Guest editorial: Climate neutral supply chains

Introduction

Climate change is one of the most pressing challenges facing our planet today. The greenhouse gases released into the atmosphere trap heat and warm the planet, exacerbating climate change. Earth's average surface temperature has risen by 1.2 °C in the past 150 years, causing more extreme weather events that are disrupting production networks around the world. In response to this escalating crisis, the concept of climate neutrality has gained traction as a vital strategy to combat climate change (Mishra *et al.*, 2023; Boyson *et al.*, 2022). Climate neutrality, an evolution of the idea of carbon neutrality, extends beyond the goal of achieving a net-zero release of carbon dioxide (CO_2) into the atmosphere. It encompasses a broader commitment to balance out any greenhouse gas emissions through equivalent measures that reduce emissions or remove these gases from the atmosphere (Guntuka *et al.*, 2023). This holistic approach, which includes but is not limited to CO_2, is crucial in our collective efforts to mitigate the adverse effects of climate change and preserve the planet for future generations (Caro *et al.*, 2022).

The pressing need for climate neutrality is underscored by a growing body of literature from both practitioners and academics, highlighting the significant environmental impact of a firm's supply chain, often exceeding that of its internal operations. This is evident in studies by Jira and Toffel (2013), Mukandwal *et al.* (2020), Villena and Dhanorkar (2020) and Guntuka (2022), among others. The urgency of addressing these impacts is echoed in the ongoing debates among international governments, policymakers, regulatory bodies and investors. A key focus is on establishing a stringent regulatory framework to mitigate both direct and supply chain-related environmental effects.

In response to this challenge, major geopolitical entities like the European Union and the United Kingdom have set ambitious targets to achieve climate neutrality and net-zero emissions by 2050 (Mishra *et al.*, 2023). These commitments are backed by evolving legislative measures that mandate companies to actively measure and reduce their greenhouse gas (GHG) emissions (Haque and Ntim, 2022). This encompasses a variety of strategies, including carbon sequestration (i.e. capturing and storing CO_2) and offsetting (i.e. compensating emissions by investing in projects that support CO_2 reduction), underscoring the indispensable role of natural carbon sinks like forests, which remain unrivaled in their ability to remove carbon from the atmosphere at a scale necessary to combat global warming. The United States of America is also actively participating in this global initiative. Agencies such as the Environmental Protection Agency (EPA) and the Securities and Exchange Commission (SEC) recognize the systemic risk posed by climate change to the economy. The SEC's recent proposal for firms to include detailed climate-related information in their periodic reports, such as Form 10-K, is a testament to the shifting regulatory landscape (Benjamin, 2022). This special issue aims to provide a platform for academic researchers and practitioners to explore and share insights on how organizations can incorporate their supply chains into the broader global climate change agenda. This aligns with the idea of economic efficiency leading to environmental efficiency and reinforces the critical role of the corporate sector in driving toward a resilient climate neutral future (Oglethorpe and Heron, 2010; Guntuka *et al.*, 2024a, b).

The primary objective of this special issue is to enhance our theoretical understanding of the practical approaches firms across diverse sectors can employ to achieve climate neutrality. Existing research predominantly centers on the environmental sustainability of

firms, particularly concerning the carbon emissions they release into the atmosphere. However, there remains a significant knowledge gap in understanding the comprehensive strategies firms can implement to balance their overall GHG emissions. Achieving such a balance is a pivotal element in the pursuit of climate neutrality. This special issue aims to bridge this gap by delving into the nuanced mechanisms and practices that enable firms to effectively neutralize their climate impact. It seeks to shed light on the myriad ways through which firms can not only reduce their emissions but also engage in activities that offset their remaining emissions, thereby achieving a state of net-zero impact. The focus is on dissecting and disseminating knowledge about the diverse pathways to climate neutrality, tailored to the unique challenges and opportunities faced by firms of different scales and within various industries. In doing so, this issue aspires to be a catalyst for meaningful change, guiding businesses toward more sustainable and environmentally responsible practices.

Special issue insights
This special issue comprises 8 research papers, along with one each dedicated to a bibliometric analysis and a structured literature review that have undergone the double-blind peer review process of the *International Journal of Logistics Management* (see Table 1).

The research by Ayaz *et al.* (2024) investigates the inclusion of the maritime transport industry in the European Union's Emissions Trading System (EU ETS), a key policy instrument for reducing greenhouse gases. While ports are highlighted as the most environmentally friendly aspect of this sector, there remain challenges to their integration

Authors	Study focus
Ayaz *et al.* (2024)	Identifying and analyzing the barriers to including ports in the European Union's Emissions Trading System (EU ETS) for the maritime transport industry
Chomachaei and Golmohammadi (2024)	Investigating the impact of the stringency of environmental policy on the financial performance of European automobile manufacturers
Nikseresht *et al.* (2024)	Reviewing the literature on sustainable green logistics and remanufacturing (SGLR) to identify key research problems, themes and emerging directions for future research
Sharma *et al.* (2024)	Study on achieving climate neutrality within the metal and mining industry supply chain to explore the challenges, practices and barriers encountered in implementing climate neutrality practices using SAP-LAP framework
Zhu *et al.* (2024)	Impact of blockchain-supported carbon offset information on consumer perceptions and purchase intentions
Yadav and Raut (2023)	Achieving climate neutrality in agriculture food supply chain by overcoming barriers such as lack of information and awareness, lack of education and lack of technical expertise
Duong *et al.* (2024)	Identifying critical success factors for sustainable food safety management systems and how Industry 4.0 technologies facilitate sustainable food safety management systems
Guntuka *et al.* (2023)	Multi-disciplinary systematic literature review of climate neutrality in supply chains
Cimen *et al.* (2024)	Examining sustainable vehicle logistics through Industry 4.0 technologies and collaborative strategies, identifying key indicators such as emissions, renewable energy and waste reduction
Prataviera *et al.* (2024)	Examine factors influencing green logistics adoption in Italy, highlighting economic incentives, stakeholder pressures and governmental influence, emphasizing the need for policy considerations that address the interplay of these factors to promote adoption effectively

Table 1.
Summary of accepted manuscripts in the special issue

into the EU ETS. This study aims to identify and understand the interrelated barriers that prevent ports from being part of the system. To address these barriers, the researchers conducted a literature review and applied the Fuzzy Decision-Making Trial and Evaluation Laboratory (DEMATEL) method for analysis, followed by the complex adaptive system approach, to propose potential solutions. The authors categorized the barriers into cause-and-effect groups, with long payback periods and high investment costs being the primary issues, acting as triggers within the model, while other barriers were more responsive to the changes proposed by the model.

Chomachaei and Golmohammadi (2024) explore the effects of strict environmental policies on the financial health of European car manufacturers, adding to the debate on how such policies influence competitive performance. This paper analyzes data from 71 firms across 18 European countries over nearly a decade (2010–2019) using a fixed-effect model. Additionally, the authors conduct a data-mining modeling approach to test the robustness of their findings. Their research reveals that while stringent environmental policies may initially negatively affect a firm's financial performance, they have a positive financial impact in the long run.

The study by Nikseresht et al. (2024) examines sustainable green logistics and remanufacturing (SGLR) and associated subdisciplines through a comprehensive review that combines bibliometric, thematic and content analyses. This paper offers an overview of current research trajectories and sets forth a future research agenda in the realm of sustainability and climate neutral logistics. The authors analyzed a vast array of literature, comprising 2,180 research and review papers from 2008 to 2023, using databases like Scopus and employing various analytical software tools, including Gephi, VOSviewer and R. The findings categorize SGLR research into seven thematic clusters: circular economy, decarbonization of operations, green supply chain management, the dynamics of reverse logistics, business models for sustainable logistics, transportation issues in green logistics and the digitalization of logistics and supply chain management. These clusters illustrate the breadth of research and the key areas of focus within the field of sustainable logistics.

Sharma et al. (2024) document a comprehensive study on achieving climate neutrality within the metal and mining industry supply chain. Their study employs the situation, actor, process-learning, action, performance (SAP-LAP) framework and the natural resource-based view (NRBV) theory to analyze the challenges and opportunities for climate neutrality within the industry. The study identifies the key sustainability challenges in the metal and mining sectors and proposes solutions, emphasizing the need for a holistic approach to climate neutrality. The study also offers theoretical and managerial implications, highlighting the strategic implications and competitive advantages associated with resource-based approaches to climate neutrality within the metal and mining sectors.

Zhu et al. (2024) investigate the effects of providing carbon offset information and shipping options, supported by blockchain technology, on consumer perceptions towards retailers and logistics providers. This research acknowledges that while blockchain and carbon neutrality are costly and complex to implement, they can enhance the transparency of decarbonization efforts. Through experimental modeling, this study tests three hypotheses concerning the influence of blockchain-backed carbon offset information on consumer attitudes and purchase intentions. The study findings indicate that consumer confidence is bolstered by the reliability, transparency and traceability of carbon offset information enabled by blockchain. Furthermore, when consumers are given clear insights into shipping options and the associated carbon emissions and offsets, they are more inclined to pay extra for the product and the shipping. Finally, this study concludes that blockchain-facilitated disclosure of decarbonization efforts in the supply chain may bolster organizational legitimacy and lead to financial benefits.

Duong *et al.* (2024) focus on food safety management systems used in the agricultural food supply chains and elaborate on the adoption of Industry 4.0 technologies for traceability, authentication, collaboration and continuous improvement purposes. For this purpose, the authors first identify the critical success factors for food safety management systems used by food production firms, and then they elaborate on how these factors, facilitated by Industry 4.0 technologies, contribute to achieving climate neutral supply chains. After surveying 255 food manufacturers in China, the authors find that top management support, human resource management, infrastructure and integration are the most important critical success factors for achieving climate neutrality. However, ecosystems, quality standards and robustness moderate the relationship between critical success factors and climate neutrality, suggesting lower human resources inputs and infrastructure investments as well as higher inputs in food safety administration.

Yadav and Raut (2023) also focus on the agricultural food supply chains, identifying the barriers that impede climate neutrality with evidence from Indian companies. The barriers identified by Yadav and Raut (2023) align with the critical success factors identified by Duong *et al.* (2024). Barriers analogous to the success factors underscored in Duong *et al.* (2024) include a dearth of collaboration among stakeholders, insufficient investment, limited information and awareness and a deficiency in technical knowledge. These studies underscore further challenges, such as greenwashing, overdependence on chemicals and fertilizers, limited demand for low-carbon products and genetically modified organisms-based food, difficulty in measuring GHG gases due to underdeveloped climate-accounting techniques and substantial reliance on fossil fuels.

Guntuka *et al.* (2023) conduct a systematic literature review on climate neutrality in supply chains, emphasizing that focusing solely on carbon neutrality is insufficient for effectively combating climate change. The authors used multiple databases to analyze 71 articles from various fields, including environmental science and energy systems. They found that while CO_2 is a primary global warming contributor, other gases like methane and nitrogen oxide are also significant. Key strategies for achieving net-zero greenhouse gas emissions identified include end-use efficiency, electrification, clean energy sources, GHG capture and improved agricultural practices. The review highlights the necessity of a comprehensive approach to greenhouse gas reduction beyond just CO_2 emissions.

Cimen *et al.* (2024) focus on vehicle logistics, investigating how vehicle allocation can be more sustainable with Industry 4.0 technologies and logistics collaboration. They identify key performance indicators for climate neutrality as logistics operations emissions, renewable energy, waste reduction, lifecycle assessment, certification and standards, stakeholder engagement and supply chain resilience. Vehicle allocation to full truckloads and less than truckload transportation in freight distribution has significant sustainability implications. Industry 4.0 technologies facilitate logistics collaboration to reach climate neutrality targets.

With a case study of logistics service providers and shippers in Italy, Prataviera *et al.* (2024) identify the factors that affect the adoption of green logistics practices. Among these factors, incentives, investments and profitability are identified as key economic and financial factors affecting the adoption of green practices. Pressures from suppliers, competitors, customers and governmental institutions are highlighted as key external factors Economic factors are found to be the key factor affected by all other factors, significantly affecting the adoption. When building policies to incentivize the adoption of green logistics practices, the interdependencies among the factors influencing the adoption should be carefully considered.

Concluding remarks
In conclusion, our special issue underscores the urgency of addressing climate change through the lens of climate neutrality, recognizing its multifaceted challenges. The special

issue provides valuable insights, ranging from the inclusion of maritime transport in emissions trading systems to the financial impact of environmental policies on European car manufacturers. The comprehensive review of SGLR sets the stage for future research trajectories, while case studies on the metal and mining industries and vehicle logistics offer practical strategies for achieving climate neutrality. The interconnected nature of economic, financial and external factors in the adoption of green logistics practices further highlights the need for nuanced policies. Ultimately, this special issue serves as a catalyst for meaningful change, guiding businesses towards sustainable practices and reinforcing the pivotal role of the corporate sector in driving a climate neutral future.

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