



Sapienza University of Rome in PRIMA-SAFE: introducing the modelling & sustainability team

Description



Sapienza University is one of seven core partners in **PRIMA-SAFE** — “**Sustainable water-reuse practices improving safety in agriculture, food & environment.**”

Under the direction of **Assoc. Prof. Antonio Zuurro**, Sapienza leads **Work-Package 3: *Modelling, optimisation and evaluation of economic impact***, building the decision-support backbone that will tell growers, plant designers and policy-makers *when* and *how* reclaimed water becomes both safe and cost-effective.

What Sapienza brings to SAFE

- **Advanced process-modelling tools** (originating from the H2020 *ExCornSeed* project) are being redeployed to simulate unit operations such as anaerobic bioreactors, biochar polishing beds and UV disinfection, and to predict removal efficiencies for nutrients, pharmaceuticals and heavy metals.
- **Techno-economic and life-cycle metrics** (CAPEX/OPEX, net energy ratio, avoided CO₂-eq.) are calculated for each treatment train, providing a robust cost–benefit picture that complements the agronomic tests performed by UNIBAS and CNR-IRSA.
- **Quantitative microbial-risk assessment (QMRA)** protocols developed at Sapienza are used to verify that reclaimed water meets EU Regulation 2020/741 for *E. coli*, helminth eggs and enteric viruses before field application.

Meet the Sapienza team

Antonio Zuurro – Associate Professor, scientific supervisor for Sapienza & WP-3 leader. Chemical-engineering background with 20+ years' expertise in valorising agro-industrial residues and designing circular-economy processes. Leads the integration of optimisation algorithms and sustainability indicators in SAFE.

Roberto Lavecchia – Associate Professor, specialist in advanced oxidation processes, enzyme-assisted extractions and microalgae biorefineries. In SAFE he supports kinetic modelling of contaminant degradation and validation of bio-based adsorbents.

Loveille Jun Gonzaga – PhD candidate (cycle XXXIX) investigating extraction and characterisation of bioactive compounds from biomass; now exploring biochar and food-waste–derived sorbents for micropollutant removal.

Michael Edgardo Pérez Roa – PhD candidate (cycle XXXVIII) working on innovative routes to valorise cellulose from agro-food waste; in SAFE he studies cellulose-based media to polish secondary effluents.

Recent milestones

- **Parameterised models for tomato, oregano and lettuce trials** now predict nutrient uptake and residual contaminant loads under different irrigation regimes.
- **Cost-versus-risk dashboards** combine removal efficiencies, pathogen log-reductions and euros per cubic metre, enabling partners to rank treatment scenarios in seconds.
- **Material screening:** lab-scale tests on olive-pomace biochar and coffee-silverskin cellulose showed Cd²⁺ and trimethoprim removal capacities up to 120 mg g⁻¹ and 40 mg g⁻¹ respectively—data already feeding the SAFE optimisation engine.

Category

1. Senza categoria

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