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Guidelines on decarbonisation practices for athletics, biathlon and floorball

DELIVERABLE 2.1

Co-funded by the European Union

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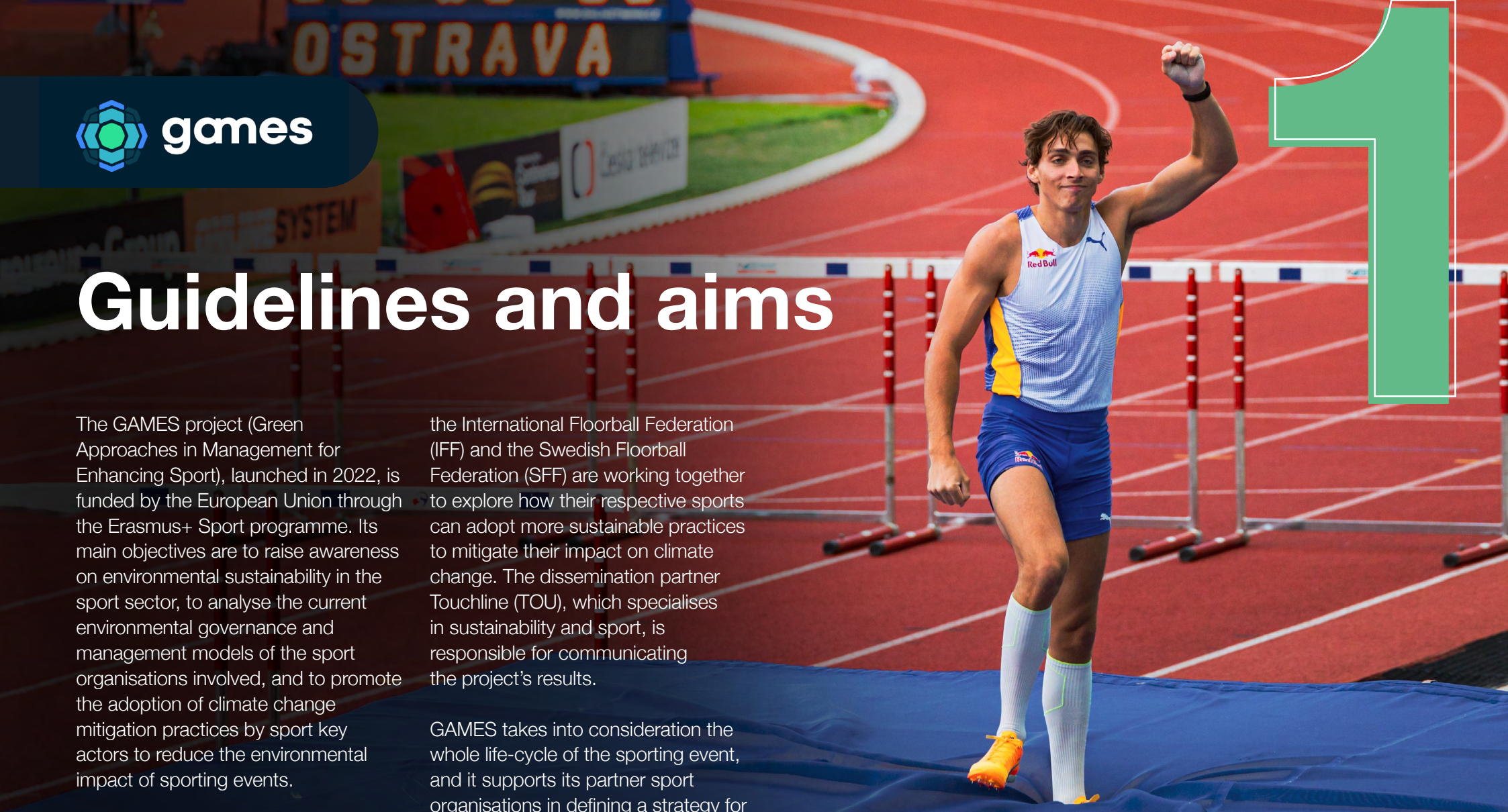
TABLE OF CONTENTS



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1

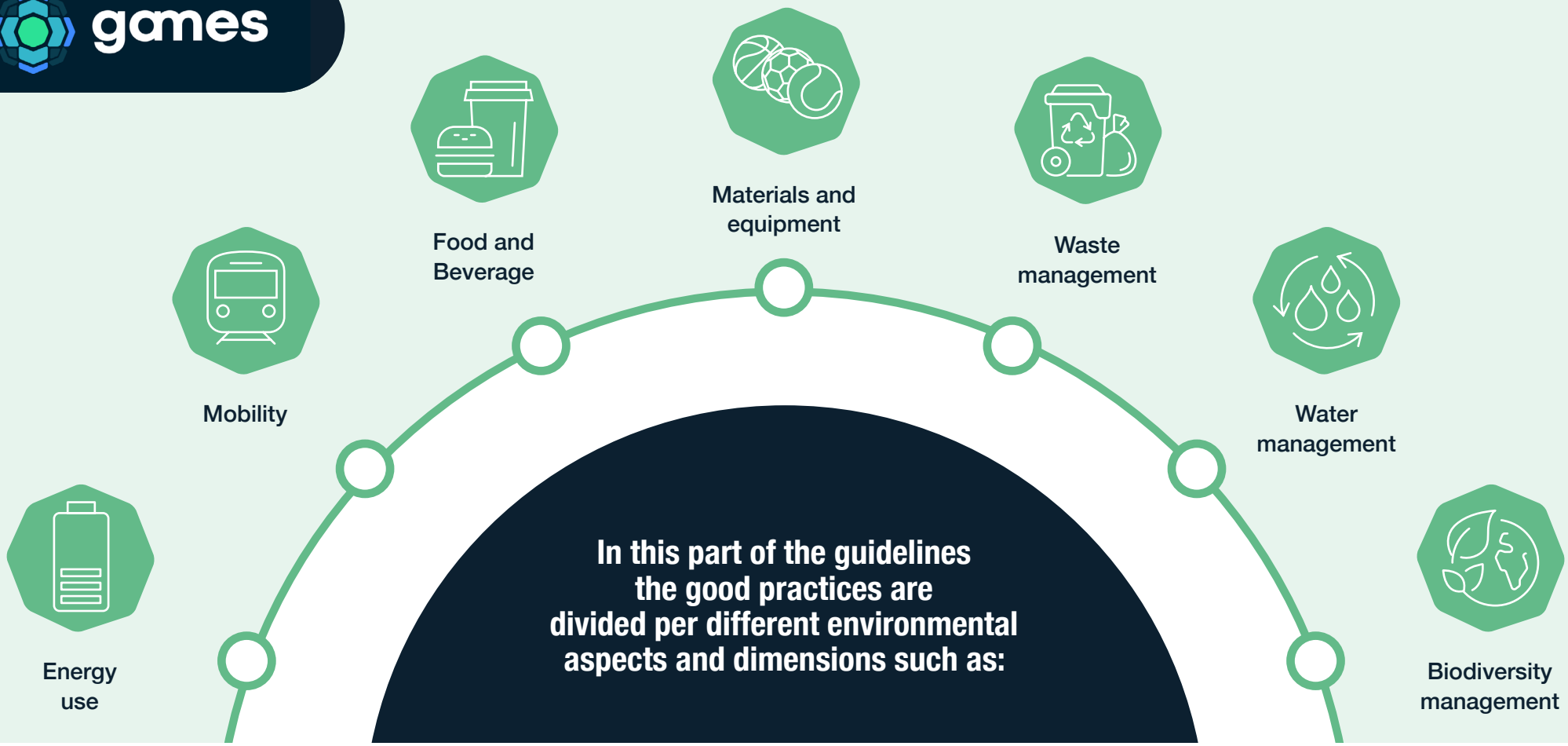
Guidelines and aims

The GAMES project (Green Approaches in Management for Enhancing Sport), launched in 2022, is funded by the European Union through the Erasmus+ Sport programme. Its main objectives are to raise awareness on environmental sustainability in the sport sector, to analyse the current environmental governance and management models of the sport organisations involved, and to promote the adoption of climate change mitigation practices by sport key actors to reduce the environmental impact of sporting events.

Under the guidance of the research team on Sport and Sustainability of the Institute of Management at Sant'Anna School of Advanced Studies (SSSA) as lead coordinator of the project, the project partners World Athletics (WA), the International Biathlon Union (IBU), the International Floorball Federation (IFF) and the Swedish Floorball Federation (SFF) are working together to explore how their respective sports can adopt more sustainable practices to mitigate their impact on climate change. The dissemination partner Touchline (TOU), which specialises in sustainability and sport, is responsible for communicating the project's results.

GAMES takes into consideration the whole life-cycle of the sporting event, and it supports its partner sport organisations in defining a strategy for the decarbonisation of their activities.

This document provides environmental management and climate change guidelines to achieve environmental sustainability and reduce climate change impacts in the sport sector. The main aspect of the approach adopted in these guidelines is its focus both on the governance and operational aspects of the organisations involved in the environmental management of a sporting event. Hence, the outline of the recommendations and best practices within these guidelines is divided into two main sections.



The first section covers recommendations and good practices in the field of governance and management, outlining all the good practices linked to the planning and monitoring of improvement actions, the training and internal and external communication needs, as well as performance monitoring, reporting and a periodical review of the governance and management system and its achievements.

These governance and management practices involve all different environmental aspects.

This part is relevant for all main sport actors such international federations, national federations, clubs, event owners and organisers and directly and indirectly covers all phases and tasks in the organisation of sporting events (conception and planning, delivery, post-event and legacy).

The second section of the guidelines is dedicated to the operational good practices that can take place during events (see above graphic).

The document is directly linked to the GAMES's database of good practices which can be downloaded in an excel format. The database is also attached to this document. The guidelines define recommendations and criteria to follow to make events and sport organisations more sustainable and with a lower carbon and environmental footprint. The database integrates the guidelines and contains more than 70 examples of good practices, which are anyway introduced and listed in this document. Some practices undertaken by GAMES partners are outlined in specific sections.

However, further details on good practices can be found in the database where they can also be selected and filtered based on different information and criteria, such as sport actors involved, general stakeholders involved, evaluation criteria and references (see methodology section for further details). In this document, good practices are shown in tables to indicate their suitability to athletics, biathlon and floorball and the "replicability potential" of the practice itself.

This value (1-3) indicates the replicability potential of the practice in the sport sector, taking into account technical feasibility, economic feasibility and the environmental and decarbonisation potential of each practice, as further described in the methodology section.

The guidelines apply to the three sports that are the focus of the GAMES project, but they can also be extended to other sports with similar characteristics. For instance, athletics, biathlon and floorball have both similarities and differences in terms of pressures on the environment and needs – i.e., biathlon (takes place outdoors during the winter season), athletics (takes place both in indoor venues such as stadiums and outdoors), floorball (takes place in arenas and sport halls) – and this represents an added value since it increases the replicability of the practices to the whole sport sector.

The international federation partners play a key role in the dissemination of the sustainability guidelines to other actors: i.e. national federations, federations of other sports, local sport organisations and clubs, event organisers, sport facility owners, etc. These diverse actors can promote cross contamination and exchange of best practices for the implementation of the guidelines and the replicability of the project outputs to different sport contexts at different levels.

2

Methodology

The identification of good practices was carried out through three methodological steps:

1. Desk research;
2. Integration of practices derived from the governance interviews (see “D2.2. Report on the decarbonisation governance assessment”);
3. Integration of practices derived from the on-site operational assessments (see “D2.3. Report on the decarbonisation operational assessment”).

The desk research was an extensive literature analysis of the sustainability practices in the sport sector. The activity aimed at identifying relevant practices starting from a sample of sport and sustainability documents, such as sustainability reports, event reports, guidelines, etc. GAMES partners provided relevant documents that were initially assessed by SSSA, the technical partner. Finally, a total of 48 documents were collected and analysed. All sports were included to increase the opportunities to identify applicable practices to the three different sports of the project. Many documents referred to sport in general, whereas others were specific, i.e. on football, rugby, etc.

Thus, the whole project consortium identified relevant practices through a protocol that was already set to optimise the collection. Finally, the technical partner revised all the practices through a fine-tuning process.

Relevant good practices were also added from the results of governance interviews carried out with GAMES partners and the on-sites visits at athletics, biathlon and floorball events. The table below summarises the main information and data of this screening process and content analysis.

The content analysis and the identification of practices led to a final number of good practices of 72: 21 related to governance and management and 51 related to operational activities in daily operations and events. Practices holistically encompass different environmental aspects and themes which have a direct or indirect influence on climate change. Some practices can be linked to various environmental aspects and themes that minimise different environmental impacts (e.g. governance practices).

ITEM DESCRIPTION		INFO/DATA
Desk analysis	Number of analysed reports	48
	Number of pages verified	> 3000
	Sports/events in the scope of the reports	All
On-site operational assessments	Events analysed	• Diamond League final 2022 (Athletics) • Men's World Floorball Championships 2022 (Floorball) • IBU Biathlon World Championship 2023 (Biathlon)
Governance interviews	Number of departments interviewed	• 4 with WA (Athletics) • 5 with IBU (Biathlon) • 5 with IFF (Floorball) • 5 with SFF (Floorball)

An excel database was created and every practice was contextualised and described, followed by specific examples in the sport sector of the implementation of such activities. Each practice was further categorised according to the following criteria:

- **Type of good practice:** Governance and management/ infrastructural/operational. In these guidelines, infrastructural practices are associated with operational ones. However, this differentiation can be screened in the database (8 good practices related to infrastructural actions, 43 to standard operational activities);

- **Environmental aspect/ theme involved:** Energy use (13,89%), mobility (5,56%), food and Beverage (9,72%), materials and equipment (26,39%), waste management (5,56%), water management (5,56%), biodiversity management (9,72%) and various (23,61%), referred to governance practices which encompass more environmental aspects);

- **Main phase(s) of the event:** conception and planning, delivery, post-event, and legacy;

- **Main sport actor(s) involved in the implementation of the practice:** International federations, national federations, clubs, stadium owners, and event organisers;

- **Main involved stakeholders:** describing the most relevant stakeholders to engage in the practice;

- **Applicability:** in athletics, biathlon, floorball or all;

- **References:** Name of the documents and links where the examples were extracted from;

games

Furthermore, for each practice we established an evaluation system based on three parameters:

- **Technical feasibility:** describes the feasibility level of the implementation of the practice from a technical point of view (score from 1 to 3; 1. low feasibility; 2. medium feasibility; 3. high feasibility)

- **Economic feasibility:** describes the feasibility level of the implementation of the practice from an economical point of view (score from 1 to 3; 1. low feasibility; 2. medium feasibility; 3. high feasibility)

- **Environmental sustainability and climate change potential:** describes the potential of the practice in limiting direct and indirect environmental impacts and especially climate change impacts compared to a previous situation where the practice is not implemented (score from 1 to 3; 1. Low environmental potential; 2. Medium environmental potential; 3. High environmental potential)

The evaluation process was carried out by GAMES sport organisations as sport experts. During the experts' consultation each partner provided scores for each practice. The final score available in the database is the average score. Finally, the evaluation system provided an aggregated parameter called "replicability potential", which is the average of the previous parameters.

This final parameter describes the replicability potential of the practice in the sport context considering economical and technical feasibilities as well as environmental benefits. Thus, the final score goes from 1 to 3: 1-1,66, low replicability potential; 1,67-2,32, medium replicability potential; 2,33-3, high replicability potential.

Each practice is contextualised and a table shows the name of the practice, the applicability in athletics, biathlon and floorball, and the replicability potential. The specific values of the aforementioned parameters can be directly found all together with the other criteria directly in the excel database.

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3

Sustainability and climate change governance practices

3.1 Environmental governance

Due to the complex network of events, actors and stakeholders involved, good governance plays a key role in the sports sector. International and national federations in particular have great responsibility in ensuring proper governance for sports competitions, championships and events at international and national levels.

As the governing bodies of sports, federations provide rules and guidelines to sports associations, clubs and event organisers internationally, nationally, and locally.

Federations are appointed to regulate and oversee all phases in the life cycle of sports events, from the qualification of event organisers and licensing of competitions, through their implementation on the field, to ensuring a positive legacy for the sports community and hosting regions in the years that follow.

In this regard, international and national federations are well-positioned to support the promotion of environmental sustainability in sporting events within their respective sectors.

This support can be achieved by sharing best practices, establishing guidelines, and enforcing the adoption of sustainability requirements among event organisers. The integration of environmental sustainability in the sports sectors usually follows a top-down path, where impetus and stimuli trickle down from international federations to their national representatives, until reaching local associations, clubs and facility managers. Additionally, federations can serve as role models by incorporating sustainability into their own structures and activities. However, these objectives are achievable if supported by good governance.

Governance refers to the overall framework of procedures, rules, roles, and responsibilities that enable an organisation to function effectively and achieve its goals. Additionally, governance encompasses decision-making processes and how those decisions are implemented within the organisation.

More specifically, good governance should contribute to the following goals:

- Establishing organisational structures and assigning resources;
- Defining the organisation's vision and mission;
- Shaping decision-making processes and control mechanisms;
- Promoting transparency and accountability towards stakeholders;
- Assigning roles and responsibilities to directors and employees in accordance with regulations;

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The role of environmental managers or sustainability officers is central in the overall environmental governance of sports organisations.

Governance plays a crucial role in steering sports events towards sustainability. Environmental governance allows sport organisations to develop procedures, mechanisms and tools that ensure that environmental risks and opportunities are properly considered in operations, as well as in decision-making and planning processes.

Having a clear understanding of how environmental issues are accounted for in decision-making processes is indeed crucial for an effective governance of sports events' environmental performance, because managing environmental aspects throughout the lifecycle of events involves interactions among various actors, such as municipalities, organising committees, partners, and other external stakeholders.

How can sports organisations implement effective environmental governance?

In the first place, environmental governance involves defining roles and assigning environmental responsibilities within the organisation or organising committee. Role clarity helps make key sports actors accountable for environmental improvement and simplifies task division among organisational actors. This is typically done by appointing an environmental manager, or a sustainability officer, or establishing a sustainability committee.

ENVIRONMENTAL GOVERNANCE

PROCEDURES | **MECHANISMS** | **TOOLS**

MANAGING RISKS AND OPPORTUNITIES

The allocation of environmental responsibilities can be centralised within a specific unit or function to concentrate decision-making or decentralise it by appointing environmental officers within each unit to distribute decision-making authority. The role of the environmental managers or sustainability officers is central in the overall environmental governance of sports organisations. The environmental officers' primary responsibility includes monitoring risks, identifying priority environmental issues, and ensuring that these issues are brought to the organisation's agenda for necessary action. In addition, environmental officers should establish and maintain relationships with local authorities, service providers, and other relevant stakeholders. These connections enable coordination and collaboration in implementing sustainable sports events.

Given such goals, ensuring that this role possesses the necessary competence and knowledge in environmental aspects of sporting events is vital. It is equally important to provide regular training to enhance their understanding and expertise in this field. As a result, training is a further integral aspect of environmental governance of sports organisations, as it ensures that individuals possess the necessary knowledge and skills to fulfill their environmental responsibilities effectively.

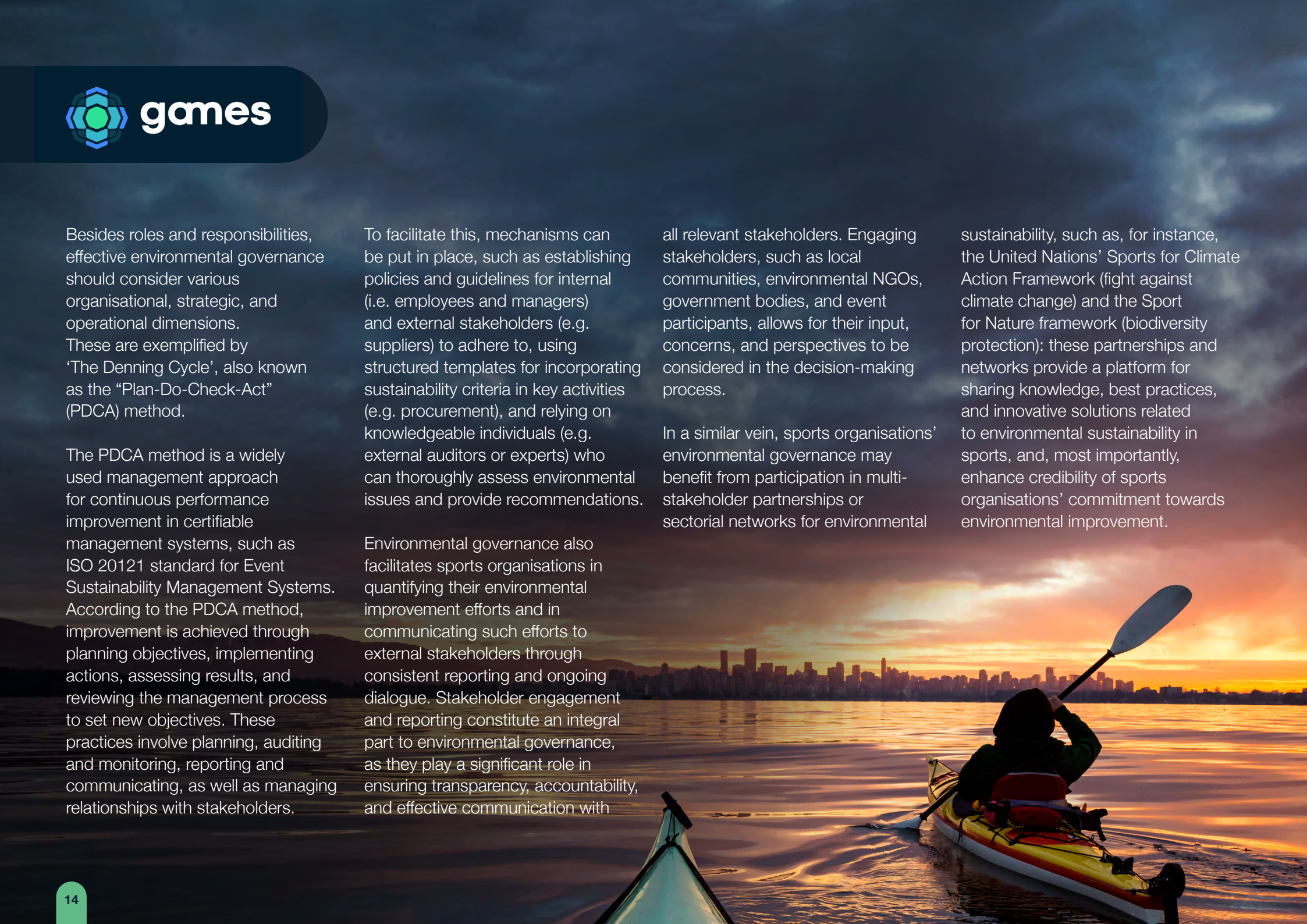
Besides roles and responsibilities, effective environmental governance should consider various organisational, strategic, and operational dimensions. These are exemplified by 'The Denning Cycle', also known as the "Plan-Do-Check-Act" (PDCA) method.

The PDCA method is a widely used management approach for continuous performance improvement in certifiable management systems, such as ISO 20121 standard for Event Sustainability Management Systems. According to the PDCA method, improvement is achieved through planning objectives, implementing actions, assessing results, and reviewing the management process to set new objectives. These practices involve planning, auditing and monitoring, reporting and communicating, as well as managing relationships with stakeholders.

To facilitate this, mechanisms can be put in place, such as establishing policies and guidelines for internal (i.e. employees and managers) and external stakeholders (e.g. suppliers) to adhere to, using structured templates for incorporating sustainability criteria in key activities (e.g. procurement), and relying on knowledgeable individuals (e.g. external auditors or experts) who can thoroughly assess environmental issues and provide recommendations.

Environmental governance also facilitates sports organisations in quantifying their environmental improvement efforts and in communicating such efforts to external stakeholders through consistent reporting and ongoing dialogue. Stakeholder engagement and reporting constitute an integral part to environmental governance, as they play a significant role in ensuring transparency, accountability, and effective communication with all relevant stakeholders. Engaging stakeholders, such as local communities, environmental NGOs, government bodies, and event participants, allows for their input, concerns, and perspectives to be considered in the decision-making process.

In a similar vein, sports organisations' environmental governance may benefit from participation in multi-stakeholder partnerships or sectorial networks for environmental sustainability, such as, for instance, the United Nations' Sports for Climate Action Framework (fight against climate change) and the Sport for Nature framework (biodiversity protection): these partnerships and networks provide a platform for sharing knowledge, best practices, and innovative solutions related to environmental sustainability in sports, and, most importantly, enhance credibility of sports organisations' commitment towards environmental improvement.



3.2 Environmental and Event Sustainability Management Systems

To ensure effective environmental governance, it is highly recommended to incorporate all practices within a comprehensive management system. Environmental Management Systems (EMS) provide a structured framework for planning, documenting, and maintaining environmental protection efforts, according to a PDCA management scheme. Additionally, management systems can be developed and implemented based on internationally recognised and certifiable standards that offer transparent and verifiable guidelines.

The most widely adopted certifiable EMS standards on the international level are ISO 14001, promoted by the International Organization for Standardization, and the Eco Management and Audit Scheme (EMAS), established by the European Commission in 1993. These standards do not set specific environmental performance targets but focus on procedural requirements to continually improve the management of environmental aspects. They also enable organisations to obtain environmental certification from third-party auditors.

While ISO 14001 and EMAS are applicable to all organisations in every industry, ISO 20121 is a specialised Event Sustainability Management System standard. It is designed to cater to events of various scales, from local small-scale events to large-scale events like the Olympic Games. ISO 20121 aims to reduce negative social, environmental, and economic impacts associated with events, contributing to improved sustainability outcomes. It follows a management structure similar to ISO 14001 and is applicable to all stakeholders in the event industry supply chain, including event organisers, stand builders, caterers, and logistics suppliers.

ISO 20121 certification ensures that the organising committee has an effective sustainability management system, which is crucial for achieving sustainability goals.

By adhering to ISO 20121 requirements, an organisation can identify its significant issues, risks, and opportunities, forming the foundation for implementing relevant processes. These processes include planning, implementation, monitoring, evaluation, and learning from the outcomes to refine and enhance future plans. Continuous improvement is a fundamental principle of ISO 20121: as sustainability is an ever-evolving topic, a well-managed organisation should constantly seek ways to enhance performance and mitigate risks.

Certifiable management system standards not only assist event organisers in effectively managing environmental and sustainability performance but also enhance their visibility and credibility among external stakeholders. Through environmental and sustainability certifications, such as ISO 14001 and EMAS, organising committees can demonstrate their commitment to environmental protection. These certifications require regular external verification by environmental auditors, which helps improve the organisation's reputation and fosters trustworthy relationships with clients, suppliers, spectators, and local communities.

In order to achieve this, ISO 20121 requirements compel sports organisations to:

- Identify sustainability issues related to their operations.
- Establish a sustainability policy to outline their commitment to sustainability.
- Develop improvement objectives and set clear targets.
- Provide sustainability training to their staff members.
- Engage suppliers in sustainability efforts.
- Create a sustainability communications plan.
- Monitor and measure the outcomes of their sustainability endeavors.
- Conduct regular audits and reviews of their documentation to ensure compliance.

3.3 Measuring and monitoring

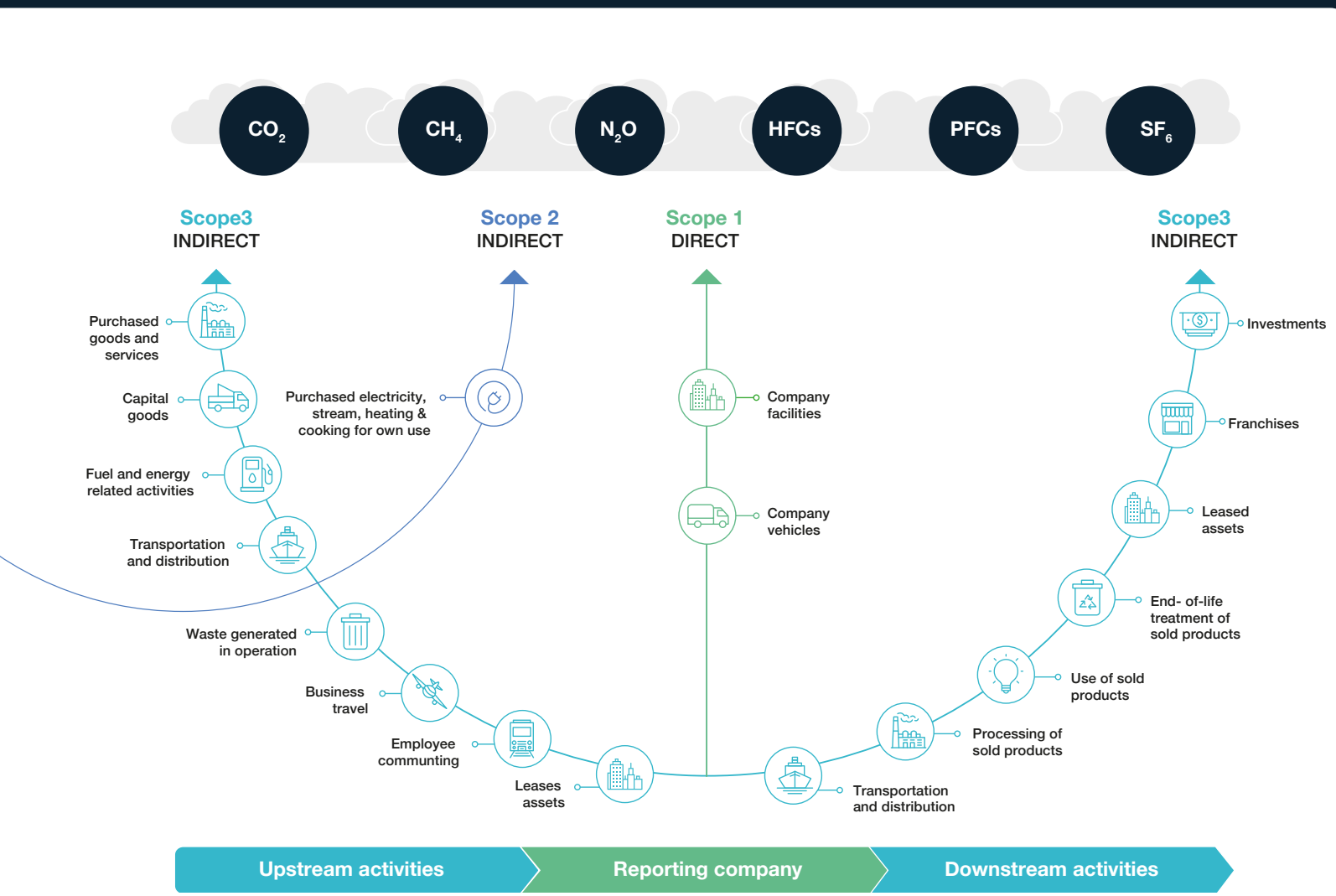
Sports organisations should consistently monitor their overall environmental impact using a wide range of environmental indicators, particularly for decision-making purposes. Establishing baseline information is essential for tracking the progress of environmental improvement initiatives and maintaining updated data repositories to support decision-making, identify improvement opportunities, and set objectives at organisational level and for events.

Environmental auditing plays a key role in collecting and assessing environmental data. Audits are conducted on-site to evaluate the performance of activities in specific environmental aspects. The most common types of audits include energy audits and waste audits. Energy audits provide a comprehensive understanding of current energy consumption patterns in buildings, enabling the identification of opportunities for efficiency improvements. Waste audits analyse the waste streams generated by facilities, gathering information on waste types, estimating the recyclable or compostable materials, and determining the current recycling rates. Waste audits record details such as sources, composition, weight, volume, seasonal variations, and destinations of the generated materials.

Once environmental data is collected, environmental impact assessment (EIA) methodologies offer a robust scientific foundation for monitoring the environmental profile of sports events using a multi-indicator approach. EIA begins with an analysis of the event context to identify potential environmental impacts and establish requirements for final approval. Indicators commonly included in EIA are carbon footprint, air pollution, impact on human health, land use, and biodiversity impact, providing a comprehensive understanding of the event's environmental footprint. The scope of EIA should be broad, encompassing activities regardless of the level of influence of the organising committee.

In the frame of the GAMES project's decarbonisation objective, carbon footprint assessment is a valuable tool for evaluating the greenhouse gas (GHG) emissions associated with a sporting event. It involves quantifying the amount of carbon dioxide and other GHG emissions released into the atmosphere as a result of activities and operations associated with the organisation, execution and closure of a sports event.

Methodologically, several key ISO standards are commonly used in carbon footprint assessments, including ISO 14064, which provides guidelines for quantifying and reporting GHG emissions and removals. The GHG Protocol is another widely recognised framework that offers comprehensive guidance on GHG accounting and reporting.



When assessing carbon footprints, emissions are categorised into three scopes: Scope 1 emissions are direct emissions from owned or controlled sources, like onsite fuel combustion; Scope 2 emissions are indirect emissions from purchased electricity, heat, or steam; Scope 3 emissions are indirect emissions from activities not owned or controlled by the focal organisation, such as business travel, and other activities occurring throughout the supply chains and product life cycles.

Understanding all three scopes is essential for effectively devising measures to reduce the carbon footprint of a sporting event. In this frame, decarbonisation strategies should account for the priorities set forth by the carbon management hierarchy: according to this framework, decarbonisation efforts should first avoid carbon-intensive activities, next reducing emissions, then replacing high- with lower-carbon activities, after that managing carbon sinks to sequester emissions, and finally offsetting (compensation strategies).

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Life cycle assessment is an advanced tool for assessing and monitoring the environmental performance of sports events, calculating the environmental impact associated with all activities under the direct control of the organising committee.

A wider scope of EIA enables more informed and accurate environmental cost-benefit analyses, supporting decision-makers in planning environmental improvement initiatives based on the organiser's economic resources, expected outcomes, and costs of the initiatives. Life cycle assessment (LCA) is an advanced tool for assessing and monitoring the environmental performance of sports events. LCA calculates the environmental impact associated with all key activities under the direct control of the organising committee, as well as the impact generated by other involved parties throughout the entire life cycle, from raw material extraction to waste disposal.

It is not limited only to climate change impacts. LCA provides a strategic approach by identifying opportunities to reduce all environmental impacts and management costs throughout the entire life cycle of services or products. It allows envisioning scenarios for optimising energy performance in stadium management and maintenance, as well as identifying levers to reduce environmental impacts and costs for other involved parties.

In terms of climate change and sustainability efforts, measurement should be the first step to develop sustainability and climate change strategies with defined objectives and targets. Framing objectives and targets into scientific-based initiatives or multi-stakeholders platforms is extremely relevant. Examples can be the adhesion to Science-Based Target Initiative (SBTi) to align decarbonisation targets to the Paris Agreement's objectives in a scientific manner.

3.4 Stakeholder engagement

Engaging stakeholders is a vital aspect of environmental governance and strategy for sports organisations, and it can be achieved through various initiatives and methods. Stakeholder engagement aims to secure commitment and support from relevant stakeholders for the organisation's environmental objectives. It also seeks feedback and advice on environmental performance targets and methods of achieving them. Different methods, such as surveys, focus groups, mailing lists, workshops, and multi-stakeholder consultations, can be used depending on the context, stakeholder types, and objectives. These methods help organisers understand stakeholders' needs and incorporate them into the environmental strategy.

Developing partnerships is another crucial step in an effective environmental strategy and should be managed at the governance level. In the context of sports events, relevant actors include international sport organisations, national sport organisations, event organisers and local authorities hosting the event. Partnering with local authorities allows for coordinated environmental initiatives, such as waste collection. Collaborating with private and public transportation companies is essential for improving the sustainability of mobility options to and from the event.

Furthermore, partnering with private companies can provide sponsorships for the event, contributing to funding ambitious environmental improvement initiatives. These partnerships offer economic benefits and visibility to sponsors. Importantly, sponsorships also create opportunities for collaboration and generating new ideas to enhance event sustainability. Event organisers should engage sponsors in productive idea sharing, networking, and cooperation.

Environmental awareness campaigns present an additional avenue for promoting environmental protection, enhancing organisational reputation, and strengthening stakeholder relationships. Major sporting events serve as powerful platforms for delivering eco-friendly messages, showcasing organisations' environmental endeavours, and raising audience awareness about sustainability concerns. To achieve effectiveness, awareness campaigns should strive to engage the public through initiatives like awards or activities involving athletes, as well as offering incentives such as free tickets. These measures ensure broad participation and maximise the impact of the campaign.

3.5 Reporting

Sustainability reporting is the process of measuring, disclosing, and being accountable for the environmental, social, and governance aspects of an organisation. Its purpose is to ensure transparency, effective communication, and demonstrate sustainability leadership among stakeholders.

As the demand for organisational accountability and transparency grows, public reporting becomes essential for sports organisations' environmental governance, alongside the definition of a sustainability policy and improvement targets. Its primary objective is to monitor and measure the organisation's sustainability impacts and progress, ensuring alignment with the organisation's strategy, and goals. Similar reporting and communication initiatives play a vital role in building transparent relationships with external stakeholders – from public authorities and partners, through supporters, to local communities – and emphasise the importance of environmental protection and sustainability efforts.

Sustainability reporting can be adopted by sports organisations and event organisers alike. For specific sports events, like major championships and tournaments, reporting may involve demonstrating environmental and social projects in a legacy report. These reports allow event organisers to showcase the sustainability strategies adopted in the frame of specific events or championships, and share the outcomes and results of the sustainability initiatives implemented during such events. Such reporting practices inspire future event planners and contribute to a culture of sustainability and accountability in the sports industry.

Besides events' legacy, sports organisations should engage in sustainability reporting on a regular basis, by periodically publishing sustainability reports.

The Global Reporting Initiative (GRI) Sustainability Reporting Standards are highly relevant and widely adopted by large- and medium-sized organisations when it comes to sustainability reporting. These standards provide a comprehensive framework and guidelines for reporting on environmental, social, and governance (ESG) aspects. By adhering to the GRI Sustainability Reporting Standards, organisations can ensure consistency and comparability in reporting their sustainability performance. This allows stakeholders, such as fans, sponsors, and the public, to better understand and evaluate the organisation's sustainability practices.

The GRI Standards help sports organisations address a wide range of sustainability issues, such as carbon emissions, waste management, water conservation, community engagement, diversity and inclusion, and labour practices. Aligning with the GRI Standards shows sports organisations' commitment to transparent reporting, advancing sustainability in the sports industry. It enables benchmarking and fosters healthy competition, driving continuous improvement in sustainability practices.

The table below lists some good practices that could be adopted to improve the environmental governance of sport organisations and the overall environmental and carbon footprint of sporting events.

Governance good practices identified for athletics, biathlon, and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability potential
UNFCCC Protocols for Sports	All	2,92
GHG inventory and calculation	All	2,58
GHG emissions offsetting	All	2,42
Life Cycle Assessment (LCA)	All	2,58
Science-Based target Initiative (SBTi)	All	2,25
Environmental roles and responsibility: appointment of environmental manager and environmental committee	All	2,92
Responsible procurement policy	All	2,75
Environmental criteria in the tender process	All	2,58
Environmental Management System (EMS)	All	2,17

Governance good practices identified for athletics, biathlon, and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability potential
Sustainable Event Management System (SEMS)	All	2,58
Stadium energy management system according to the ISO 50001	All	1,92
Collection and analysis of environmental indicators	All	2,42
Energy/waste/decarbonisation audit	All	2,83
Sustainability and legacy reporting	All	2,75
Conservation efforts and collaborations with local organisations to protect biodiversity	All	2,33
Sustainability-rated accommodations for fans	All	2,75
Climate contribution from spectators	All	2,67
Implementation of environmental awareness raising actions	All	2,83
Partnerships and engagement with sport actors and stakeholders	All	3,00
Develop an athlete ambassador's program engaging players in environmental and climate action	All	2,83
Environmental scoring system for the League	All	2,00

3.5 Good practice examples

GAMES GOOD PRACTICE 21
Environmental governance

SPORT: Biathlon
EXAMPLE: Appointing a multi-stakeholder sustainability commission in IBU

DESCRIPTION: To integrate sustainability in its governance structure, the IBU Executive Board established the IBU Sustainability Commission, a key component of its Sustainability Strategy 2020-2030. Comprising members from seven National Federations, the Commission's core mission is to ensure full integration of sustainability within the IBU's governance structure. It actively advises the Executive Board on strategy development and implementation, proposing impactful policies, rules, and recommendations. The Commission empowers both the IBU and its National Federations to embrace sustainability best practices aligned with strategic commitments and goals. This best practice exemplifies proactive and collective efforts to foster sustainability in sports and sets an inspiring model for other sporting organisations.

GAMES GOOD PRACTICE 65
Environmental and event sustainability management systemy

SPORT: Athletics
EXAMPLE: Adoption of an event sustainability management system according to ISO 20121

DESCRIPTION: World Athletics has developed a Sustainable Event Management System (SEMS) to integrate sustainability into sports events. The SEMS has achieved certification for the ISO 20121 standard, which focuses on addressing sustainability risks and opportunities. To receive certification, an organisation must demonstrate consideration of financial, economic, social, and environmental issues to reduce their impact on the environment and promote a just society. The certification process involves a rigorous two-phase audit by a certification body (such as BSI, a global leader in ISO standard compliance).

The SEMS, which provides detailed guidance in 15 key areas of event planning and delivery, was introduced to World Athletics licensed one-day meetings, tour events, label road race organisers and organising committees of upcoming World Athletics Series events in November 2021 alongside the Athletics for a Better World (ABW) Standard, an evaluation that measures and scores an event's achievement in sustainable delivery in alignment with the World Athletics Sustainability Strategy.

GAMES GOOD PRACTICE 34
Measuring and monitoring

SPORT: Athletics
EXAMPLE: Life cycle assessment of World Mountain and Trail Running Championships 2023

DESCRIPTION: The World Mountain and Trail Running Championships (WMTRC) 2023 set a new standard for sustainability in sports events by pioneering an innovative approach to calculating and managing its Environmental Footprint (EF). Collaborating with the Sustainability Management Lab of Sant'Anna School of Advanced Studies, World Athletics utilised the Life Cycle Assessment (LCA) methodology, including and going beyond GHG emissions in scope 1, 2, and 3. The comprehensive study covers all event aspects, from infrastructure to waste management, throughout its life cycle. By defining system boundaries and conducting on-site visits, the EF assessment leaves no environmental impact unaccounted for. The transparent results will be shared publicly, inspiring other sports events to adopt similar practices, contribute to environmental conservation, and promote a greener future.

GAMES GOOD PRACTICE 43
Stakeholder engagement

SPORT: Floorball
EXAMPLE: Swedish Floorball Federation's partnership with Pantamera to increase deposit rate of beverage packaging (during floorball events).

DESCRIPTION: The Swedish Floorball Federation (Svensk Innerbandy) established a partnership with Pantamera, a Swedish company responsible for collecting all deposit packaging from collection points and transporting them to their recycling facility. The partnership aims to influence the environmental attitude and behaviour of children and young people through specific initiatives, with the aim of increasing the deposit rate of beverage packaging (cans and PET bottles) during floorball events. However, the overall target is to increase domestic deposit rate in general. Floorball was chosen as partner because of the target group profile: a large proportion of the 120,000-plus licensed players are children and young people. Since 2015 Sweden's floorball clubs have collected 3,5 million cans and bottles and 242 floorball teams are connected to a developed refund concept. Because of the partnership, the average annual increase since 2015 is 18% more packaging and 19% more active compounds (=collection points).

GAMES GOOD PRACTICE 10 – Stakeholder engagement

SPORT: Athletics
EXAMPLE: World Athletics' "Champions for a Better world" athletes

DESCRIPTION: In November 2022 World Athletics launched its inaugural group of 'Champions for a Better World', athletes who will lend their voices to sustainability campaigning within the sport. Under the initiative, the Champions for a Better World will advocate for more sustainable practices across athletics, help with awareness raising and encourage other athletes to take a more active role in addressing their environmental concerns. The athletes have been recruited to support World Athletics' efforts to reduce the sport's environmental impact in alignment with the World Athletics Sustainability Strategy.

GAMES GOOD PRACTICE 65 – Reporting

SPORT: Floorball
EXAMPLE: IFF Men's World Floorball Championships 2022's evaluation report

DESCRIPTION: The 2022 IFF Men's World Floorball Championships showcased best practice in sports event sustainability through its comprehensive legacy evaluation report. The report not only assessed the event's overall success but also included a dedicated section on social impact and sustainability, with a particular focus on environmental aspects. In this section, the report summarised the sustainability initiatives undertaken during the championships, evaluating their strengths and weaknesses. Key areas for concrete emission reductions, such as Arena, Teams, Travel for Fans, Food, and Materials & Waste, were identified and analysed to promote sustainable practices. By incorporating social and environmental aspects into the event evaluation, the report demonstrated a commitment to holistic sustainability. This best practice highlights the significance of considering sustainability beyond the playing field, embracing responsibility towards the environment and communities. Such evaluations set a precedent for sports events worldwide, fostering transparency, learning, and continual progress towards a more sustainable sports industry.

4

Sustainability and climate change operational practices

4.1 Energy use

Description

Energy consumption plays a crucial role in influencing climate change. Overall, the production and use of energy are responsible for 73% of global greenhouse gas emissions (this includes the use of energy for industry, buildings and transport). A large portion of the world's energy still comes from fossil fuels such as coal, oil, and natural gas, which are burned to generate electricity and provide heat. The dependence on non-renewable energy sources exacerbates climate change and its associated environmental impacts.

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Energy use in the sport sector

Every industry uses energy to carry out its activities. This is also the case for the sport sector leading to a significant impact on climate change. The energy required to power sporting events and facilities, such as for lighting, heating, and cooling systems, contributes to greenhouse gas emissions.

Direct energy use emissions fall under Scope 1 and Scope 2 categories. Moreover, under a life cycle perspective any material, equipment and infrastructure used to practice a sport and for events embed the consume of energy (i.e. indirect energy use, which falls under Scope 3 category). Direct energy usage in athletics includes lighting for training facilities, stadiums, and indoor training areas. In biathlon, energy consumption is evident in facilities and infrastructure, particularly ski resorts and shooting ranges. However, relevant energy use comes also from snow cannons, which are increasingly needed because of climate change.The use of energy consumption in floorball mainly revolves around indoor arenas, including lighting, heating, and cooling systems.

Solutions

Addressing energy use and adopting sustainable energy practices are crucial for mitigating the carbon footprint of sports and achieving climate goals. Sport organisations should actively look for solutions to minimise energy consumption before, during and after the event. International and national federations should provide guidelines to event organisers and venue owners to follow during the different phases of the event.

Starting from a governance approach and through carbon footprint measurements and decarbonisation plans from international and national federations as well as clubs, event organisers and venue owners should put in place management and technical solutions to lower carbon emissions associated with the use of energy whenever possible.

Operational good practices identified in the frame of energy use for athletics, biathlon and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability Potential
Energy management/solutions to reduce energy consumption	All	2,33
Design of ice sport infrastructure to minimise energy consumption	Biathlon	1,33
Renewable energy procurement	All	2,42
Independent energy production	All	1,92
Surplus energy storage	All	1,67
Second sun technology	Athletics	1,11
Reducing diesel generator dependency	All	2,67

Management solutions should always include as a starting point the implementation of **environmental and energy management systems**, supporting organisations in the continuous improvement process to identify energy consumption minimisation opportunities.

Technical actions should pursue **energy efficiency**, **cleaner energy sources and renewable energy alternatives**. Optimising HVAC (heating, ventilation, and air conditioning) systems and prioritising energy-efficient lighting solutions, such as LED fixtures, can improve energy efficiency of sports facilities and infrastructure. The use of bio-based or greener fuels can decrease the impact of powering systems.

Additionally, the independent production of renewable electricity through solar panels or wind turbines, especially on the roof of facilities and venues, can further contribute to decarbonisation efforts in sport.

After applying all these energy mitigation measures, the unavoidable electricity needed for activities and events can come from renewable sources through the **procurement of certified renewable energy** contracts covering total energy consumption needs.

All energy mitigation actions and targets should always be framed in a **scientific-based context**.

The table above lists some good practices that could be adopted to reduce the energy consumption and the overall environmental and carbon footprint of sporting events.

4.2 Mobility

Description

The way we move, whether it's for daily commuting, travel, or transportation associated with various industries, has a significant impact on greenhouse gas emissions and the overall climate crisis. The burning of fossil fuels in vehicles, such as cars, trucks, ships, and aeroplanes, releases carbon dioxide (CO2) and other greenhouse gases into the atmosphere, contributing to the warming of the planet. Energy used for transportation accounts for 16,2% of global greenhouse gas emissions.

Mobility in the sport sector

In the broader context of sports, mobility encompasses the movement of individuals (players, staff and fans), equipment, and resources related to sporting activities. The transportation of athletes, officials, and spectators to and from venues contributes to greenhouse gas emissions and environmental degradation. The reliance on fossil fuel-powered vehicles, such as cars and planes are the main reason. Furthermore, the extensive travel distances involved in international sports competitions further amplify the carbon footprint of these events.

In terms of the event's carbon footprint, mobility is generally the highest contributor, and it is usually considered an indirect impact (Scope 3 category). In 2022, the FIFA World Cup Qatar organisers calculated that the event generated about 3.63 million tonnes of CO2e, of which the majority (98%) are indirect emissions: about 52% of the total emissions came from travel (1.9 million tCO2e) and 20% from accommodation (728.403 tCO2e) of fans, staff and players participating in Qatar matches.

In the GOALS Erasmus+ Project, Real Betis Balompiè calculated the environmental footprint of its matches, identifying that mobility accounts for 70% of its total annual emissions. The International Biathlon Union estimated that for the season 2021/2022 all IBU events led to 12.907 tonnes of CO2e, of which 89% under Scope 3 category, strongly influenced by mobility footprints.

In athletics and biathlon mobility considerations primarily involve transportation to training centers, stadiums, and international competitions. In floorball, while transportation distances may be shorter compared to outdoor sports such as biathlon and in some cases athletics, transportation is still relevant as much as in the other sports.

Solutions

To mitigate the impact of sports-related mobility on climate change, sustainable transportation solutions should be adopted.

From a strategic perspective, careful planning of event locations scheduled by international and national federations should be the first solution. Events should be geographically optimised to minimise travel distances and reduce unnecessary flights. Moreover, players and staff should always be made **aware of sustainable transportation solutions** such as the use of public transport for any event-related activity.

In this regard, event organisers and clubs should select **hotels according to green criteria**, as for example hotels with environmental sustainability certifications such as ISO14001, EMAS or EU Ecolabels. Moreover, hotels should be close to the stadium/venue or to a public transportation line which directly takes the event's venue.

Fans are the highest contributors to CO_2e in terms of mobility. First, optimising the **design and layout of venues and stadiums** according to the city's mobility plans and public transportation services can enhance accessibility and reduce unnecessary mobility by fans. Then, sport organisations and event organisers should **promote the use of public transportation**, encouraging carpooling and ridesharing, promote the use of electric means and investing in infrastructure for cycling and walking.

Continuous engagement with municipalities and city main stakeholders is fundamental both to identify correct venues and to incentivise the use of public transportation by guaranteeing proper availability of means.
A good practice is to increase the frequency of buses, trains and trams when events take place.

Sport organisations and event organisers can also encourage and convince fans through the presence of discounts or free tickets for public means. Another effective and easy practice to be implemented is the draft and the communication of a list of accommodation possibilities that follow green criteria or with green certifications, so that away fans can choose their lodging accordingly.

The table to the right lists some good practices that could be adopted to reduce mobility and the impacts related to mobility as well as the overall footprint of events.

Operational good practices identified in the frame of energy use for athletics, biathlon and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability Potential
Strengthening public transport services and providing sustainable means of transport	All	2,33
Integration of free public transport tickets in the event tickets through co-operation and synergies with the city	All	2,58
Local cycling infrastructure and bicycle friendly facilities	All	2,25
Proximity of hotels location to public transport/event venues	All	2,67

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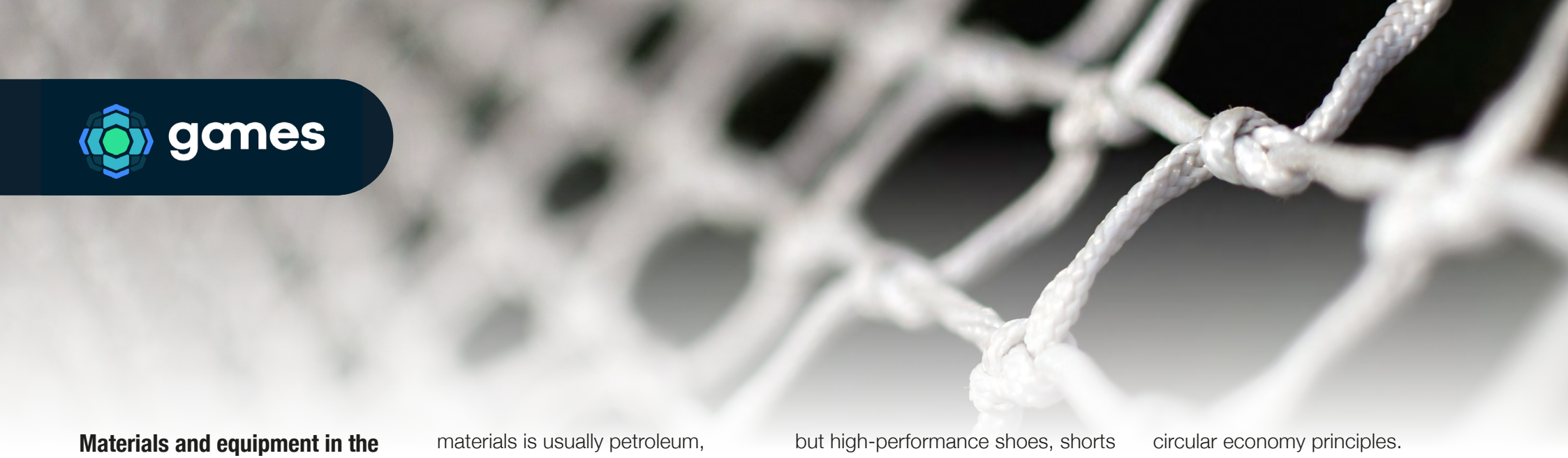
4.3 Materials and equipment

Description

Global consumption of materials has increased in recent decades, and it will further intensify as the world population and the economies grow.

Materials have significant environmental impacts throughout their life cycle, from extraction to production, use, and disposal. The extraction of raw materials often involves resource-intensive processes that can lead to habitat destruction, deforestation, and soil degradation. Manufacturing and processing materials consume energy and water, releasing greenhouse gases and pollutants into the environment. Additionally, the transportation of materials across the globe contributes to carbon emissions and air pollution. During the use phase, some materials may release toxins or contribute to pollution, while others may require excessive maintenance or disposal processes that harm ecosystems.



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Materials and equipment in the sport sector

The construction of stadiums, arenas, and sports facilities requires extensive use of materials, including concrete, steel, and other building components, and the process contributes to several environmental impacts. Moreover, looking at the sport sector, the environmental impact of sport equipment and the use of materials in general is growing as the sport sector is expanding. Sport requires the provision of uniforms, safety equipment, shoes, and other gear.

Although the lightweight and durable synthetic fabrics have revolutionised sports equipment and apparel, enhancing performance and durability, the main source for materials is usually petroleum, which is associated with high environmental impacts. During events and daily operations, materials such as paper and plastics and food and beverage packaging are common to the whole sport industry. Moreover, all big sporting events require, in some form, the use of promotional and branded merchandising materials.

As they are both primarily hosted outdoors, athletics and biathlon events often use temporary infrastructure. Floorball is primarily practiced indoors in permanent venues and sports halls. The choice of sport materials in athletics, biathlon and floorball are similar.

Equipment used by athletics athletes vary depending on their discipline, but high-performance shoes, shorts and t-shirts are common products used by everyone. Biathlon needs specific technical gear for the winter season and specific materials for cross-country skiing and rifles. Sticks and balls are the main pieces of equipment used by floorball. For all the three sports, materials and equipment are usually made from composite materials that may contain fossil-based, non-renewable resources. All three sports involve the use of branding materials such banners, signage and venue dressing materials during events.

Solutions

Sustainable solutions for infrastructure, items (office items, branding, merchandising and gadgets) and equipment follow circular economy principles. Circular economy promotes the reduction in resource and raw material use, improved resource efficiency, greater recycling and reuse, together with the reduction of environmental impacts (which can be assessed with the measurement tools described in the governance section). Through the circular econom model, a product may be re-designed so it is manufactured using different, fewer, less toxic and more durable materials; it can be designed so that at the end of its useful life it can be readily disassembled and reused; the product's manufacturer maintains a relationship with its customers to ensure best use of the product, its maintenance and return at end-of-life, and so on.

(i) Dematerialisation of materials

In terms of circular economy principles, avoiding the use of materials is the main action to take to eliminate GHG emissions occurring in the first place. This means finding opportunities to avoid the use of materials (items, equipment, etc.) and understanding when and whether such materials are really needed. An example of the benefits of avoiding materials comes from the environmental visit carried out by the GAMES consortium at the Diamond League 2022 in Zurich. As described in Deliverable 2.3, in the stadium one of the most used items was paper clappers needed to make noise (rhythm purposes) during athletes' performances.

The GAMES consortium calculated the climate change impact of such items during the event. It was found that, in the most conservative option, their use produced 1.463,28 Kg of CO_2e, which is equivalent to the CO_2e. emitted to travel 32.662,50 km by train (more than two times the street distance between Lisbon and Hong-Kong). As shown by this example, avoiding the use of materials when possible, or minimising their use, can reduce substantial CO_2e emissions.

Sport organisations should ideally pursue the dematerialisation of all relevant materials in daily operations as well as in the life cycle of the events. Elimination of single use materials and products such as bottled water, as well as packaging for food and beverage, should be among the top priorities. The plastic sector is indeed one of the biggest GHG emitters. Moreover, when it becomes waste for improper management, plastic items become one the main causes of pollution, affecting ecosystems and damaging biodiversity and wildlife.

The identification of unnecessary material can be supported by a proper environmental management system and monitoring systems. In this context, management practices can help minimise materials use and optimise resource efficiency in offices and press rooms. Designing events more thoughfully during conception and planning (pre-event phase) helps to minimise the use of materials during events.

Digitalisation is also key to dematerialise the use of papers. For example, cards, leaflets, memberships, clappers and any paper items can be substituted with a digitalised version in daily operations as well as in events (press room and communication to fans).

(ii) Life extension and reuse of materials

Minimisation of material use is essential, and sports organisations should extend the shelf life of materials and reuse them as much as possible.

Reusing materials involves enabling their renewed use, by the same or different entities, through refurbishment and/or repair to extend viability. Material choices should align with reuse goals, requiring items and facilities designed for it. For instance, temporary infrastructures support events independently, while modular ones serve varied purposes over time. This applies to items like temporary running tracks.

Branding and signage materials if properly designed can be used more times. For example, banners without specific sponsors or without the reference year of the event, can be used again over the years for the same event. When this is not possible, another good practice comes from the World Floorball Championship 2022, where branded materials were recycled to produce different products.

Sport organisations could provide equipment to players and then ask to give it back at the end of the season to be reused again in the next season, saving the production of new equipment. Moreover, reuse of sport equipment could also be promoted through online platforms such as SidelineSwap or Play It Again Sport. These platforms have created an open marketplace with the purpose of allowing users to sell and buy used sports equipment and apparel that is still in good condition at affordable prices, for different sport disciplines.

During events, another good practice is the rental of items, for instance electrical items such as computers and office furniture, as well as vehicles for daily travel for event staff. Renting permits optimise the use of existing materials and thus limiting further material demand and environmental impacts. For example, temporary infrastructures could be owned by event organisers or rented.

Furthermore, non-profits like LPF facilitate sport equipment donation. LPF, for instance, has given $12M worth of gear via centers in Maryland, Pennsylvania, and Virginia, aiding 100,000-pluse youths. Donations are accessible at dedicated centres, aiding underprivileged families, coaches, and directors, promoting equitable sports participation.

(iii) Recycled and sustainable materials

More sustainable items and equipment should be prioritised. The aim is to use eco-designed products, designed according to green criteria which reduce the overall life cycle impact of the product compared to previous solutions. In addition to design for reuse the sport industry should use items and equipment made of recycled materials, bio-based materials or low-impact processed and/or sustainably-sourced materials. Daily and event-related products should follow the same logic.

One of the most effective practices to reduce environmental impacts, to promote a circular economy and global environmental awareness is the use of recycled items and equipment. For example, Real Madrid's new football kit is made entirely from recycled PET through a collaboration between Parley Ocean Plastic and Adidas. The 5,000 pieces of clothing produced for the volunteers working at the World Floorball Championships 2022 were made of a blend of recycled polyester and recycled cotton obtained from the waste of textile production. The provider operates its own recycling plant through energy from windmills and solar power. Overall, this practice allowed to save up to 95% of GHG emissions.

LIFE TACKLE project exemplifies broader recycling possibilities. In a Serie A match (Spal-Bologna), 6,000 flags of recycled polyethylene saved 936 Kg CO_2e, equating 47-day heating emissions for a 60 m2 apartment, showcasing eco-friendly innovations.

At the 2022 Diamond League in Zurich, paper clappers were made of 100% recycled paper. Recycled materials can also be used for medals, gadgets, stadium seats and equipment such as turf. For example, during the World Floorball Championship 2022, plastic team prizes and memorabilia items were produced from broken floorball balls and sticks previously collected and recycled.

Bio-based items should also be prioritised. Bio-based materials are indeed substitutes of fossil materials, generally reducing the overall environmental footprint. Examples can be found in food items, such as packaging, forks, knives, cups and plates.

Other sustainable solutions involve items and equipment with sustainability-certified performances and reduced toxicity and impact on the environment. Examples can be the use of sustainably sourced paper certified by the Forest Stewardship Council (FSC), or the use of Eu-Ecolabel certificated items, such as hygiene products. Also, specific items and equipment for sports such as waxes and rifles in biathlon can be substituted with non-toxic waxes and lead-free rifles.

The table on the following page lists the good practices that could be adopted to reduce the overall use of materials, improve resource efficiency and decrease the direct and indirect environmental impacts linked to the use of materials.

Operational good practices identified in the frame of materials and equipment for athletics, biathlon and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability Potential
Reuse of existing venues and temporary infrastructures	All	2,83
Use of FSC certified paper	All	2,58
Dematerialisation of printed materials (such as cards, tickets and memberships, leaflets and brochures)	All	2,67
Environmental management of the press room and other offices	All	2,58
Rental of material and equipment instead of purchase	All	3,00
Life extension of sports apparel and equipment through reuse	All	2,83
Donation of sport equipment, furniture, uniforms and other event materials	All	2,67
Use of recycled or environmentally friendly materials for sports apparel, equipment, merchandising, advertising products, signage	All	2,50
Reduce plastic use	All	2,08
Recycle Plastic from Oceans to produce clothing	All	2,08

Operational good practices identified in the frame of materials and equipment for athletics, biathlon and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability Potential
Recycled plastics seats for stadia	All	2,25
Reuse of branding and signage materials	All	2,17
Medals with recovered materials from WEEE	All	1,83
Recyclable artificial turf (Re-Match)	Athletics	2,00
Green products to treat natural turf and avoid the use of chemicals	Athletics	2,33
Eco-friendly gadgets and gifts for supporters	All	2,50
EU ecolabel and sustainable hygiene products	All	2,50
Non-toxic wax products for skis	Biathlon	2,33
Lead-free rifles	Biathlon	1,67

4.4 Food and Beverage

Description

The food and beverage industry has significant environmental impacts related to the excessive use of natural resources, such as water and energy, throughout the supply chain.

The industry is one of the biggest greenhouse gas emissions contributors worldwide. From agricultural practices, including irrigation and fertilizers, and animal farming, to food processing, packaging, transportation, and waste management, each stage contributes to resource depletion and greenhouse gas emissions. Another significant concern is the excessive generation of packaging waste, including single-use plastics, which can contribute to pollution and harm ecosystems.

Food and beverage in the sport sector

Increasingly, sports events offer food and beverage provisions. Substantial consumption occurs among athletes and fans. Athletes require sustenance pre, during, and post-performance. Fans consider food integral to events. Offerings span pre, during, and post-event, indoors and out, featuring favorites like hot dogs, burgers, snacks, and drinks.

Athletics, biathlon, and floorball share food trends. Yet, outdoorsy athletics and biathlon may pose greater littering risk due to packaging.

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Solutions

Sustainable food solutions must target three areas: trim food and packaging waste, improve food types, and enhance eco-friendly packaging. The relationship between food and waste management, as discussed earlier, is tackled in section 5.5. Here, our emphasis is waste prevention, while section 5.5 addresses waste management during events.

First, food and packaging waste should be minimised. **Packaging of food and of beverages** should be reduced as much as possible and used only when needed (i.e., dematerialisation). An example of this practice comes from the 2022 Diamond League final in Zurich where sometimes big reusable condiment containers were used, avoiding single-use packaged sauces.

Food-saving campaigns are also implemented to reduce the amount of organic waste during events as well as daily life of athletes and fans. In such cases, food donation avoids waste production, environmental impacts and has positive social implications. For instance, according to estimates from the LIFE TACKLE project, a professional football club with a capacity of 60,000 seats in the stadium and 1,500 seats in the VIP area consumes 9.644 kg of sandwiches and 18.090 kg of food during a match.

About 2.313 kg of the sandwiches prepared were leftover (around 20%), and if they are not donated, they will be thrown away as waste, despite being perfectly good and unused. Food waste could be avoided by using market platforms such as Too Good To Go, an application that connects restaurants, stores and events with customers to sell or donate leftover food.

Evaluating and **proposing vegetarian and vegan food and menu options** during events can lower the indirect environmental impacts linked to the event organisation and the athletes and fans' ecological footprints. Generally, transitioning from a meat-based menu to a more plant-based menu avoids livestock farming environmental impacts. Thus, such options lead to lower greenhouse gas emissions, reduced land use, higher water conservation, decreased energy consumption and higher biodiversity conservation.

For example, Liverpool Football Club in collaboration with Quorn provide meat-free alternatives to Liverpool fans that can now choose from vegetarian and vegan foods on matchdays. By using Quorn foods, they report that the stadium saved over 100 tonnes of carbon emissions during the 2021-22 season.

Pricing choices as well as environmental communication activities during events are good practices to influence fans' behaviors. For example, discounts for vegetarian and vegan food in events could incentive fans' choices avoiding meat food. Similarly, environmental communication and awareness raising activities could detail the benefits of vegetarian and vegan food over meat.

In addition to different menu options, another good practice is the **choice of local food providers**.

Operational good practices identified in the frame of food and beverage for athletics, biathlon and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability Potential
Food-saving campaigns	All	2,83
Food donation	All	2,83
Eco-friendly catering items	All	2,75
Reusable cups for drinks	All	2,42
Vegetarian and vegan menu	All	3,00
Local and ethical food suppliers	All	2,42
Water refill stations	All	2,92

This reduces GHG emissions associated with transport and long distances, generally guarantees higher quality, and brings social value around the event, by sponsoring local organisations and sending awareness raising messages to athletes and fans on consumption habits. Another food option is the use of biological or organic food. Choosing certified organic food guarantees the use of good cultivation practices that allow for a reduction in the overall impact on biodiversity and nature. Organic food is a part of vegetarian and vegan menu options and can be supported by local food suppliers.

Sustainable choices can be implemented also in packaging and catering items. **Recycled materials** should be preferred over virgin ones. Moreover, packaging and tableware should be made of **biodegradable or compostable, recyclable materials**. Good practices can be for instance the use of reusable cups or cups made of compostable materials compared to classic plastic items and the use of certified materials (such as FSC for paper napkins).

In terms of beverage, practices should avoid overselling of plastic bottles. The implementation of **water refill stations** around the venue of the event and inside stadiums is fundamental. Athletes and fans can fill their own water bottles, reuse them over again without consuming unnecessary plastic packaging.

The table above enlists some good practices that can be adopted to minimise the environmental and climate change impacts linked to the food and beverage provision during sporting events.

4.5 Waste Management

Description

Proper waste management is key to reducing environmental impacts and carbon emissions. The waste sector is the fourth largest GHG emitting sector in the EU-28, after energy, agriculture and industrial processes, contributing 3% to total GHG emissions in 2017.

The disposal (collection and transportation) and treatment of waste can produce emissions of several greenhouse gases, which contribute to global climate change.

The most significant GHGs produced from waste treatment come from the breakdown of organic matter in landfills. Other forms of waste disposal also produce GHGs, such as incineration. Even the recycling of waste produces some emissions, due to energy consumption and natural resources for the recycling process. Also, environmental impacts can be related to littering when waste enters the soil or groundwater contaminating them, a problem for example exacerbated by plastic pollution.

Organic waste can also lead to eutrophication, which damages wildlife in rivers and can affect biodiversity altering different ecosystems. All these impacts can have an indirect influence on climate change affecting the natural ecosystem functions.

Waste generation in the sport sector

In sports, waste poses key eco concerns and event-related indirect effects. Diverse waste includes packaging and discarded gear. Single-use plastic bottles, frequently used for hydration by athletes and spectators, are a significant example.

Additionally, food wrappers and packaging from concession stands and food vendors contribute to the accumulation of waste. Broken or worn-out sporting equipment, such as balls, or protective gear, also generate waste.

In athletics, biathlon and floorball waste is produced at event offices, at the event facilities and at event venues during the event build-up, event delivery and event breakdown. Waste streams from event offices include paper, electronics, batteries, cleaning products, food packaging, waste food, and leftover food.

At the event waste includes branding, equipment, glass, paper and cardboard, plastic packaging, and leftover food. Athletics involves the production of waste inside and surrounding event venues, but competitions can happen also without the presence of indoor facilities.

In fact, many athletics disciplines are open-air, with production of waste such as packaging, paper and plastics. Biathlon competitions happen open-air too, whereas floorball matches are played within stadiums. Specific types of waste occurring during competitions can be the use of water bottles and equipment (such as bibs) during athletics competitions, as well as discarded bullets in biathlon events.

Solutions

Regarding waste management, the most important operational actions to help address global climate change are waste prevention and circular economy approaches directly with an event life-cycle perspective. However, waste is unavoidable and proper waste management is needed.

Waste management practices should always start with and be included in a detailed waste management plan of the events. Waste management guidelines could also be shared by international and national federations with a top-down approach to event organisers, so as to follow agreed common criteria and steps. Implementing a waste management strategy helps prevent and minimise waste generation, while simultaneously enhancing recycling and recovery rates well before sporting events.

These plans aim to proactively establish targets for waste reduction, outline actionable steps to attain them, and define specific measurable milestones, enabling event organisers to arrange the required infrastructure. Waste management plans foster collaboration and consensus on waste reduction goals among key stakeholders, including municipalities, local waste management entities, and treatment facilities, among others.

Collaborations with public and private organisations managing the waste in the city/province where events take place become key to set criteria and procedures.

Operational good practices identified in the frame of waste management for athletics, biathlon and floorball.

Practice identified in GAMES database	Sport	Replicability Potential
Waste management plan	All	2,42
Optimise waste collection operations	All	2,42
Engage fans in waste collection operations	All	2,75
Conversion of organic waste into reusable compost	All	1,92

Optimising waste collection in stadiums and venues represents the first practical solution. Proper separate waste collection as well as an increase of bins in stadiums and all event locations can increase the percentage of recycling in waste treatment plants. Collaboration with contractors is key to increasing the efficacy of waste collection during events.

Engagement with fans during events and outside events is a useful practice to reduce plastic consumption and waste generation, as well as to send awareness raising messages. For example, the Chicago White Sox “Hit for the Cycle” recycle programme engages fans in collecting as many plastic cups as possible after the sporting event. Cups are then brought to a designated area where they are exchanged for tickets which can be redeemed for prizes. U.S. Cellular Field (stadium) estimates that this initiative leads to over 50% recovery rate of plastic cups and bottles.

Lastly, methods can explore converting organic waste (food, grass, etc.) into compost for direct use by sports organisations.

The table above enlists some good practices that can be adopted to minimize the environmental and climate change impacts linked to waste management during sporting events.

4.6 Biodiversity management

Description

Biodiversity encompasses the rich diversity of species, ecosystems, and genetic variation that collectively sustain life. Climate change poses significant risks to biodiversity by altering temperature patterns, precipitation levels, and the frequency of extreme weather events. Rising temperatures contribute to the loss of biodiversity through the destruction of fragile ecosystems.

At the same time, biodiversity loss exacerbates climate change. Healthy ecosystems, with their diverse array of plants and animals, provide critical regulatory ecosystem services such as carbon sequestration and water regulation. The loss of biodiversity reduces the ability of ecosystems to absorb and store carbon, intensifying greenhouse gas concentrations in the atmosphere.

Biodiversity in the sport sector

On one hand, sport can impact on biodiversity in relation to the need for land area to construct permanent and/or temporary sports venues and support facilities. Further adverse impacts on biodiversity can arise during sport events from the demand for natural resources such as water, the generation of high quantities of solid waste and water pollution linked to the use of chemicals and the generation of municipal waste-water, high levels of noise and light pollution triggered by the presence of hundreds to many thousands of athletes, spectators, and media, especially if in natural areas.

However, sport impacts on biodiversity do not happen only in sport events. Many impacts are indirect effects linked with the supply chain of the sport industry, especially through the goods and materials it purchases and greenhouse gas emissions from day-to-day activities. In general, sport events can cause habitat loss or modification, disturbance or damage to wildlife, introduction of alien invasive species, soil erosion and compaction, depletion of water resources, pollution, climate change and unsustainable sourcing.

It's also true to say that sports themselves heavily rely on biodiversity and nature. Indeed, certain sports derive cultural and recreational services from ecosystems. Recreational services encompass intangible benefits that both sports and individuals gain from ecosystems, such as aesthetic and engineering inspiration, cultural identity, and spiritual well-being.

For instance, according to a series of IUCN documents on sport and biodiversity, a healthy natural environment offers several practical advantages for sporting events: natural landscapes and vegetation are integral to the visual and sensory experience of sports venues and enhance the spectators' enjoyment; vegetation provides shade, reduces glare, dust, and erosion, filters sound and airborne pollutants, and mitigates urban heat-island effects; clean rivers, lakes, and seas enable water sports to take place without posing public health risks; sites with a diverse range of natural habitats are less susceptible to pest species that can cause costly damage to playing surfaces, and so on.

In the case of athletics disciplines and biathlon, these sports are directly linked to recreational ecosystem services both in terms of practice location and enjoyment of the practice by athletes, e.g. landscapes wellness and beauty.

For example, running pathways and ski infrastructure identified for events could contribute to biodiversity damage and loss, through the cutting of the flora and trees, noises of fans scaring animals, plastic use etc. In general, both open-air athletic disciplines (such as, for example, mountain running) and biathlon are practiced in non-urban ecosystems and in both cases the nature and landscape are severely affected by infrastructure, roads and initiatives of the fans, especially in big events.

Specifically in case of biathlon, the use of artificial snow requires the consumption of energy and of high quantities of water, leading to water depletion which causes animal damage as well as influence the ecosystem services related to water (especially in moments where there is no snow, as in the case of artificial snow, and thus no water in mountains). Also, chemicals used to maintain the snow longer can damage the environment, since they are released on the land and rivers, affecting biodiversity. The same goes for temporary infrastructure damaging nature without proper and sustainable planning.

Floorball is played in more urbanised contexts and stadiums and temporary/permanent facilities require land, increasing concrete and reducing the diversity of species that would take advantage of such land and live under and in it. Floorball events can lead to high mobility of fans, producing high amounts of waste, noise, excess light and smogs due to traffic affecting terrestrial and aerial ecosystems.

Solutions

Sport organisations and events should both reduce their impacts on nature as well as maximising opportunities for biodiversity conservation.

Efficient planning and monitoring systems such as environmental management systems and life cycle assessments should be the first step to identify biodiversity hotspots and operational activities to implement.

Proper management of all the environmental aspects described in this document contributes to minimise impacts on biodiversity: from the selection of the location of the venue in non-sensitive areas and the use of temporary infrastructure, to sustainable transportation incentivising the use of public transport, renewable energy use, efficient water use, sustainable sourcing of items and equipment with lower environmental footprint, sourcing of food from sustainable suppliers, and effective waste management.

First, events should not take place in protected areas or World Heritage Sites, key biodiversity areas, and critical habitats. Thus, event activities should be designed taking into consideration the specific needs and characteristics of local fauna and flora that could be affected by sport activities, to avoid harming biodiversity. This could be done through interviews and surveys with different local stakeholders as well as specific biodiversity assessments during the event design process.

Moreover, during events, even participants should be managed to limit impacts on the environment, by identifying specific pathways to follow, and especially in natural contexts, limit access to more sensible areas. Indeed, fans, staff and players should not compromise the conservation of green and sensible areas sited in the proximity of facilities and venues.

Event organisers should avoid/minimise the pollution of water resources. The practice involves the use of less harmful chemicals and management actions to avoid the spills of pollutants into the environment. Use of environmentally friendly technology is also very effective.

For example, snow cannons can be selected not only based on energy efficiency, but also based on noise performances to avoid bothering the local fauna. In terms of conservation, sport and sporting events can also be an opportunity for biodiversity.

During sporting events ecological corridors can be implemented and grass and green areas can be regenerated with the aim to enhance natural habitat biodiversity. In this sense, it is recommended to establish a grass management plan that provides for an alignment with the times of pollination and reproduction of different species. Other practices could be encouraging seed sowing, bat and flower survey, insect hotel, bee feeders, beehives, etc.

Even equipment and items can be repurposed for conservation purposes, as in the case of unusable tennis balls that can become houses for small animals, protecting them from adverse conditions.

Operational good practices identified in the frame of biodiversity management for athletics, biathlon and floorball in GAMES **database**.

Practice identified in GAMES database	Sport	Replicability Potential
Enhance natural habitats in urban environments	All	2,17
Repurposing sport equipment for enhancing local natural habitats	All	1,83
Avoid/minimise pollution of water resources	All	2,83
Avoid/minimise harm to biodiversity through the management of competitors and spectators during events	All	2,50
Noise-friendly technology for snow cannons	Biathlon	1,56
Artificial intelligence to optimally manage the turf	Athletics	2,00

Finally, sport events can be an opportunity to raise public awareness about biodiversity and to collect biodiversity data and knowledge for future sporting events and the whole sport community.

The table below enlists some good practices that can be adopted to minimise the environmental and climate change impacts linked to biodiversity during sporting events and increase biodiversity conservation.

4.7 Water management

Description

As declared by the United Nations, “Water is at the core of sustainable development and is critical for socio-economic development, energy and food production, healthy ecosystems and for human survival itself. Water is also at the heart of adaptation to climate change, serving as the crucial link between society and the environment.”

Water and climate change are inextricably linked. Climate change is causing shortages and droughts in some areas and floods in others. Growing demand for water increases the need for energy-intensive water pumping, transportation, and treatment, and has contributed to the degradation of critical water-dependent carbon sinks such as peatlands.

Water use in the sport sector

The sport industry is not exempt from the conspicuous consumption of water. For example, sports such as hockey require large quantities of water to maintain the playing field. Football and soccer fields are exceptionally large, and natural turf requires frequent watering to maintain. Arenas and sport facilities that host sporting events attended by hundreds or thousands of fans use water in toilets and sinks, as well as in athletes’ locker rooms.

Regarding athletics and floorball, the use of water is mainly linked to the operations that take place inside the sporting venue (arenas, halls) or in the areas right outside, such as cleaning the venue, water use and discharge in bathrooms, irrigation of the areas adjacent to the sports facility.

It is however in outdoor winter sports such as biathlon that water consumption is much more relevant: winter sporting events often require the production of artificial snow. As climate change worsens and global temperatures rise, experts confirm that a heavy reliance on artificial snow is the unfortunate inevitable future of winter sports.

Artificial snow was first used in winter sports in the 1980s and since then it has become an increasingly common practice. In particular, Beijing made history in 2022 as the first city to host a Winter Olympics essentially wholly reliant on artificial snow, with consequent enormous amounts of water used: its 100 snow generators and 300 snow guns used the amount of water equivalent of a day’s worth of drinking water for 900 million people.

Solutions

The sports sector can cut its usage of water by implementing some good environmental practices. Revision of the management of the water aspect should be framed into environmental management systems or monitoring systems (such as KPIs, water footprint calculations, etc.), to optimise operational management and evaluate technical practices to reduce water consumption.

For example, harvesting rainwater and reusing wastewater are among the most relevant and effective best practices in this context. Sport facilities could implement rainwater collection and reuse for all operations that do not require the use of potable water, such as washing of floors and/or stadium benches after each game or at cleaning times; water discharge of flushing; turf irrigation, playing field maintenance.

A great example of integrating rainwater harvesting facilities into the design of a stadium is the Accor Stadium, an 82,500-capacity stadium located at Sydney Olympic Park. The building collects rainwater through a siphonic drainage system that is connected to the primary arches of the stadium. The water then flows into four water collection tanks located below ground with 3,200 m3 water capacity. The water is primarily used for irrigating the grass and has led to a 56% reduction of water compared to other facilities of equal size.

In case of winter sports such as biathlon, events should limit water extraction to a minimum and indispensable quantity to fulfill the sporting functions, whereas maintaining reservoir ponds recreational functions. An example comes from the IBU World Championship 2023 in Oberhof, where protection of nature and limited use of water was a key objective. In a competition site, the rainwater retention basin at the ARENA-slope had a downstream separator system to filter pollutants. A throttled discharge system ensured the appropriate water recirculation of the filtered water masses, thus limiting waste of water. Moreover, reservoir ponds should also be integrated into the landscape, to lower environmental impacts.

The table above summarizes some of the best practices that can be adopted by the sports sector to minimise the environmental and climate change impacts linked to the use of water.

Operational good practices identified in the frame of water management for athletics, biathlon and floorball.

Practice identified in GAMES database	Sport	Replicability Potential
Water use optimisation solutions	All	1,92
Rainwater and wastewater collection and reuse	All	2,44
Limit water extraction	Biathlon	1,67
Integration of reservoir ponds into the natural landscape	Biathlon	1,67

4.8 Good practice examples

GAMES GOOD PRACTICE 50
Energy use

SPORT: Biathlon
EXAMPLE: The Big Battery Box for the IBU World Cup 2022

DESCRIPTION: The Big Battery Box, a self-sufficient 20-foot container with lithium-ion batteries and renewable energy sources, provided the backup power supply for TV broadcasting and floodlights during the IBU World Cup in Ruhpolding (Germany), replacing the need for traditional diesel generators. In 2022, all electricity for TV broadcasting for the event was for the first time generated from renewable energy sources, eliminating the use of diesel.

GAMES GOOD PRACTICE 30
Environmental and event sustainability management systemy

SPORT: Biathlon
EXAMPLE: Energy transition for the Biathlon Center “Grogg”

DESCRIPTION: Since the 2022/23 season, the Biathlon Center “Grogg” in Val Martello has been entirely powered by green electricity from nearby rivers thanks to the construction of a hydropower plant in cooperation with the municipality of Martell. Because of this, the center now also features hyper charging points for electric cars and an environmentally friendly woodchip-based heating system. It was certified as a “GreenEvent” during the IBU Junior Cup in December 2022, receiving the highest level of sustainable event recognition from the Autonomous Province of Bolzano.

GAMES GOOD PRACTICE 44
Mobility

SPORT: Athletics
EXAMPLE: Accommodation for staff and athletes at the Diamond League Final 2022

DESCRIPTION: During the Diamond League final, held in Zurich in September 2022, the hotel chosen for hosting athletes was located just 5 minutes away by walk from the stadium. The location also offered fast routes to the heart of the city: the first nearby tram stop was only five minutes by walk and it reached old Zurich in 10 minutes. Moreover, it was possible to walk 15 minutes to the Hardbruecke train station.

GAMES GOOD PRACTICE 31
Mobility

SPORT: Floorball
EXAMPLE: Free public transport ticket for fans at the Men's World Floorball Championship 2022 (WFC)

DESCRIPTION: The IFF designated local organising committee (LOC) of the WFC designed and disseminated a survey to 2,500 people aimed at understanding the fans' expected mobility behaviours and preferences during floorball events. Based on the results, and thanks to some city sponsors, the LOC (IFF) integrated the ticket for public transport within the canton of Zurich directly into the WFC ticket. Therefore, public transport was free for fans attending the event, incentivising the use of public transport.

GAMES GOOD PRACTICE 56
Materials and equipment

SPORT: Floorball
EXAMPLE: Bags and souvenirs from branding materials at the Men's World Floorball Championship 2022

DESCRIPTION: During the Men's World Floorball Championship 2022 many branding materials (e.g., banners) were made of textiles, such as polyester and cotton. Before the event took place, event organisers had already planned to reuse those materials to produce and sell bags and other souvenirs to floorball supporters. People interested in buying them were able to order them online already during the event.

GAMES GOOD PRACTICE 68
Materials and Equipment

SPORT: Floorball
EXAMPLE: 3D-printed recycled prizes and memorabilia items from broken balls and stick blades World Floorball Championships 2022 (WFC)

DESCRIPTION: For WFC 2022, all-Star Team prizes and memorabilia items were produced from broken balls and stick blades. Broken balls and stick blades had been recovered through specific collection boxes in retail stores and practice venues before the event took place. The waste plastic from the material collection at the WFC 2020 was also utilised. To obtain a sufficient amount of plastic, this material was supplemented with plastic waste from the sea. Thanks to the involvement of IWK, the Plastic Institute at the Eastern Switzerland University of Applied Sciences, the collected plastic was shredded and melted using a specially developed process and extruded to filaments for 3D printers. New products, including prizes and memorabilia items, were then produced by 3D printing.

GAMES GOOD PRACTICE 72
Water usage

SPORT: Athletics
EXAMPLE: Compostable toilets at the Diamond League Final 2022

DESCRIPTION: During the 2022 Diamond League final held in Zurich, some compostable toilets were introduced in the square where the event took place. Compostable toilets do not use water flows, avoiding the consumption of many litres of water in the discharge process. Moreover, compostable toilets avoid possible production of low-quality waste during the water treatment process. At the same time, the organic solid waste is immediately compostable and can be reused as compost.

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