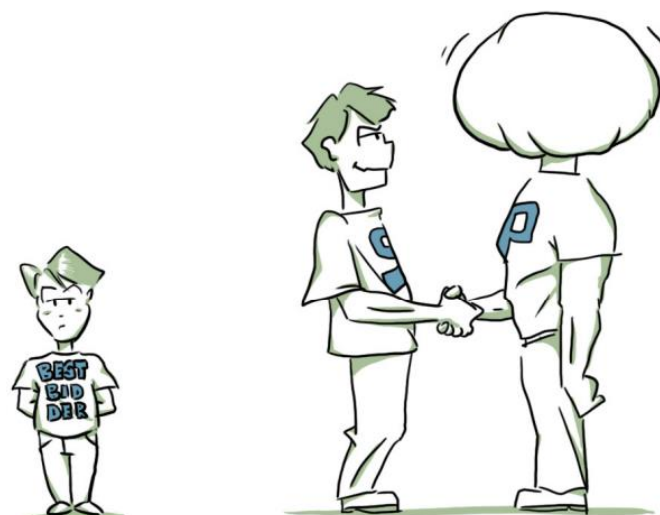


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# OMC process

proactive analysis of the offer system (availability of solutions and knowledge, business risks, technical and operational info...) to identify and define the most suitable means to satisfy one's needs.



INFORMATION ASYMMETRIES

Bella & Tundo

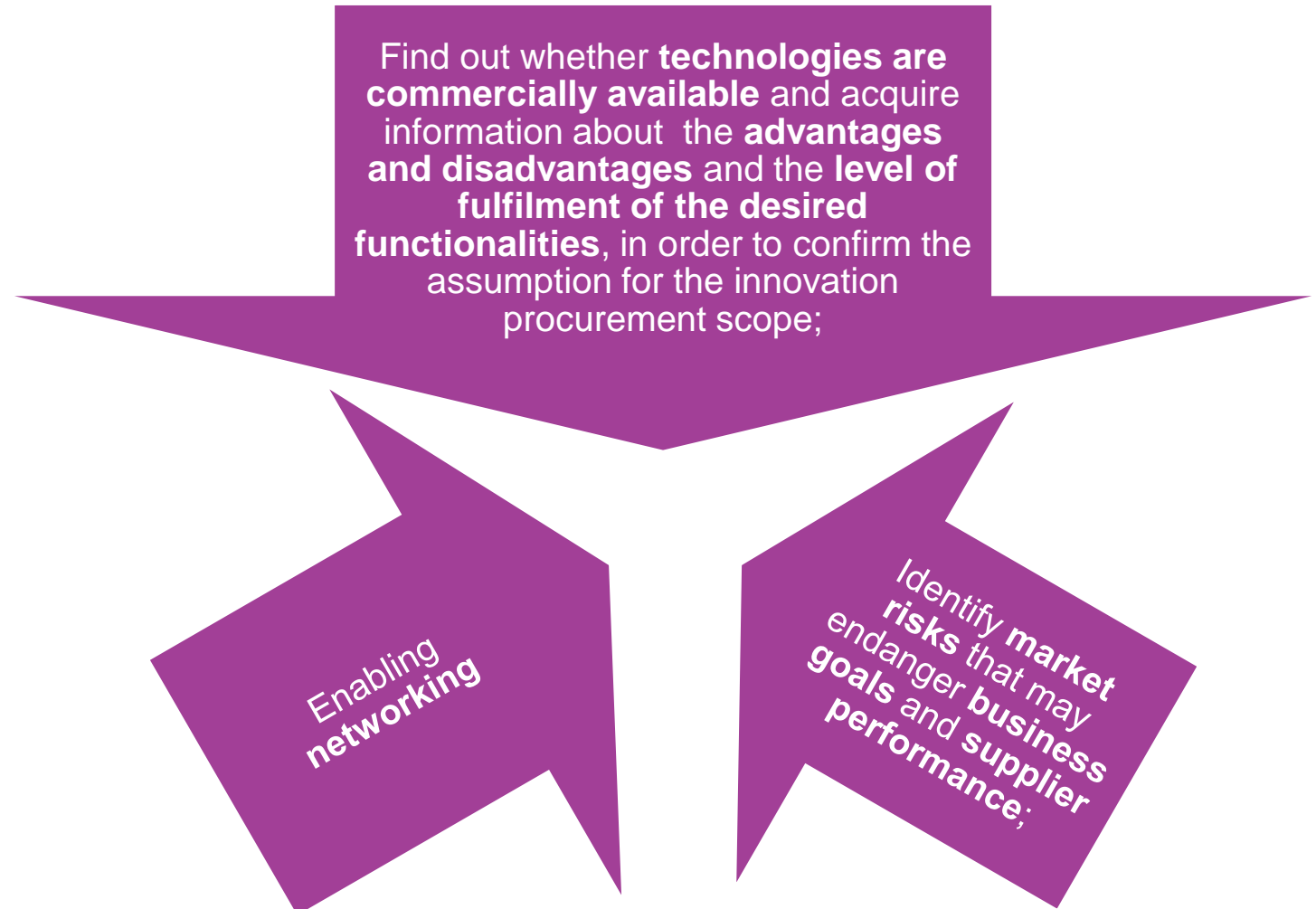
pre-information to the market in order to give a congruous time for the preparation of competitive fit-for-purpose consortium

reducing the information asymmetries existing between contracting authorities and market operators, so that the procurement takes place according to the best competitive criteria.



# OMC objectives

*Proactively analysing technology offerings and on-going developments.  
Providing an overview on the intended contract objectives.*





# OMC “rules”

Supply side

consultative, non-selective and free-of-charge process

not a requirement to submit a proposal to the planned call for tender,  
not lead to any rights or privileges for the participants,  
not part of any prequalification or selection process,  
contributions provided free of charge, without any right to reimbursement of expenses.

not a commitment to procure,  
not an obligation to set limits to the content of the (future) invitation to tender,  
any obligation to initiate a tender process on one or more or all investment areas considered after the preliminary market consultation.

Based on the results, decide to go back to the market for further input

Demand side



# How to participate?

On-line market survey (under a non-disclosure agreement)

<https://hooproject.eu/open-market-consultation-process-launched-by-lipor/>

[https://forms.office.com/pages/responsepage.aspx?id=Y-ocl4\\_Zg02qx3nvqLXU7M1CH5hQxWZFuZGG1bhwKJpUMTVSRDFWWDNaRjhXSEMwVE1YMIFBTUVZMy4u](https://forms.office.com/pages/responsepage.aspx?id=Y-ocl4_Zg02qx3nvqLXU7M1CH5hQxWZFuZGG1bhwKJpUMTVSRDFWWDNaRjhXSEMwVE1YMIFBTUVZMy4u)

# How to stay in touch?

Question # 15 - We would like to retain your contact details for other potentially relevant direct emails and/or newsletters around HOOP initiatives.



# Transparency and confidentiality conditions

The report with all relevant info and **broad topics of discussion** and all **questions and answers** will be shared and made public in an **aggregated** and **anonymous form**.

Open market consultation can be **filmed and put online** and the **names of companies/entities** that attend and participated (to) the open market consultation will be **published** (also to encourage further networking also between actors that were not able to attend).

- However, economic operators are required to accept / not accept to share and make public the **contact details** in the HOOP website (question 16 questionnaire).
- However economic operators are responsible to indicate, in written form, what **sensitive commercial information needs to be handled confidentially** and cannot be disclosed through the market consultation report.



## 03 LIPOR

Who we are

Biowaste management

Innovation strategy & Product development

*Susana Lopes and Telmo Machado, LIPOR*



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**“To transform waste into new resources through the implementation of innovative and circular practices, generating and sharing value.”**

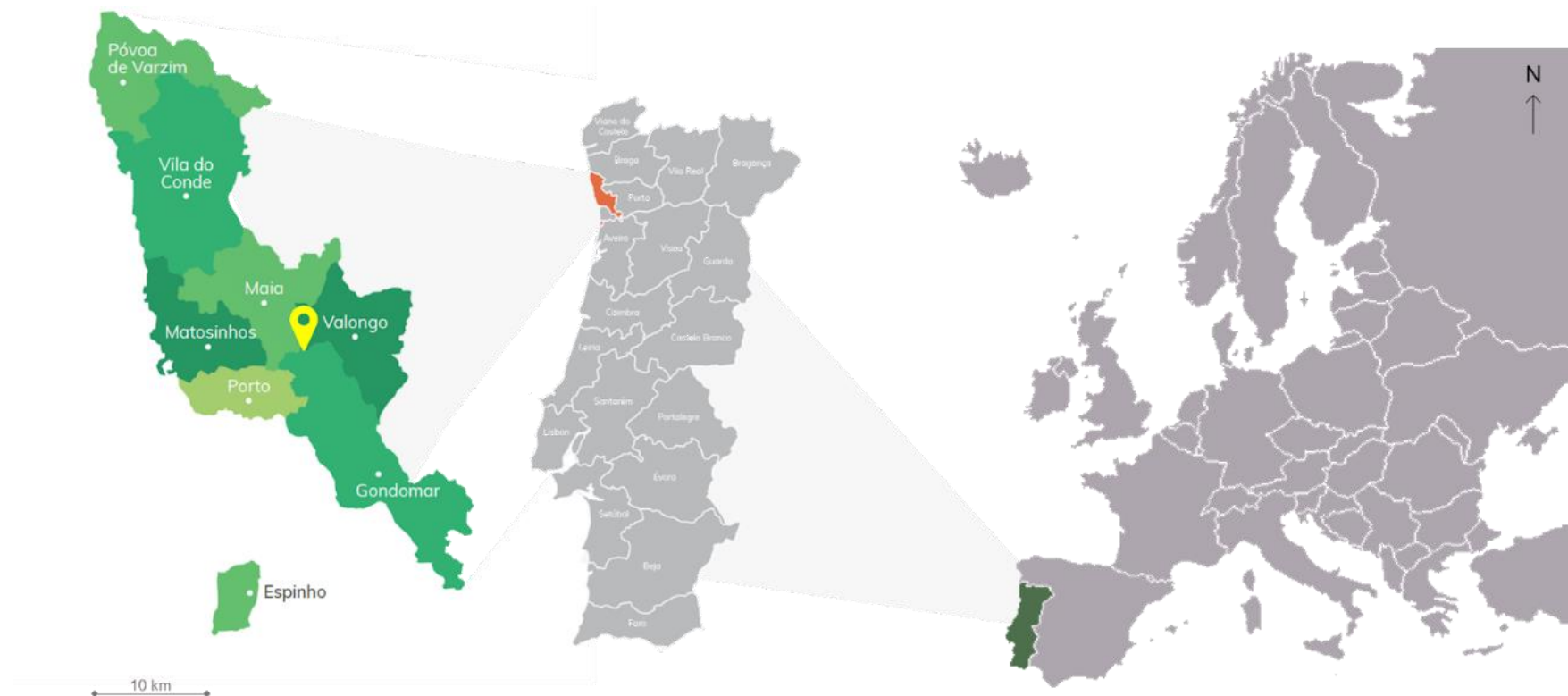


# Who we are

LIPOR – Municipalities Association for Sustainable Waste Management of Greater Porto, founded in 1982.

We specialise in waste treatment and recovery – managing, recovering and treating municipal waste generated by our 8 Associated Municipalities.

But we go further.





# Who we are



LIPOR

In Baguim do Monte/Ermesinde

Sorting plant, composting plant, operational support and management areas



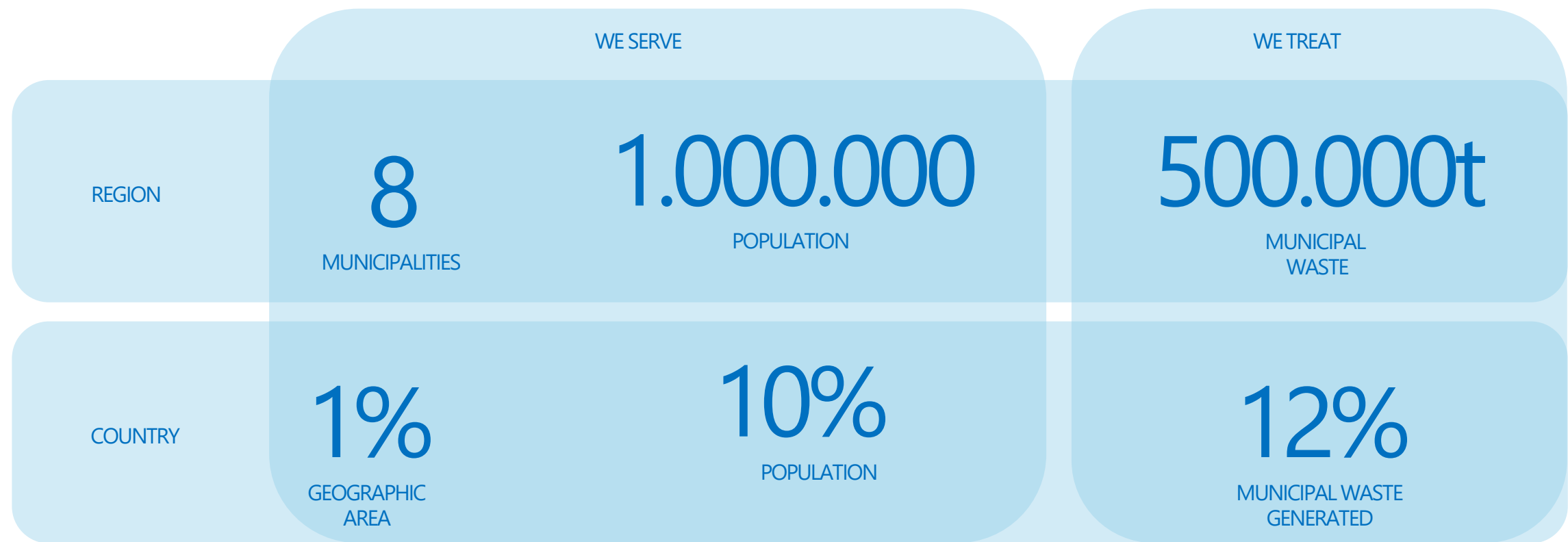
LIPOR II

In Maia

WtE unit, technical confinement (landfill) and WWTP



# Who we are





# Who we are

2023

IN:

+52kt t of biowaste to composting  
+85 kt for multimaterial recovery  
363 kt of municipal waste for energy recovery

OUT:

10 kt Nutrimais  
76kt materials for recycling  
163,182 MWh Electricity

# Biowaste Management



Reduction and reuse

Treatment at source

Decentralized treatment

Centralized treatment



# Biowaste Management

## Reduction and reuse

### *Dose Certa*

We foster healthier food catering





# Biowaste Management

## Reduction and reuse

### *Embrulha*

We provide packages for leftovers in restaurants





# Biowaste Management

## Treatment at source



17 333 compost bins  
9 community composting sites





# Biowaste Management

## Decentralised treatment

*Small-scale anaerobic digestion*  
900 t/year of food waste





# Biowaste Management

## Decentralised treatment

*Green waste composting park*  
8000 t/year of garden and park waste





# Biowaste Management

## Centralised treatment

*Composting plant*

52kt biowaste

10kt mutrimais





# Innovation Strategy & Product Development

Change in the business model

Unveil the potential value of waste and  
develop products and services for the Market

*Innovation Mission*





# Innovation Strategy & Product Development

Slag from W2E





# Innovation Strategy & Product Development

## Polymers





# Innovation Strategy & Product Development

Products for agriculture

For heathy soils:

*Natural organic compost*

*Growing media – 3 formulas*

*Wormcompost*

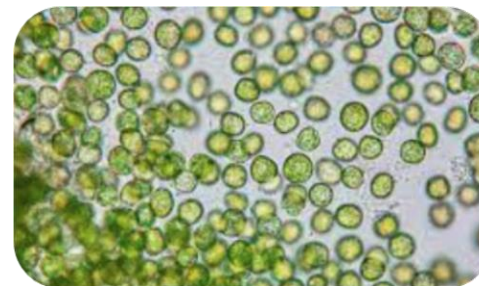




# Innovation Strategy & Product Development

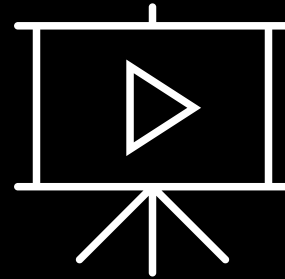
Products for agriculture

I&D





# LIPOR in HOOP



[https://youtu.be/NJJ\\_A7xGpRg?feature=shared](https://youtu.be/NJJ_A7xGpRg?feature=shared)



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# Innovation Strategy & Product Development

HOOP Project



## ***Pyrolysis***

To produce biochar for use in agriculture  
To treat refuse and waste streams that cannot be treated in the composting plant (eg. invasive plants)

## ***Nutrient recovery***

To produce circular P and N fertilisers  
To valorise digestate from LIPOR's future anaerobic digestion plant





# 04 LIPOR's Innovation Challenge

Solutions for nutrient recovery from liquid digestate

*Susana Lopes and Tania Pinto, LIPOR*



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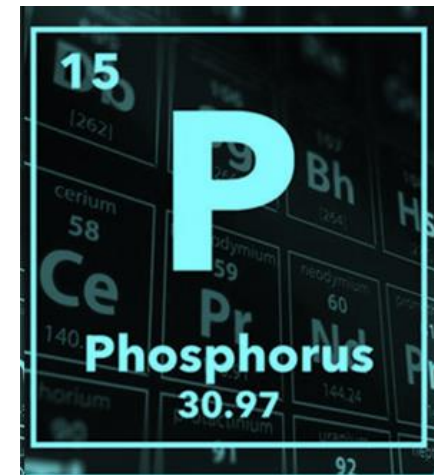
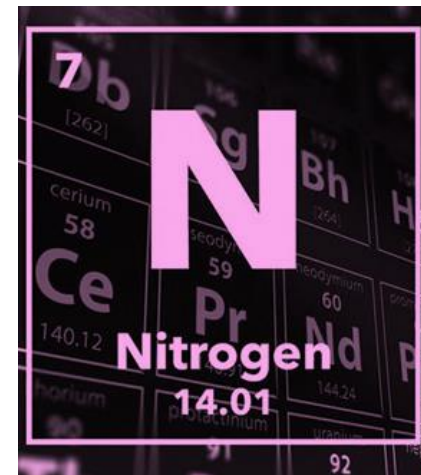


# Innovation Challenge

For the future anaerobic digestion plant, build a wastewater treatment plant capable to both **recover phosphorus** and **ammoniacal nitrogen** from the effluent to make a **marketable product** and **treat the wastewater to comply with discharge criteria**.

The desired solution should **optimize the trade-off** between high **nutrient recovery** system and **compliance of wastewater treatment** with discharge requirements.

*Both nitrogen and phosphorus are valuable nutrients essential for fertiliser products. This is of interest for regional agriculture.*





# Innovation Challenge

Baseline: Anaerobic digestion plant

Capacity: 65,000 t/yr of food waste from separate collection

Biogas to biomethane

Digestate to fertilisers

WWTP for effluent treatment

Achieve target for *preparing for reuse and recycling of municipal waste*

Carbon neutrality and circular economy





# Innovation Challenge

Baseline: Anaerobic digestion plant

**Raw liquid digestate:** about 160,000 t/year

The raw liquid digestate will be **dewatered**

The solid fraction will be **composted** and used as fertiliser/soil amendment

The liquid fraction (effluent) will be **recirculated** and/or **treated**

**Liquid fraction (effluent)** is around **150,000 m<sup>3</sup>/year**



# Innovation Challenge

## OPTIONS

1. A treatment module of 25,000 t/year (basic solution which only refers to the excess effluent stream)
2. A treatment module of 150,000 t/year (solution which refers to the entire liquid fraction of digestate)

*Or anything in between?*

### *Considerations:*

- Most of the nitrogen in the effluent is in form of **ammoniacal nitrogen** (NH<sub>4</sub>-N)
- Possible **recirculation** of a large part of the effluent back to the anaerobic digestion (~125,000 m<sup>3</sup>/year)
- High **concentrations of ammoniacal nitrogen** can **inhibit** the **anaerobic digestion**



# Innovation Challenge

## Characteristics

The untreated liquid fraction (effluent) in similar plants:

- has an **ammoniacal nitrogen** content of **3000 – 4500 mg/L**
- has a **total phosphorus** content of **50 – 250 mg/L**

(Other expected parameters for the effluent in the Table 1)

Table 1. Expected Effluent Parameters

Parameter	Unit	Average	Range
pH	Sorensen	8.3	7.8 – 8.8
BOD5 20°C	mg/L O2	3200	1500 – 7800
COD	mg/L O2	15200 (11300)	5400 – 25300 (3000 – 20100 dissolved)
TS	%	1.8	0.6 – 2.4
VS	%	56.4	45 – 75
TSS	mg/L	0.9	0.1 – 1.2
Conductivity	µS/cm	24200	8800 – 27600
Nitrogen total	mg/L N	2700	700 – 4600
Nitrogen ammoniacal	mg/L NH4	3600	1200 – 5000
Phosphorus total	mg/L P	200 (130)	75 – 585 (55 – 350 dissolved)
Alkalinity	Mg CaCO3/L	11500	2300 – 14700
Carbonates	Mg CaCO3/L	720	100 – 2000
Bicarbonates	Mg HCO3/L	13400	2800 – 16700



# Innovation Challenge

## Requirements

Requirements for treated effluent (output after nutrient recovery):

- **Total nitrogen** content lower than **40 mg/L**
- **Ammoniacal nitrogen** content lower than **30 mg/L**
- **Total phosphorus** content lower than **20 mg/L**

(Other requirements on Table 2)

Table 2. Output requirements

Parameter	Unit	Limit accepted value
pH	Sorensen	6.0 – 9.0
BOD5 20°C	mg/L O2	≤ 500
COD	mg/L O2	≤ 1000
TSS	mg/L	≤ 500
Conductivity	µS/cm	≤ 2000
Nitrogen total	mg/L N	≤ 40
Nitrogen - ammoniacal	mg/L NH4	≤ 30
Nitrates	mg/L NO3	≤ 50
Phosphorus total	mg/L P	≤ 20
Sulphates	mg/L SO4	≤ 2000
Sulphites	mg/L SO3	≤ 1
Sulphides	mg/L S	≤ 1
Chlorides total	mg/L Cl	≤ 150
Available residual chlorine - free	mg/L Cl2	≤ 0.5
Available residual chlorine - total	mg/L Cl2	≤ 1
Aldehydes	mg/L	≤ 1
Phenols	mg/L C6H5OH	≤ 0.5
Oils and fats	mg/L	≤ 100
Mineral oils	mg/L	≤ 15
Detergents	mg/L	≤ 20
Hydrocarbons total	mg/L	≤ 50
Cyanides total	mg/L CN	≤ 0.5
Aluminium	mg/L Al	≤ 10
Iron – total	mg/L Fe	≤ 2
Manganese – total	mg/L Mn	≤ 2
Arsenic - total	mg/L As	≤ 1
Lead -total	mg/L Pb	≤ 1
Cadmium – total	mg/L Cd	≤ 0.2
Chromium – total	mg/L Cr	≤ 2
Chromium (VI)	mg/L Cr (VI)	≤ 0.1
Mercury – total	mg/L Hg	≤ 0.05
Copper - total	mg/L Cu	≤ 1
Nickel - total	mg/L Ni	≤ 2
Selenium – total	mg/L Se	≤ 0.05
Tin	mg/L Sn	≤ 1
Heavy metals – total	mg/L	≤ 10

# Innovation Challenge

List of Functional Requirements	Performance Requirements
Must be able to <b>treat an effluent</b> with the characteristics in Table 1	Must <b>comply</b> with the parameters in <b>Table 2</b>
Must <b>recover some ammoniacal nitrogen</b>	Nice to <b>recover at least 40% of ammoniacal nitrogen</b> in the effluent
Must <b>recover phosphorus</b>	Nice to recover <b>at least 15% of phosphorus</b> in the effluent
Must <b>allow the recirculation</b> of liquid digestate	
Should provide a <b>marketable product</b> containing the recovered nutrients, preferably a fertiliser, which should <b>comply</b> with one or more of the categories in Fertiliser Product Regulation <b>2019/1009</b> and with the Portuguese fertiliser legislation <b>DL30/2022</b> and <b>P185/2022</b>	
Should be <b>economically sustainable</b> , both in terms of investment size ( <b>CAPEX</b> ) as in terms of operational costs ( <b>OPEX</b> ) The desired solution needs <b>to optimize the OPEX for nutrient recovery</b> along the entire life-cycle	Transmit guaranteed performances in terms of <b>energy consumption</b> (kwh/m <sup>3</sup> of treated effluent) Transmit guaranteed performances in terms of <b>consumables</b> (t or m <sup>3</sup> /m <sup>3</sup> of treated effluent)
The desired solution should ideally not create new waste streams	



# Innovation Challenge

**Answer the questionnaire available on HOOP website!**

- Identify confidential information
- Reports and results will be presented in an aggregated and anonymised manner
- If we feel the need to discuss any aspect further, we might invite you for 1-2-1 meetings
- If you need any information: [hoop-omc@lipor.pt](mailto:hoop-omc@lipor.pt)





# 05 The state-of-the-art dialogue

Advanced commercial solutions and relevant R&D&I projects in the field

*Miguel Ángel Suárez, Cetenma*



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# State-of-the-art dialogue

## State of the art

Stripping-scrubbing

Reverse osmosis

Membrane contactor

Ion exchange

Precipitation of ammonium salts

Microalgae production

Electrodialysis



# State-of-the-art dialogue

1. **Known technology, pilot or demo solving the same problem? What is the TRL?**
2. *"Should provide a marketable product containing the recovered nutrients, preferably a fertilizer, compliant with relevant legislation"?*
3. **Any technological/regulatory/market barriers and requirements?**



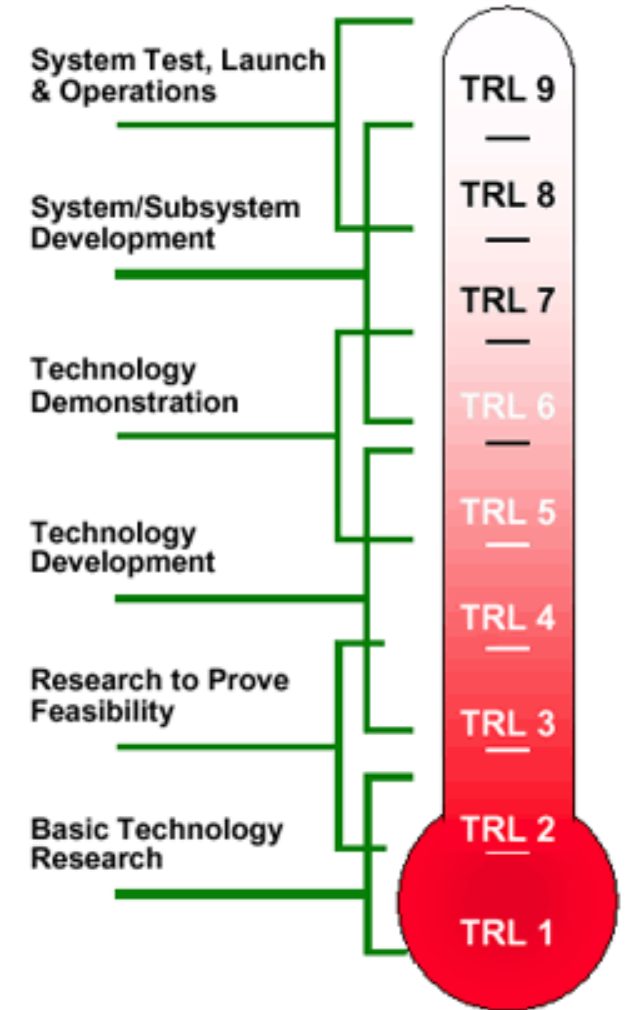
# State-of-the-art dialogue

## 1. Known technology, pilot or demo solving the same problem?

**What is the TRL?**

## 2. *"Should provide a marketable product containing the recovered nutrients, preferably a fertilizer, compliant with relevant legislation"*?

## 3. **Any technological/regulatory/market barriers and requirements?**





**Q&A**



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