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RECYCLES WORKSHOP

Metagenomics and metabarcoding approaches to describe ecological systems and infer their development

5th, 6th & 7th of July 2022

Project overview

David Gabriel

Dept. d'Enginyeria Química, Biològica i Ambiental

Universitat Autònoma de Barcelona

GA: 872053 — H2020 - MSCA - RISE-2019

Project Data

PROGRAMME	HORIZON 2020-EU.1.3.3. – Stimulating innovation by means of cross-fertilisation of knowledge
TYPE OF ACTION	MSCA-RISE-2019 – Research and Innovation Staff Exchange (RISE)
GRANT AGREEMENT ID	872053
DURATION	January 2020 – ~~December 2023 (48 months)~~ → **18 months extension**
CONSORTIUM	8 institutions from 5 countries
COORDINATOR	Universitat Autònoma de Barcelona
OVERALL BUDGET	1 209 800 €

Project Data

EU Partners

Universitat Autònoma de Barcelona

aeris TECNOLOGÍAS AMBIENTALES

UNIVERSITÀ DEGLI STUDI FIRENZE

ITALPROGETTI

UNIVERSITÀ DI PISA

Third Country Partners

University of Manitoba

Prince of Songkla University

Pontificia Universidad Católica de Valparaíso

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Context

Current situation:

- Many treatments are based on intensive energy-consuming unit processes
- Large energy/chemicals consumption: increased costs
- Based on non environmental friendly technologies
- Biological systems: often relying on aerobic processes
  - high substrate-biomass yields
  - significant aeration costs
  - Poor/nil materials/energy recovery

Context

- Circular economy and energy efficient processes
- Extensive Research and Innovation:
  - Many developments in the removal of C, S, N, P (often targeted individually)
  - Many biotechnological alternatives available at low-medium TRL

Objective:

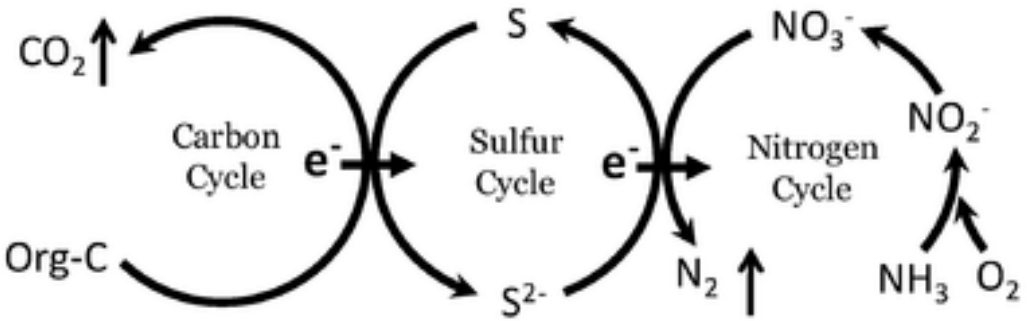
to exploit the **integration** of the C, N and S cycles in **bioreactors** to design optimal **treatment trains** to **recover** added-value products out of liquid and gaseous effluents

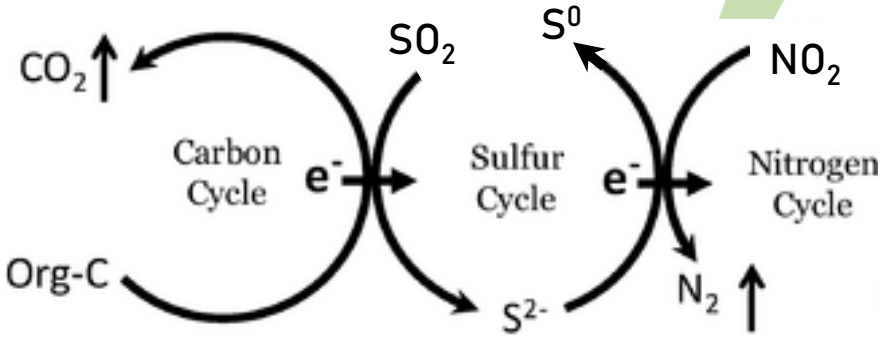
Project Objectives

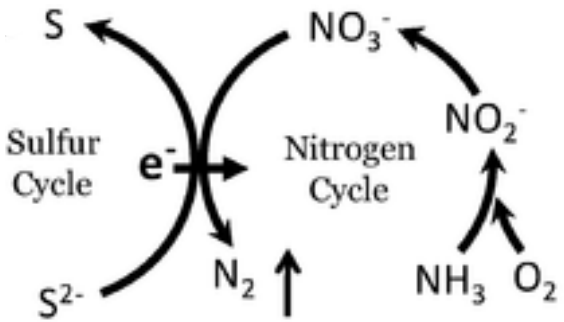
1. to investigate **innovative biotechnologies** and solutions allowing an improved integration of mass transfer and biodegradation rates

2. to investigate the potential of **combining liquid and gaseous effluents** treatment in **optimal treatment trains** reducing energy requirements, costs, environmental impact considering resources recovery

Use of oxidoreductive capacity of each cycle



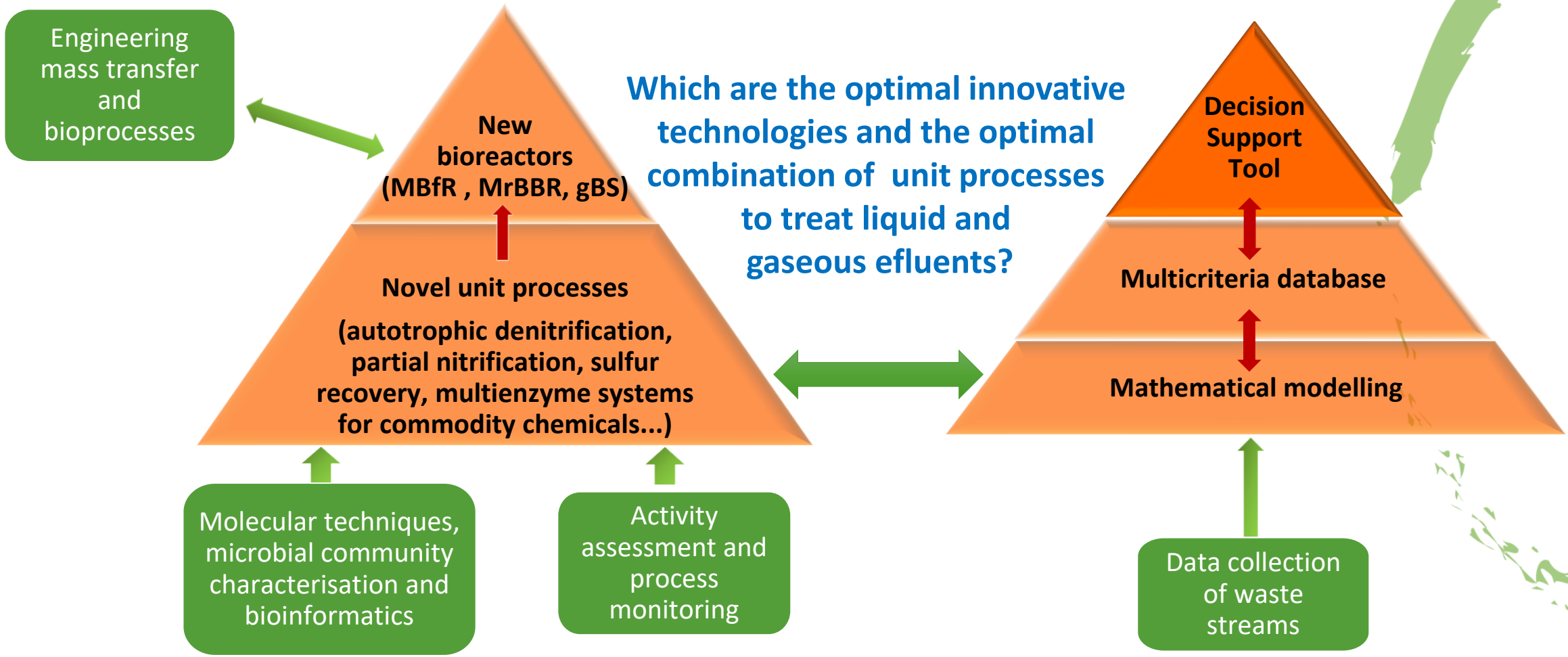




Ammonia removal from composting off-gases combined with S removal in biogas desulfurization

NOx and SOx absorption combined with oxidoreductive mechanisms of the S cycle for biosulfur recovery

Project Implementation



Main current activities

-Construction of a **database** of characteristics of selected gaseous and liquid effluents

-Exploring mechanisms **of autotrophic denitrification** for the removal of sulfur and nitrogen pollutants in environmental matrices

-Development of **mathematical models for SO-NR bioreactors** and their interactions with reduced carbon compounds

-Study of **microbial diversity** of a range of bioreactors

-**Life cycle analysis and life cycle costing** of biosulfur recovery treatment trains

Project Outcomes

After RECYCLES: reversing the actual situation

- Advanced treatments trains based on innovative biotechnologies
    - Based on environmental friendly technologies
    - Less resources-consuming unit processes
    - Reduced costs
    - Potential recovery/production of energy and chemicals
- A decision tool and mathematical models that will help decision making

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