

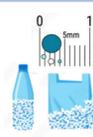
# Emerging pollutants in the environment : Occurrence, fate and mitigation

## Bioremediation with biomass production for bioenergy generation

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### Introduction

- Emerging Pollutants (EP) are generated by daily anthropogenic activities and are considered persistent contaminants in the environment. Wastewater Treatment Plants (WWTP) are the first barrier for most of these pollutants and their entrance in the environment depends on the removal rate during WW treatment. Microplastics, Nanoplastics, Active Pharmaceutical ingredients herbicides, pesticides and personal Care Products (PCPs), are the main compounds found in WWTP effluents, that ultimately enter into the water cycle leading to bioaccumulation with harmful impacts in the ecosystems.



#### Microplastics

Small plastic particles (< 0.5 mm – 0.1µm) that are originated from macro plastics degradation.



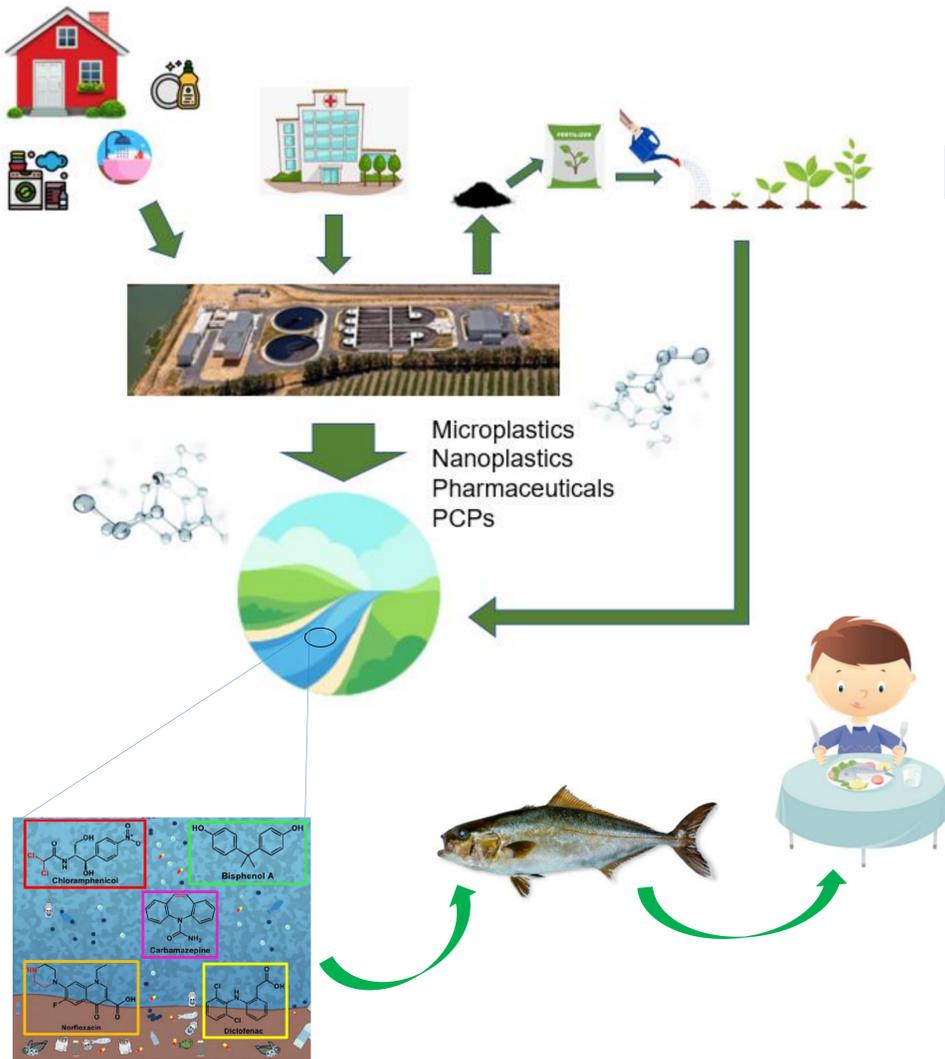
#### Pharmaceuticals

Therapeutical compounds for human and veterinary use, excreted by urine and faeces, entering the WWTP systems.



#### PCPs

Different classes of compounds present in personal care and house hold products - Main source for wastewater contamination by nanoplastics



### Microplastics and APIs WWTPs

Presence of MPs particles up to 447 particles/L in a WWTP effluent (Sun *et. al.* 2019)

>2 000 000 Particle/day released in the aquatic systems !

Presence of APIs and PCPs in WWTP effluents in Portugal (Paíga *et. al.* 2020; Salgado *et. al.* 2010)

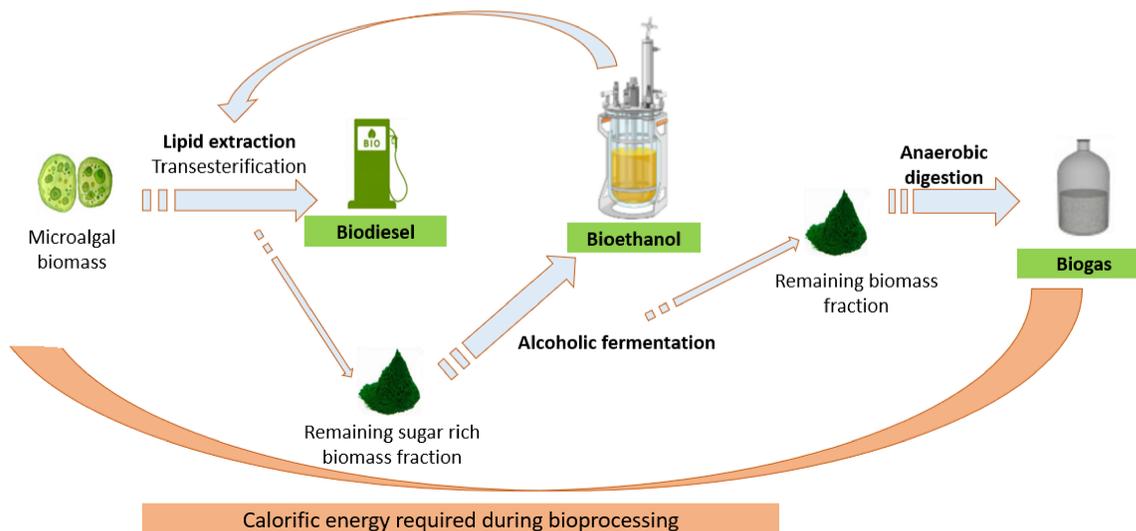
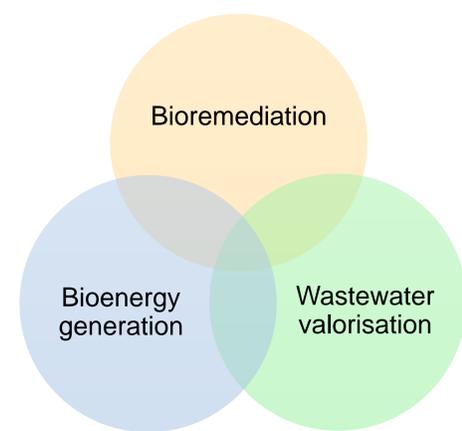
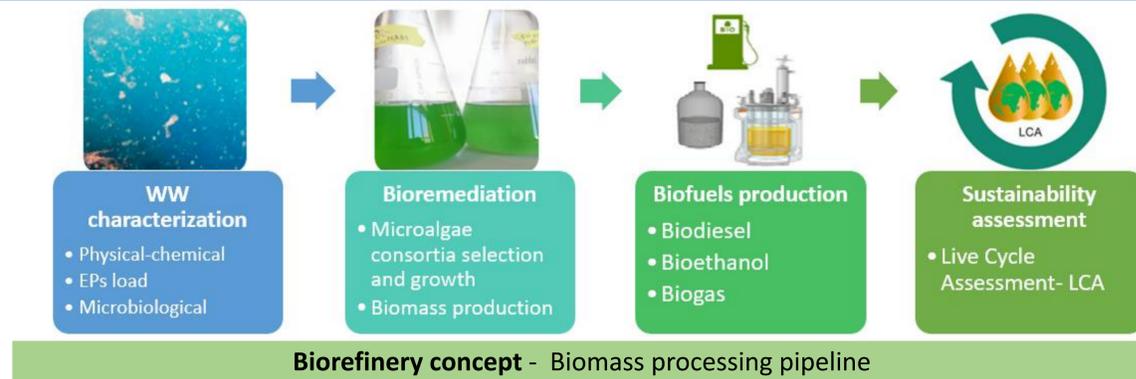
> 50 different APIs have been detected in WWTP effluents!

In the Arade river, was detected the presence of 13 APIs (Gonzalez-Rey *et. al.* 2015)  
**Up to 800 ng/L !**

Although concentrations of EPs in marine water are low, their continuous discharge in the aquatic systems by WWTPs leads to a phenomena known as bioaccumulation in marine organisms causing toxicological effects and entering the food chain and human feed.

### Project goals – Solutions for EP mitigation and WW valorisation

- This starting project aims to characterize wastewater effluents samples from two WWTPs located in Algarve, in terms of EPs load, with focus on microplastics, nanoplastics, APIs and PCPs. Effluent water will be used to select natural occurring microalgal consortia by blooming process, to address their bioremediation potential. The biomass produced will be characterized in terms of biofuels production potential. Three types of biofuel will be produced from the different fractions of the biomass: biodiesel, bioethanol and biogas, in a biorefinery concept.



### Main challenges

- Finding and developing accurate and reproducible methods for EPs detection .
- Heterogeneity of biomass produced in WW
- Cost effective Biomass harvesting methods
- Low yields in biodiesel production
- High costs of the whole bioprocess

#### References

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