



# SYSTEMIC

Circular solutions for biowaste



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## Introduction

- In the present economy, many natural resources are becoming scarce while on the other hand, waste disposal is increasingly causing negative effects on the quality of our environment.
- Organic waste – such as manure, sewage sludge and food waste – contains many valuable nutrients which can be recovered and re-used to close the nutrient cycle. SYSTEMIC facilitates the transition towards a circular economy by demonstrating new approaches to nutrient recovery from those types of biowaste streams.

*Recovery of nutrients from biowaste is essential to sustaining our future food production while decreasing environmental impacts.*

## Goals

- This innovative business project showcases at five large-scale demonstration biogas plants a cascade of novel nutrient-recovery approaches and techniques, including their performance and business model.
- The options of the techniques and the lessons learned will be evaluated at another ten European biogas plants.
- Policy advice to overcome innovation barriers and advance the Circular Economy in Europe will be provided.

## Treatment of biowaste

- Within the Circular Economy, biowaste is a source of energy, organic matter and nutrients, e.g. nitrogen (N), phosphorus (P) and potassium (K).
- The recovered nutrients can be used either as a direct substitute of fertilisers, or as a resource for the production of mineral fertilisers.
- The remaining organic matter with a reduced mineral content is a valuable soil improver that can be applied in the local region.
- This treatment approach of biowaste will:
  - reduce the energy consumption and CO<sub>2</sub> emissions associated with synthetic nitrogen production;
  - reduce Europe's dependency on external and finite phosphate reserves;
  - reduce CO<sub>2</sub> emissions of biowaste transport and reduce the nutrient losses to water and air due to the increased the nutrient utilisation.

## Demonstration plants

Name	Capacity and main feedstock	Products
Groot Zevert Vergisting, the Netherlands	100,000 t pig slurry	Biogas, ammonium sulphate, (N/) K-concentrates, calcium phosphate, organic soil improvers
AM-Power, Belgium	180,000 t food waste	Biogas, N, K-concentrates organic fertiliser
Acqua e Sole, Italy	120,000 t sewage sludge	Biogas, ammonium sulphate organic fertilisers
Waterleau New Energy, Belgium	70,000 t Manure, biowaste, industrial sewage sludge	Biogas, ammonium solution, dried solid fraction, NPK concentrate and process water
Benas (GNS), Germany	80,000 t corn silage, poultry litter	Biogas, Ammonium sulphate calcium carbonate, organic fertiliser, cellulosic fibres

## Towards a circular economy

- Existing biogas plants will be enhanced with novel nutrient-recovery technologies. These pioneering plants play a pivotal role in the evaluation of the performance of our new circular solutions.
- The composition and quality of the products will be tuned to meet the requirements of regional markets. This market-driven approach is needed to develop a viable and sustainable industry.



## SYSTEMIC large-scale, eco-innovation approach

### leading pioneers

(five demonstration plants in their local contexts)

working on novel Nutrient Recovery & Re-use (NRR) techniques

### first followers

(ten outreach plants in additional regions)

gaining business opportunities

- Advance the Technology Readiness Level (TRL) from pilot scale to full scale plant
- Showcase the technology & business case



- Regional market survey
- Nutrient-recovery strategies
- Co-creation into new businesses options

Dissemination & Policy advice

## Expected results and impacts

- Substantially improve efficient resource use in Europe, contributing to significant reduction of adverse environmental impacts;
- Create new business opportunities for industry and SMEs in the EU, including in manufacturing in the global market for eco-innovative solutions;
- Demonstrate the economic, social, and environmental sustainability of the proposed approaches and main elements that a business plan should include in order to realise them, including an assessment of possible positive and negative side-effects and risks;
- Provide evidence-based knowledge for enabling framework conditions (such as the regulatory or policy framework) that facilitate a broader transition to the Circular Economy in the EU.



SYSTEMIC receives funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under Grant Agreement no. 730400.

