



PhD in SCIENCE, TECHNOLOGY AND POLICY FOR SUSTAINABLE CHANGE - 38th cycle

THEMATIC Research Field: CONNECTING GLOBAL CLIMATE POLICIES WITH HIGH SPATIOTEMPORAL RESOLUTION POWER SYSTEM OPERATIONS TO SUPPORT CLEAN ENERGY TRANSITION IN SUB-SAHARAN AFRICA

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

To mitigate climate change, a fast transition to clean energy sources is required. While the latter are being increasingly deployed, this substantial transformation of our energy and power infrastructure needs to overcome more difficulties in less developed areas where energy demand is expected to increase in the coming decades and access to energy is expected to increase. Sub-Saharan Africa power systems are struggling to meet current power demand and rely on rolling outages to prevent more widespread disruption. For this reason, the scale of unmet demand requires that the transition is planned to solve the reliability and the greenhouse gases emission problem simultaneously. Currently, climate and energy policies are designed using Integrated Assessment Models (IAMs) and energy system models that simulate the energy and power system models with a very low spatial and temporal resolution to cover a multi-decadal time horizon. Yet, this result in overlooking power reliability risks. In the scientific literature, new methods are being designed to connect IAMs and power system models. Yet, an integrated development framework integrating reliability in climate and energy decision support is missing, putting at risk the economic development of currently less developed regions. This research will focus on developing soft-linking methodologies to connect different types of climate, energy, and power system models to assess reliability of



	<p>power system and to support a clean energy transition without compromising economic development of Sub-Saharan Africa. In addition to that, a decision analytic platform will be designed to explore potential alternatives and explore their trade-offs.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>State of the art integrated assessment modelling, energy and power system modelling tools will be used together with optimization, optimal control, and mathematical modelling of environmental and socio-economic systems. Energy and economic systems models will be used to derive local socioeconomic projections to complement existing databases with coarser resolution. Big data, statistics, and machine learning will be leveraged to facilitate soft-linking of the different types of models and to build a decision analytic platform to explore the tradeoffs of different alternatives for energy and power system planning.</p>
<p>Educational objectives</p>	<p>The doctoral program offers advanced training organized in three pillars:</p> <ul style="list-style-type: none"> - Basic Research, which includes methodological courses related to key aspects of theoretical and applied research in science, policy, and technology of sustainable change; - Specific Research, designed to strengthen candidates' knowledge on specific topics aligned with their research interests and increase their presence in the international scientific community through participation in conferences and presentation of their scientific work in academic contexts. - Development of the Doctoral Thesis, which allows candidates to develop leading-edge research competencies and produce original scientific work on a topic that contributes to scientific debate and has societal impacts. <p>A period of study in worldwide most recognized research institutions is supported by the doctoral school and the supervisor.</p>
<p>Job opportunities</p>	<p>The PhD graduates will be equipped with distinctive skills and advanced trans-disciplinary knowledge that open up career opportunities as analysts, researchers, or planners</p>



	at universities, international research centers, public and international institutions, R&D departments, regulatory authorities, policy institutions, and other public bodies.
Composition of the research group	1 Full Professors 0 Associated Professors 2 Assistant Professors 5 PhD Students
Name of the research directors	Prof. Andrea Castelletti

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	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>A desk in the lab offices and a personal laptop will be provided over the duration of the PhD programme. Teaching assistantship opportunities might be available over the triennium. Supercomputing facilities are available both at the department and with external associated partners.</p>