

Sustainable sports logistics: A theoretical framework integrating digitalisation and environmental strategies

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Background: The sports industry increasingly demands logistics systems that are not only efficient but also sustainable and digitally integrated. As globalisation and the complexity of sporting events increase, so does the need for environmentally conscious and technologically advanced logistics solutions.

Objectives: This study aims to offer a theoretical analysis of sports logistics, focusing on the integration of sustainability and digital transformation. It seeks to identify key components and propose a new framework – the Sustainable Sports Logistics System (SSLS).

Method: A qualitative research methodology was applied using secondary literature analysis. Sources were selected from peer-reviewed academic journals and international reports to develop the SSLS model conceptually.

Results: The SSLS model incorporates resource optimisation, green transport, digital traceability and circular asset use. Findings indicate that combining sustainability with digital tools boosts efficiency, resilience and adaptability. This is particularly evident during disruptions such as venue shifts or equipment breakdowns.

Conclusion: There is a growing necessity to re-evaluate sports logistics from both operational and strategic standpoints. The integration of sustainability and digitalisation is not optional but essential for future-ready logistics systems.

Contribution: This study offers a conceptual framework that bridges theoretical insights with practical applications. It provides guidance for sports event organisers, logistics providers and facility managers on how to implement greener, more adaptable and digitally integrated logistics systems.

Keywords: circular economy; digital integration; resilient systems; sports logistics; sustainability.

Introduction

In recent decades, the sports industry has gained significant economic and social importance worldwide. Its role has expanded beyond cultural and health dimensions to become a complex economic system closely linked to logistics (Kenyon & Postlethwaite 2025). Sports events increasingly require robust logistical support – from infrastructure and equipment management to international transport. Globalisation, professionalisation and media growth have intensified these challenges, demanding high levels of coordination (Guidry, Dragun & Valadka 2025).

While many studies address sustainability in logistics or digital transformation in supply chains, few connect these domains within sports. The integration of environmental and digital strategies in sports logistics remains fragmented, and no unified framework currently guides decision-making or performance measurement. This gap is critical because sporting events operate under time-sensitive, resource-intensive and high-visibility conditions where logistics performance directly affects environmental outcomes and stakeholder satisfaction. To address this, the present study develops the Sustainable Sports Logistics System (SSLS) – a conceptual framework integrating digital and environmental dimensions into one model. It identifies key connections between sustainability, resilience and digitalisation, outlining how these elements can enhance logistics performance in sports events. The proposed framework provides both academic and managerial value by guiding the design of greener, smarter and more resilient systems. The remainder of the article is structured as follows: Section 2 reviews the literature and theoretical

perspectives; Section 3 presents the methodology; Section 4 introduces the Sustainable Sports Logistics System (SSLS) framework; Section 5 discusses managerial implications and Section 6 concludes with future research directions.

Literature review

Theoretical background and research gap

Reviews on the digital supply chain (DSC) agree that DSC is more than IT adoption: it rearchitects processes around data to improve stability, agility and efficiency, with common building blocks such as end-to-end visibility, advanced analytics and platform integration (Ferdinand & Kitchin, 2016; Tan & Sidhu, 2022). Yet definitions and scopes vary, and few studies tailor DSC concepts to event-type, temporary logistics systems like sports events.

Within the domain of the digitalisation, digital twins emerge as a unifying capability to couple near-real-time data with simulation for decision support and resilience (e.g. disruption response, capacity rebalancing) (Liu et al., 2023; Qi et al., 2025). Recent reviews show growing evidence that twins enhance visibility and agility, but applications remain concentrated in manufacturing and generalised SC cases; domain-specific designs for sports logistics are largely absent.

On the sustainability side, sport generates material flows and footprints that are non-trivial at the mega-event scale. Empirical work around recent Games and MSEs shows both improvements (venue reuse, material choices) and stubborn hotspots – spectator travel emissions dominating totals – underscoring the need for integrated logistics interventions rather than isolated initiatives.

A parallel stream addresses the circular economy (CE) for sports goods and event assets. Studies indicate user preference and feasibility for durability or repairability in outdoor gear and stress collaboration across actors to scale circular models; however, these insights rarely translate into operational logistics rules (inventory, reverse flows, refurbishment capacity) for sports events.

Digital traceability technologies (e.g. blockchain and IoT) are being piloted in sports contexts (ticketing, equipment tracking, sponsorship assets), but the literature still fragments along technology lines and does not unify traceability with green logistics targets (carbon, waste, reuse) in one decision framework.

Research gap

The current body of knowledge provides generic DSC definitions and toolkits, evidence that digital twins improve SC visibility and resilience, sustainability findings for sports events and CE/traceability concepts in sports contexts – but there is no integrated, sport-specific framework that links digital capabilities (twin, traceability, analytics) with environmental objectives (carbon, waste, circularity) and

operational performance in event logistics. This gap limits managers' ability to design data-driven, low-carbon, resilient sports logistics systems.

Positioning and contribution

To address this gap, the article proposes the SSLS, integrating four pillars – resource optimisation, low-carbon transport, digital traceability and circular asset use – and deriving design rules and indicators that connect digital levers to sustainability and performance outcomes. Sustainable Sports Logistics System complements prior DSC reviews and sports sustainability evidence by offering a unified, domain-specific model suitable for empirical validation and managerial deployment.

Facility logistics and equipment management

The continuous operation of sports facilities – such as stadiums, sports halls and training centres – requires a long-term logistics strategy (Tadić et al. 2025). Facility logistics encompasses the maintenance of buildings, energy management, transportation and parking infrastructure, as well as the continuous availability of various assets, including sports equipment, lighting systems and security devices. The objective of equipment management is to ensure the optimal availability of necessary physical assets.

Supply chain of sports equipment

The production, warehousing and distribution of sports equipment (e.g. clothing, shoes, balls, protective gear) represent one of the most extensive areas within sports logistics (Cong et al. 2024). Globally operating sports manufacturers (such as Nike, Adidas and Decathlon) manage complex supply chains involving raw material suppliers, regional distribution centres and local retailers (Jhanji Dhir 2025). Demand for sports equipment is highly seasonal and event dependent, making inventory strategy a critical element. As visualised above, the supply chain of sports equipment is a multifaceted system that directly ties into the SSLS framework. Through digital tracking, circular equipment management and sustainable sourcing, this supply chain becomes a key domain for implementing environmentally conscious logistics practices. Figure 1 illustrates the typical structure of a sports logistics supply chain, including the main stages from manufacturer to event venue, followed by reuse.

This model highlights the linear and circular flows within the SSLS framework. Products are distributed through retailers

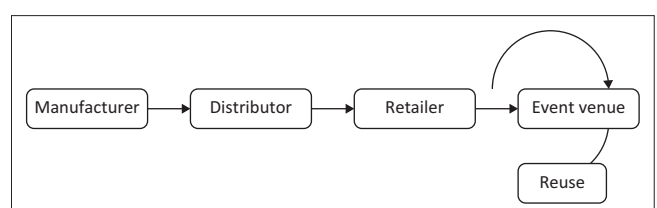


FIGURE 1: Schematic of the supply chain for sports equipment.

to venues, where, instead of disposal, reuse loops are introduced to support circular logistics practices and reduce environmental impact.

The outline of the sports logistics model presents the key sustainability and digital components that contribute to the system's efficiency and flexibility. At the core of the model are integration, traceability and resource optimisation.

The supply chain of sports equipment is closely linked to the commercial export sectors of health, pharmaceuticals, education, culture and sports (Wang & Liang 2024), as these tools directly support a healthy lifestyle, prevention and education. The efficiency of the supply chain affects the availability of sports goods in schools, healthcare institutions and recreational urban spaces, thereby influencing the widespread adoption of physical activity across society. The quality and accessibility of sports articles indirectly impact public health and help ease the burden on healthcare systems. In global trade, sports equipment holds not only economic but also cultural and educational value (Cecere 2025), being part of the infrastructure needed for an active lifestyle. The uninterrupted functioning of supply chains is a prerequisite for the stability of the sports economy and the strengthening of social well-being; thus, their comprehensive analysis is of great importance from a multidisciplinary perspective.

Taking a comparative international perspective, commercial exports in the sectors of health, pharmaceuticals, education, culture and sports appear at varying levels across Central and Eastern European countries (Dettenhofer et al. 2019).

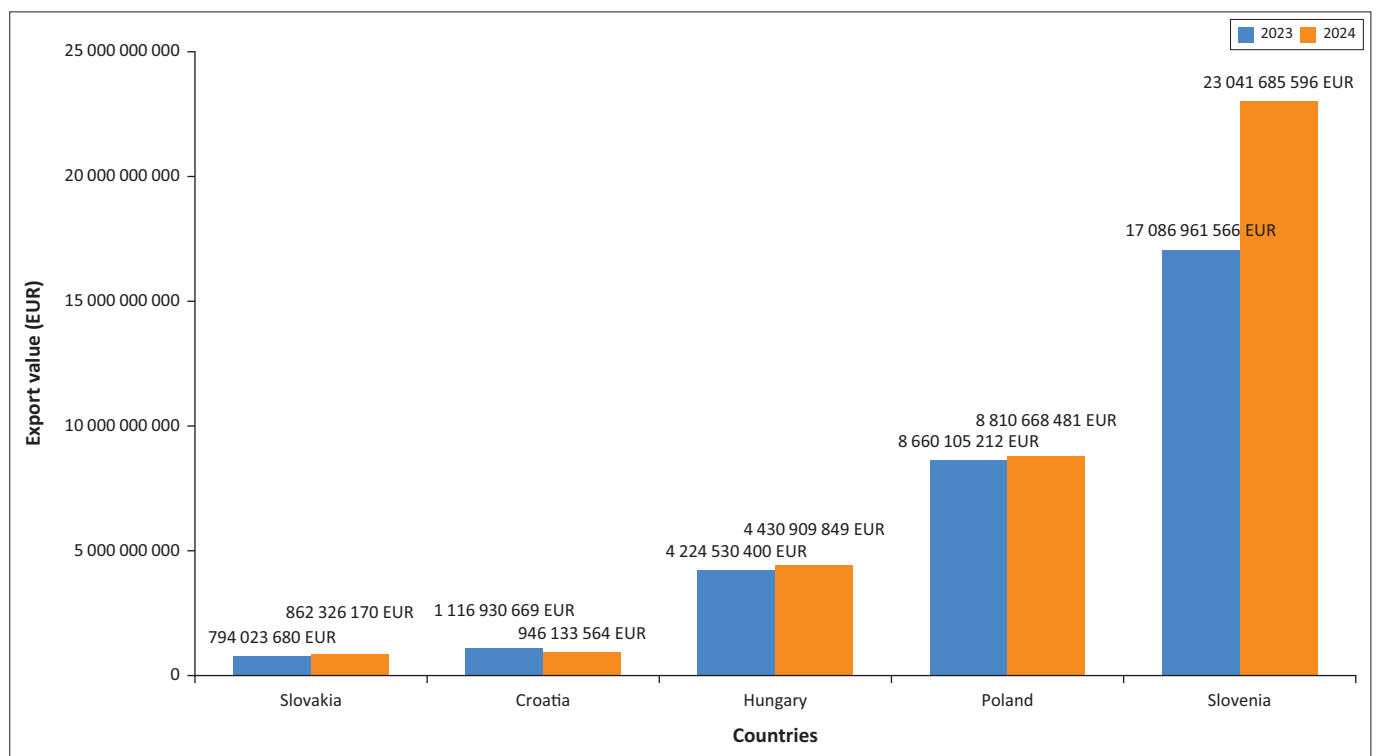
Among Croatia, Hungary, Poland, Slovenia and Slovakia, Slovenia records the highest level of commercial export, showing significant growth in 2023 and 2024. Hungary ranks third in this comparison, while Croatia and Slovakia lag.

Analysing the trends of 2023 and 2024, only Slovenia indicates notable development, while the indicators for the other countries remain like the previous year or show only minor growth.

Figure 2 illustrates the export performance of five Central and Eastern European countries (Slovenia, Hungary, Poland, Croatia and Slovakia) in the fields of sports, culture, health and education between 2023 and 2024. It is clearly visible that Slovenia shows an upward trend, while the other countries display rather stagnant patterns (Dettenhofer et al. 2019).

Demand for sports equipment often surges suddenly ahead of seasonal events, placing increased pressure on all stages of the supply chain (Ray 2023). Therefore, predictive inventory planning and the establishment of a responsive distribution network are essential, particularly in markets where demand is highly seasonal. The availability of sports logistics tools is closely linked to the level of development in national healthcare, education and cultural systems (Wu 2024). The following Table 1 provides an overview of the export activity of Central and Eastern European countries.

Having examined the main areas of sports logistics, the next section introduces the methodology used to explore and conceptualise the SSLS.



EUR, Euro.

FIGURE 2: Export values (in Euro) in five Central and Eastern European countries for 2023 and 2024.

TABLE 1: Components of the sustainable sports logistics systems.

SSLS component	Sustainability impact	Resilience benefit
Resource optimisation	Reduced inventory loss, less material waste	Faster response, demand-driven planning
Eco-friendly transportation	Lower CO ₂ emissions, improved energy efficiency	Integration of alternative routes and vehicles
Digital tracking and transparency	More accurate data, fewer redundant shipments	Real-time intervention capability
Circular equipment usage	Reuse of materials, reduced waste generation	Mobilisation of local resources

SSLS, Sustainable Sports Logistics System.

Theoretical framework

In the field of sustainable logistics, several conceptual models offer a foundation for the development of advanced systems integrating environmental and technological dimensions.

The current study builds on three established theoretical perspectives that inform the structure and function of the SSLS proposed herein.

Firstly, the circular supply chain model emphasises the closed-loop management of resources, aiming to reduce waste and maximise the reuse and recycling of materials. This approach is particularly relevant for sports logistics, where equipment, infrastructure and packaging can be strategically re-introduced into the system through modular design and reverse logistics.

Secondly, the concept of resilient logistics systems underlines the importance of adaptability and responsiveness in the face of disruptions, such as pandemics or extreme weather events. These features are increasingly vital for sports logistics in a volatile global context.

Thirdly, the integration of digital twin-based logistics provides real-time synchronisation between physical and DSC operations. Digital twins allow for enhanced visibility, predictive modelling and optimisation of logistics flows. In the context of sports events, such capabilities support timely decision-making, inventory control and sustainability monitoring.

These theoretical models collectively serve as the intellectual foundation of the SSLS framework, which aims to blend circularity, resilience and digital integration into a coherent system tailored to the demands of the sports industry.

Research methods and design

This study applies a systematic literature review (SLR) approach, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 protocol to ensure transparency and reproducibility. The goal of the review was to identify and synthesise existing academic work at the intersection of sports logistics, sustainability and digitalisation, thereby supporting the conceptual development of the SSLS framework.

Database selection and search strategy

The search was conducted across four major academic databases known for peer-reviewed content: Scopus, ScienceDirect (Elsevier), SpringerLink and MDPI. These platforms were selected because they comprehensively cover transport, logistics and sustainability disciplines.

The search strings were developed iteratively, combining thematic and Boolean keywords: ('sports logistics' OR 'event logistics') AND ('sustainability' OR 'green logistics' OR 'circular economy') AND ('digital' OR 'digitalization' OR 'digital twin' OR 'blockchain' OR 'IoT').

The time frame was limited to 2014–2024, ensuring coverage of the most recent decade of research. Only English-language, peer-reviewed journal articles were included.

Screening and inclusion process

The initial query returned 162 publications. After removing duplicates and screening titles and abstracts for relevance, 84 articles remained.

A full-text review was then conducted, applying the following inclusion criteria:

- The study addressed logistics or supply chain processes in a sports or event context.
- It explicitly discussed sustainability, digitalisation or both.
- It provided conceptual or empirical insights relevant to logistics system design.

Exclusion criteria:

- Conference abstracts, editorials and non-peer-reviewed materials.
- Articles focusing solely on marketing, sponsorship or fan engagement without logistics relevance.

After applying these filters, 41 articles met the inclusion criteria. A secondary cross-check for methodological rigour and thematic alignment reduced the final sample to 24 core articles, which formed the analytical basis of this study.

Thematic analysis and synthesis

The selected articles were coded and categorised along three analytical dimensions:

- Sustainability orientation (carbon reduction, circularity, resource efficiency),
- Digitalisation intensity (use of data, automation, digital twins, traceability tools),
- Logistics domain (transport, inventory, facilities, waste management, event operations).

A matrix synthesis was performed to identify intersections between sustainability and digital dimensions.

Recurrent concepts across studies were then consolidated into the four pillars of the SSLS framework:

- resource optimisation,
- low-carbon transport,
- digital traceability and
- circular asset use.

Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow summary

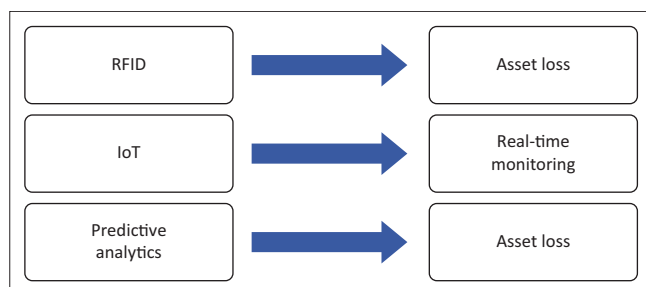
The process is illustrated in a PRISMA-style flow summary: Records identified ($n = 162$) → screened ($n = 84$) → eligible ($n = 41$) → included in synthesis ($n = 24$).

This structured approach ensures replicability and academic transparency in developing the conceptual SSLS model. Sports tourism – whether involving spectators attending international competitions or amateur athletes – requires substantial logistical coordination (Kennelly & Toohey 2014). Digital solutions such as mobile applications, online ticket purchasing, route planning, accommodation booking and integration of public transportation systems ease travel logistics (Garritsen, Grigolon & Geurs 2025). Artificial intelligence (AI)-powered travel planning tools help determine the most optimal routes while taking sustainability criteria into account. The impact of digital tools on the vulnerability points of sports logistics is illustrated in Figure 3.

This figure illustrates the differences between traditional and modern sports logistics systems. The classical model is characterised by a linear and manual approach, whereas the modern system incorporates digitally supported, integrated and sustainability-oriented processes. Supply chain risk mitigation strategies are used to keep the effects of disruptions from stopping the continuity of various flows (Nel 2024).

Following the overview of digital tools and technological advancements, it is appropriate to present a comprehensive model that integrates the elements of sustainability and technology discussed thus far. After reviewing the technological advancements in sports logistics, the study proposes an integrated model that combines sustainability and digital innovation, the SSLS.

Having explored the technological background, the article now shifts to presenting the core findings and theoretical contributions.



RFID, Radio Frequency Identification; IoT, Internet of Things.

FIGURE 3: The impact of digital tools on vulnerability points.

Ethical considerations

This study did not involve human or animal participants. Therefore, no ethical clearance was required. The research relied exclusively on secondary sources from publicly accessible academic literature and databases.

Results

Framework development

Sports activities and events increasingly require robust logistical support, including infrastructure provisioning, equipment management and international transportation processes. The intersection of sport and logistics is especially relevant in the era of sustainability efforts and digital development (Irajifar et al. 2023).

Globalisation in the sports sector and the increasing international nature of competitive sports pose new logistical challenges. Short transition times between events held at geographically distant locations, the fast and safe transportation of athletes and their equipment and the demands of media coverage all require high-level logistical coordination (Herold et al. 2019). At the same time, the digitalisation of logistics systems enables the sports industry to operate more sustainably and efficiently while reducing its ecological footprint and enhancing supply chain resilience.

Operating sports facilities – such as lighting, heating, cooling and water systems – requires substantial energy consumption (Elnour et al. 2022). In pursuit of sustainability, an increasing number of facilities are adopting energy-saving technologies, solar panels, smart control systems and energy-efficient transport equipment. Preventive control and digital monitoring assist public institutions in improving resource efficiency (Klein, Lubinga & Masiya 2024). Digital technologies – such as smart sensors and data-driven control systems – allow for optimisation of energy use and waste reduction (Ullah et al. 2025).

Based on the reviewed literature, the study developed the SSLS framework to integrate sustainability and digitalisation into one unified model. The theoretical logic of the SSLS follows an Input–Process–Output (IPO) structure (Figure 4):

- **Input:** sustainability drivers (e.g. carbon reduction, resource efficiency, circularity) and digital enablers (e.g. IoT, blockchain, digital twins, data analytics) identified across the literature.
- **Process:** thematic synthesis showing how digitalisation mechanisms – visibility, efficiency and resilience – enable sustainable performance.
- **Output:** four interrelated pillars defining the SSLS framework:
 - Resource optimisation – data-supported allocation of materials, energy and facilities.
 - Low-carbon transport – emission-reducing mobility and routing strategies.

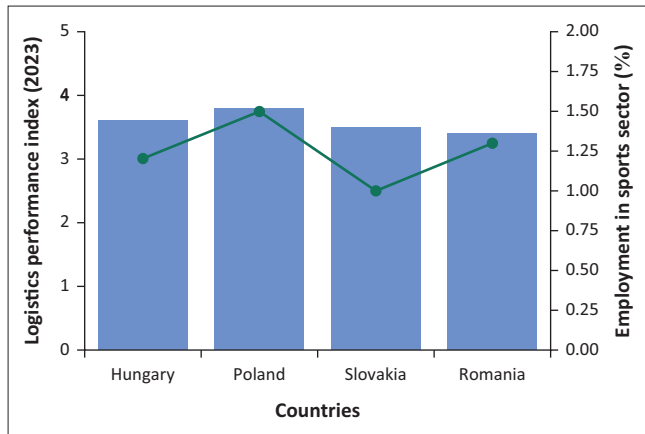


FIGURE 4: Derivation of the sustainable sports logistics system framework.

- Digital traceability – end-to-end monitoring and transparency of logistics flows.
- Circular asset use – reuse and lifecycle extension of sports equipment and venues.

Together, these pillars describe a system where digital and environmental strategies mutually reinforce one another to improve logistics efficiency and reduce ecological impact. The model covers the full spectrum of the supply chain within the sports industry – from event planning and execution to post-event sustainability evaluation – and is illustrated in Figure 4.

The SSLS model, once defined, can be translated into practice through concrete applications, as the following section will illustrate with real-world examples and development points.

Findings and interpretation of results

The findings of this study reinforce the growing recognition that sustainability and digitalisation must be jointly embedded into the logistics structures of the sports industry. The SSLS introduced in the previous section demonstrates how these two dimensions can coexist and mutually strengthen each other in operational practice.

The results highlight that the digitalisation and sustainability challenges in sports logistics require a systemic transformation rather than isolated technological or environmental measures (Chaplynska & Chelombitko 2023). Integrating digital tools such as real-time monitoring, IoT-based asset tracking and predictive analytics enables sports organisations to improve efficiency and reduce waste, while sustainability strategies – such as carbon-conscious transport planning and circular asset use – enhance long-term resilience.

The SSLS model, built on four pillars, provides a strategic framework for implementation rather than merely a conceptual vision. In practical terms, it supports managers in aligning logistics operations with sustainability metrics and performance indicators. By linking resource optimisation, low-carbon transport, digital traceability and circular asset use, the model creates a balanced system

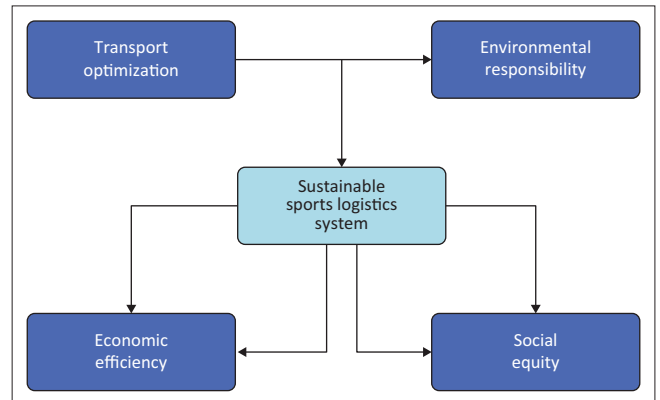


FIGURE 5: Application of the sustainable sports logistics system model at the World Athletics Championships in Budapest.

where environmental responsibility and operational performance reinforce one another.

As shown in Figure 5, the SSLS integrates environmental, economic, social and operational dimensions into a single cohesive structure that strengthens both sustainability outcomes and logistical reliability. The framework thus bridges theoretical insight and managerial practice, offering a foundation for future empirical validation and adaptation across different sport-event contexts.

The figure illustrates the environmental impacts of the elements within the sports logistics supply chain, highlighting the carbon footprint of transportation, storage and events. It emphasises the importance of sustainable logistics decisions in reducing the environmental effects of sports events.

Development areas and practical application

The advantages of the SSLS model are particularly evident in the operation of major sporting events and sports facilities, as it supports the implementation of energy-efficient systems, enhances forecasting capabilities, optimises logistics costs and contributes to the reduction of waste generation. These findings are important for the elaboration of public policies in the environmental management of solid waste (Coronel-Chugden et al. 2024). Table 1 summarises the key sustainability impacts and resilience benefits of the four main components of the SSLS. The 2024 Paris Olympics can also serve as an example for the implementation of these practices.

Reducing logistical vulnerability

One of the key challenges in sports logistics systems is flexibility (Pott et al. 2024), which becomes particularly important in the face of external shocks such as pandemics, global supply chain disruptions or extreme weather events. The SSLS model addresses this issue by enabling rapid adaptation to alternative transport and equipment usage solutions and by facilitating real-time responses through the continuous analysis of digital data streams. In addition, it supports inventory optimisation and allows for procurement from multiple sources, increasing system resilience (Pereira, Christopher & Silva 2014). Furthermore, by encouraging the

use of local resources, the model helps reduce dependence on global supply chains. Through these mechanisms, SSLS not only promotes sustainability but also builds a more resilient logistics system capable of withstanding future disruptions.

This model thus provides not only a sustainable but also a resilient system, designed to address future challenges in sports logistics.

The logistics system of the 2023 World Athletics Championships in Budapest (case study): The event's newly constructed main venue, the National Athletics Centre, operated with temporary capacity and was sustainably dismantled after the competition.

The organisers demonstrated their commitment to sustainable event management by obtaining ISO 20121 certification (Mogaji & Nguyen 2024). The MÁV-Volán Group offered discounted 'VB2023' travel options, while the city's public transport system operated with extended schedules to support the movement of participants and spectators. Waste collection points, educational displays and green area developments (e.g. tree planting) were also introduced. Digital solutions included online ticket sales (Mogaji & Nguyen 2024), transport information via mobile applications and innovative broadcast technologies (e.g. cable-mounted cameras). Several operational elements of the organisation exhibited a strong alignment with the principles of the SSLS model. Resource optimisation was manifested through the application of modular stadium design, enabling efficient spatial planning and adaptable construction solutions. The commitment to sustainable transport was demonstrated by the strategic promotion of public transportation systems, aimed at reducing carbon emissions and alleviating urban congestion. Digital tracking was effectively integrated via advanced ticketing platforms and mobile applications, ensuring enhanced traceability, data accuracy and user accessibility. Furthermore, the circular use of equipment was reflected in the implementation of temporary infrastructure (Kawa et al. 2024), which facilitated reuse, minimised material waste and supported environmentally responsible event planning. Figure 6 presents a structured summary of how each core element of the SSLS model was applied during the 2023 World Athletics Championships in Budapest. This event serves as evidence that even large-scale sporting events can be successfully implemented using a sustainable logistics model supported by digital tools.

The figure clearly illustrates that all four pillars of the SSLS model were actively implemented during the event. The modular and temporary stadium structure supported resource efficiency, while the integration of public transportation and the 'VB2023' ticket contributed to sustainable mobility. Real-time digital tools enhanced the transparency and responsiveness of the logistics system, and the use of temporary infrastructure reflected circular economic principles. These practices collectively demonstrate how sustainability and operational excellence can be harmonised in large-scale sports logistics.

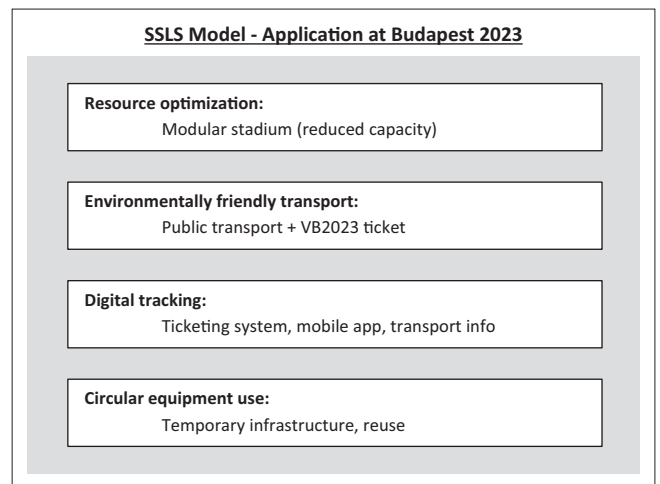


FIGURE 6: Application of the sustainable sports logistics system model at the World Athletics Championships in Budapest.

Recommendations

The sustainable development of sports logistics is no longer merely an option but a necessity. Based on the findings of this study, several recommendations should support this transition. Firstly, it is essential to encourage technological innovation in logistics systems to improve efficiency and reduce environmental impact. Furthermore, sustainability considerations should be integrated directly into the planning and design phases of logistics operations. In addition, launching targeted training programs can enhance professional awareness and capabilities in sustainable logistics practices. Secondly, forming strategic partnerships between logistics providers, sports organisations and public institutions can foster collaborative approaches that support long-term sustainability goals.

Future research opportunities

Future research in the field of sustainable sports logistics could focus on several key areas. One promising direction involves the logistics analysis of different sports disciplines, allowing for tailored strategies that meet their unique requirements. Another area is the evaluation of the effectiveness of digital solutions, particularly in enhancing operational transparency and agility (Avinash & Joseph 2024). Developing sustainability indicators specific to sports logistics would also offer practical tools for performance measurement. Additionally, the creation of quantitative models is essential to the assessment of resilience, offering new ways to measure adaptability within logistics networks.

Bringing together theoretical insights and practical observations, the final section summarises key conclusions and outlines directions for future research.

Contribution of the study

This study makes a significant contribution to the emerging field of sustainable sports logistics by bridging the theoretical gap between sustainability principles and digital transformation strategies. The proposed SSLS model

integrates CE practices, digital technologies and resilience concepts into a unified framework tailored to the unique logistical demands of the sports industry. By conceptualising this integrated model, the study advances existing knowledge in supply chain management, environmental logistics and sports event operations. It provides a structured foundation for the development of greener and more adaptive logistics systems, particularly in the context of large-scale international sporting events.

In practical terms, the SSLS framework offers guidance for stakeholders such as sports event organisers, logistics service providers, infrastructure managers and policymakers. It supports decision-making in areas like infrastructure planning, inventory control, transport optimisation and risk management under volatile conditions. Furthermore, the inclusion of a real-world case study (the 2023 World Athletics Championships in Budapest) demonstrates the model's applicability and provides insights into best practices for future event planning. As such, the study contributes not only to academic discourse but also to practical implementation within the sports logistics ecosystem.

Conclusion

The future of sports logistics clearly points towards the integration of digitalisation and sustainability not merely as parallel considerations but also as an integral part of strategic planning. The SSLS model proposed in this study is not simply a new system description but rather a guideline for stakeholders in the sports industry to move towards more conscious and resilient logistics operations.

The significance of the model lies in its ability to provide a framework for rethinking sports logistics where optimal resource utilisation, real-time information flow and environmental principles are all simultaneously upheld. This is not solely about improving operational efficiency but also about promoting a fundamental shift in mindset.

The application of the proposed model facilitates the transformation of the sports industry into one that is not only more sustainable but also more adaptive in responding to future challenges (Szathmári 2025).

Managerial implications

The managerial implications of the SSLS framework emphasise the practical pathways through which sustainability and digitalisation can be embedded in sports-event operations. Implementing the model enables decision-makers to redesign logistics processes based on real-time data, measure carbon and energy efficiency and improve transparency across suppliers and service partners. The four pillars – resource optimisation, low-carbon transport, digital traceability and circular assets serve as operational levers for achieving measurable sustainability targets. For logistics managers, the SSLS

offers a diagnostic and planning tool: it translates abstract sustainability objectives into actionable performance indicators, while for policymakers and event organisers, it provides a roadmap for aligning environmental commitments with economic and social goals. By institutionalising these principles, sports organisations can strengthen resilience, reduce costs and build long-term stakeholder trust.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

CRedit authorship contribution

Istvan Gal: Conceptualisation; Data collection; Data curation; Formal analysis; Investigation; Methodology; Project administration; Supervision; Visualisation; Writing – original draft; Writing – review & editing. Beatrix Farago: Conceptualisation; Data collection; Data curation; Formal analysis; Investigation; Methodology; Project administration; Supervision; Visualisation; Writing – original draft; Writing – review & editing. All authors reviewed the article, contributed to the discussion of results, approved the final version for submission and publication and take responsibility for the integrity of its findings.

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Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

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