



Editorial

Ways forward to promote resource equity: The role of cleaner production and circular economy as moderator: Action or reaction to save the planet



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ABSTRACT

This editorial explores the critical intersection of cleaner production and circular economy principles as vital strategies for promoting resource equity in the face of escalating environmental challenges. It emphasizes the necessity for a multifaceted approach to address the complexities of production and consumption that impact resource distribution and sustainability. The research articles highlight the importance of robust monitoring and evaluation frameworks to assess the effectiveness of implemented practices, as the absence of such frameworks can lead to an inadequate understanding of their impact on sustainability goals. Discussing the regulatory restrictions that may hinder the applicability of innovative recycling methods and cleaner production technologies, particularly in developing regions, the authors underscore the need for collaboration across various sectors and stakeholders to facilitate the uniform application of circular practices, which is essential for achieving widespread adoption. The Special Issue also addresses the potential for public environmental concern to influence legislation positively while recognizing the risk of environmental inequality due to pollution transfer. The findings suggest that while cleaner production and circular economy practices offer pathways to sustainability, their success is contingent upon overcoming technological gaps and fostering cooperation among diverse stakeholders. Ultimately, the Special Issue calls for comprehensive strategies that consider the unique challenges different industries and regions face, aiming to inspire actionable solutions for global resource management and environmental protection.

1. Introduction

As the global population grows and economies expand, the demand for natural resources—including fossil fuels, minerals, and freshwater—increases (UN, 2019; Steffen et al., 2015). This rising demand places significant pressure on the planet's resources and ecosystems. Unsustainable extraction and consumption of these resources can lead to severe issues such as resource scarcity, biodiversity loss, and ecosystem degradation (Rockström et al., 2009, 2023). Therefore, promoting resource equity is crucial for ensuring the long-term sustainability of our planet (Raworth, 2012, 2017).

One effective approach to mitigating these challenges is cleaner production and adopting a circular economy. Cleaner production emphasizes reducing pollutants and waste, using resources more efficiently, and adopting environmentally friendly practices throughout manufacturing (Huisingsh et al., 2015). Conversely, the circular economy minimizes waste and pollution, keeps products and materials in use for as long as possible, and regenerates natural systems. Together, these measures help reduce resource consumption, minimize waste, and mitigate the environmental impact of economic activities (Geng and Doberstein, 2008; Geissdoerfer et al., 2017).

For these strategies to be successful, they must be proactive rather than reactive. Proactively addressing environmental issues involves anticipating problems and implementing solutions before they become

critical. This approach is essential for effectively managing our planet's complex and interconnected challenges.

Given these considerations, this special issue is dedicated to original research contributions focusing on proactive and collaborative efforts to advance resource equity and ensure just and inclusive resource use. It highlights innovative approaches to implementing sustainable methods, adopting cleaner energy alternatives, preserving biodiversity, and fostering a global commitment to environmental stewardship. These efforts are fundamental to building a sustainable and resilient future for all.

Specifically, the special issue that counts with the contribution of the participants of the 11th IWACP (Florence, Italy) and the 12th IWACP (Stellenbosch, South Africa) explores topics including, but not limited to, innovative technologies and practices in cleaner production and resource efficiency, strategies for the adoption and integration of renewable energy sources, methods for conserving and enhancing biodiversity in the face of development pressures, policies and frameworks that support equitable resource distribution and sustainable consumption, proposals for the implementation of circular economy principles, and collaborative initiatives that bridge the gap between research, industry, and policy to achieve environmental sustainability.

This special issue aims to contribute to the global discourse on sustainable resource management by bringing together diverse perspectives and cutting-edge research. It seeks to inspire actionable solutions

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and foster a shared commitment to safeguarding our planet for future generations.

2. Overview of the articles included in this special volume

This overview introduces the key concepts underlying resource equity and circular economy, emphasizing its focus on minimizing waste and maximizing resource efficiency (Fig. 1).

The articles composing this Special Issue examine the innovations and specific practices shaping this paradigm, emphasizing the novel approaches businesses adopt to integrate sustainability into their operations. Furthermore, they explore emerging technologies advancing resource equity, supported by case studies showcasing practical applications and successful implementations across various industries. Together, this journey aims to smooth the path toward a more resilient and sustainable future. Papers were classified according to the categories shown in Fig. 1 and displayed by title, corresponding author, and country of origin.

1. *Introduction to Concepts of Resource Equity and Circular Economy:* The papers introduce the concept of resource equity within the context of a circular economy and further examine methods for implementing a circular economy and the challenges of engaging the population, setting the stage for discussions on equity and circularity.

Handloom and resource equity - A circularity narrative from India in the Global South, Rajani Suresh, India. Despite the recognized importance of circularity, research has largely overlooked consumer awareness, behavior, and adoption of circular fashion practices. This study explicitly investigates the diminishing trend of handloom purchases in India, which is considered a circular consumption practice due to the rise of fast fashion. By exploring the influence of story marketing on handloom awareness and purchase intention, the study aims to identify motivational factors that drive consumer behavior toward circular fashion practices, offering novel insights into consumer behavior in the circular economy framework.

Circular and sustainable space: Findings from hyperspectral imaging, Roberta Palmieri, Italy. This study describes the transition to cleaner production and the pursuit of ecological sustainability, which present

significant challenges for international space organizations as they seek to develop new strategies for managing and recycling space waste within a circular economy framework. It proposes a method for identifying and categorizing space waste to enhance sorting and recycling operations in space. Specifically, it investigates the feasibility of utilizing hyperspectral imaging as a sustainable, low-cost approach to distinguish between different materials in space waste effectively. The technique enables the differentiation of potentially valuable space waste from pollutants, supporting sustainable waste management efforts and enhancing resource recovery within the circular economy framework.

Circular Economy via Chat: Evaluation of Adoption and Use of Whatsapp Instant Messaging Platform for Trading Second-Hand Products, Moacir Godinho Filho, France. Still thinking about consumers, this research evaluates the adoption and use of Instant Messaging Platforms (IMPs) for buying and selling second-hand products within the circular economy framework. The goal is to enhance participation in second-hand transactions to support the circular economy by leveraging consumer insights and technology adoption theories. The study adapts the Expanded Unified Theory of Acceptance and Use of Technology, elucidating the unique dynamics influencing consumer behavior in digital marketplaces.

Facilitating most population engagement with the circular economy: Challenges for academics and (as) social media influencers. Giancarlo Medeiros Pereira, Brazil. Recognizing that the lack of consumer engagement with the circular economy significantly limits the utilization of recycled materials in products manufactured by B2B companies, the study explores how this gap created an institutional void, giving rise to knowledge brokerage—an essential process facilitating the exchange of knowledge and expertise among stakeholders. This multiple case study highlights the importance of knowledge brokerage in facilitating interactions between companies and academics. By exchanging insights on consumer behavior and circular economy principles, businesses can develop targeted marketing strategies that address barriers to engagement.

2. *Systemic Approaches and Transitions to Circular Economy:* Discussions examine socio-material networks essential for transitioning to a circular economy, focusing on resource equity. They also discuss the

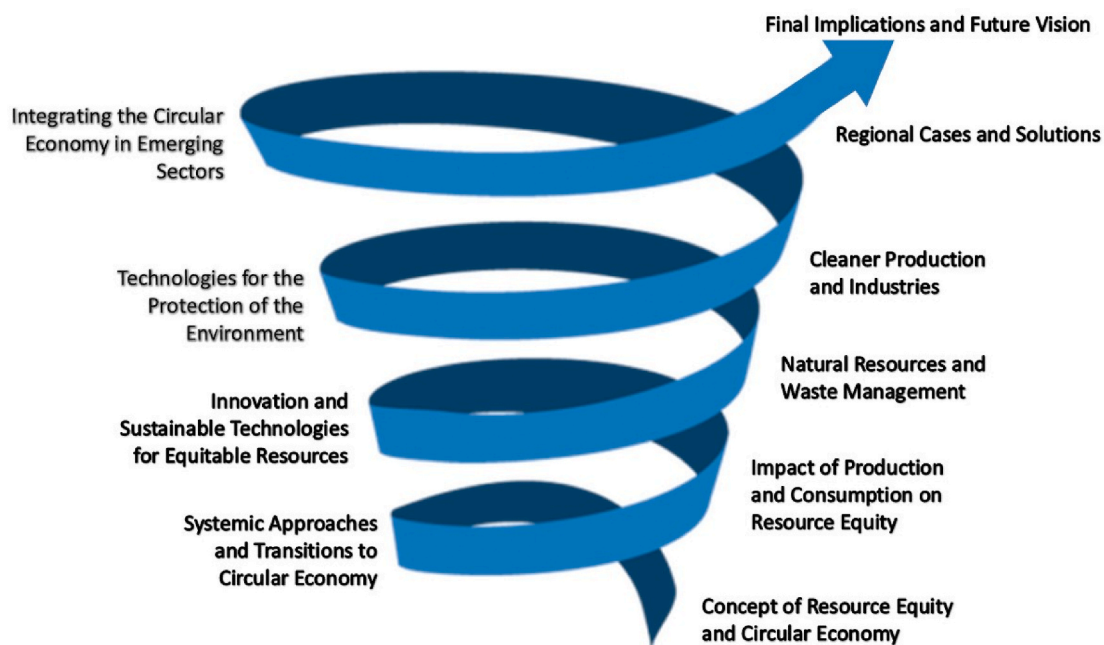


Fig. 1. Overview of the topics covered by the articles in this Special Issue.

financial feasibility of circular innovations and explore the interplay between economic sustainability and resource equity.

Sociomaterial Networks for a Systemic Circular Economy Transition In A Global South City, Melanie Valencia, Belgium. A first analysis employs socio-material theory to explore the interconnectedness of social and material elements within a broader systemic narrative, claiming that traditional technocratic assessments often inhibit the transformative economic shifts required to implement CE principles successfully. It emphasizes the need to understand regional contexts to avoid exacerbating regional inequalities. A qualitative assessment of the local recycling sector reveals a complex socio-material network with inherent strengths and significant gaps in the valuation and consideration of materials and relationships within informal sectors.

Financial sustainability of circular innovations in SMEs. A case study from the fashion industry in Italy, Francesco Dainelli, Italy. While extensive research has focused on the circular economy's environmental advantages, sustainable development's financial aspects have received comparatively less attention. This paper assesses the financial benefits of circular innovations in the fashion industry, employing Life Cycle Assessment to validate their sustainability credentials. The analysis concentrates on two innovative processes (salt recovery and tannin bath reuse) implemented by a small Italian company in the tanning industry. A comprehensive cost-benefit analysis was conducted to evaluate the net contribution of these circular actions to the company's operating margin.

3. *Impact of Production and Consumption on Resource Equity:* Material footprints and import dependency highlight future challenges for achieving resource equity. The influence of public environmental concerns on the transfer of pollution and the significant implications for resource equity are discussed.

Material footprint and import dependency in EU27: past trends and future challenges, Luca Lodi, Italy. The material footprint and import dependency of the European Union focuses on four key material categories: biomass, fossil fuels, metal ores, and non-metals. It aims to assess the feasibility and efficacy of EU strategies concerning the transition to a circular economy and the reduction of raw material extractions, particularly emphasizing the Critical Raw Materials Act. The analysis indicates a gradual shift towards the relative decoupling of GDP from material use in the EU27, particularly for non-metals and fossil fuels. Additionally, the region shows a decreasing dependency on non-EU countries, as evidenced by the reduction in net trade over recent years.

Does Public Environmental Concern Cause Pollution Transfer? Evidence from Chinese Firms' Off-site Investments, Hui Sun, China. Using data from the off-site investments of Chinese heavy polluting firms, the paper examined how public environmental concern influences pollution transfer. The findings highlight the importance of public environmental concern in shaping environmental policies and practices. For policy-makers, it is critical to leverage public concern to enhance the governance structure of environmental regulation to ensure a more equitable distribution of resources and mitigate the adverse effects of pollution transfer.

Dynamic Connectedness, Portfolio Performance, and Hedging Effectiveness of the Hydrogen Economy, Renewable Energy, Equity, and Commodity Markets: Insights from the COVID-19 Pandemic and the Russia-Ukraine War, Aktham Maghyereh, United Arab Emirates. The impact of production and consumption on resource equity is examined from the perspective of how the dynamics of economic activities influence the fair distribution of resources. The study highlights how production and consumption patterns affect various markets and resource equity, especially during global disruptions like the COVID-19 pandemic and the Russia-Ukraine conflict. A Time-Varying Parameter Vector autoregressive connectedness approach is utilized to explore the dynamic interconnections, portfolio performance, and hedging effectiveness

across sectors such as the hydrogen economy, renewable energy markets, equities, and energy commodities.

4. *Innovation and Sustainable Technologies for Equitable Resources:* This segment explores cutting-edge technologies for metal extraction, proposing solutions to the worldwide problem of resource scarcity. It also discusses the reuse of natural waste, emphasizing circular economy approaches and resource recovery.

Enhancing the Efficiency of Metals Extraction from Waste Lithium-ion Batteries through Glycine Leaching Using Response Surface Methodology for Economic Feasibility, Sunil Kumar, India. Recycling lithium-ion batteries exemplifies the intersection of innovative technologies and practices in cleaner production and resource efficiency. This recycling process has garnered significant interest due to its potential to mitigate pollution and conserve natural resources and energy. Recent research has focused on establishing an environmentally friendly method for leaching metals from LiBs, utilizing glycine (NH₂CH₂COOH) as a leaching agent. In this study, glycine is employed as a green extractant, demonstrating the capability to reduce the reliance on more traditional and harmful inorganic acids typically used in hydrometallurgical processes. The research investigates lithium (Li) dissolution as a function of several operational parameters, including time, pulp density, glycine concentration, and temperature. The study also utilizes Response Surface Methodology techniques to optimize the leaching process, enhancing the overall efficiency of the resource recovery operation.

Metathetic degradation of waste natural rubbers for potential reutilization, Peng Liu, China. Innovative technologies and practices in cleaner production and resource efficiency can play a critical role in transforming waste materials into valuable feedstock for the chemical industry. Waste rubbers, particularly from discarded products like natural rubber gloves, pose a substantial environmental hazard due to their non-biodegradable nature. Addressing this issue through innovative recycling and resource recovery practices is essential for fostering a sustainable society. Effective waste management strategies to repurpose these materials alleviate pollution and contribute to resource efficiency in industrial processes.

The study identifies four primary reactions involved in the olefin cross-metathesis degradation of waste rubbers, elucidating the complex interactions that govern the effectiveness of the process. Notably, the research indicates that maintaining a consistently low concentration of the chain transfer agents enhances the degradation yield by minimizing unwanted by-reactions. This discovery highlights an innovative strategy to optimize resource recovery from waste rubbers, aligning with cleaner production and resource efficiency principles.

5. *Natural Resources and Waste Management:* This section demonstrates how agricultural waste can be enhanced within a circular economy framework and discusses the management of biosolids, which are crucial for preserving and reusing natural resources.

Valorization of rice husk for electricity production by enzymatic hydrolysis and microbial fuel cell, Wei Han, China. A promising example of innovation is the combined bioprocess of enzymatic hydrolysis and microbial fuel cells for electricity production from rice husk. This approach shows the potential of utilizing agricultural waste to generate renewable energy, thus advancing resource efficiency and environmental sustainability. This case study underscores the importance of using cleaner production technologies to enhance resource efficiency, reduce environmental impact, and provide economic viability. Such innovations are pivotal as we strive for a sustainable and resilient future, demonstrating the transformative potential of combining scientific research with practical applications in resource management.

Biosolids management and utilizations: A review, Khalid Z. Elwakeel, Egypt. A comprehensive review of biosolids covers their production methods and classification based on treatment processes. It examines the

various products that can be derived from biosolids, including organic matter-rich soil amendments for agricultural use, inorganic nutrient supplements for improving plant growth, and the potential for energy recovery through anaerobic digestion and thermal conversion technologies. Additionally, the review discusses the application of biosolids in civil engineering projects, such as landfill capping and construction materials.

6. *Technologies for Environmental Protection*: This section discusses water treatment technologies that ensure the preservation of the environment, which is essential for resource equity. It addresses solutions for wastewater treatment, contributing significantly to protecting natural resources.

Occurrence, analysis and removal processes of emerging pharmaceuticals from waters for the protection and preservation of a sustainable environment: a review, Yassine Kadmi, France). Pollution from pharmaceutical residues is a primary concern and is studied from different angles. This emerging issue underscores the need for innovative and sustainable strategies to effectively detect, analyze, and remove pharmaceutical compounds from water sources. A review highlights the need for advanced detection, analysis, and remediation methods, combined with a synergistic approach to treatment, to safeguard our water resources sustainably. The development of these technologies aligns with the broader goals of environmental protection and resource efficiency by focusing on cutting-edge research and practical applications.

Evaluating Centrifuged Water Treatment Plant Sludge as an Adsorbent for Nutrients, Microorganisms, and Heavy Metals Removal from Wastewater, Mirella Almeida, Brazil. This article investigates using centrifuged water treatment plant sludge, without prior treatment, as an adsorbent to remove contaminants from treated wastewater, thereby offering a sustainable waste management solution. Findings indicate that sludge exhibits adsorption capacities for phosphorus, chemical oxygen demand, and metals under specific conditions. Maximum removal efficiencies for total coliforms and *Escherichia coli* were achieved with extended contact times.

Strategies for biological treatment of wastewater: A critical review, Dhananjay Singh, India. To tackle the pollution of existing water bodies, which reduces the available water supply and poses risks to human health, wildlife, and the environment, this paper reviews both conventional and advanced biological methods for wastewater treatment. It aims to provide vital information that underpins the development of sustainable hybrid solutions for effective wastewater management.

7. *Cleaner Production and Industries*: This section examines sustainable practices that ensure resource equity. It also investigates the effectiveness of circular practices and emphasizes waste reduction, governance, and technologies for process improvement.

Sustainable Practices in Steel Manufacturing: Substitution Elasticities Between Waste, Raw Materials, and Energy for Greenhouse Gas Emission Reduction, Yanran Liu, China. The potential of waste utilization to mitigate greenhouse gas emissions, with a particular focus on the steel manufacturing industry, was investigated by employing a translog production function. The study analyzes the substitution elasticities among scrap steel, iron ore, and energy, exploring their roles in carbon reduction. The approach incorporates the resource efficiency and climate change mitigation model to simulate the impact of various waste utilization strategies on GHG emissions. The findings suggest that increasing the usage of scrap steel can significantly reduce emissions while decreasing the demand for iron ore.

Agricultural Label for Egg Production Based on Emergy Accounting, Samanta Amaral, Brazil.

Using emergy accounting to evaluate four distinct egg production systems offers a thorough method for assessing resource use and sustainability. Consistent with the principles of cleaner production, which

focus on efficient resource utilization and minimizing environmental impact, the study established a link between selected Emergy indexes and the Traffic Light Index, introducing a tool to advance cleaner production within industries. It demonstrates how emergy accounting and ecological labeling can improve resource management, sustainability, and communication in industrial processes.

Circular Practices in the Hospitality Sector Regarding Food Waste, Marcelo Cárdenas, Australia. Considering the increasing focus on addressing food waste within the hospitality sector and supporting the achievement of SDG 12.3, a systematic literature review has been conducted to identify, analyze, and summarize research related to circular practices aimed at mitigating food waste in this industry. The examination of various circular principles reveals that implementing these practices can significantly reduce food waste while fostering sustainable behaviors among customers.

Effective Stakeholder Governance in Circular Economy: Insights from Italian Companies, Giulia Roman, Italy. Despite the growing scholarly interest in stakeholder governance, the relationship between stakeholder governance and the motivation for stakeholders to cooperate in transitioning to a circular economy still needs to be explored. This study aims to enhance understanding in this area by examining the comparative effectiveness of three stakeholder governance models—hub-and-spoke, lead role, and shared governance—in motivating stakeholders of a focal company to collaborate on the development and implementation of circular business models. The findings emphasize that stakeholder governance can serve as an essential tool for achieving CE targets at the local level.

Technical Transformation of Heavy/Ultra-heavy oil Production in China Driven by Low Carbon Goals: A Review, Ruiying Xiong, China. As global energy demand rises and conventional crude oil sources become limited, extracting unconventional heavy and extra-heavy oil has gained unprecedented attention. Challenges due to heavy oil's high viscosity and the complex chemical environment of its reservoirs increase the economic costs and environmental pressures associated with heavy oil extraction. This comprehensive review explores the mechanisms behind heavy oil's high viscosity and evaluates various recovery technologies. The technologies are scrutinized based on their basic principles, main characteristics, applicability, and limitations. Significant innovations focus on technologies that ensure low energy consumption, low emissions, and minimal pollution.

8. *Integration of Circular Economy in Emerging Sectors: In the context of sustainability and innovation*, solutions that aim to integrate the sustainable use of biomass and marine resources in biofuel production are emerging. These approaches leverage the abundance of organic material and provide renewable energy alternatives. In vertical agriculture, optimizing resource use, minimizing waste, and promoting a more efficient production cycle by implementing a circular economy highlight the synergy between technology, agriculture, and sustainable energy, which is essential for addressing contemporary environmental challenges.

A Circular Economy Integration Approach into Vertical Farming with Computer-based Simulation Model for Resource Optimization and Waste Reduction, Hribhu Chowdhury, United States. An innovative approach aims to optimize resource utilization and minimize waste through systematic methods; however, significant knowledge gaps persist regarding the effectiveness of vertical farming techniques within the circular economy, particularly in the development of simulation models for resource optimization and waste reduction. This study sought to evaluate various vertical farming methods within the circular economy framework and introduce a zero-waste circular economy model through experimental approaches and simulations. The proposed model repurposes waste from hydroponics and aquaponics, enhancing it with vermicompost tea and aerobic compost tea/quick compost, to nourish six different halophyte plants in a secondary farming setup.

Miscanthus x giganteus biochar: Effective adsorption of pharmaceuticals from model solution and hospital wastewater, Hana Burdova, Czech Republic. Using biochar derived from phytoremediation biomass for adsorbing pharmaceuticals from wastewater showcases a compelling intersection of waste valorization and pollution mitigation. By integrating advanced material sciences with sustainable practices, such technologies can substantially reduce environmental impacts and promote resource optimization. The findings offer valuable insights into developing eco-friendly adsorption methods, crucial for future ecological protection endeavors and achieving sustainability goals.

Analysis of yellow mealworm (Tenebrio molitor) frass as a resource for a sustainable agriculture in the current context of insect farming industry growth, Jorge Poveda, Spain. Innovative technologies and practices in cleaner production and resource efficiency are essential to address the environmental challenges posed by traditional livestock production and the need for sustainable agricultural practices. One promising approach gaining traction is the industrial development of mass insect rearing, particularly the production of *Tenebrio molitor*, commonly known as the mealworm. Using insect-rearing industry by-products like frass can improve agricultural sustainability, reduce dependence on chemical fertilizers, and promote a circular economy. Adopting mealworm production and valorizing frass align with broader goals of resource efficiency and environmental protection. This approach addresses the urgent need for sustainable protein sources and significantly benefits soil health and crop resilience.

An innovative 'sea-thermal' synergetic biorefinery for biofuel production: Co-valorization of lignocellulosic and algal biomasses using seawater under hydrothermal conditions, Javier Remón, Spain. Innovative co-hydrothermal treatment of almond hulls and *Chlorella Vulgaris* exemplifies the potential of integrating diverse biomaterials and optimizing processing conditions to achieve high efficiency and resource recovery in biofuel production. This method demonstrates how advanced technological practices can contribute to cleaner production and enhanced resource efficiency, providing a sustainable pathway for future biofuel development. By deploying such innovative and synergistic processes, industries can significantly mitigate environmental impact, strengthen energy recovery, and promote sustainable resource utilization. This study offers valuable insights into the transformative potential of cleaner production technologies in achieving a sustainable and resilient future.

9. *Regional Cases and Solutions*: These articles focus on local architecture and policies that promote resource equity in specific communities and investigate the mechanisms of land degradation and the protection technologies in regions where environmental sustainability and social justice intertwine. The analysis aims to understand how these can meet local challenges and promote more equitable development.

Degradation mechanism of cultivated land and its protection technology in the central coal-grain overlapped area of China, Yi Tan, China. Innovative technologies and practices in cleaner production and resource efficiency are crucial for addressing the unique challenges faced by regions where agricultural and mining activities coexist. Henan Province, a major coal-producing and high-yield farming region within this area, plays a pivotal role in ensuring national food security and maintaining the mineral resource supply. The transmission mechanism—from “underground mining” to “overburden failure” and then to “surface subsidence” and “farmland degradation”—has been revealed, along with an evaluation of the current status of damage. As innovative solutions are required to address these challenges effectively, an integrated approach provides theoretical and technical support for sustaining the dual objectives of food and energy security. By promoting cleaner production and resource efficiency within this framework, the region can move towards a more sustainable future while addressing the pressing environmental and social challenges posed by coal mining activities.

Indoor temperature and CO2 in South African primary school classrooms: inspecting brick, container, and prefab structures, MJ Booyesen, South Africa. In South Africa's resource-constrained education sector, temporary infrastructure is often repurposed as permanent classrooms, particularly in low-income areas. This study examined temperature and CO2 levels across various classroom types and compared conditions on school days versus non-school days. The key findings reveal that temporary classroom solutions result in significant air quality and thermal comfort disparities, negatively impacting children's learning and well-being. These insights are essential for devising effective regional solutions to address the specific educational infrastructure challenges in South Africa. By promoting resource equity, these solutions can enhance the overall quality of education.

Optimizing urban resource efficiency: a scenario analysis of shared sports facilities in fostering sustainable communities in Nanjing, China, Zhen Xu, China. Regional studies focused on joint-use agreements can offer transformative insights into addressing the challenges faced by high-density urban areas in China. Implementing such agreements could catalyze increasing accessibility to vital community resources, improving public health outcomes, and ultimately fostering sustainable urban development.

10. *Final Implications and Future Perspectives*: This section concludes with an analysis of the impact of technological progress, an essential factor for building a sustainable future. By exploring how innovations and emerging technologies can optimize resource use and reduce carbon emissions, the aim is to understand technology's crucial role in mitigating climate change and promoting more sustainable practices across various industries.

Impact of Capital and Labour based Technological Progress on Carbon Productivity, Zina Yu, China. The paper evaluates the progress made thus far and underscores China's proactive approach to reducing carbon emissions while prioritizing preserving the international ecological environment. It aims to understand the implications of technological progress, the bias towards capital, labor, and energy, and how these biases affect carbon productivity. The findings reveal that a technological bias favoring capital significantly enhances carbon productivity, but an emphasis on energy-enhanced technological advancements without proper alignment could detract from overall carbon productivity.

Scheduling with mixed fleets to improve the feasibility of electric minibuses taxis: a case scenario of South Africa, MJ Booyesen, South Africa. This paper proposes a method to bridge the gap between achieving current mobility patterns and adapting to passenger demand through trip extraction. It introduces the concept of mixed fleets to facilitate electrification in the paratransit industry. Key findings show that leveraging passenger demand to place charging infrastructure and schedule vehicle charging strategically leads to fewer vehicles, a higher proportion of electric vehicles in the fleet, fewer required chargers, minimized grid impact, and a slight increase in total fleet distance covered. The authors suggest using the electrification transition to restructure the paratransit industry in sub-Saharan Africa, promoting a more efficient and sustainable transport system.

Design Principles for a Blockchain-based Multi-sided Platform for the Sustainable Trade of Water: An Affordance Approach, Hanna Buysens, Belgium. Since water scarcity is a significant global challenge impacting numerous communities and is a key focus of SDG 6, digital technologies, such as blockchain, promise to enable efficient water distribution from abundant regions to areas of scarcity. This study uses affordance theory and affordance-based design to explore how blockchain or distributed ledger technology can be designed to mitigate water scarcity challenges. Through design science research, the paper proposes design principles for a blockchain-based multi-sided platform to facilitate intelligent water distribution and trade. Key elements were identified by collaborating with a company already using a blockchain for water trade, including affordances and material properties. This research aims to

advance scholarly discussions by offering practical insights into the effective design of blockchain applications.

3. Concluding remarks

The Special Issue discusses various strategies to promote resource equity through cleaner production and circular economy practices. However, it also acknowledges several limitations that could impact the effectiveness of these strategies, such as technological gaps that may hinder the effective implementation of innovative solutions, particularly in developing regions. This can limit the scalability and applicability of proposed practices. Moreover, the Special Issue highlights the absence of collaboration across different sectors and stakeholders as a potential barrier. This lack of cooperation can complicate the uniform application of circular practices, making it difficult to achieve widespread adoption.

Papers composing this Special Issue also point out that the absence of robust monitoring and evaluation frameworks to assess the effectiveness of implemented practices can lead to an inadequate understanding of their impact on sustainability goals. This limitation can prevent stakeholders from making informed decisions based on empirical evidence and regulatory advancements. New technologies may face regulatory restrictions that limit the use of certain chemicals or processes. These restrictions can hinder the applicability of innovative recycling methods and cleaner production technologies.

The authors also call attention to the fact that implementing circular economy principles requires a systemic approach that acknowledges the complexities of socio-material relationships. The diverse contexts of circular transitions can pose challenges in effectively applying these principles across different regions. While public environmental concern can positively influence environmental legislation and corporate social responsibility, it may also lead to environmental inequality caused by pollution transfer. This aspect is often overlooked, undermining efforts to promote resource equity.

Finally, the financial sustainability of circular innovations was evaluated in terms of the progress made. Still, it was emphasized that production and consumption challenges will continue to impact resource equity without a multifaceted approach.

The research presented in this Special Issue highlights the need for comprehensive strategies that address the unique challenges faced by various industries and regions in promoting resource equity and sustainability.

- Continued research and collaboration are vital for addressing challenges in resource management and promoting circular economy practices across various sectors.
- The integration of circular economy principles into diverse industries, including fashion and space management, is essential for fostering sustainability and resource equity.

- A multifaceted approach involving stakeholder engagement, technological advancements, and education is necessary to implement circular economy strategies effectively.

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