



# PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 38th cycle

Research Area n. 3 - Environmental and Hydraulic Engineering and Geomatics

PNRR\_352 Research Field: TECHNOLOGIES FOR DIGESTATE VALORIZATION

## Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

## Context of the research activity

### Motivation and objectives of the research in this field

Biogas/biomethane production is a consolidated technology for bioenergy from organic wastes/wastewaters/industrial by products. Digestate is the residue of biogas production and contains inorganic components, such as nutrients, and poorly degradable components, such as lignocellulosic materials and recalcitrant organics. In order to improve the overall environmental and economic sustainability of biogas/biomethane production, digestate valorization technologies are needed, which aim at turning digestate into marketable products for agriculture to favor the recycling of nutrients to the fields, in line with EU policies on energy and food security and on circular economy. Specifically, this research fits within the Cluster "Climate, Energy and Mobility" of the Horizon Europe framework and it is fully in line with the Italian National Research Program - PNRR (Area 2 and 3, "Bioindustry and bioeconomy").

### Methods and techniques that will be developed and used to carry out the research

Initially, a literature review will be carried out aiming at drawing an updated picture of the research framework, including available technologies and their TRL (Technological Readiness Level), legal constrains, market constrains/opportunities. A decision making system will be



	developed to identify relevant options depending on the digestate quality. Finally, a case study will be identified for a field experimentation of promising options at different TRL levels aiming at process optimization and at collecting operational data and process performances to be used to draw a sound techno-economic assessment.
<b>Educational objectives</b>	Acquire technical skills related to the design and operation of innovative processes for digestate valorization; reinforce competences in techno-economic assessment and in data analysis through the use of modeling and statistical tools; reinforce critical thinking; strengthen personal skills of team working in an international environment, and in scientific communication.
<b>Job opportunities</b>	A PhD experience in this field will open up employment opportunities in the energy, agricultural and environment sectors; typical career opportunities include companies operating in the field of environmental services and consultancy, engineering companies dealing with energy generation and waste valorization, research centres and universities, public authorities
<b>Composition of the research group</b>	1 Full Professors 1 Associated Professors 1 Assistant Professors 0 PhD Students
<b>Name of the research directors</b>	Elena Ficara, Francesca Malpei

<b>Contacts</b>
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	A2A Life Company - <a href="https://www.a2a.eu/it">https://www.a2a.eu/it</a>
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Laboratoire de Biotechnologie de l'Environnement, INRAe, Narbonne, FR, Centro di ricerca sull'agricoltura e l'ambiente <a href="https://www6.montpellier.inrae.fr/narbonne">https://www6.montpellier.inrae.fr/narbonne</a>
By number of months abroad	6

**Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information**

Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:

- A2A Life Company
- Laboratoire de Biotechnologie de l'Environnement, INRAe, Narbonne, F

Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): approximately 1902,38 euros per PhD candidate per year, on average.

Teaching assistantship (availability of funding in recognition of support to teaching activities by the PhD candidate): there are various forms of financial aid for activities of support to the teaching practice. The PhD candidate is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability and desk availability: individual assignment for the entire career.