POLITECNICO DI MILANO

PhD in INGEGNERIA GESTIONALE / MANAGEMENT ENGINEERING - 41st cycle

THEMATIC Research Field: DECARBONIZING LOGISTICS AND SUPPLY CHAINS: PROCESSES, GOVERNANCE, AND DIGITAL TOOLS

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	Decarbonization is a key priority in the transition toward sustainable supply chains, especially in logistics-intensive sectors. Logistics and supply chain operations, such as transportation, warehousing, and distribution, are responsible for a significant share of global greenhouse gas (GHG) emissions, particularly Scope 3 emissions, which are often the most difficult to measure and reduce. In this context, companies are called to move beyond isolated actions and embrace systemic approaches that involve multiple actors across the supply network.Decarbonization is not only a technical challenge but also a relational and organizational one. Supply chains are complex ecosystems where power asymmetries, governance structures, and inter-organizational relationships influence the ability to implement and scale sustainability initiatives. The research will explore how relational dynamics, such as collaboration, trust, and dependency among supply chain actors, shape the design and execution of decarbonization strategies.Moreover, the increasing complexity of supply chains requires the integration of digital tools and data infrastructures to support traceability, emissions tracking, and decision-making. Digital platforms and technologies, such as blockchain-based systems or other data-sharing solutions, can act as enablers, but their effectiveness depends on how they are embedded in governance and relational structures.The PhD research project will adopt a dual perspective:-First,

	it will investigate how decarbonization actions are designed and implemented across the logistics chain, including logistics-specific processes such as transport optimization, reverse logistics, and cold chain management.-Second, it will analyze how these actions are influenced by relational dynamics, power structures, and the availability of technological and informational supports.The ultimate goal is to understand not only what actions companies undertake to decarbonize, but how they do this, with whom, and with what tools, contributing to both theoretical advancement and practical solutions for sustainable logistics and supply chain transformation.
Methods and techniques that will be developed and used to carry out the research	The research project will begin with a comprehensive literature review and exploratory case studies to investigate how logistics and supply chain processes contribute to decarbonization efforts. Particular attention will be given to the role of inter-organizational relationships, governance mechanisms, and digital infrastructures in shaping sustainability strategies. In the second phase, the research may involve the development of new models and tools to support the design, implementation, and monitoring of decarbonization initiatives across supply chains. These tools may include: -Qualitative frameworks to analyze power dynamics, collaboration patterns, and governance structures. -Empirical analysis based on case studies, surveys, and document reviews to assess how companies engage with partners and use digital tools to support emissions reduction. -Simulation and optimization models to evaluate logistics configurations, transport strategies, and reverse logistics processes under sustainability constraints. Depending on the specific proposal, students may also apply social network analysis or other theories to map relationships and investigate collaborative behaviors. The research may include a focus on digital platforms and data-sharing infrastructures to understand how these tools support traceability, transparency, and collaborative governance to foster decarbonization in logistics and supply chains. Collaborative projects with companies may be planned to

	validate the proposed models and frameworks, and to ensure relevance to real-world supply chain challenges. These collaborations may involve manufacturing firms, logistics providers, retailers, or technology platforms operating in sectors with high Scope 3 emissions, such as FMCG, fashion, or food. Some of these collaborations could also involve firms operating within the Italian industrial context, where interactions in the local language could facilitate engagement and data collection. The methodological approach will be interdisciplinary, combining insights from logistics, sustainability science, organizational theory, and digital innovation. It will be tailored to the specific research question proposed by the candidate, allowing for flexibility and depth.
Educational objectives	The program will provide candidates with advanced competencies in: -Sustainable logistics, with a focus on decarbonization strategies and Scope 3 emissions. -Supply chain management, including inter-firm collaboration, organizational governance, and power dynamics. -Research design and methodology, including qualitative and quantitative techniques. -Digital innovation for sustainability, including platforms for traceability, certification, and emissions tracking. -Policy and regulatory frameworks, such as the EU CSRD and CSDDD, and their implications for supply chain governance. Candidates will develop the ability to critically assess how companies interact within supply chains to achieve climate goals, and how governance structures can be adapted to foster inclusive and effective decarbonization. The program will encourage interdisciplinary thinking, combining insights from logistics, supply chain management, sustainability science, organizational studies, and digital transformation. It will prepare students for careers in academia, industry, or policy-making, with a focus on sustainable operations and sustainability strategy.
Job opportunities	The main opportunities for a Ph.D. graduate in this

	research area are: -Academic career in the field of Logistics, Supply Chain Management, and Sustainability, with a focus on inter-organizational governance, decarbonization strategies, and digital innovation. -Career in logistics and supply chain providers, including roles in sustainability strategy, emissions tracking, and collaborative project development with partners and clients. -Career in consultancy, particularly in firms specialized in ESG, sustainable operations, digital transformation, and climate strategy, where expertise in relational dynamics and data governance is increasingly valued. -Career in manufacturing and retail companies, especially in sectors with high Scope 3 emissions (e.g., FMCG, fashion, food), where roles may include Sustainability Manager, Supply Chain Analyst, or Decarbonization Lead. -Career in technology and platform providers, offering digital solutions for traceability, emissions monitoring, and supplier engagement (e.g., EcoVadis, CDP, blockchain-based systems). -Career in the public sector, including agencies, international organizations, and authorities working on policy design for sustainable innovation, supply chain regulation, and climate governance (e.g., European Commission, UN bodies, national ministries). The interdisciplinary nature of the research, combining logistics, supply chain management, sustainability, organizational theory, and digital tools, will equip graduates with a versatile skill set applicable to both strategic and operational roles in sustainability transitions.
Composition of the research group	3 Full Professors 5 Associated Professors 2 Assistant Professors 12 PhD Students
Name of the research directors	Claudia Colicchia

Contacts
claudia.colicchia@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)

Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
The Ph.D. candidate will have the opportunity to attend courses and seminars on managementn engineering, research methodologies and skills, sustainable innovation, logistics management, and operations management at Politecnico di Milano. He/she will be supervised by the research director through frequent meetings and will receive feedback on his/her intermediate results during regular meetings with the Doctorate board. He/she will have the opportunity to attend scientific conferences. Over time, the candidate will be involved in some teaching and communication activities, which are seen as a major opportunity to practice with the dissemination of research results. He/she will be offered a desk near the office of the research directors and other Ph.D. candidates, fostering informal interaction. For the overall development of their capabilities, PhD candidates will work on sinergical projects to favour empirical data collection and network development for their career. Projects will give candidates the opportunity to work in groups (peers and other senior professors). If coherent with the development of their doctoral program, the PhD candidate will have the opportunity to be involved in: teaching activities, tutoring to master students, tutoring to PhD candidates for administrative processes. **Funding for educational activities: 6.100,00 Euros for three years.**