



PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 39th cycle

PNRR 118 INTERDISC Research Field: MODULAR AND INTEROPERABLE DIGITAL TWIN FOR THE CREATION OF POSITIVE ENERGY DISTRICTS

Monthly net income of PhDscholarship (max 36 months)
€ 1275.0
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	<p>Interdisciplinary PhD Grant</p> <p>The PhD research will be carried out in collaboration with research groups of the PhD programme in "INFORMATION TECHNOLOGY".</p> <p>See https://www.dottorato.polimi.it/en/prospective-phd-candidates/calls-and-regulations for further information.</p> <p>The project aims to lead the development of a Positive Energy District that will improve the integration of various systems (buildings, stakeholders, mobility, energy, and communication systems), using a modular and interoperable Digital Twin, with the goal of accelerating societal sustainability in terms of energy transition and climate change mitigation measures. It is important to highlight the alignment with a couple of the PNRR objectives, such as: Digitalization, innovation, competitiveness, culture and tourism, and Education and research. It is also essential to underline the significance of the principle DNSH ("Do No Significant Harm"), which acts as a pillar in the PNRR, and will be fundamental for the carrying out of the project, as it is based on what is specified in the "Taxonomy for Sustainable Finance", adopted to promote private sector investment in green and sustainable projects and help achieve the objectives</p>



	<p>of the Green Deal. The Regulation identifies six criteria to determine how each economic activity shall contribute substantially to the protection of the ecosystem without causing damage to any of the environmental objectives: Climate change mitigation and adaptation, Sustainable use and protection of resources, and others (Fondazione IFEL, 2022).</p> <p>All the above-mentioned objectives are in perfect harmony with the European Green deal aiming at reducing GHG and, in general, overcoming the challenges of climate change and environmental degradation, moving towards climate-neutral European cities by 2030. It's essential to recognize that district-level approaches are crucial in accelerating the reduction of GHG emissions in the building sector. This approach has the potential to be highly effective by leveraging interactions between different buildings and optimizing the use of renewable energy sources.</p> <p>https://www.italiadomani.gov.it/it/Interventi/dnsh.html</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The objective is to involve organizations representing all critical actors in the decarbonization of cities while ensuring a balanced EU geographical coverage by incorporating the efficient development, implementation, demonstration, and evaluation of a Digital Twin in a PED, through the participation of diverse institutions and partners. The ability to integrate technical and non-technical capabilities and engage stakeholders within and outside the city hall, complemented by the capacity to learn, are key relational components to the success of the project (collaborative governance).</p> <p>The model will be used as a prototype to replicate the solution in diverse PEDs geographically distributed in Europe, particularly in the Southern part of the continent. It will incorporate Artificial Intelligence and Big Data analysis to accelerate the innovation process in creating cutting-edge services that support urban planning authorities in achieving their sustainable targets. By using a set of conceptual keys and thematic areas, it will be possible to gain a comprehensive understanding of the current progress in the area. This information can be used to identify gaps, opportunities, and best practices in</p>



	<p>project design, development, and implementation, which can inform future policy and practice.</p> <p><u>This research will include a mandatory period abroad of 6 months to be defined at the beginning of PhD.</u></p>
Educational objectives	<p>The idea is based on five primary pillars, or innovation acts, where innovation must be used to benefit communities and cities.</p> <p>A collection of auxiliary tools will be created to support it:</p> <ul style="list-style-type: none"> •Energy self-sufficiency and reduction of consumption management •Urban Planning focused on decarbonization •Urban digitalized ecosystem •Knowledge transfer •Democratic governance
Job opportunities	<p>The project will involve a multi-stakeholder approach to ensure that different viewpoints and interests are considered in the development and deployment processes: project management and coordination, administrative and financial management, technical and risk management, data management, real estate development. These and others will enable effective collaborative governance framework between science, innovation, and society.</p>
Composition of the research group	<p>1 Full Professors 1 Associated Professors 2 Assistant Professors 1 PhD Students</p>
Name of the research directors	<p>Prof. G. Ciaramella (ABC) and L. Mottola (DEIB)</p>

Contacts
<p>andrea.ciaramella@polimi.it luca.mottola@polimi.it</p>

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	637.5 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	
By number of months at the company	0
Institution or company where the candidate will spend the period abroad (name and brief description)	The destination will be defined at the beginning of the PhD.
By number of months abroad	6

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

Additional support:

Budget for the research activity (only for positions supported by scholarship):

total amount Euro 5197.60 per student

In detail:

- 1st year Euro 1732.53
- 2nd year Euro 1732.53
- 3rd year Euro 1732.53

Additional information about the organization and regulations of ABC-PhD programme can be found in the Regulations for the 39th Cycle of ABC-PhD:

download is available at link:

<https://www.dottorato.polimi.it/corsi-di-dottorato/architettura/architettura-ingegneria-delle-costruzioni-e-ambiente-costruito>

Additional information about ABC department and ABC-PhD programme:

available at link:

<https://www.dabc.polimi.it/>

Desk availability:

The ABC department provides non-permanent desks to be temporarily booked in common PhD rooms.