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Planetary Health and Sustainable Sport (2018–2024): A Scoping Review of Eco Friendly Sports Event Management Practices

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Abstract

Sport occupies a unique place in global culture. It inspires millions of participants and audiences, has a powerful economic and social impact, and shapes social norms and behaviour through mass media. This pervasiveness means that the sports industry impacts and is affected by environmental and planetary health. Major competitions create large carbon footprints, consuming vast amounts of energy and resources; Elite athletes and fans travel worldwide; and game structure changes scenarios. At the same time, climate change, biodiversity loss and pollution increasingly challenge sport viability: heat waves threaten athlete health, drought reduces snow availability for winter sports, and pollution closes rivers and lakes to sport, environmental practices have begun to incorporate into event planning, operations and legacy programs The purpose of the systematic review study is to review the academic and Gray literature published in 2018 and 2024 that evaluates environmentally friendly sport program management practices from a planetary health perspective. Evidence was gathered through extensive searches in institutional reports and credible media sources. These findings are categorized into thematic areas such as governance and policy framework, carbon and energy management, transport, site and infrastructure, waste and resources, food and meals, procurement and products, stakeholder engagement and activation emissions are heterogeneous, construction and operations in event footprint These can significantly reduce travel planning, was disposal, plant-based catering Environmental impacts are also greatly reduced by using locally sourced resources. Best-practice case studies from organizations such as Formula One, World Surf League, International Aud Strasbourg, and NFL Green offer innovative solutions, while frameworks such as ISO 20121 and the UN Sustainable Development Goals provide governance guidance Comprehensive planetary health activism is a catalyst, but true sustainability requires systemic change, inclusive stakeholder engagement and rigorous accountability

Keywords - Planetary Health, Sustainable Sport Event Management, Environmental Sustainability, Carbon Emissions in Sport, Eco-friendly Sports Practices

Introduction

Over the past decade, the concept of planetary health has emerged as a unifying framework that recognizes the interdependence between human health, ecological systems, and sustainable development. Coined by the Rockefeller Foundation–Lancet Commission, planetary health emphasizes that human wellbeing cannot be separated from the integrity of Earth's natural systems. In this context, sport—as a global social, cultural, and economic phenomenon—occupies a paradoxical position. While sport promotes physical activity, social cohesion, and mental wellbeing, it also generates significant environmental pressures through large-scale events, infrastructure development, energy consumption, travel-related emissions, waste generation, and resource-intensive operations.

Between 2018 and 2024, growing awareness of climate change, biodiversity loss, and resource depletion has intensified scrutiny of the environmental footprint of sports events. Mega-events such as the Olympic Games, FIFA World Cup, Commonwealth Games, and international marathons, as well as recurring national and

community-level tournaments, have increasingly been evaluated not only for their economic and social legacies but also for their ecological impacts. This period is particularly significant as it coincides with the UN Sustainable Development Goals (SDGs), the Paris Climate Agreement implementation phase, and the post-COVID-19 rethinking of event sustainability and resilience.

Sustainable sport and eco-friendly sports event management have thus gained prominence as strategic approaches to align sporting activities with planetary health principles. Eco-friendly sports event management refers to the systematic integration of environmental considerations into the planning, organization, execution, and post-event evaluation of sports events. Practices such as carbon footprint assessment, renewable energy use, sustainable transportation planning, zero-waste initiatives, water conservation, ethical sourcing, biodiversity protection, and community engagement are increasingly being adopted to minimize environmental harm while enhancing positive social outcomes.

Despite the growing body of research and policy discourse, the literature on eco-friendly sports event management remains fragmented, spanning disciplines such as sports management, environmental studies, public health, urban planning, and sustainability science. Moreover, the linkage between planetary health and sports event sustainability is still evolving, with varying terminologies, conceptual frameworks, and methodological approaches. A scoping review is therefore an appropriate method to systematically map existing evidence, identify key concepts, highlight best practices, and reveal research gaps without restricting the analysis to narrowly defined outcomes.

This scoping review aims to examine and synthesize literature published between 2018 and 2024 on eco-friendly sports event management practices, with a specific focus on their relevance to planetary health and sustainable sport. By analyzing trends, strategies, challenges, and innovations across different types of sports events and geographical contexts, the review seeks to provide a comprehensive overview of how the sports sector is responding to global environmental challenges. The findings are intended to inform researchers, policymakers, event organizers, sports federations, and sustainability practitioners, and to support the development of more environmentally responsible and health-promoting sporting events in the future.

In doing so, this study contributes to the broader discourse on sustainability by positioning sport not merely as a beneficiary of healthy planetary systems, but as an active agent capable of advancing environmental stewardship, public health, and sustainable development at local, national, and global levels.

Planetary Health and Sport

Planetary health is a multidisciplinary concept that highlights the deep and inextricable link between human health and the life-sustaining capacity of Earth’s natural systems This approach recognizes that human-induced climate change, biodiversity loss and increasing pollution are not only environmental threats. On the one hand, the environmental impacts of sports activities such as high energy consumption, greenhouse gas emissions, land use change, waste generation and exploitation of natural resources are degrading the earth's environment according to the Rapid Transition Alliance about 3.6 million 216 million tons of carbon dioxide in Russia, respectively. This poses health risks, water shortages and droughts reduce the availability of snow needed for winter sports, air pollution and weather disasters can force sporting events to be cancelled or moved, which is an important ethical obligation for the sporting world.

Sustainability and Sport Event Management

Sport event management encompasses planning, organizing, conducting and evaluating events from local tournaments to large-scale global spectacles. Traditionally, the success of a sporting event is measured by financial benefits, attendance figures and media attention. Over the past decade, however, environmental and

social sustainability have appeared as an important criterion in this assessment. The International Olympic Committee (IOC) incorporated environmental protection in 1992, later established the Sports Environment Commission in collaboration with UN Environment Program (UNEP), and developed sustainability policies formally recognizing environmental responsibility in sporting events are limited to specific case studies and often ignore the socio-economic aspects of indirect emissions. On a practical level, organizers face challenges such as insufficient financial resources, limited infrastructure, lack of reliable data, poor partnerships etc. At the same time, public and spectator expectations rise, sports fans demand more environmentally friendly experiences and want to change their behaviour at events seen as examples of sustainable practices. In this context, the aim of this review is to highlight the current state of environmentally friendly sport event management, find best practices and shortcomings, and link these findings to a broader planetary health perspective.

Objectives and Scope

The purpose of this review study is to comprehensively understand sustainability efforts in sport program management. The first aim is to collect and analyse evidence from the academic literature and grey literature published between 2018 and 2024 to understand the extent and nature of sustainable practices adopted in sporting events. Green Transport and Eco-Friendly Infrastructure The third objective is to analyse the challenges and limitations faced in sustainability implementation, including financial limitations, technical barriers, policy discrepancies, lack of data and lack of coordination among different stakeholders, sustainable practices adopted in sport event management How they relate to human health, environmental protection and social well-being Although the primary focus of this review is managing sport events, it also draws insights into sustainability initiatives adopted by sport organizations, professional leagues and athletes Concerted efforts are needed. The study is global in scope, encompassing summer and winter sport, professional and amateur events, and a variety of geographic and socioeconomic contexts, providing a comprehensive and balanced picture of global sustainability in sport event management.

Methodology

This study reviewed the scope following the PRISMA-ScR framework. The literature search was conducted between June and December 2024 using web-based research tools, including open-access academic databases such as PubMed, Frontiers and MDPI, as well as the International Olympic Committee, World Athletics, World Surf League, Gray, and Earth.Org Official websites include reputable media sources like Sport Heroes, and UVA Sustainability, and report guides search terms include “sport,” “sustainability,” “eco-friendliness,” “sport event management,” “planetary health,” “carbon footprint,” “green practices,” and Paris 2024 and Inclusion Criteria 2020 specific events To name a few, publications from January 2018 were required to publish initiatives focused on sport management or broadcasters by December 2024. Studies that were purely theoretical, lacked practical application, or were duplicative were excluded with sport sustainability, full text availability, environmental sustainability or planetary health relevance. Data were extracted from selected literature on event type, geographic context, sustainability areas, specific policies or practices adopted, emissions reduction or waste diversion etc. Their results and challenges faced Thematic analysis of these findings categorized practices into nine major areas. Literature related to planetary health and sport activism was also reviewed to broaden the context. All citations are presented in APA style (7th edition). It is also worth mentioning that due to open-access limitations, some International Olympic Committee and sustainability-related documents were not directly accessible, yet necessary insights into their content were obtained through secondary sources.

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Results

1. Governance and Policy Frameworks

International directives and standards played a critical role in shaping sustainable sport event management, with the IOC commitment to environmental protection appearing as a set key driving force in climate positive operations at all Olympic Games held after 2030 (IOC, 1992; UNEP). The “Sustainable Events Management Guidance” (2021) provides a comprehensive framework for aligning athletics events with sustainability principles, defining sustainability as practices that ensure social, economic and environmental balance while attending to the needs of future generations (World Athletics, 2021). This document envisions the Union as a leading player in the sustainable agenda through managing social and environmental risks, active stakeholder engagement, and alignment with the UN Sustainable Development Goals, outlining six key priority areas: leadership and sustainability, sustainable production and consumption,; Climate-carbon neutrality, local ambient air quality, global equity, diversity, accessibility and well-being have adopted similar frameworks by other sports associations, such as the International Automobile Association pledging to achieve zero carbon emissions by 2030 and ISO 20121 certification (FIA) on the formula Japan's Advancing Global Warming Resistance Act and mandates an energy efficiency program, while China's "dual-carbon" goals are low-carbon strategies, carbon trading, peak emissions by 2030 and local governments promoting renewable energy use to achieve carbon neutrality and by 2060, e.g. Seen in the Paris 2024 Legacy Plan, also important are resilience key pillars are the former are existing or temporary, and 80 per cent are located within 10 kilometres of the Olympic Village (Paris 2024 Legacy Plan) In addition, increased integration of corporate social responsibility and voluntary initiatives within sport, with business clubs, driven by UN initiatives and standards such as ISO 20121, aiming to use 100% recycled polyester by 2024, makes 15 million shoes from marine plastic a sustainable part of their mission (Adidas & Parley; Formula) collaborates with E and DHL). Formula E efforts to reduce transportation emissions by adopting multiple coordination.

2. Carbon and Energy Management

Analysis of emission profiles of sporting events shows that mega events are a major source of greenhouse gases, mainly due to site construction, energy consumption, and transportation Recent research has shown that large-scale sporting events generate significant carbon emissions and energy use. Socio-economic dimensions are also relatively neglected Transport and logistics are often the largest contributors; Professional sports such as the NFL, MLS and NBA, for example, emit about 20.8, 18.2 and 13.7 metric tons of carbon dioxide per game internationally, the 2016 Rio Olympics and the 2018 Russia Soccer World Cup about 3.6 million and 216 million tons respectively Carbon dioxide emitted To address these challenges, research indicates that emissions can be significantly reduced by strategically selecting sites, encouraging green transport, and implementing energy-saving measures. Steps include offsetting residual emissions etc. Energy efficiency measures Using natural light, LED lighting, load-adjusting generators, renewable grid electricity, and temporary solar or biofuel-based systems, with credit schemes to offset carbon reporting at the Paris 2024 Olympics 95 percent of the site was prefabricated or temporary, reducing construction-related emissions, while the wood-framed recessed-roof hydraulic centre reduced the volume of heated and ventilated areas by about 30 percent Formula E-electric vehicles, which solar panels, rainwater harvesting and 100% waste recycling accepts, reduces emissions through biofuel-powered generators, post-race recycling of batteries and tires, while organizing eSport ESL Gaming measures its emissions through reforestation projects Organizing carbon-neutral tournaments Accurate measurement and reporting is crucial at the heart of all these efforts, because the goal Reliable carbon accounting is essential to determine and avoid greenwash In this context, the need for comprehensive approaches to include indirect emissions and socio-economic impacts has been

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emphasized. Many sporting organizations have adopted carbon calculators and reporting tools, such as the World Athletics recommendation for collecting travel data in ticket sales, spectator and participant carbon counting they offer effective guidance for measurement and improvement.

3. Transportation and Mobility

Transport to sporting events is often considered the biggest source of emissions, as the movement of athletes, officials, spectators and event equipment generates significant greenhouse gas emissions Guidance issued by World Athletics highlights the importance of travel planning Encouraging active transport, providing improved accessible public transport, encouraging carpooling in low-emission vehicles, limiting business class flights, offsetting residual emissions and implementing credible abatement measures The Paris 2024 Olympics provide an effective example of these principles 80 percent and located within a 10 km radius of the Olympic Village As reliance on private vehicles and long journeys declines, the International de Strasbourg tennis tournament partnered with BMW to offer electric hybrids and collaborated with French Railways (SNCF) to promote sustainable transport options for spectators has been greatly reduced and in addition the NFL Green Program is planting trees to offset travel emissions; For example, nearly 3,000 trees were planted during the 2007 Miami Super Bowl, demonstrating that strategic travel management and environmental compensation measures play an important role in making sporting events more sustainable

4. Venues and Infrastructure

Sustainable management strategies for designing and building sporting events primarily reduce environmental impacts throughout the life cycle of buildings, increase renewable energy use, conserve water and ensure infrastructure and repurpose to suit future needs f reduce emissions Carbon reviews clearly show that site construction is a major source of greenhouse gas emissions The Paul Rickard Circuit at Forest reduces water consumption by harvesting rainwater and significantly reduces electricity use by using solar panels, while Levi's Stadium in the US shows NFL teams How to Renew and Promote Sustainability Highlights the importance of reducing energy demand prior to the adoption of renewable energy; Event planners are therefore encouraged to adopt techniques such as maximizing natural light, using high efficiency appliances, energy efficient lighting, smart metering etc. Rainwater harvesting, grey water systems and drought resistant landscaping have proven to be effective measures to conserve water. Golf courses certified under the Audubon Cooperative Sanctuary Program have reported water use reductions of up to 30 percent, demonstrating the effectiveness of such programs and WTA Strasbourg Tournament sources nearly 70 percent of its food and beverages from organic, local seasonal suppliers, reducing tangible water and energy consumption Resource efficiency, sustainable supply chains and the sustainability of sporting events can make a significant contribution to the environment

5. Waste and Resource Management

Sustainable sport event management places particular importance on the concept of "waste hierarchy" in the context of waste management and single-use materials elimination, which includes steps such as elimination, recycling, recycling, recovery, treatment, and final disposal Establish, and set concrete volume goals, such as completely eliminating single-use plastic and unnecessary packaging Recycling at least 60 percent of waste on major scales, replacing disposable containers with recyclables, water and beverages In addition to including refill space provision, guidance encourages leased infrastructure, to reuse Design worthy branding materials and donate leftover food through digital platforms like Olio and Copia These principles are effectively implemented in various sporting events, such as Formula One's Paul Ricard Circuit recycling waste, from the NFL's Levi's Stadium, which recycles about 99 percent of waste generated during matches, International D

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to the Strasbourg Tennis Tournament, where there are used tennis balls collected, turned into mats and played surfaces. Similarly, the UVA Green Games program prevented nearly 66,000 pounds of stadium trash from going to landfills in 2023–24 and with waste management certified as a Virginia Green Travel Partner, circular purchasing and merchandise have dimensions of sustainability in guiding reusable, recyclable, It recommends developing buying plans that prioritize ethically-sourced goods, while Sport Heroes and other sources cite examples such as Mizuno's "Father Christmas in Trainers" campaign reusing and recycling more than 11,000 shoes, an Adidas–Parley partnership that aims to make 100 percent recycled polyester by 2024 does the materials. In addition, eco-friendly business practices such as biodegradable packaging and digital ticketing not only reduce waste but also convey a clear message of environmental values to consumers, strengthening the culture of sustainability at sporting events.

6. Food and Catering

Food systems contribute nearly a quarter of total greenhouse gas emissions globally, so food at sporting events is considered sustainably important Adopting plant-based menus can reduce carbon footprint by nearly 90 percent compared to meat-based options, and sourcing local seasonal produce within a 25-mile radius; Choosing organic fair-trade suppliers is recommended Dishes, control serving sizes and calculate different dietary needs to not only minimize environmental impact but ensure nutritional balance The Paris 2024 Olympics is one to put these principles into practice elimination, and games plans to reuse donations by food waste management, composting programs, and reduce donations to landfills. Similarly, the WTA Strasbourg event partners with local restaurants to provide about 70 percent organic, local and seasonal food. Such initiatives play an important role in reducing emissions, supporting regional agriculture and raising awareness about sustainable food among the public.

7. Athlete and Stakeholder Engagement

Fan and community involvement at sporting events is considered an effective tool to promote environmental sustainability, as research shows audiences are positively receptive to ecological initiatives and sporting events can also influence sustainable behaviour at home Promotion encourages fans to make choices Eco-friendly alternatives to private vehicles Volunteers at games interacted with fans at "zero-waste" stations, improved waste sorting, prevented large volumes of waste from ending up in landfills Athlete advocacy and activism is emerging as a powerful tool for planetary health, as athletes use their global recognition and social influence to raise awareness of climate and environmental issues #COP26 campaign, with more than 50 Olympic and Paralympic athletes calling for ambitious climate action, It underscores the effectiveness of athlete activism. Programs like Eco Athletes train student athletes to become climate ambassadors and amplify sustainability messages through name-image recognition agreements. Sports academic literature also suggests that sport's global reach and emotional connection hold untapped potential for advancing planetary health action, although challenges such as greenwashing and sport washing must be addressed in the process. Creating inclusive forums for local communities and co-designing sustainability initiatives is considered a key step in ensuring long-term ownership and impact.

8. Case Studies and Best Practices

In the context of mega-sporting events, the Paris 2024 and Tokyo 2020 Olympics give impressive examples of sustainability integration. Paris 2024 can be regarded as a model for the Sustainable Games programme, designed in line with the Paris Climate Agreement and the UN Sustainable Development Goals, to prioritize strategies with climate protection, biodiversity, circular economy and resilience as key pillars. Its only new sustainable venue, the St-Denis Aquatic Centre, reduces energy demand through wood-based structure and

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innovative roof design, exemplifying environmentally friendly design The Tokyo 2020 Olympics, though held under pandemic-related restrictions, pioneered measures to prevent extreme heat, where In addition to improved weather forecasting, medical teams and specialized training, there is the use of pre-cooling techniques, which reduced health risks for athletes and officials, Olympic preparations also encouraged improvements to the water infrastructure; Treated wastewater efficiency increased from 17 percent to 49 percent during preparations for Rio 2016. For example, solid sustainability efforts leading to long-term improvements in water quality and positive legacies are also clear in professional league and club initiatives It is, and the Paul Ricard Circuit implements best practices such as rainwater harvesting, solar panels, waste recycling, biodiversity conservation, etc. Formula E promotes a low-emissions model through electric racing, biofuel-powered generators and recycling components, while the NFL green program in American football offsets emissions by planting trees and stadium renovations, Levi Stadium in this case The direction is a prime example, with solar panels, green roofs, 99 percent waste recycling Likewise, the WTA Strasbourg tournament achieved nearly 30 percent reductions in emissions through 79 sustainability actions including electric hybrid vehicles, local organic food and tennis ball recycling carry out, where the USGA's million investment in turfgrass and environmental research enables golf courses to reduce water use by about 30 percent, and the Audubon Cooperative Sanctuary program certifies courses meeting ecological standards etc. Student-led programs encourage behaviour change through waste diversion, plant-based snacks, and active athlete participation In addition, the World Surf League's "We Are | One Ocean" campaign connects surfers and fans to protect the ocean ecosystem from mega events Reaching out to local communities, sport can be an effective vehicle for improving sustainability and planetary health

Discussion

This review makes clear that sport not only contributes to planetary health crises but is also a sector directly affected by them. As a result, there is widespread recognition of the need to integrate planetary health principles into sport program management. Sport organizations in turn embed sustainability in event governance, align themselves with global frameworks and adopt quantitative goals, recognizing that the link between sport and planetary health requires systems thinking, deeply intertwined with decisions on carbon, energy, water, waste, food and transport reduces and promotes the use of public transport Reusing existing facilities reduces construction-related impacts and embodies circular economy principles; Opting for plant-based foods simultaneously reduces greenhouse gas emissions, water use, and health risks. Multisectoral collaborations involving organizers, public officials, sponsors, athletes, fans, and local communities are essential to effective integration of planetary health principles, as such partnerships harness the broad popularity of sport to inspire collective action through co-benefits such as active transport and healthy diets Can see significant progress since 2018, with mega-events like Paris 2024 setting new standards incorporating sustainability at every stage of planning and execution, including comprehensive site reuse, energy-efficient manufacturing, plant-based catering and a net zero commitment to holistic waste management and Formula E's ISO Examples of grassroots engagement demonstrated by the 2021 certification can be found in community college programs, where initiatives like Green Play prevent large volumes of waste from going to landfills, and measure technological innovations like data-driven carbon calculators and renewable energy microgrids, as well f telemetric monitoring and strengthen transparency, despite this, several persistent challenges remain, such as difficulty data and methodological gaps due to comprehensive carbon accounts, neglect of indirect life-cycle impacts, lack of standardized measurement protocols and open reporting mechanisms Gaps arise between policies and actual implementation, especially at Winter Games events where limited infrastructure, resource constraints and unpredictable weather pose serious obstacles, ethical issues

like green washing and sports washing arise whenever they sponsor agreements with highly polluting industries undermine sustainability messages. Transparency in partnerships and supply chains is critical. Social justice and equity dimensions are also often overlooked, while accessibility, inclusion and well-being are central to the concept of planetary health Although frameworks like World Athletics prioritize these, more evidence is needed on their practical implementation They affect. Organizers must develop concrete plans for thermal management, water conservation, and climate-resistant infrastructure. As the Tokyo 2020 experience shows, improved forecasting and multi-stakeholder collaboration can mitigate risks, though investment and coordination are essential Finally sport can be a powerful catalyst for sociocultural change, as sport's global reach and emotional connection lies in its ability to foster intersectoral activism They are more vocal. Initiatives like Eco Athletes empower athletes to advocate for environmental change, and fan engagement shows that when events themselves model sustainable behaviour, audiences are willing to embrace it. However, this cultural shift requires avoiding the "hypocrisy trap," where sustainability is advocated by taking part in high-emissions activities. Addressing this stress requires systemic reforms, such as changing travel policies, investing in digital and regional tournaments, rigorous vetting of sponsors, transparent communication and education programs to enable athletes, fans and staff to develop environmental literacy and play an active role in holding organizations accountable.

Future Directions and Recommendations

Effectively strengthening sustainability in sport programs and organizations needs a holistic and academic approach, with the development of standardized measurement and reporting systems critical This requires sport organizations to adopt a comprehensive carbon accounting framework that includes direct and indirect emissions, lifecycle analysis and socio-economic impacts. It enables transparency and comparative assessment of sustainability performance Moreover, sustainability should be integrated as a core criterion from the start of event planning, not just additionally so environmental impact assessment, use of renewable energy, zero-waste systems design, sites adaptive reuse plan event bid process, design and implementation Can take advantage of for example collaboration between the World Surf League and environmental NGOs fostering public awareness and collective action. Prioritizing social equity and inclusion is also an essential dimension of sustainable sport programmes, ensuring accessibility, affordability, community benefits and cultural representation; Examples include Decathlon's focus on women's sports and Adidas' inclusive multisport pitch, which underline the importance of equality, and policies ensuring local communities get tangible benefits in terms of infrastructure and employment publicly promote behavioural change Finally, to assess the effectiveness of sustainability measures, especially through, longitudinal multiple case studies to explore co-benefits such as active transport or plant-based diets; It will play an important role in innovating material energy technologies and digital equipment, and in reducing the environmental and social impacts of sporting events

Conclusion

The period between 2018 and 2024 appears as an important turning point in the integration of planetary health principles into sport program management. Driven by increasing public awareness of climate change, high-level climate disasters and the impact of the COVID-19 pandemic, sport organizations have begun to critically assess their environmental footprint and take concrete steps towards adopting eco-friendly practices. This scoping review reveals that comprehensive sustainability strategies have been developed in many areas including governance, carbon and energy management, transport, site development, waste management, food systems, procurement and stakeholder engagement Resource savings and possible Paris 2024 climate positive model, net-zero commitment to Formula Forest, Audubon Cooperative Sanctuary program in golf, and

community-based programs like UVA's Green Game highlight sport's transformative potential yet data gaps, resource limits, risk of greenwashing, social inequality And the obstacles to full implementation are the same. The playing field must therefore move beyond fragmented efforts to systematic change, standardized measurement and real accountability. Effective integration of planetary health into sport programs demands alignment with global frameworks, building inclusive partnerships, empowering athletes and spectators, and fostering innovation throughout the event lifecycle If sport programs embrace environmentally sound practices as a core value rather than as an option, sport will play a crucial role in securing a healthy planet for future generations.

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