



PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 40th cycle

PNRR 630 Research Field: DEVELOPING INTEGRATED ENERGY SUPPLY-CHAINS MODELS FOR ENVIRONMENTALLY-SUSTAINABLE TRADE POLICIES

Monthly net income of PhDscholarship (max 36 months)

€ 1500.0

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

The intersection of trade and climate policies presents significant scientific and policy challenges. While the global trade system is a critical driver of economic growth, it also significantly contributes to climate change and environmental degradation. Effectively integrating trade policies with climate action requires sophisticated analytical tools to assess the multifaceted impacts of trade on the environment. However, current multi-sectoral modeling approaches face substantial limitations, including inadequate data granularity, reliance on conventional trade theories, and limited representation of emerging technologies. Existing input-output (IO) databases, like GTAP and EXIOBASE, are pivotal in multi-sectoral modeling but often lack the necessary detail to capture the nuances of energy transition technologies and supply chains. These limitations hinder the ability to accurately assess the environmental impacts of trade policies and to develop strategies that align trade activities with climate objectives. Expanding these databases to include detailed inventories of new technologies is essential for improving the precision and applicability of trade-climate models and sustainability assessments in general, and represents one of the core activities of eNextGen, a start-up company and spin-off of Politecnico di Milano, engaged in developing tools for comprehensive impact assessment of transitional technologies.



| | |
|--|--|
| | <p>Both eNextGen and Politecnico di Milano are partner within the consortium of the ENTICE Horizon project. ENTICE aims at addressing the mentioned gaps by developing data and modeling capacities. One of the project's objectives is to enhance the granularity of data within existing IO databases and to integrate new theoretical and empirical insights into macroeconomic models.</p> <p>The candidate's research will focus on the development and application of a consistent Life Cycle Assessment (LCA) modeling platform, capable of integrating new technologies crucial for the energy transition, along with their related supply chains, into existing IO databases. This platform will be developed based on the MARIO open-source software, designed to handle IO databases and models, and consistently linked to other process-based LCA data sources.</p> <p>The developed modeling platform would be adopted to assess the economic and environmental impacts of innovative energy technologies and their integration into global trade models. This involves evaluating the supply chain implications of these technologies and developing policy scenarios that explore the effects of trade policies on their deployment. By doing so, the research will provide insights into how trade policies can be structured to support the energy transition while minimizing environmental impacts and promoting economic growth. The same modelling platform will found applications also in more business-oriented activities of eNextGen, out of the scope of the ENTICE project.</p> |
| <p>Methods and techniques that will be developed and used to carry out the research</p> | <p>Theoretical tools:</p> <ul style="list-style-type: none"> - Input-Output Analysis - Life Cycle Assessment (LCA) - Linear Programming and constrained Optimization <p>Computational tools:</p> <ul style="list-style-type: none"> - Python and SQL programming languages - MARIO software to handle input-output databases - Process-based LCA software (OpenLCA/SimaPro, Brightway) |



| | |
|--|--|
| Educational objectives | <ol style="list-style-type: none"> 1. Develop a Life Cycle Assessment (LCA) modeling platform integrating new technologies into existing IO databases. 2. Assess the economic and environmental impacts of energy transition technologies and their global trade implications. 3. Formulate energy scenarios to guide sustainable trade and climate policies. |
| Job opportunities | <p>The candidate will be prepared for roles such as modeler and analysts in:</p> <ul style="list-style-type: none"> - LCA consultancy companies - Energy utilities and R&D departments - Ministerial offices or International institutions - Public or private research centers and academia |
| Composition of the research group | <p>2 Full Professors 4 Associated Professors 2 Assistant Professors 11 PhD Students</p> |
| Name of the research directors | Colombo Emanuela, Inzoli Fabio |

| Contacts | |
|---|--|
| Polimi: Prof. Matteo Vincenzo Rocco (matteovincenzo.rocco@polimi.it) eNextGen: Dr. Nicolò Golinucci (nicolo.golinucci@enextgen.it) | |

| 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 | 750.0 € |
| By number of months | 6 |

| National Operational Program for Research and Innovation | |
|---|----------|
| Company where the candidate will attend the stage (name and brief description) | eNextGen |
| By number of months at the company | 6 |



| | |
|---|--------|
| Institution or company where the candidate will spend the period abroad (name and brief description) | Purdue |
| By number of months abroad | 6 |

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

Educational activities:

Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and computer, etc. This amount is equal to 10% of the annual gross amount, for 3 years.

Teaching assistantship:

Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer and desk availability:

Computer availability: individual use.

Desk availability: individual use.

Housing:

Accommodation in Politecnico's Residences (<http://www.residenze.polimi.it>) is available for PhD candidates; special rates will be applied to selected out-of-town candidates (detailed info in the call for application).

Awards:

Awards will be recognized to the PhD candidate up to Euro 2000,00 (gross amount) per year, in case of exceptional achievements in the research project, subject to the evaluation of the research director.