



PhD in SCIENCE, TECHNOLOGY AND POLICY FOR SUSTAINABLE CHANGE - 39th cycle

PNRR 118 INTERDISC Research Field: POTENTIAL AND LIMITS OF CARBON-FREE SYNTHETIC FUELS IN THE CONTEXT OF THE WATER-FOOD-ENERGY NEXUS

Monthly net income of PhDscholarship (max 36 months)

€ 1350.0

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

Objectives of the research are, in a water-food-energy nexus perspective, the analysis of the use of natural resources and the competition for them, and the identification of sustainable production strategies for synthetic fuels from renewable sources. The production process of synthetic fuels, despite being based on renewable energy and capture and carbon storage, can require quantities of water similar to those required for traditional biofuels, whose effects on the competition for natural resources are well known in the literature. In particular, the use of natural resources for synthetic fuels can determine and/or exacerbate stressful conditions if we consider the consumption of water and soil necessary for the production of renewable energy (e.g. solar, wind) feeding the process. Hence the need to study the actual use of natural resources in order to identify specific areas in conditions of resource availability natural for which this technology is sustainable both in current conditions and with respect to trends future expansion of agriculture.

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

The water used in the process of electrolysis for the production of synthetic fuels will be quantified and related to the conditions of water availability at the site of withdrawal. Competition for water resources with other sectors will also be considered, especially concerning the agricultural sector. Water demand from agriculture will be assessed through an advanced and spatially distributed agro-hydrological modeling according to scenarios of



	agro-hydrological modeling according to scenarios of global sustainable development. The induced competitions, the limits, as well as the potential synergistic solutions, will be investigated through the delineation of an analytical framework strongly transdisciplinary and oriented towards the water-food-energy nexus, which is able, on the basis of local conditions of availability and demand for natural resources, to identify the correlations between the chosen renewable energy source (e.g. solar, wind, etc.), management (e.g. scale, grid connection), and the correct siting of the system itself, also with respect to innovative nexus solutions (e.g. agri-voltaic).
Educational objectives	The PhD program is oriented to improve the scientific background of each student, preparing the basis for a university researcher as professional specialist careers.
Job opportunities	Main opportunities in the job market include Universities, Research Centers, top-level management in Authorities involved in environmental policy, and senior consultants for engineering companies.
Composition of the research group	2 Full Professors 2 Associated Professors 3 Assistant Professors 8 PhD Students
Name of the research directors	0

Contacts	
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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	675.0 €
By number of months	6

National Operational Program for Research and Innovation



Company where the candidate will attend the stage (name and brief description)	University of California at Berkeley
By number of months at the company	0
Institution or company where the candidate will spend the period abroad (name and brief description)	University of California at Berkeley
By number of months abroad	6

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