Deliverable B.1.4

Revised version of the Guidelines

Version 5.0

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Document History

Version	Date	Description
1.0	01.02.2019	1st draft of the document Del. A.1.2 Guidelines
2.0	30.04.2019	Complete version of Del. A.1.2 approved by all the members of the Consortium. For each section, it includes a brief description of the best practices and their evaluation through a colour system. The final version is a general revision aiming at the maximum coherence between all sections and the maximum readability.
3.0	04.10.2019	Text revision aimed at correcting typos.
4.0	05.02.2020	Integration of a new template OM/SM25
5.0	18.12.2020	Text revision aimed at correcting typos, integration of the examples of the practices adopted during LIFE TACKLE, integration of templates.

Table of contents

1. INTRODUCTION

1.1 LIFE TACKLE "Teaming-up for A Conscious Kick for the Legacy of Environment"

The main objective of TACKLE is to increase the awareness and to improve the practices of sport events key actors in order to improve the environmental management during football events. The project focuses on all the phases of the sport event life cycle (i.e., conception, organisation, staging, and closure) to develop the necessary competences and organisational structures within the National Football Associations (NFAs) to guide the diffusion of best practices in the related football leagues and stadiums. Moreover, the project will promote the continuous improvement of the environmental management of football events even after the end of the project by setting targets and via the peer-influence of the NFAs committed to environmental sustainability. Finally, TACKLE will develop and implement communications campaigns aimed at increasing environmental awareness in football clubs, fan clubs, supporters, stadiums and sport facilities staff. Overall, the project activities will be valorised during the European Championship 2020.

TACKLE is a Life project leaded by the Institute of Management of S. Anna School of Advanced Studies (Italy) and brings together additional seven partners from Belgium (Euractiv, ACR+), Italy (NFA of Italy, AMIU Genova S.p.A.), Portugal (LIPOR), Romania (NFA of Romania) and Sweden (NFA of Sweden) and is also endorsed by UEFA. A major milestone is to apply the knowledge and best practices acquired throughout the project to the organisation of the European Championships in 2020. Overall, the project has a duration of 37 months and will end on September 30th, 2021.

1.2 Guidelines on Environmental Management in Football Events.

One of the main deliverables of TACKLE is a set of guidelines that will guarantee a high level of information diffusion and awareness-raising in the fields covered by the project. The main aspect of the approach adopted in the project 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 best practices within these guidelines is divided into two sections (sections 3.1 and 3.2). The first

section (section 3.1) covers the **best practices in the field of governance**. In this section the roles of the different stakeholders (NFAs, event organisers, suppliers, etc.) are defined to assure an effective environmental management structure. Moreover, the governance section will outline all the best practices linked to the planning and monitoring of improvement actions, the training and internal / external communication needs, as well as performance monitoring, reporting and a periodical review of the governance system and its achievements. The second section of the guidelines will be instead dedicated to the **operational best practices**. In this part of the guidelines the best practices will be divided into five sub-sections (context of the event, event, stadium management, procurement, mobility and logistics) covering the major phases and tasks in the organisation of a sporting event.

2 METHODS

2.1 Desk research

Through the desk research we have extensively analysed the contents of sustainability and environmental reports published by sport organisations, football clubs and football big event organisers (such as European and World Football Championships). The activity aimed at identifying environmental governance and operational practices. To systemise the approach, a team of four researchers has been constituted to test a protocol for the investigation of the reports. Then, the team has tested the protocol on a unique report. The achieved results have been discussed in order to fine-tune the approach and to agree about the selection of the identified practices in the reports. In the next table, the characteristics of the content analysis of technical environmental reports are resumed.

ITEM DESCRIPTION	INFO/DATA
Number of analysed reports	94
Number of pages verified	> 3500
Publication date of the reports	From 2006 to 2018
Sports/events in the scope of the reports	Football, Rugby, Hockey, Baseball, American Football, Expo Milano, Olympic games
Football and sport events covered by the analysed reports	2015 Rugby World Cup, 2018 FIFA World Cup, 2014 FIFA World Cup, 2010 FIFA World Cup, 2011 FIFA Women World Cup, 2006 FIFA World Cup, UEFA Euro 2012, UEFA Euro 2016, Olympic games Vancouver 2010, Olympic games London 2012, Olympic games Rio 2016, Olympic games Tokyo 2020, Taiwan Innotech Expo 2018, Expo Milano 2015, Greenbuild 2010
Football clubs that published the sustainability reports analysed	Juventus FC, Milan AC, Manchester Utd, Green Rovers, WfL Wolfsburg, Tottenham Hotspur, (etc.)

Table 1. Environmental and sustainability reports analysed

2.2 On-site visits and interviews

In addition to the analysis of reports we carried out five on-site visits. They have been carried out in Italy, Romania and Sweden with the support and coordination of the three National Football Associations. The data collection lasted a whole day and it has been structured on three different activities. Firstly, we interviewed the stadium managers in order to investigate mainly the management aspects related to the governance. Secondly, they attended three football matches (one match for each case study, excepted for Mapei Stadium). During and before the matches, the TACKLE partners visited different stadium areas such as external areas, catering and restaurants areas or gradinate-terraces to verify operational practices adopted to manage waste, energy consumption, mobility and other operational aspects. Finally, after the match the team has completed the visit of stadium areas not accessible during the matches such as, dressing rooms, warm up area, the pitch, the waste deposits, technical rooms (e.g., boilers), etc. Table 1 includes the key features of the interviews.

	COUNTRY	STADIUM	CAPACITY (PEOPLE)	DATE AND MATCH VISITED FOR THE CASE STUDIES	INTERVIEWED PEOPLE
INTERVIEW #1	Romania	National Arena – Bucharest	55,634	12th November 2018 *Steaua Bucarest vs Dynamo Bucarest*	Stadium manager, waste manager
INTERVIEW #2	Italy	S. Siro - Milano	80,018	17th November 2018 *Italy vs Portugal*	Stadium manager
INTERVIEW #3	Sweden	Friends Arena - Solna	50,000	20th November 2018 *Sweden vs Russia*	Stadium manager, Stadium owner
INTERVIEW #4	Italy	Mapei Stadium – Sassuolo	21,584	17th January 2019	Stadium manager
INTERVIEW #5	Italy	Olympic Stadium - Rome	70,634	18th April 2019 *Lazio vs Udinese*	Stadium owner

Table 2 Interviews details

3 GUIDELINES ON ENVIRONMENTAL MANAGEMENT OF FOOTBALL EVENTS

In this section, we present the best practices identified through the desk research and the interviews. We have identified and analysed more than 80 practices on football events and facilities' environmental management. These practices have been classified and resumed in specific templates according to the following ratio:

1) First of all, we have divided the practices into 2 main categories: governance and operations. Governance collects all the actions and strategies that must be adopted and developed at the organisational and decisional level, i.e., practices relating the overall organisation of the event such as the appointment of an environmental manager, the adoption of an environmental management system, the development of a specific sustainability strategy etc. whereas the operational practices are more directly connected with the event phase.
2) In the framework of the operational practices, we have identified and distinguished 5 sub-categories:
    a. Context of Event – all the aspects related to the location of the event (i.e., presence of green accommodation, water treatment facilities etc.);
    b. Event – all the actions necessary to carry out the event (i.e., waste management, volunteers training, on-site communication means etc.);
    c. Stadium management – all the aspects related to the infrastructure management (e.g., instalment of solar panels, optimised light management, pitch management etc.);
    d. Procurement – all the green choices that can be made at the procurement level in order to prevent and limit the overall match's environmental impact (e.g., green electricity, green detergents and cleaning products, green procurement guidelines etc.);
    e. Mobility and logistics – all the solutions that can be adopted in order to encourage fans to reach the stadium with more sustainable means of transport and to limit the logistics' impact (e.g., combo tickets, usage of electric or hybrid cars etc.).

In the different sections, the practices are briefly described, then you will find a reference to a template that provides further details about the practice and its previous applications. These templates are part of these Guidelines and you can download them from the TACKLE website (https://lifetackle.eu/).

We have selected the most promising practices in terms of potential replicability in the context of football events. More precisely, we have elaborated an evaluation system based on four parameters: economic feasibility, environmental management potential, technical feasibility and replicability potential.

For each category a score from 0 to 3 has been attributed for each parameter and a final total average score for each practice has been calculated (where 0 means that the practice has a very low replicability potential whereas 3 means that it has a high potential.

At the end of each category's description, the practices' evaluation table, with all the scores, has been added.

3.1 Practices on the Governance of Football Events

3.1.1 Defining practices on environmental roles and responsibilities (Template GOV8)

In general terms, Governance refers to the broad framework of regulations, systems, roles, and procedures that enable an entity or organisation to function and achieve its own objectives. Given such a wide domain, a more specific definition of the term is difficult to formulate. However, for the sake of the present guidelines, Governance is understood as a set of voluntary self-regulatory tools that leaders or managers implement to direct and manage one or more specific aspects related to the functioning of an organisation, event or activity. More precisely, Governance:

- defines the vision, mission and values of an organisation;
- defines organisational structures and design;

- assigns roles and responsibilities to directors and employees in compliance with existing regulatory frameworks;
- shapes decision-making processes and control mechanisms;
- safeguards the equitable treatment of shareholders;
- ensures transparency and accountability with respect to stakeholders.

In these terms, Governance appears as a primary function in the organisation of sport events and, most importantly, a crucial leverage for steering sport events towards sustainability. Greening sport events indeed requires altering existing governance mechanisms as well as introducing new self-regulatory and managerial tools within existing governance frameworks. Voluntary self-regulation aids sport organisations to codify mechanisms and tools supporting the overall organisation of sport events in a more environmentally responsible and transparent manner. Accordingly, sport organisations are increasingly undertaking efforts to establish comprehensive self-regulatory frameworks within which inscribing and monitoring activities from an environmental perspective. Besides providing a coherent regulatory structure to environmental management efforts, self-regulation helps communicating such efforts to external stakeholders by means of consistent reporting initiatives and, ultimately, establishing a permanent dialogue and interface between stakeholders and the organisation.

An effective framework for environmental governance should account for a wide array of organisational, strategic and operational dimensions. Such dimensions are well explicated by the so-called Deming cycle, also known as the "Plan – Do – Check – Act" (PDCA) management method, which underlies the majority of certifiable management systems (such as, for instance, ISO 20121 management standard for sustainable events or ISO14001 and EMAS Regulation management standards to implement and certify an Environmental Management System). According to the PDCA management method, continuous performance improvement is achieved through the following steps: 1) planning improvement objectives; 2) implementing improvement actions (e.g. training, operational control etc.); 3) assessing the results (e.g. internal or external audits); 4) reviewing the management process in order to set new coherent objectives.

The practices on the Governance of football events presented in this paragraph are interpreted as means to operationalise the above-mentioned four steps of the PDCA management method. In this perspective, the practices are categorised according to six operational dimensions of governance: *a)* assigning roles and responsibilities; *b)* planning; *c)* auditing and monitoring; *d)* certifiable management system; e) reporting and communicating; f) managing stakeholders' relationships.

The primary task of environmental governance is defining roles and assigning environmental responsibilities within the organisation or organising committee. Usually, this is accomplished by appointing an environmental manager or a sustainability committee. Assigning environmental responsibilities imply clarifying how decisions about green aspects will be managed within the organisation. On the one hand, environmental responsibilities may be allocated to a specific organisational unit or function in order to concentrate decision-making with regard to environmental issues within a unique decisional centre. On the other hand, an environmental manger may be appointed within each organisational or operational unit in order to decentralise decision-making.

Under this point of view, Juventus F.C. represents a good example of sustainability governance. In fact, besides establishing a central Governance Sustainability Committee, Juventus FC decided to appoint a sustainability officer in each organisational department in order to foster a systemic, pervasive and shared governance on environmental issues (Juventus F.C. Sustainability Report, 2017). Regardless of such organisational considerations, the allocation of environmental responsibilities should be matched by the allocation of resources, both human, financial and capital. In this sense, top managers need to empower environmental managers, or the environmental department, in order to effectively push environmental governance within their sport organisations.

3.1.2 Workflow management and checklists for sustainability planning (Template GOV12)

Once roles and responsibilities are defined, the next step for an effective governance is planning objectives and means to achieve them. Planning implies breaking down objectives into activities to be performed and identify the specific actions that need to be implemented, as well as resources that need to be activated in order to successfully achieve such objectives. Integrating environmental concerns in

pre-event planning contributes ensuring that environmental principles are effectively incorporated in every relevant aspect of the event management and are accounted in the budgeting process. Planning with regard to environmental management aspects contributes increasing stakeholders' (such as workforce, contractors, suppliers and all departmental units) awareness about environmental issues and about their specific environmental responsibilities.

Effective planning makes use of workflow management tools in order to coordinate activities and instruct workforce about environmental aspects associated with each relevant activity. Accordingly, workflow management plans should account for the main activities to be carried out before and during event-time, such as food preparation, waste management, energy management, event promotion and materials, logistics, mobility and transport. To further detail the environmental aspects of each activity, checklists can be used to keep track of environmental aspects along workflow activities and assure that all actions are met and environmental aspects monitored.

3.1.3 Waste management planning (Template GOV15)

Waste constitutes a major environmental externality to most stadium management activities; accordingly, adopting a waste management plan emerges as a best practice to contribute prevent and reduce waste production, while improving recycling and recovery rates, well in advance of sport events. Waste management plans aim at planning in advance waste reduction objectives, actions to achieve them and to further detail specific quantitative milestones, in order to allow event organiser to set up all the necessary infrastructures. Waste management plans allow sharing and agreeing waste reduction objectives among all relevant actors that are expected to play a role, such as municipalities, local waste companies and treatment plants etc.

3.1.4 Waste recycling planning (Template GOV10)

As part of planning activities with regard to waste management, the recovery of recyclable materials should represent a fundamental step in each event's workflow management plan. Recycling and

recovery initiatives allow reducing environmental impact of all waste producing activities, while simultaneously reducing cost associated with waste collection and disposal.

3.1.5 Sport events emissions offsetting (Template GOV2)

As in the case of waste, greenhouse gases (GHG) emissions are among the most detrimental environmental externalities associated with a wide array of activities carried out during the organisation of sport events, especially the most carbon-intensive and energy-intensive activities (such as heating, cooling, mobility and transportation). Emissions of climate-altering GHG, especially carbon dioxide, contribute worsening global warming, which is a major cause of environmental degradation and a major threat to sustainability of modern lifestyles. To reduce the impact of sport events on global climate, organising committees should plan and put in place greenhouse gases (GHG) emissions offsetting activities. Similar activities aim at compensating carbon emissions associated with a specific sport event by funding GHG saving or carbon dioxide reduction initiatives implemented somewhere else. Offsetting initiatives may envision participating in voluntary carbon emission allowances markets, purchasing renewable energy credits, or funding tree plantations.

3.1.6 Sport events GHG inventory (Template GOV1)

Adopting carbon offsetting initiatives implies measuring and monitoring GHG emissions associated with each activity, in order to estimate the amount of CO_2 event organisers need to compensate. This implies creating a so-called GHG inventory, which constitutes a relevant aspect in the auditing and monitoring dimension of environmental governance. Indeed, a GHG inventory is a crucial management tool for identifying activities that are most impactful in terms of GHG emissions, with the aim to structure a coherent and effective reduction strategy. As set forth by the standard ISO 14064, GHG inventories may have diverse scopes. GHG inventories may exclusively focus on emissions generated by activities that are directly owned or controlled by the organisation or event organiser. Broader GHG inventories may include indirect emissions associated with purchased energy

consumption. Finally, wider GHG inventories may even include all indirect activities associated with the value chain of the reporting organisation, such as, in the case of sport events, emissions associated with spectators' traveling to the stadium.

3.1.7 Collection and analysis of environmental indicators (Template GOV14)

Besides accounting for GHG emissions in dedicated inventories, organising committees should constantly monitor the overall environmental profile of activities according to a wider set of environmental indicators, especially for decision-making purposes. Developing baseline information on operations is crucial for tracking progress of environmental improvement initiatives, as well as for establishing updated data repositories for decision-making purposes, for identifying improvement opportunities and setting objectives.

TACKLE example:

A monitoring system composed of environmental KPIs based on the core environmental performance indicators presented in Annex IV to Regulation (EC) No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) was drafted in order to Real Betis's monitoring of the different environmental aspects. The monitoring system, a systematic and periodical collection and elaboration of environmental data, aims to monitor the environmental performance of the organisation. The performance indicators cover the following environmental aspects: energy consumptions, water consumptions, waste production, emissions and material efficiency. The monitoring system could require several rounds of reflections and evaluations in order to draft a "tailor-made" version of the KPIs based on the organisation's needs and activities.

3.1.8 Energy and waste audit (Template GOV17 and GOV18)

Environmental data are collected and assessed by means of environmental auditing. Audits allow gathering information on-site on the performance of activities with regard to specific environmental

aspects. Audits that are most commonly performed are energy audits and waste audits. Energy audits aim at developing thorough knowledge on the current energy consumption profile of a building or group of buildings, in order to identify efficiency improvement opportunities. Similarly, waste audits analyses facilities' waste streams, gathering information on typologies of waste materials produced, estimating the amount of recyclable or compostable materials, and how much of each category is currently recovered for recycling. Waste audits record the sources, composition, weight, volume, seasonal variation, and destinations of the materials that the venue generates.

3.1.9 Environmental Impact Assessment (EIA) and cost benefit analysis (Template GOV3 and GOV6)

Once environmental data are collected, environmental impact assessment (EIA) methodologies provide a solid and reliable scientific ground for keeping track of sport events' environmental profile according to a multi-indicator approach. First of all, EIA requires an initial analysis of the context aimed at identifying which environmental impacts could be generated by the event and thus, determining some requirements for the final approval. Therefore, an EIA will often include indicators such as carbon footprint, air pollution, impact on human health, land use and impact on biodiversity, in order to provide an understanding of the environmental footprint of the event as complete as possible. As in the case of GHG inventories, EIA should embrace a wider scope as possible, including activities regardless of the organising committee's level of influence.

The wider the scope of the EIA, the more informed and accurate will be the environmental cost benefit analysis the organiser will be able to carry out. Environmental cost benefit analysis support decision-makers in planning environmental improvement initiatives based on the economic availability of the organiser, expected results and cost of the initiative.

3.1.10 Life Cycle Assessment (Template GOV19)

One of the most advanced tools for assessing and monitoring the environmental performance of sport events is life-cycle assessment (LCA). LCA allows calculating, according to a recognised and replicable approach, the environmental impact associated with every key activity that is under the direct

control of the organising committee as well as the impact produced by the activities of other parties involved, in every stage of the life cycle (i.e., from extraction of raw material to waste and disposal). LCA fulfils a strategic scope as it allows identifying levers for reducing environmental impacts and management costs simultaneously along the whole life cycle of services or products. LCA allows envisioning possible scenarios of energy performance optimisation in the management and maintenance of the stadium assets or identifying levers to reduce environmental impacts and costs for the other parties involved.

3.1.11 Environmental Management System (EMS) (Template GOV9)

In order to be effective, all environmental governance practices need to be inscribed within a comprehensive and coherent management system. To this aim, environmental management systems (EMS) provide a policy framework for systematically planning, documenting and maintaining environmental protection efforts. Similar management tools constitute self-regulatory and voluntary policies that could be developed and implemented according to verifiable and transparent guidelines set forth by internationally recognised and certifiable standards. At the international level, the most widely adopted certifiable EMS standards are ISO 14001, promoted bythe International Organisation for Standardisation, and the Eco Management and Audit Scheme (EMAS), which has been established by the European Commission in 1993. Similar standards do not set environmental performance targets, but rather state procedural requirements with the aim to continuously improve management of environmental aspects and they allow to obtain an environmental certification issued by a third-party auditor.

3.1.12 Sustainable Event Management System (Template GOV16)

While ISO 14001 is suitable to every kind of organisation in any sector and industry, ISO 20121 is an event sustainability management system standard, specifically designed to suite every typology of event, ranging from local small-scale events to mega events like the Olympic Games. Certification to this scheme aims at continuously reducing the negative social, environmental and economic

externalities that events may cause, therefore contributing improving events' legacy from a sustainability perspective. ISO 20121 is based on the same management structure of the more popular ISO 14001 standard, and its adoption is suitable to all stakeholders in the event industry supply chain, ranging from event organisers, managers stand builders, caterers and logistics suppliers.

3.1.13 Stadium energy management system (Template GOV20)

Another relevant certifiable standard within the family of ISO management standards is the ISO 50001 for energy management. Similarly, to ISO 14001 and ISO 20121, ISO 50001 grounds its management structure on the paradigm of continuous improvement, supporting organisations to systematically control and reduce energy consumption in the daily activities. In particular, ISO 50001 sets forth procedural requirements for identifying and setting data-informed energy-efficiency objectives, measuring results of energy conservation initiatives and setting new challenging objectives.

3.1.14 Sustainability Reporting (Template GOV5)

Besides supporting organisers in managing events' environmental, sustainability and energy performance, certifiable management system standards help organising committees in making their environmental protection efforts visible to external stakeholders, such as spectators, local communities, suppliers through certification. Environmental and sustainability certifications indeed help organisations improve their reputation in the eyes of stakeholders and establishing a trustful relationship with clients and suppliers, because most certifiable management standards (such as ISO 14001 and EMAS) regularly require external verification from environmental auditors.

Similarly, environmental reporting and communication initiatives are crucial tools for maintaining solid and transparent relationships with external stakeholders and for valorising environmental protection and sustainability efforts. Sustainability reporting initiatives are adopted by organising committees during large sport events for spreading awareness about the sustainability strategy underlying the organisation of the event, gaining attention and commitment to their sustainability objectives from external stakeholders and, after the conclusion of the event, to report results of all the sustainability initiatives and inspire future event planners.

3.1.15 Environmental awareness raising campaigns (Template GOV13)

A further opportunity for fostering environmental protection, while improving organisational reputation and stakeholder relationships, is provided by environmental raising campaigns. Major sport events are indeed a great vehicle for conveying environmentally friendly messages, giving visibility to organisations' environmental efforts, and for raising audience's awareness about sustainability issues. To be effective, awareness raising initiatives should aim at engaging the public by means of awards or initiatives (e.g., involving athletes, providing free tickets etc.) that ensure a broad participation and resonance of the initiative.

3.1.16 Stakeholder engagement and public consultancy (Template GOV7 and GOV22)

As previously stated, engaging stakeholders constitute a fundamental aspect of environmental governance and strategy, which can be realised by means of very diverse initiatives and methods. Stakeholder engagement with regard to organisations' environmental and sustainability strategy aims at gaining commitment and support from relevant stakeholders for the realisation of said objectives, as well as gaining feedbacks and advices on environmental performance targets and means to achieve them. Several methods may be adopted for engaging stakeholders, depending on the context, types of stakeholders and objectives. For instance, surveys, focus groups, mailing lists, workshops or multi-stakeholders' consultations are method that organisers can adopt at an early stage of environmental planning in order to understand stakeholders' needs and demands and plan their environmental strategy accordingly.

3.1.17 Partnerships and Sponsorship (Template GOV4 and GOV11)

As a subsequent step to stakeholder engagement, developing relevant partnerships is a further crucial aspect of an effective environmental strategy that should be managed at the governance level. In the context of sport events, relevant actors may include international sport organisations (such as FIFA,

UEFA etc.), NFAs and other national sport organisations. For the sake of implementing an effective environmental strategy, it is fundamental to partner with local authorities, such as municipalities hosting the event, in order to coordinate environmental initiatives, such sorted waste collection. Similarly, private and public transportation companies are fundamental partners for what concerns improving the sustainability of mobility solutions from and to the event.

Furthermore, partnering with private companies allow organisers to gain sponsorships for the event, which could help funding the most ambitious environmental improvement initiatives. Indeed, partnerships can lead to significant economic benefits, and the visibility that a major event can grant to a private sponsor can be profitable. Most importantly, sponsorships are also important opportunities for cooperating and generating new ideas on how to improvement the sustainability of the event. To this aim, event organisers should engage sponsors in productive idea sharing, networking and cooperation.

Scoring of the **Governance** practices

ID	Description	Economic Feasibility	Environ-mental Manage-ment Potential	Techni-cal Feasibili-ty	Replicabi-lity Potential	Avera-ge score
GOV1	*GHG inventory*					**3**
GOV2	*GHG emissions offsetting*					**2.75**
GOV3	*Economic and environmental cost benefit analysis*					**3**
GOV4	*Partnerships*					**2.5**
GOV5	*Sustainability and legacy reporting*					**2.5**
GOV6	*Environmental impact assessment*					**3**
GOV7	*Stakeholder engagement*					**2.75**
GOV8	*Environmental roles and responsibility of environmental manager and environmental committee*					**2.75**
GOV9	*Stadium environmental management system ISO 14001 or EMAS*					**2.5**
GOV10	*Mlb's recycling initiative*					**2.5**
GOV11	*Sponsors sustainability network*					**2.5**
GOV12	*Workflow management and use of a checklist in the planning of a sustainable even*					**2.75**
GOV13	*Environmental awareness raising campaigns*					**2.75**

GOV14	*Collection and analysis of environmental indicators*					**3**
GOV15	*Waste management plan*					**3**
GOV16	*Sustainable event management system according to ISO 20121*					**2.5**
GOV17	*Waste audit*					**3**
GOV18	*Energy audit*					**3**
GOV19	*Life cycle assessment*					**2.5**
GOV20	*ISO 50001 certification*					**2.75**
GOV21	*ESOS certification*					**2.5**
GOV22	*Public consultancy and financing on renewable energy for football grassroots clubs*					**2.25**
GOV23	*Sustainable event handbook*					**2.75**

High score **Medium score** **Low score**

3.2 Practices on the Operational Management of Football Events.

The previous section analysed good practices on Football Events governance, i.e., how the organising entity should structure itself in order to ensure proper environmental management during the event phase.

In the following section, we are going to analyse all the operational aspects that have to be taken into consideration for the event phase:

- the context of the event, i.e., all the aspects that are not direct responsibility of the event organiser such as city' s and region's infrastructures, environmental regulation, and the actual state of the local environment;
- event, i.e., all the activities that are supposed to be carried out during the event itself or that have a strong correlation with the strict event management (i.e., catering, security, waste operations etc.);
- stadium management, i.e., all the activities that are connected with both ordinary and extraordinary stadium environmental management (e.g., energy and water supply contracts, maintenance, building renovation etc.);
- green procurement, i.e., all the initiatives adopted in order to prevent events' environmental impacts through careful selection of key event related goods and services such as merchandise, food and beverage, choreographic material, equipment, tableware etc.);
-mobility and logistics, i.e., all the actions taken to prevent GHG emissions due to private cars usage through the implementation of effective public transportation service and through a smart logistic distribution network.

3.2.1 Context of the event.

Context of the event is a concept used to define the environment and manner in which an event takes place. Such activities may promote environmental awareness, improve resource management, or even discourage non-environmentally respectful behaviour. Carrying out best practices during the event context helps to enhance the effectiveness of other best practices that are developed during other phases

of the event. In some cases, context of the event best practices can help understand the overall impact achieved by the sustainability strategy implemented by the organising team.

3.2.1.1 Metropolitan environmental assessment (Template OM/CE1)

For example, in view of the 2020 Olympic Games, the Tokyo Metropolitan Government conducted metropolitan environmental assessments. This assessment took the form of early-phase environmental surveys to evaluate the environmental sustainability of all venues, outdoor events, etc., in order to understand whether measures were necessary in order to improve the environmental conservation and sustainability of the event.

3.2.1.2 Water treatment and reuse of treated water (Template OM/CE2)

Football events, and the running of a stadium more generally are resources intensive. Water, energy, light and heating have to be provided for the basic functions of the stadium. Such resources are generally used in large quantities; hence, any practice promoting their reuse or maximising the efficiency of how they are employed may have a greatly positive environmental impact. In the case of the Australian team Melbourne Cricket Club, in order to achieve its goal of better water management, the Club invested in the implementation of a water treatment plant that transforms sewage water into Class A recycled water. The recycled water is employed to irrigate the lawns surrounding the stadium and within toilet facilities. This practice allowed a reduction in the costs related to water consumption as well as a reduction in water usage by 50%, thus improving the sustainability of resource consumption of the stadium.

3.2.1.3 Green accommodation (Template OM/CE3)

As aforementioned, practices carried out during an event context may promote greater environmentally friendly behaviour. This is particularly important during an event which attracts a great number of fans

from abroad, which will look for services for accommodation, food and transport. In the context of the event the organising team may provide information to all fans about accommodation enterprises which have been certified with an eco-label according to ISO type 1, EMAS, or ISO 14001. As fans from abroad are usually unaware of the environmental certification of hotels, bed and breakfasts, etc., it may help them to choose a sustainable accommodation service if the organising team suggests them a list of appropriate structure. This information may be easily provided to fans through invitations, website or emails.

Scoring of the **Context of the Event** practices

ID	Description	Economic Feasibility	Environmental Management Potential	Technical Feasibility	Replicability Potential	Average score
OM/CE1	*Metropolitan environmental assessment*					**3**
OM/CE2	*Water treatment plant and reuse*					**2**
OM/CE3	*Suggested accommodation enterprises with environmental certification*					**2.75**

High score **Medium score** **Low score**

3.2.2 Event

Sport nowadays is capable to attract large numbers of spectators, fans, as well as presence of media. Stadiums and other sports venues can easily have capacities to welcome a large city with a population of 50.000 to 90.000 people. Although different in every country in terms of popularity, sports events taking places in these sports venues can easily turn into a fully functional town, with many facilities available – food and beverage providers, restaurants and other hospitality providers, sanitary facilities, commerce and other commercial activity. These characteristics can easily apply to various popular sports across the planet – hockey, basketball, tennis, American football, rugby and especially football – which is considered as the most popular sport across the world and especially in Europe. Once we add to these other activates, such as mobility and energy consumption for instance, one can easily consider a stadium a fully living large town for a day. It's well known that an average European Union citizen generates 1.3 kg of waste per day (Eurostat, 2018). Multiply that by up to 100.000 people involved in a large-scale football game, such as a Euro Cup game, for example, and we come to something that shouldn't be easily ignored.

This is why material flows and environmental management in general must be observed and adjusted or improved in order to meet certain sustainability criteria. Although a football match lasts 90 minutes, a football game must be considered more than a full-day activity, including the planning of the event in the three days before the match; the arrival of the teams, media, fans, pre- and post-game activities, departure from the stadium during the match-day; all the post-match activities such as collection and disposal of waste. This further means that a sports events isn't only what happens on the pitch, although being the most important part of a game. We are talking the immediate are around the stadium, the stands, commercial stadium facilities, transportation hubs and more. And then, once the day is over, the following morning could easily seem like nothing happened. Where did all the people go, what happened to their waste, all the resources needed for organising the game?

3.2.2.1 Promote reuse and increase the life of sports equipment (Template OM/E1)

Whatever sport we talk about, a game requires different equipment. Depending on the sport it could be rackets, balls, shoes, technical equipment, clothes etc. Most of this equipment is durable and can be reused; however strict standards for high-level games require a continuous replacement of those. This is why donation or an exchange of sports equipment is a common practice where lower level clubs or junior clubs can benefit from perfectly functional equipment. And then there is an important added value of such a practice – it prevents the equipment from becoming waste. The best thing about this practice is that it can be used not only in football, but also to other sport and in any case can be transposed. The renewal of the stock of material (nets, poles, tatamis ...) is a good opportunity to avoid the generation of waste by equipping structures that do not have the financial capacity to invest in new equipment.

3.2.2.2 Life extension for staff uniforms (Template OM/E13)

If a certain sport implies wearing uniforms, employer should consider setting up a proactive return-of-uniform policy for when individuals leave your employment. This will increase the supply of uniforms for re-use and save you purchasing new uniforms. Longer duration of the uniforms implies the postponing of new purchases and to amortise the investment in a longer period. Both practices can be linked with the circularity concept of durability; consequently, increasing the lifetime and reducing the environmental footprint of uniforms and sports equipment. Longer duration of the uniforms and sports equipment implies the postponing of new purchases and to amortise the investment in a longer period.

3.2.2.3 Reusable temporary structures (Template OM/E6)

Speaking of the circularity concept of durability, the example of temporary structures and installations could easily fall under this reuse principle. Large sport events usually use a large amount of temporary structures and installations, such as tents, containers, barriers, stands, that are built within and aside

venues for operational needs. Smart design choices also allow efficient use of existing materials, including modular structures, to reduce the amount of customised manufacture.

These temporary facilities include tents for catering and medical aid, restaurant and sanitary facilities, media centres and offices, terraces and stands. Temporary facilities are always very important, since most activities – such as catering, shows, games and exhibitions – take place in the area surrounding the actual sporting event. Even a complete sports facility can be erected as a temporary construction. Low-waste and resource-saving construction methods are therefore of particular importance in this area.

For instance, Rio's 2016 headquarters were a temporary modular structure whose expansion follows the head count growth, allowing reducing underutilised space and eliminating unnecessary materials and energy use. Preassembled steel structures arrived ready to use on-site and came together through a simple mechanism of assembly consisting of slots. With this method, construction work was three times faster than usual, with minimal disposal of rubble. Up to 80 per cent of the modular material shall be reused in future installations.

At the 2006 World Cup the TV presenter studios, the substructure of the 48 studios was built as a frame, and the studios themselves were erected as a superstructure in a modular system. Individual elements were suitable for reuse, which would not have been possible with conventional studios. For example, walls and roofs comprised sandwich elements from container construction, which could be reused after the World Cup.

3.2.2.4 Recycled plastic from ocean to realise football clothing (Template OM/E9)

Still in the field of football uniforms and clothing but passing from a focus on durability to a focus on reuse and recycling we can mention the possibility, we can speak in a program "Ocean Plastic". "Ocean Plastic" is a program witch the aim to reduce the amount of plastic in the sea beds through the realisation of highly performing clothes. It is possible to reduce the amount of waste in the oceans and at the same time prevent the accumulation of plastics. The most important economics benefit deriving

from this initiative is the possibility of redesign the sportswear through innovative materials and then make business out of it.

3.2.2.5 Low environmental impact food (Template OM/E19)

All stadiums distribute meals before and during the football matches. Several sport and football organisations have adopted food choice to reduce the environmental impact of this activity. The choice is to sensitise both supporters and players towards a more sustainable lifestyle. In fact, being vegan for the team means not only to avoid any kind of organic food or derivate but also to contribute to the reduction of the negative impact towards the environmental and animal welfare during the livestock farming. A study of University of Oxford reveals that meat and dairy production is responsible for 60 per cent of agriculture's greenhouse gas emissions, while the products themselves providing just 18 per cent of calories and 37 per cent of protein levels around the world.

Additional options suggested by the International Olympic Committee (IOC) are:

- Food sourcing to include at least 50 per cent local products;
- Food waste to be reduced by 40 per cent per meal between 2017 and 2020;
- Finished product packaging and disposable tableware to be reduced by 20 per cent per meal between 2017 and 2020;
- Vegetarian offer to be increased by 2020;
- use of compostable tableware;
- offer seasonal menus in order to reduce road miles and the energy needed for fresh produce production;
- use food from organic farms.

3.2.2.6 Separate waste collection and recycling and composting program (Template OM/E4 and OM/E12)

As mentioned before, football events can easily be considered as a living large town for a day. Therefore, the waste generated in the stadium can easily be aggregated to that generated in households and commerce. In football events, food waste represents an important kind of waste, thus, a system of separate waste collection has to be set up both in the common areas open to the public and in the technical areas reserved to staff and service providers.

The choice of the different waste fraction to collect separately should be taken considering:

- The local waste management regular practices (which are the fractions that are normally collected separately in that Municipality) and the local waste facilities;
- The type of waste that is normally produced in every specific venue' an area (e.g., food waste in restaurant and kiosks in the immediate vicinity of the stadium before the matches, special waste in the infirmary etc.).

In order to set up an efficient waste management collection system during football events, it is necessary to engage different actors like event organiser, Venues and Stadium authorities, Sites Owners and Host cities, Hospitality services and licensed souvenir providers, commercial partners, concessions stand operators, Cleaning Service providers, Waste Management operators, hotels, sponsors, other partners and organisations etc. The bottom line is that the stadium needs to develop a separate collection scheme as similar (if not same) to the one deployed by the local authority in order to facilitate the collection and treatment afterwards. There are cases where a certain local or regional authority had good separate collection performance, but these good results are missing in football games. Football games, given the number of people attending it and the amount of waste can easily improve the overall local waste management performance!

In addition, ad hoc training to waste and cleaning service provider's staff and to all the persons that will work on the event sites and somehow will produce waste is needed.

TACKLE examples:

The Roi Baudouin Stadium in Brussels (Belgium), based on the results of a waste composition analysis, implemented a separate collection scheme using selective collection infrastructure in order to collect

both the waste generated inside the stadium's premises and the waste bins outside the stadium's premises. Sensibilisation campaigns upon the introduction of selective collection inside the stadium's premises was done in order to raise the supporters' awareness. The results of this pilot test were more than satisfactory, as the new collection scheme managed to redirect 120 kg of packaging material from the residual waste. This basically means that the capture rate of packaging material was 83.2%, since 120 kg out of 144.21 kg of packaging material was captured. It also reflected in the total amount of residual waste inside the stadium's premises dropped to 1,120 kg from 1,375.17 kg. The result of the sensibilisation and PMD collection pilot test outside the stadium's perimeter were 10,550 cans collected which amounted up to 2.85 tonnes of empty beer cans which were redirected for recycling.

Even Dragão Stadium in Porto (Portugal) improved their waste management focusing especially on separate waste collection in the office areas. After conducting a waste characterisation analysis, the stadium manager introduced equipment for selective waste collection in the administrative areas and a mixed waste sorting station. Bins for selective collection of plastic and metal packaging, glass and paper and cardboard packaging were installed in the administrative area. All the waste produced by the visitors during a game, as well as the waste produced in bars and restaurants are sent to the sorting station. To be able to sort mixed waste, at least one employee is allocated daily (depending on the volume of waste). After sorting, the waste is stored and sent to the appropriate final destination. This employee places a container in the waste turner and activates the electrical system so that the garbage can be dumped on the table. Afterwards, the employee sorts the waste manually, separating glass for a dedicated container, plastic and metal for another, as well as paper and cardboard and rest for the residual container.

Another case is the Luigi Ferraris in Genoa (Italy). all waste produced inside the stadium, except glass, would not go to recycling plants. The one and only cause of this mismanagement of waste was due to the fact that the stadium was endowed only with bins dedicated to the mixed and unsorted waste. 2 on-site visits were organized at the stadium in order to redefine which containers the stadium was using, which ones were needed and where would it be optimal to place them in order for the waste collection truck to unload them easily. Once the collection scheme tailored for the stadium was agreed on and planned, the new waste containers were handed over to the stadium and the new recycling scheme started.

3.2.2.7 Waste management guide (Template OM/E5)

A good practice is the development of short operative waste management guides aimed at explaining how the waste has to be managed, which are the collection procedures and the equipment to use (different types of bins, bags, temporary waste storage points etc.). Fractions to de separated must be on a clear of which materials and object can go into a specific waste fraction, for example:

- organic waste from kitchens and grass clippings for composting or anaerobic digestion which results in compost and/or energy for further use;
- recyclables, resulting from consumption of plastic bottles, aluminium and tin cans, glass bottles in some cases, or from catering services during the match, like film-based packaging; paper from commerce and offices falls under this category, too;
- general waste, including various non-recyclable single-use items, or simply material non-suitable for recycling.

These guides must be distributed among all the subjects that are going to work on the event sites in duly time: they must have time to understand the procedures, ask for help in managing particular situation and familiarise with terms and equipment.

Waste management guide can be prepared for every stadium.

3.2.2.8 Engage fans in waste collection operations (Template OM/E15)

In addition to the collection of cups during a bowl sweep by a crew of stadium workers, fans are challenged to collect plastic cups from the seating area. Cups are brought to a designated area where they are exchanged for tickets which can be redeemed for prizes. This idea improves of separate waste collection plus fans environmental awareness raising.

3.2.2.9 Donate unused prepared food (Template OM/E14)

It is suggested to create a project to donate unused prepared food. All teams committed to pack up all such concession food on game nights for redistribution to local shelters and other places that serve people in need (distributed to charities working with people living in conditions of poverty). Several tons of food are diverted from landfills and incinerators and it can reduce greenhouse gas emissions through this initiative.

TACKLE example:

In order to eliminate food waste, the stadium catering of the Luigi Ferraris in Genoa (Italy) agreed to redirect all leftovers to charities. The identified stakeholders were the stadium catering as well as a local charity which distributes food to the homeless. Over four months of pilot test the stadium catering stadium met with the charity six times and donated over 170.5 kg of food. The environmental impact is very high and positive as it avoided the creation of organic waste, and from an economic point of view it contributed to food waste avoidance and spending money for the treatment of waste. Disregarding the carbon footprint and the emissions caused by food preparation or land use change, as well as its transport and storage to the stadium, the estimated CO_2 savings this pilot test were estimated based on the emissions caused by the food waste treatment. In Genoa, the food waste originating from the stadium was being collected as unsorted waste and landfilled. Considering the emissions from landfilling food waste at 2.54 kg Co_{2eq} per a kilogram of food waste, the overall CO_2 savings originating from this pilot test is estimated at 433.07 kg CO_{2eq}.

3.2.2.10 Exchange machine pet bottles for tickets (Template OM/E7)

Football events of any kind attract a large audience and since such events last at least 2 hours, food and refreshments are nearly inevitable - especially refreshments, from water and soft drinks to alcohol. These refreshments usually come in single use plastic packaging – cups or bottles, usually due to security reasons. But at the same time, these are the easiest for distribution and they don’t require any additional logistics – washing up, return, storage etc. However, due to these characteristics, such

packaging material becomes a big concern as it makes up a large share of waste in stadiums and sporting venues.

Numerous solutions exist worldwide, which combine deposit schemes, reuse principles etc. The Brazilian Football Confederation, in collaboration with the Ministry of Environment, established the Green Cup, which is a competition for teams from the North and Midwest regions of the country in which the competition is based on the complement of a set of actions that foster environmental awareness through activities such as recycling materials. Part of the efforts made by the Green Cup resulted in an innovative exchange machine in which fans, before and after match events, could exchange PET bottles for tickets. The exchange machine allowed to collect and send in total 2 tonnes of plastic bottles to four different cooperatives affiliated to the national recyclable waste pickers movement.

3.2.2.11 Water refill stations (Template OM/E11)

The USTA Billie Jean King national tennis centre, an American stadium complex and home of the US Open Grand Slam tennis tournament, has some green initiatives in place including installations of water refill stations to encourage people to use refillable water bottles and cut down on single-use bottles. The same practice exists at Fiddler Amphitheatre in Colorado. The Fiddler's Green operations team installed new water refill stations to support guests who want to fill their own reusable water bottles. EXPO Milano 2015 also saw 24 water refill stations installed all over the Exposition Site. Each station had 4 such stations.

3.2.2.12 Reusable cups for drinks (Template OM/E18)

Such installations require reusable cups to be provided to the visitors. The advantages of a reusable cup system are plain for all to see. Provided there is an adequate collection and cleaning system, one cup can be used several times at one event. The Danish experience, as a part of Copenhagen's current Resource and Waste Management Plan (2013-2018), reports on the city administration's partnership with event organisers to test reusable cups to replace single-use plastic cups.

The concept is adding an extra step of logistics to the event-management since reusable cups must be

returned washed after use. However, it adds several benefits including lower CO_2-emissions, higher user satisfaction, less cleaning and a potential economic benefit. A user evaluation conducted at the two-day festival in Copenhagen shows that 98% of the participants would like festivals in general to replace single-use cups with reusable cups.

Spectators at the French Open, Roland Garros, are given Ecocup reusable cups to cut out single-use cups, a simple strategy that has also led to economic savings. The objective of this particular practice is to propose a decision support tool to select the best mode of packaging to serve drinks according to the environmental, economic and logistical constraints of each event organiser or to understand the conditions to be met to reduce environmental impacts.

A life cycle assessment (LCA) was conducted in Denmark in the frame of FORCE project to compare a number of scenarios with either reusable cups or single-use cups. The overall conclusion from using reusable cups instead of single-use cups based on experiences from a festival in Copenhagen shows, that reusable cups need only three use-cycles before becoming an environmental benefit. The study compares single-use cups made of PET at a weight of 12,5g. The reusable cups are made from PP and weighing 41g. Former studies confirm this conclusion. Our results show that if an event with 50.000 servings replaces single-use plastic cups with reusable cups it can save 2.000 kg CO_2. Overall, the LCA shows that the environmental footprint is 60% lower with reusable cups compared to single-use cups.

<u>TACKLE examples</u>:

65,000 reusable cups were deployed for the Ireland - Scotland match before the test was repeated on 8 February during the Ireland – Wales match, again a 6 Nations Cup in the AVIVA stadium of Dublin (Ireland). Just like the majority of reusable cup schemes in events, the customer pays an extra €1 when buying the first drink. The money that does not get returned to customers (due to unreturned cups) is used to wash the cups and is reinvested to replace any unreturned cups. The model is designed to be cost neutral. Customers had very positive feedback and appreciated the efforts the stadium was making to eliminate single use plastics. At the very end of the Ireland – Scotland game, 52,360 reusable cups were returned to the washing facility. If these 52,360 were replaced with single-use plastic pint cups, they would amount up to 418.88 kg. In terms of CO_2 savings, this pilot test achieved a saving of above 2 tonnes of $CO_{2\text{-eq}}$. This saving includes savings by avoiding incineration and manufacturing new single use cups and losses by not incinerating them and the emissions coming from washing. Moreover,

the success of this pilot test is reflected in two different manners, yet very much interlinked, linked to waste management. While the decrease in the collected amount of mixed packaging waste is caused by eliminating single use cups and replacing them with reusable ones, the dry mixed recycling rate increases as the quality of that waste is improved by preventing dirty and wet plastic from being a part of that waste.

Even the Roi Baudouin Stadium in Brussels (Belgium) performed a pilot test on reusable cups. In this case, instead foreseen an extra 1€ on each drink that shall be refund to the customers when the cups would return, the stadium offered a free beer worth of €2.5 for each ten single use cups collected. Through this sponsorship, 674 beers were given for free. In terms of feasibility, this temporary pilot test served well for what would come later with reusable cups. Fans showed motivation and willingness to go back to the bar and take their cups back to the bar. However, even if it was a one-time practice, the pilot test obtained good results. The temporary pilot test ended with 6740 single-use cups collected through the temporary scheme, which equals to 24.2 kg of single-use plastics which were sent to an appropriate treatment. It resulted in 143.44 kgCO_{2eq} savings.

3.2.2.13 Bio-digester implementation (Template OM/E8)

There are sport clubs that have certain measures and practices in place as a part of an overall strategy or a programme. Such is Philadelphia Eagles of the American National Football League that started the programme “Go Green” in 2003 in order to be more environmentally responsible. In particular, among others, they focused on two event management related practices and improvements.

The club installed a bio-digester that decomposes pre-consumer food waste and can handle up to 150 kg daily. For a successful and efficient usage of this installation, both fans and employees play an active role as they are encouraged to use proper containers during each match event. Since the installation, the digester digested more than 6.7 tonnes of food waste.

The practice adopted by Philadelphia Eagles allowed reducing the costs associated with the collection and disposal of waste. However, the initial costs of acquiring and installing such a technology and necessary equipment hinder and affect the practice’s replicability potential.

3.2.2.14 Bio-plastic cups (Template OM/E10)

Apart from this installation, the club also uses cups made of bio-plastics and thereby joined a large number of other clubs who decided to replace single use plastic cups with more sustainable solutions. However, these solutions differ and the environmental sustainability depends a lot on the characteristics of the cups, their origin, the afterlife, disposal options etc. But replacing cups used at events is usually proven to be an easily replicable practice.

3.2.2.15 Reuse electronical and electrical equipment (Template OM/E20)

Modern sporting events, especially the most popular ones across the world such as football, the Olympics and other popular sports regionally (hockey, basketball, handball …) not only attract millions of spectators, stadium goers and those in front of TVs combined, but also require a modern coverage. This implies a whole set of electronic and electrical equipment in order to provide the best experience to those attending or watching the event. It is rather easy as the technology continuously improves. However, the continuous improvement also leads to perceived and planned obsolescence or simply outdated equipment.

There are several different approaches to this issue – leasing, proper WEEE management (including collection and treatment), donations etc. Over a year before the London 2012 Olympic Games, the London Organising Committee for the Olympic and Paralympic Games (LOCOG) approached selected leasing companies to buy technological equipment at the outset and then rent it back to LOCOG for the duration of the Games. The outcomes of this project were:

- **Computing equipment**: 60% of laptops, computers and servers (some 16,500 items) were, by the time a contractual agreement had been made with suppliers, earmarked to go back to schools. It was initially planned that these assets would be offered to schools within only the six London Boroughs. A decision was later taken to widen the geographical scope of recipients such that children across the whole of the UK could benefit from the Games legacy.
- **Televisions**: televisions were procured using a ‘buy-back’ condition with an independent

resale organisation and a ‘preparation for re-use’ requirement on the supplier (Panasonic). Once the Games were over, televisions would be taken back by the supplier for reconditioning to a standard where the original warranty was valid. Some 8,168 televisions were re-used in this way, diverting over 160t of potential waste from landfill.

These significantly reduced the amount of time and resources LOCOG had to employ in order to meet its target of re-using or recycling at least 90%, by weight, of the material associated with venue installation and decommissioning.

3.2.2.16 Gold, silver and bronze medals with metals recovered from used electronic appliances (Template OM/E16)

The upcoming Olympic games in Tokyo in 2020 will also see some innovations in terms of WEEE management. Through a project called Tokyo 2020 Medal Project: Towards an Innovative Future for All, gold, silver and bronze medals for use at the Tokyo 2020 Games will be manufactured from gold, silver and copper metal materials recovered and extracted from used consumer electronic appliances such as used mobile phones, so-called “urban mines” donated by people across Japan. This project which is supported by people’s effort will be a good demonstration of ways to build a more sustainable society using resources

Under such circumstances, “Tokyo 2020 Medal Project: Towards an Innovative Future for All” aims to achieve that the whole amount (100%) of the gold used in the medals for the Tokyo 2020 Games will be applied by recycled gold material from collected used consumer electronic appliances donated by people through making the best use of Japanese technological expertise as well as with support from many Japanese citizens towards utilising eco-friendly recycled metals to create medals.

3.2.2.17 Operating with generators (Template OM/E17)

Modern stadiums can be considered like an artificial city, taking into consideration the number of people visiting one during an event. They have their own commercial zones, catering options and much more. Energy is an essential element for each stadium’s functionality. However, there are still cases where generators play an important role. Generators consume a baseline of fuel even if they are not

employed at capacity, and the “fuel consumed” versus “power generated” relationship is not linear. Efficiency is therefore largely determined by load. A good rule of thumb is that around 70-80% load is perfect (optimum). Going downwards, anything between 80% and 50% load is still good (reductions in efficiency are marginal), but as the load goes down from 50% to 25% efficiency reduces. The “danger zone” is below 25% with low efficiency. Below 10% one needs to really start thinking about better ways to manage power.

For example, create fuel cost savings by using a number of generators in sequence that operate only in times of peak demand, rather than running one large generator continually. Share generators across the site for example power for toilets, multiple catering outlets and field lighting could all be driven from one source.

In addition, the plan of the energy use by creating an energy use map for your whole event could be considered a good practice, for example through the following activities:

- Know demand peaks and troughs and what levels they will reach.
- Know where energy is consumed; stage, lighting, campsite, catering, heating.
- Specify energy requirements correctly by understanding what power is needed and working with the supplier to create efficient solutions.

3.2.2.18 On-site communication means (Template OM/E3)

Communicating new measures and practices to game goers, which usually span over several different age groups, cultural backgrounds, gender etc. is always a challenge as it is an essential step towards a successful implementation. Fans and spectators need to recognise and acknowledge where environmental measures were taking place in stadiums and how they themselves could contribute. The experience shows that it is essential to define the precise location of posters and stickers as early as possible.

Examples are plenty and they include modern means of communicating objectives, reasons behind the implementation of a certain measure and can be found in different forms, including passive-aggressive messages, acknowledging people’s efforts, offering alternatives and many more. For instance, stickers

and posters featuring the Green Goal logo attracted attention to areas where environmental measures were taking place, such as the installation of water-saving valves in toilets and the use of reusable cups to reduce waste at the Women Football World Cup Germany 2011. In other areas, the involvement of fans was acknowledged with posters like the one which read “Did you travel here by public transport? If so, thank you for supporting the FIFA Women's World Cup 2011 Environment Campaign!” Eye-catching stickers and posters were often positioned in busy areas, so it can be safely assumed that a large proportion of fans were reached.

On the other hand, The University of Southern California’s game-day composting and recycling initiative incorporates education with a dash of humour. The team laminated and posted humorous signs based on popular Internet memes near waste diversion stations around athletic venues and in the tailgating areas at football games.

The replicability potential is very high in case of this measure, as it can be adapted to local or national communication patters, sense of humour and can be customised very much in order to reach as many attendees at stadium events as possible.

3.2.2.19 Volunteers environmental training and contribution (Template OM/E2)

Whatever good practice a stadium or a football club decides to implement, communicating these practices and bringing it closer to the game goers is as important as the practice itself. Because the practice makes sense only if exploited by the people attending the event.

Most of major events involve several volunteer active participations during the event: volunteers usually provide information to spectators and are trained on some basic topics (security and safety, general organisation, public transport station locations etc.).

Engage volunteers in spreading the event’s environmental objectives and ask for their help in sharing on the most environmentally friendly behaviour can make the difference.

Volunteers can be hired in every event.

3.2.2.20 Reuse of banners (Template OM/E21)

Advertising and information dissemination in stadiums may involve promotional objects that may come in physical or digital formats. Although digital communication should be preferred, some physical banners and other accessories still exist. The material of these advertising banners is mostly made of PVC (polyvinyl chloride), with physical characteristics of durability, flexibility, and low flammability. In order to not sending banners to landfills, event organisers should donate banners to employees or entities and institutions that are interested in the reuse of this material or reuse them in their own facilities (e.g., segregation of benches for safety and protection of fans, protection of spaces susceptible to infiltration and in the operation and management of the stadium as protection of turnstiles).

TACKLE example:

FC Porto has, annually, about 5,000 m^2 to 6,000 m^2 of advertising banners. This volume corresponds to between 2,000 kg and 2,500 kg of PVC that would be disposed of. FC Porto is prefers not sending banners to landfills, always focusing on advanced treatment and disposal options.

- 5% for Energy Recovery;
- 15% for donation;
- 80% for reuse in FC Porto's own facilities .

Scoring of the **Event** practices

ID	Description	Economic Feasi-bility	Environmen-tal Management Potential	Tech-nical Feasi-bility	Replica-bility Potential	Ave-rage score
OM/E1	*Promote reuse and increase the life of sports equipment*					**2,75**
OM/E2	*Volunteers environmental training and contribution*					**2**
OM/E3	*On-site communication means*					**2,25**
OM/E4	*Separate waste collection*					**2,5**
OM/E5	*Waste management guide*					**2**
OM/E6	*Reusable temporary structures*					**2,5**
OM/E7	*The exchange machine pet bottles for tickets*					**2,5**
OM/E8	*Bio-digester implementation*					**2**
OM/E9	*Recycled plastic from ocean to realse football clothing*					**1,75**
OM/E10	*Bio-plastic cups*					**2,5**
OM/E11	*Water refill stations*					**2,75**
OM/E12	*Recycling and composting program*					**2,5**
OM/E13	*Life extension for staff uniforms*					**2**
OM/E14	*Donate unused prepared food*					**2,25**
OM/E15	*Engage fans in waste collection operations*					**2,5**
OM/E16	*Gold, silver and bronze medals with metals recovered from used electronic appliances*					**1,5**
OM/E17	*Operating with generators*					**2,25**
OM/E18	*Reusable cups for drinks*					**2,5**
OM/E19	*Low environmental impact food (e.g., vegetarian)*					**2**
OM/E20	*Reuse electronical and electrical equipment*					**2**
OM/E21	*Reuse of banners*					**2.5**

High score **Medium score** **Low score**

3.2.3 Stadium Management

Stadium management is a broad concept used to define an integrated and systematic process to support and improve the effectiveness of the primary activities and key services provided within the stadium, before, during and after a sport event. Accordingly, stadium management envisions a wide array of very diverse activities, ranging from the management and maintenance of buildings, facilities and infrastructures to the provision and monitoring of key primary services (such as water and energy).

Effective stadium management is crucial for ensuring the functionality, safety and comfort of sports events, and, consequently, satisfy spectators' demand for safe entertainment and further attract people to attend stadia. In this perspective, activities such as the ordinary and extra-ordinary maintenance of infrastructures (such as buildings, parking spaces, electricity and water supply systems) emerge as a core function of stadium management. Similarly, the provision of adequate equipment, cleaning and security services are further aspects of stadium management.

At the same time, stadium management plays a crucial role in the business model of sport events to ensure the economic sustainability of events. Stadium management envisions tools and methods for evaluating the performance of the services provided, setting improvement objectives and ensuring that established goals are met. Assessing services performance by monitoring key indicators is indeed a crucial function of stadium management, aimed at quantifying the effectiveness and efficiency of operations, reducing waste of resources and planning optimisation strategies.

Altogether, stadium management refers to a set of transversal and interdisciplinary support services that, once integrated within a coherent management system, are essential to the functionality of sport events in stadia. As a result, stadium management emerges as a very complex activity, which requires shared efforts from diverse actors (from stadium's employees to contractors) and affects multiple stakeholders (such as supporters, athletes and local communities). Nevertheless, stadium management is a primary responsibility of the stadium manager, who is appointed to supervise and coordinate each aspect of this challenging task.

In recent years, environmental concerns have been increasingly integrated in stadium management practice, due to increasing pressures from regulators and the civil society for more sustainable sport

events. Being a transversal and overarching activity that supervise most of the services provided within stadia throughout all the phases of an event life cycle, stadium management provides several important opportunities for "greening" sport events.

First, stadium management is responsible for setting up and maintaining basic infrastructures of the stadium. Accordingly, "green building" principles could be applied to reduce the overall environmental impact of the stadium's infrastructures throughout their life cycle (from design to construction, from maintenance to renovation). Such principles focus on improving resource efficiency of buildings, by adopting greener technologies and more sustainable materials, and by deploying environmentally responsible practices. More specifically, "green building" principles pursue the improvement of the following aspects: *a)* sustainable materials and materials efficiency; *b)* energy efficiency; *c)* water efficiency *d)* waste reduction and waste recycling.

Solutions for improving the sustainability of materials, and materials efficiency, concern the adoption of technologies or processes that allow reducing resource consumption and environmental impacts deriving from the maintenance of stadium's infrastructures.

3.2.3.1 Seats made from recycled material (Template OM/SM24)

Under this point of view, since stadium's managers have always to substitute a significant number of damaged seats after each match, it would be the case to look for seats made from recycled materials instead of virgin plastic ones.

TACKLE example:

The Stadio Olimpico started replacing broken and old seats with 40% recycled seats. Recycled plastic seats are not significantly more expensive than regular ones, especially if the stadium orders a large number of seats. The carbon emission savings could be significant on the long run, especially if the stadium substitutes all its seats. Furthermore, it could also have a reputational positive impact and educational and engaging side effects if properly communicated to supporters. Based on SimaPro software for LCA the environmental benefits of the adoption of recycled seats compared to virgin plastic seats achieve a carbon footprint reduction of -35% and a water footprint of -41%. If we look at

one seat, which weights 1.75 kg comparing the two different seats, one made of 100% virgin polypropylene and the other with 40% recycled plastic (0.7 kg of recycled plastic and 1.05 kg virgin polypropylene) the carbon footprint drops down from 5.34 $kgCO_{2eq}$ (100% virgin plastic seat) to 3.47 $kgCO_{2eq}$ (40% recycled plastic seat) while the water footprint decreases from 1.65 m^3 water eq (100% virgin plastic seat) to 0.98 m^3 water eq (40% recycled plastic seat)

3.2.3.2 Organic or artificial pitches and Secondsun technology (Template OM/SM10 and OM/SM25)

Furthermore, in the case of stadiums hosting football events, the pitch requires considerable maintenance due to intense wear and tear during matches and to the quality standards required by football clubs, NFAs and UEFA. Accordingly, diverse options could be envisioned to reduce environmental impacts and materials consumption associated with turf treatment and maintenance. At this regard, stadia like the New Lawn, home of the English Football Club Forest Green Rovers, have opted for adopting **organic pitches**, which eliminate the use of fertilizers, pesticides and other detrimental chemicals substances. SecondSun, a Dutch start-up is testing a reflecting panel based system to re-orient and maximise sunlight exposure of natural grass pitches: this is a smart solution for both stadiums sited in Northern Europe countries where natural sunlight is weak and limited or for ensuring a balanced distribution of sunlight on the whole surface of the pitch preventing steady shade areas. As an alternative to the organic pitch, artificial pitches allow eliminating the use of both fertilizers and water for irrigation, while ensuring high level and safe athletic performances.

3.2.3.3 Artificial turf recycling (Template OM/SM1)

Furthermore, smart solutions for improving materials efficiency include recycling worn out artificial turf by means of a mechanical process that separate waste from recyclable materials (such as grass fiber, sand and rubber) which are then used for producing new plastic materials. Similar processes allow recycling up to 99% of worn out artificial turf.

3.2.3.4 Temporary buildings and facilities made from recycled materials (Templates OM/SM8 and OM/SM13)

Further solutions for materials efficiency and sustainability may involve the use of recycled materials, or other low-impact materials, in the construction of facilities such as temporary stands or tends. Temporary facilities are indeed frequently required at large events; they are built for a specific event and then dismantled or removed on its conclusion. These temporary facilities may include tents for catering and medical aid, restaurant and sanitary facilities, media centres and offices, terraces and stands. Low-waste and resource-saving construction methods are therefore of particular importance in this area: the construction of sports facilities indeed involves considerable emissions of greenhouse gases and airborne pollutants as well as the use of land and resources. To prevent or reduce environmental impact, temporary facilities may be built using modular, durable and reusable materials in order to extend their life cycle, while the use of consumable materials should be limited as much as possible to prevent waste generation. As an alternative, temporary structures may be rented. Similarly, the use of facilities produced using recycled materials is a simple and smart solution for reducing materials consumption and waste at the source.

3.2.3.5 Use of environmentally-friendly products (Templates OM/SM12, OM/SM15 and OM/SM21)

The use of environmentally-friendly products in maintenance, cleaning and renovation of facilities and structures is set to considerably improve stadiums' environmental performance. Simple and economically-efficient solutions for greening the above-mentioned activities may envision the use of products certified according to reliable environmental certification schemes (such as the EU-Ecolabel), and abandon products with a worst or unclear environmental performance. Similar environmental criteria can be applied for procuring environmentally-friendly products that can be commonly used in a wide array of activities, even the simplest ones. For instance, environmentally-friendly paints can be adopted for the maintenance of stadiums' infrastructures and buildings, greener cleaning products may be adopted for cleaning seats and terraces, and even EU Ecolabel sanitary products (such as sanitary paper and napkins) may be provided in the stadium's toilets.

3.2.3.6 Biodiversity and green spaces management (Template OM/SM19)

The final and most relevant aim of environmental management should be preserving green areas sited in the proximity to the stadium and, most importantly, protecting the biodiversity of the natural environment where the stadium is located. Stadium management activities should be designed taking into consideration the specific needs and characteristics of local fauna and flora that could be affected by stadium activities, in order to avoid causing harm to biodiversity. To this aim, so-called differentiated management should be applied, according to which operations are designed and scheduled according to the quality of local green areas.

3.2.3.7 Switching modes (Template OM/SM4)

As previously noted, optimising the use of resources along all primary processes and activities is a fundamental function of stadium management. However, optimisation goals must guarantee that key services are effectively provided and that spectators' needs and expectations are met, especially in terms of comfort, accessibility and safety. Balancing efficiency and customers' satisfaction requires stadium managers to understand resource consumption parameters associated with each key service and monitor how such indicators fluctuate during peak hours and slack hours (for instance, during and before/after game time) in order to identify optimisation opportunities based on the differentiation of key services. This is especially relevant for energy-intensive primary services, such as lighting and heating, whose energy requirements made up large part of stadium's energy consumption, as well as energy bills.

To improve energy efficiency, adopting an integrated building management system is a necessary step for collecting data on energy consumption associated with services like heating, conditioning and lighting provided throughout the stadium. Energy management tools allow monitoring real-time operational data in order to elaborate modular energy efficiency schemes based on data collected. Innovative management systems include cloud-based solutions for controlling services through a unique centralised in-cloud hub, considerably reducing time and personnel efforts. Similar tools support stadium managers to monitor energy needs and efficiently distribute energy throughout the

venues during peak times, avoiding service interruptions due to electrical overloads and controlling energy consumption associated with lighting, heating and conditioning systems.

3.2.3.8 Heating modulation and control programs (Template OM/SM22)

Heating is often one of the most energy intensive and expensive services provided within stadia. However, several solutions can be adopted to improve energy efficiency associated with heating, therefore reducing energy costs and limiting climate-altering emissions, without undertaking expensive renovation works. First, heating modulation and control programs could be adopted to set precise time programming and modularly regulate temperatures in different areas of the stadium (such as locker rooms, offices, gym etc.), according to the specific needs of athletes, supporters and staff.

3.2.3.9 Hydraulic balancing of heating supply lines (Template OM/SM6)

Other smart solutions for optimising energy consumption in relation with heating services may envision installing hydraulic balancing valves in the heat supply lines across the stadium. Hydraulic balancing valves control the flow rate of hot water, evenly distributing heat to the different radiators according the specific output demand. The purpose of hydraulic balancing valve is to correctly regulate the correct amount of heat in every area of the stadium based on the required heat output in the pipeline network, therefore avoiding overheating areas located closer to the heating centre while inadequately supplying areas that are unfavourably located. This simple measure simultaneously allows to improve comfort of the building, by avoiding excess or inadequate heating, while reducing waste of energy and avoidable CO_2 emissions in the atmosphere.

3.2.3.10 Light management optimisation (Template OM/SM5)

Lighting constitutes a relevant energy intensive activity in stadium management. However, it offers several smart and economically efficient opportunities for improvement based on the adoption of energy-saving and cost-efficient technologies. First, the adoption of energy-saving light bulbs, such as

LED or fluorescent lights, as a replacement to more energy-intensive incandescent or halogen light bulbs, is set to produce relevant energy savings. Besides adopting LED lights, which are considered particularly efficient in the case of field lighting, efficiency could be improved by adopting a modular regulation system for floodlights, which allow regulating the intensity of floodlighting according to a specific timing or demand, in order to avoid lighting the pitch at full capacity when not necessary.

3.2.3.11 Reduce transformer voltage (Template OM/SM3)

Efficiencies associated with better light management can be conspicuous. For instance, as a result of improving floodlights' energy performance, the Berlin stadium opted for reducing transformer voltage, from 420 to 400 volts. This decision allowed considerable cost savings (estimated 10,000 euros per year), as well as indirectly extended the equipment lifespan, and reducing CO_2 emissions. Besides floodlights, further solutions may be adopted to regulate lighting in other areas of the stadium, such as locker rooms, washrooms and offices. In such areas, presence detectors could be installed in order to reduce the amount of time such rooms are lighted when not necessary.

3.2.3.12 Renewable energy power plants in stadium (Template OM/SM9)

Environmentally proactive stadia can decide to move ahead of energy efficiency and directly generate green energy, such as solar energy. Sports facilities frequently offer sufficient space for installing photovoltaic panels – whether on roofs or in the immediate vicinity of the stadium. It is important to notice that photovoltaic plants are not only of interest for new buildings, but they can also be retrofitted to existing sports facilities. The energy generated is usually not directly supplied to the sports facility, but is fed into the power supply network. Installing solar or wind power plants allow reducing energy costs, while reducing climate-altering emissions.

TACKLE example:

With the aim of reducing dependence on diesel generators, and enhancing energy efficiency of operations while limiting emissions, the Paolo Mazza Stadium in Ferrara (Italy) assessed the feasibility, both technical and economical, of installing photovoltaic panels in the stadium to generate

solar energy to feed into the power network. Given the size of the roofs of the stadium's North and East stands, the provider of solar panels suggested installing two panels on the Northern block and one panel on the Eastern one. In total, the three panels would account for 335 kWp (kilo Watt peak, i.e., maximum power that the panels can produce).

3.2.3.13 Storm water management system and rainwater recovery system (Template OM/SM11 and OM/SM23)

As far as concern water efficiency, diverse typologies of water conservation systems are frequently adopted to reduce the amount of water consumed for activities like turf irrigation, which do not require the use of potable water. Conservation systems may simply envision installing water-efficient plumbing fixtures for monitoring water flows through drip irrigation techniques, while more complex systems may include water recovery systems via drainage of land and ditches. Solutions for reducing stadiums' reliance on external water supply include adopting storm water management systems or rainwater recovery systems. Similar techniques may require installing modular rainwater tanks on the top of stadium's roof surfaces, drainage pipes that connect collector tanks to storage tanks and filtering systems for ensuring water quality, as well as hydraulic and sanitary safety. Besides reducing water consumption, similar practices are particularly useful for avoiding water shortages during interruptions of public water supplies.

3.2.3.14 Dry urinals, renovation of urinal flashing and other water-saving practices (Template OM/SM2)

Besides the use of rainwater, several simple and easily replicable solutions may be adopted for reducing water consumption, also in relation with activities that require the use of potable water. For instance, installing low-flow showerheads and aerated taps in locker rooms and gym, adopting ecological flushing systems with double discharges option and self-closing taps in the toilets, water- free dry urinals across the stadium areas etc. Despite being easy to replicate also in already existing facilities, these practices offer great opportunities for reducing the amount of water consumed in routine stadium management activities. Indeed, according to data provided by Green Goal Legacy Report in 2006,

more than 40% of the total amount of expensive potable water consumed in World Cup stadiums is associated with the use of toilets and urinals.

3.2.3.15 Waste collection operations (Template OM/SM18)

With regard to waste management, efforts should be undertaken to implement practices aiming at facilitating separate waste collection, increasing the amount of waste that is recycled rather than sent to landfills and, most importantly, reducing waste generation at the source. As far as concern waste collection, stadia may face restrictions on the number and type of bins that can be located across stadium areas, because of safety and security concerns. Therefore, separate waste collection and sorting is often carried out by cleaning service companies that take care of collecting waste produced by supporters and spectators after game time.

3.2.3.16 Organic waste management (Templates OM/SM14, OM/SM17, OM/SM25)

Once collected and sorted, compostable waste materials (such as food waste and worn out grass turf from the pitch) can be converted into reusable compost. Waste conversion and composting allows diverting considerable amount of waste from the landfills, as well as reducing costs associated with waste disposal, by producing compost that can be used for gardening and farming. Similarly, other materials like cooking oil utilised for food preparation could be recovered and recycled for producing biofuels. For instance, Geoffroy Guichard stadium in Saint-Etienne (France) lighting system runs on biodiesel produced from recycled cooking oil previously utilised in the stadium. However, similar initiatives imply installing machineries, such as compactors and organic dehydrators, and having adequate infrastructures for treating waste on-site under safe conditions.

3.2.3.17 Sustainability awards (Templates OM/SM20)

To promote the adoption of environmental practices and foster sustainability of sport events, NFAs and other sport organisations could establish sustainability awards or prizes in order to engage football

clubs, stadium managers, as well as other relevant stakeholders (such as suppliers, contractors and supporters). Sustainability competitions could be organised at the national level: committees could be appointed by NFAs to monitor sport events and evaluate environmental performance based on environmental criteria like sustainable food, green procurement criteria, waste management and carbon footprint. Similar initiatives could help engaging diverse stakeholders and foster a collective and proactive commitment to environmental performance, leveraging the expectations of reputational gains.

3.2.3.18 Faucet aerators (Templates OM/SM26)

On a daily basis, stadiums record high consumptions of water in bathrooms, changing rooms, for lawn watering, washing benches and floors, among others. The installation of faucet aerators (mixture of air and water) in areas such as public bathrooms, pantries, office bathrooms and maintenance areas enable organisation to reduce water consumption, avoid water scarcity and successively reduce associated costs. After the selection of the faucet aerator by the procurement department, the maintenance team can gradually install the faucet aerators in the different areas. One of the advantages of this test is that water saving is a widely popular subject, with many solutions and opportunities to choose from on the market. Another factor that makes this test easy to apply is the fact that internal resources can be used, such as a maintenance team, to carry out the installation of the faucet aerator, without the need for an external contractor. The application of faucet aerators saved 20%-25% of the water previously consumed.

TACKLE example:

Having already several practices for water savings in place FC Porto proposed a pilot test which would see an installation of faucet aerators (mixture of air and water) in areas such as public bathrooms, pantries, office bathrooms and maintenance areas in order to reduce water consumption, avoid water scarcity and successively reduce associated costs. The objective of the pilot project was to reduce water consumption, maintaining a feeling of comfort for users (perceiving water pressure). To start the pilot test, areas for placement of faucet aerator were identified. Public bathrooms (for visitors), pantries,

office bathrooms and maintenance areas were defined and the number of equipment to be installed was counted. Subsequently, the market was analysed, and several suppliers were contacted for the purchase of faucet aerators, the objective being to reduce water consumption, maintaining a feeling of comfort for users. After the market study, different brands and models were selected and tested in order to choose the best one in terms of value for money. The indicators for tap selection focused on choosing the best one for: lower pay-back; greater water savings, greater sense of comfort, best value for money. After selecting the faucet aerator, the maintenance team gradually installed the faucet aerators in the different areas. In practice, the application of faucet aerators allows clubs to reduce costs related to water consumption and management. It turned out to be a very affordable solution, as one aerator costed merely €1.13. With 64 aerators installed, the cost of this pilot test amounted to €72.32.

Scoring of **Stadium Management** practices

ID	Description	Economic Feasibility	Environ-mental Management Potential	Technical Feasibility	Replica-bility Potential	Ave-rage score
OM/SM1	*Re-match artificial turf recycling*					**2**
OM/SM2	*Dry urinals and renovation of urinal flashing*					**2.75**
OM/SM3	*Reduction of the transformer voltage*					**2.25**
OM/SM4	*Energy management systems*					**2.5**
OM/SM5	*Optimised light management*					**2.75**
OM/SM6	*Hydraulic balancing of supply lines*					**2.25**
OM/SM7	*The organic dehydrator*					**1.75**
OM/SM8	*Temporary building sustainable options*					**2.75**
OM/SM9	*Stadium solar plant*					**2.25**
OM/SM10	*Stadium organic or artificial pitch*					**1.75**
OM/SM11	*Storm water management system*					**2**
OM/SM12	*Green cleaning products*					**2.5**
OM/SM13	*Recycled stadium's carpets*					**2**
OM/SM14	*Cooking oil management*					**2.5**
OM/SM15	*Low-emitting paints*					**2.25**
OM/SM16	*Water conservation system*					**2.5**
OM/SM17	*Conversion of waste into reusable compost*					**2.25**
OM/SM18	*Waste collection operations*					**2.5**

OM/SM19	*Biodiversity and green spaces*					**2**
OM/SM20	*Sustainability award*					**2**
OM/SM21	*Sanitary paper*					**2**
OM/SM22	*Establish a heating modulation and control program*					**2.25**
OM/SM23	*Rainwater recovery and reuse*					**1.75**
OM/SM24	*Revet recycled plastic seats*					**2.5**
OM/SM25	*Secondsun technology*					**2.25**
OM/SM26	*Faucet aerators*					**2.75**

High score **Medium score** **Low score**

3.2.4 Procurement

Green Procurement (GP) may be defined as a process whereby organisations seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured.

At the European level, the GP approach has been endorsed in a number of EU policies and strategies concerning public procurement and recognising its potential to encourage a more sustainable use of natural resources and establish behavioural changes for sustainable consumption and production. Major studies aimed at identifying those products that have the greatest environmental impact throughout their life cycle, single out three areas as having the greatest impact: food and drink, private transport and housing. Together, they are responsible for 70 to 80% of the environmental impact of consumption, and account for some 60% of consumption expenditure. The Food and drink area, in particular, causes 20 to 30% of the various environmental impacts of private consumption, and this increases to more than 50% for eutrophication[1]. In such a context, GP can be a major driver for innovation, providing industry with real incentives for developing green products and services and stimulating the markets towards more sustainable solutions.

Stadium managers should adopt a Green Procurement system aimed at orienting the behaviour of all the main stadium's suppliers toward the use of eco-compatible materials, the minimisation of resource consumption and the reduction of the environmental impact of their products and services. At the same time, stadium's managers should try to influence also their key partners, sponsors and necessary contractors (i.e. necessary contractors that cannot be substituted such as the local waste operator or the local recycling facilities) towards the adoption and implementation of green criteria in their daily operations and in the selections of their own suppliers.

Green Procurement in Stadium management can affect overall adverse environmental impacts in the three main detected relevant categories: private transport, housing and food and drink. In relation to private transport, stadium manager can conclude ad hoc agreement with local transport companies to

[1] Environmental Impact of Products (EIPRO). Analysis of the life cycle environmental impacts related to the final consumption of the EU-25, http://ec.europa.eu/environment/ipp/pdf/eipro_report.pdf.

push supporters preferring public transport means (please, see chapter 3.2.5 of this Guidelines). In terms of housing, the easiest equivalence can be made with the stadium's infrastructure and its adoption of green building criteria: this is something that stadium managers can address in a very limited way since, apart from some renovation intervention and the instalment of renewables sources of energy, there is little they can do to modify a pre-existing building. And, in any case, renovation and renewables instalments are costly interventions that not all stadiums can afford.

Some smart solutions on these aspects are described in the chapter dedicated to stadium management of this guideline (please, see chapter 3.2.3 of this Guidelines) however, there are some procurement choices that can help addressing this issue as well.

3.2.4.1 Certified green energy (Template OM/PR1)

In fact, if the instalment of renewables is not feasible or, in any case, not sufficient to cover the whole amount of energy required to ensure stadium's functioning, one solution could be the purchase of certified green energy, i.e., energy produced by renewables sources and fed into the electric grid.

Ideally, the total amount of green energy to purchase should equal the effective energy consumptions of the stadium, deducted the amount of energy already generated by renewables, if any. However, certified green energy can be more expensive to purchase and thus, the effective coverage of the whole amount of energy consumption could not be always possible: in this case, also a partial purchase of green energy would be preferable than nothing.

In certain cases, there could be also a pre-existing long-term contract of energy provision with a certain contractor that does not foresee the possibility to buy green energy. A smart solution to this impasse could be the purchase of an equivalent amount of green certified energy to fed into the concerned national grid, as a sort of "compensation for equivalent". This is not, for sure, the preferable solution, however, it can work for overcoming previous energy provision contracts that did not foresee the purchase of certified green energy.

3.2.4.2 Food packaging guidelines (Template OM/PR4)

In relation to drink and food instead, there are several green criteria that can be useful to prevent food waste and food related waste, i.e., food packaging waste. First of all, stadium managers might think about elaborating food packaging guidelines to distribute among their caterers and food and beverages providers and sub-contractors and concessionaries (e.g., kiosks and food trucks next to the stadium's entrance.

3.2.4.3 Biodegradable and compostable tableware (Template OM/PR3)

In general, food packaging should be minimised and avoided at all when possible: one solution, could be the adoption of reusable and washable tableware. When disposable tableware is necessary however, these guidelines should suggest which type of food packaging materials should be avoided (e.g. plastics) and which should be preferred. In particular, one solution could be the adoption of biodegradable and compostable tableware and food packaging in general. This would be particularly useful when adopted in municipalities that collect organic waste as a separate waste fraction and have easy access to composting plants.

3.2.4.4 Selection of cleaning and waste service providers (Template OM/PR 5)

In order to maximise separate waste collection at the stadium and in its vicinity, a proper waste management plan should be adopted by stadium managers (please, see chapter 3.2.3) and some procurement solutions should be considered as well. First of all, the selection of the cleaning and waste service provider is crucial for ensuring the success of the waste management plan. This should ensure the inclusion of ad hoc green criteria, e.g., on detergents and cleaning procedures, and the necessary alignment with waste management procedures aimed at maximising waste production and separate waste collection. If these objectives are set in the bids' offer and constitute a selection criterion, the

provider will be more committed to achieve them and could also be considered liable if they are not met at certain level.

3.2.4.5 Waste bins selection (Template OM/PR6)

In addition, waste bins selection can seriously affect the success of the waste management plan: it may seem a secondary issue, but it can actually make a huge difference. In fact, bins should be strategically positioned in accordance with the expected different types of waste streams production (e.g., paper container next to stationery and organic bins next to food and beverages providers) and they should be all the same type and reproduce the same infographics and colours in order to be easily detected and distinguished by the public. These precautions can strongly affect supporters' behaviour and influence over the final separate waste collection percentages.

3.2.4.6 Merchandise and promotional materials (Template OM/PR2)

Finally, waste should be prevented in the first place: this means that some green criteria could be set as waste prevention measures. For instance, in occasion of football matches, it is quite common to distribute merchandise and promotional materials as well as choreography aimed items: these are often disposable products that end up in the unsorted waste fraction. The insertion and adoption of green criteria in the selection of all these types of products could effectively prevent the generation of a significant amount of waste.

3.2.4.7 Green Procurement Guidelines (Template OM/PR7)

These abovementioned measures could be collected in Green Procurement Guidelines that should serve as an internal document for all the main Stadium's direct purchases and that could also be distributed among all the Stadium's suppliers, contractors, partners and sponsors in order to align all these key subjects with the Stadium's approach to green provision of its main goods and services.

In the elaboration of such guidelines, the following aspects should be taken into consideration. At the general level, the inclusion of environmental criteria may relate to all stages of the procurement process, from supplier selection, technical specification, evaluation of suppliers, awarding of contracts, auditing and improving supplier performance and on-going contract management. Whilst different partners, contractors and sponsors may have different procurement terminology, the procedures and stages in procurement cycles are often similar:

1. **definition of the object of the contract (subject matter)** – Environmental criteria may be incorporated into the object of various types of contract in different ways. For example, in supply contracts, ecological criteria for the goods supplied may be expressly indicated (e.g. recycled paper for printers and photo copiers);
2. **candidate selection (selection criteria)** – The candidate selection criteria in the call for bids may contain environmental aspects regarding the technical capabilities of the candidates. In this case, candidates are selected on the basis of the evidence they are able to provide to demonstrate their capacity to carry out their activities in an environmentally sound manner, e.g., evidence of the regular environmental training of their staff, or of specific environmental management measures which they routinely apply. A certified environmental management system (such as EMAS or ISO 14001) – if covering and attesting environmental management capacities as laid down in the selection criteria – shall be recognised as evidence of compliance;
3. **definition of technical specifications and contract performance clauses** – Environmental criteria may affect the definition of the technical specifications of the contracts in two ways: *a)* as *technical standards* - e.g., raw material characteristics, quality levels, production methods, etc. as contained in technical laws or regulations or industry standards – incorporated by requiring: I) the use of certain raw or basic materials having low environmental impact; II) specific production processes (e.g. organic foods in food services); III) eco-labels in product specifications. *b)* as *functional and performance requisites* including environmental components (e.g., energy consumption within use). Contract performance clauses may be

included in the call for bids that specify the method of executing works in order to ensure environmental protection. Clauses may address, for example: materials delivery methods; environmental training of personnel; means of transportation; reduction in energy and water consumption during execution of work;

4. **inclusion of award criteria** – Environmental criteria can be incorporated in the assessment of the bids' quality as specific award criteria leading to the final choice of the supplier. For example, the possession of environmental certifications or any other pertinent environmentally friendly feature may constitute a distinctive rewarding "plus" for those contracts whose proper management of environmental aspects is important.

The suggestion is to integrate the environmental criteria in those phases of the contract awarding process being more effective in terms of environmental performance, e.g., via technical specifications criteria instead of award criteria, whenever possible and feasible.

TACKLE examples:

The Romanian Football Association (FRF) implemented a set of rules in order to adopt green criteria in procurement procedures. The FRF's procurement department revised the existing procedure for procurements and modified the procedure. The new procedure implied a new requirement for granting contracts. If the offers could grant the same price and same quality of goods/services. like before, the contract would be given to the offer that can prove the best environmental performance. As confirmed by FRF, this new procedure does not put different green criteria as mandatory requirements, but rather a voluntary provision and could serve as an advantage for companies with better environmental performance. The way companies sending offers would prove their good environmental governance are environmental certificates.

Real Betis Balompié for the Benito Villamarín in Seville (Spain) designed and put in place a procedure which would further result in taking green criteria into consideration when selecting cleaning services provider. In this case, environmental criteria are included in all contracts with environmental impact (cleaning services, maintenance, electricity services, etc.), as these criteria fall under the compliance of legal requirements on environment. Additional environmental criteria (EMS or Ecolabel, among other) were included for the first time. Thus, the first evaluation was carried out at economical and

technical level, while the second evaluation was applied at environmental level verifying companies' compliance with these environmental criteria.

Even the Stadio Olimpico in Rome (Italy) added some amendments aimed at ensuring the addition of green criteria where required by law and when appropriate even if not mandatory by law in the procurement procedure. A matrix with all the main goods and services to be purchased by Olimpico was completed with alignments to the existing environmental criteria set by Ministry or to other useful standards or criteria that could lower the environmental impact of that products ore services' impacts.

3.2.4.8 Recycled choreography products (Template OM/PR8)

Given the large amount of waste generated by the supporters' choreography at the end of football matches, there is the opportunity to reduce the environmental impact of the choreography by using accessories made of recycled and recyclable plastics (recycled LDPE). Recycled polyethylene is mainly obtained from processing waste of industrial products (e.g., plastic bags for the food sector) made of low-density polyethylene (LDPE), followed by adding a portion of virgin material in the mix. LDPE is a thermoplastic polymer made from the monomer ethylene and belonging to the polyolefins group. The regenerated polyethylene utilised in the manufacturing of the flags is both recycled and recyclable, after disposing of it in the appropriate waste stream. Price and performance of choreography items made of recycled materials are equally comparable to choreography items made of virgin materials.

TACKLE example:

The pilot action was feasible as SPAL closely monitors supporters' choreographies for security and safety reasons, and often directly procures materials for its fan base. The TACKLE team identified a supplier of choreography materials (flags) made of recycled plastics (recycled polyethylene). Six thousand flags (3.000 blue and 3.000 white) were ordered and purchased by SPAL for the SPAL - Bologna match, and distributed to the fan base. The size of each flag was 40 cm x 60 cm, weighting 39 g with the thickness of 009 μm, which corresponded to a total of 234 kg of recycled polyethylene for the 6000 flags. Producing 1 kg of recycled polyethylene corresponds to emission of 0.79 kg of CO_2, against emissions of 2.78 kg of CO_2 for producing 1 kg of virgin polyethylene. Accordingly, each 1 kg of recycled polyethylene corresponds to savings of 2 kg of CO_{2eq}. Therefore, the analysis showed

that use of the six thousand flags made of recycled polyethylene resulted in a saving of 936 kg CO_{2eq}, which can be compared to the emissions produced by heating a 60 m^2 apartment for 23 days.

Scoring of ***Green Procurement*** best practices.

ID	Description	Economic Feasibility	Environmental Management Potential	Technical Feasibility	Replicability Potential	Ave-rage score
OM/ PR1	*Buying green electricity*					**2**
OM/ PR2	*Sustainable promotional products*					**2.5**
OM/ PR3	*Compostable and eco-friendly tableware*					**2.25**
OM/ PR4	*Packaging guide*					**2.5**
OM/ PR5	*Cleaning and waste service provider selection*					**2**
OM/ PR6	*Separate waste bins selection and management*					**2.5**
OM/ PR7	*Green procurement guidelines*					**2.5**
OM/ PR8	*Recycled choreography products*					**2.5**

High score **Medium score** **Low score**

3.2.5 Mobility and Logistics

All football events bring together people from different locations. In the case of mega football events, citizens from all countries are attracted to one specific location. Thus, the carbon footprint of them can be considerably high due to the international transportation, especially travels via air-planes, to the locations hosting the event. For example, the 2006 FIFA's Green Goal Programme aimed to organise the most environmentally friendly event by tackling the issues revolving around water and energy usage as well as transportation. During any sporting event, transport has a significant impact on the carbon footprint of the overall event. For the Sydney Olympics the organisers succeeded in providing locally, public means of transportation to and from the venues of the event, however at a greater scale, they did not have any impact on how the international and national spectators and fans arrived in Sydney.

3.2.5.1 Incentivise public transport means (Template OM/ML1)

It is therefore very important to implement practices to increase the use of public transport. Firstly, it is important to convince as many fans as possible to reach the host venue of the event with the means of public transportation that has the least impact on the environment (e.g., rail, buses, bikes, walking, etc.). The methods to put in action this best practice includes the presence of discounts on public transportation to and from the venue of the event as well as the availability of one or more means of public transportation with high frequency, which serve the public since before the beginning of the event to after the end of the event. This best practice allows lowering the CO_2 footprint of an event as well as helping generate higher profits for local transport companies. It is easily replicable, but a key challenge involved in this best practice is the need for connection stations and services between the venues of the event.

3.2.5.2 Hydrogen-powered transportation (Template OM/ML2)

Another best practices to alleviate the CO_2 production during a sporting event is the use of hydrogen energy. Indeed, hydrogen energy has no CO_2 emission. This best practice has the objective to implement hydrogen energy in the both the stadium energy sources as well as for the transportation of fans from one venue to another. The usage of hydrogen energy is replicable. However, it requires the implementation of ad hoc infrastructure. In order to implement this best practice, it is necessary to include it since the conception of the event. Overall, hydrogen-powered transportation can be used for the run-up to the event phase as a means to move material around venues as well as during the staging and managing phase for the transportation of fans and for the closure and post activities for the movement of equipment.

3.2.5.3 Environmentally-friendly vehicles (Template OM/ML3)

The transportation between venues of the sporting event can be transformed into a more environmentally sustainable service by operating environmentally-friendly vehicle fleets. This best practice aims to transform all vehicles employed during the staging of a sporting event, especially VIP and staff vehicles, into environmentally-friendly transportation. For example, the Tokyo 2020 organisers are planning to use fuel-cell vehicles and hybrid vehicles to reduce the impact that VIP and staff transportation as well as fans mobility from the venues will have on the event's carbon footprint. The organisation of environment-friendly vehicles requires planning during the preparatory phase of the event as well as during the actual staging of the event. Overall, it requires strong cooperation between the event organisers and the sponsors, which are usually the main providers of VIP transportation.

3.2.5.4 Logistics (Template OM/ML4)

The transportation of goods and materials is another CO_2 intensive activity during the organisation and staging of a sporting event. The sports equipment for athletes as well as other materials required to be moved from a venue to another contribute to the enlargement of the CO_2 footprint of a sporting event. Nevertheless, measures to reduce the impact of freight logistics exist and many include simple measures such as optimal loading of vehicles, using low-emission fleets, as well as using local materials when possible to avoid the long-distance transportation of equipment and materials.

3.2.5.5 Transportation software (Template OM/ML5)

Often it is hard to plan which transportation solutions are the most efficient and environmentally friendly. Therefore, a suitable best practice can be the implementation of a transportation software. It helps public authorities to find viable solutions for the transportation of goods that are environmentally friendly, allow the reduction of human fatigue and are economically efficient. This software is able to calculate the best routes to employ to reduce the travel distance to sporting events, allowing to further minimise the carbon footprint of the sports sector. Optimouv Software is widely available and is free.

3.2.5.6 Supporters' mobility (Template OM/ML6)

Another important best practice to abate the CO_2 produced by the mobility involved in a sporting event is to communicate to the fans and supporters attending the event the climate-compatible ways in which they can travel to and from the event. Supporters mobility to and from a sporting event venue may require international transportation, meaning that the CO_2 footprint of the event will grow even larger. Since it is often difficult to find all the necessary information about the means of transport to a sport facility, in order to allow fans to travel environmentally-friendly transportation it is very useful for them to receive, together with the programme or invitation to the event, a document with all the

practical information on how to reach the event location with soft mobility to promote environment-friendly transportation. This simple best practice helps minimise the sport sector's carbon footprint with a very easily replicable method. The organising team should be in charge of providing the necessary information on transportation means to all fans.

TACKLE examples:

The Romanian Football Federation (FRF) launches a mobility strategy titles "Host City Strategy". The underlying reason for drafting such a strategy was the upcoming EURO 2020. The comprehensive strategy includes free public transport programme - throughout the duration of UEFA EURO 2020 being hosted in Bucharest, the Host City shall offer a free public local transport programme applicable in the entire Bucharest-Ilfov region for different groups (ticket holders and accredited personnel). Moreover, wayfinding signage to contribute to the effectiveness of the Mobility plan will be implemented approx. 2 days before the first match and will be taken down approx. 2 days after the last match disputed in Bucharest. Lastly, Host City Mobility Makers will be established. Mobility Makers will act as the face of EURO 2020 in Bucharest. They will be the first point of interaction, being visible to all ticketed spectators who will provide spectators with Tournament, Match and City Information & on-the-ground directional support and mobility information.

3.2.5.7 Carpooling and carsharing (Template OM/ML7)

During an event, fans mobility to and from sporting venues also occurs through the use of private cars. Initiatives aiming at diffusing the practice of carpooling enables to maximise the efficiency of private cars so that more than one-person travels in a car. This practice prevents the need for others to use their private cars and therefore it reduces the total number of private cars employed. It is recommended that electronic platforms are used to advertise the carpooling system. Overall, carpooling is a more environmentally-friendly and sustainable way to travel, as sharing journeys reduces pollution, traffic congestions and the need for parking spaces. It is also a means to divide the travel expenses and therefore it gives and economic benefit to the participants of the carpool.

3.2.5.8 Bike and electrical scooters sharing (Template OM/ML8)

The use of bikes and/or electrical scooter during the staging of an event is another best practice which can allow for a more environment-friendly movement of fans. A system of electric bikes and/or scooters allows fans to rent an electric bike or a scooter to reach a venue of the sporting event or to move from one venue to another. This means of transport is environment-friendly and also reduces traffic congestion. This best practice is highly replicable and is compatible with other mobility best practices (e.g., OM/ML1 – carpooling initiative). It can be applied during the staging and breaking out of the event. The main actors responsible for the implementation of this best practice are the event organisers.

3.2.5.9 Secured bike parking (Template OM/ML9)

Most of the stadiums do not have any infrastructure to welcome cyclists. Moreover, one negative occurrence, quite notorious in fact, is bike theft and tentative theft. This turns down many cyclists from cycling to mass events, such as concerts, sport events and similar. Temporary bike parking could turn into a permanent one if an agreement is reached and a cooperation between concert organisers and sport event organisers is achieved. Such an opportunity would surely be well perceived by the visitors and cyclists as it would save them time when returning home, as they would not only avoid traffic jams but also cramped trams, metros and buses. The only additional efforts that the event organiser would need to provide is staff that would make the bike park secure. The launch of a secured bike parking should include an extensive media coverage and the participation of celebrities and/or athletes as testimonials would increase customers' knowledge and awareness. While building and installing a permanent secured bike park could result in certain costs, transforming an existing temporary bike parking into a secured one would require only to provide and ensure required security and staff.

Scoring of **Mobility & Logistics** best practices.

ID	Description	Economic Feasibility	Environmental Management Potential	Technical Feasibility	Replicability Potential	Average score
OM/ML1	*Practices to increase the use of public transport*					**2.75**
OM/ML2	*Hydrogen energy*					**1.5**
OM/ML3	*Operate environment-friendly vehicle fleets*					**2**
OM/ML4	*Logistics of goods and materials*					**2.5**
OM/ML5	*Optimouv software*					**2.75**
OM/ML6	*Climate-compatible travelling*					**2.5**
OM/ML7	*Carpooling initiatives*					**2.75**
OM/ML8	*Bike and electrical scooters sharing*					**2.5**
OM/ML9	*Secured bike parking*					**2.25**

High score **Medium score** **Low score**

Bibliography

- AC Milan, 2017. Sustainability Report 2016/17. Milano.
- AEG, 2018. Sustainability report. Los Angeles.
- Agence de l'environnement et de la maîtrise de l'énergie (ADEME), 2005. Éco-Communication - Vers une communication plus Éco-Responsable
- Andrea Collins, Andrew Flynn, Max Munday and Annette Roberts, 2007. Assessing the Environmental Consequences of Major Sporting Events: The 2003/04 FA Cup Final. Urban Studies
- Andrea Collins, Max Munday and Annette Roberts, 2012. Environmental Consequences of Tourism Consumption at Major Events: An Analysis of the UK Stages of the 2007 Tour de France. Journal of Travel Research
- Atchariyasopon, K., 2017. Sustainable Solid Waste Management in Sport Events: a Case Study of Football Matches in Thailand. Mahidol University (Journal of Population and Social Studies)
- Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, 2014. Eco-label Guideline "UZ 62" Green Meetings and Green Events. Vienna.
- Aviva Stadium, 2016. Aviva Stadium: Sustainability Policy. Dublin
- Beijing Organising Commitee for the Games of the XXIX Olympiad, 2008. Preparation for the Games - New Beijing Great Olympics, Official Report of the Beijing 2008 Olympic Games - Volume III. Beijing.
- Bundesministerium für Umwelt, Naturschultz Bau und Reaktorsicherheit, 2017. Sport 2020 – Impulsgeber für eine nachhaltige Gesellschaft. Berlin.
- Commission for a Sustainable London 2012 (CSL), 2012. London 2012 – From vision to reality. London.
- Commission for a Sustainable London 2012, 2010. No time to waste. A review of Waste and Resource Management across the London 2012 programme. Commission for a Sustainable London 2012.
- Commission for a Sustainable London 2012, 2010. Sustainable? Naturally... A review of biodiversity across the London 2012 programme. Commission for a Sustainable London 2012.
- Consortium Stade de France, 2017. CSR Report Consortium Stade de France 2015-2016. Paris
- Deutcher Olympischer Sport Bund, 2010. DOSB I Nachhaltige Sportgroßveranstaltungen Dokumentation des 18. Symposiums zur nachhaltigen Entwicklung des Sports. Bodenheim/Rein.
- Deutcher Olympischer Sport Bund, 2016. Nachhaltigkeitskommunikation 2.0 im sport - Dokumentation des 23. Symposiums zur nachhaltigen Entwicklung des Sports. Bodenheim/Rein
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2014. International conference in Brazil: ensuring that major sporting events leave a legacy that benefits the host country?
- Deutscher Fussball-Bund (DFB), 2016. Sustainability Report. Frankfurt am Main.

- Deutscher Fußball-Bund (DFB), 2018. Sustainability Concept Uefa Euro 2024 Germany.Frankfurt
- Dosumu, A., Colbeck, I., & Bragg, R. (2014). Greenhouse Gas Emissions: Contributions Made by Football Clubs in England. Atmospheric and Climate Sciences, 4(04), 642-652.
- Ernst & Young Terco, 2011. Sustainable Brazil: Social and economic impacts of the 2014 World Cup. São Paulo.
- Eunomia Research & Consulting Ltd for FIFA March 2017, 2017. Environmental impact study on artificial football turf. Zurich.
- European Commission, 2016. Recommendations on major sport events, in particular on legacy aspects with a focus on social, economic and environmental sustainability. Bruxelles. (EU Work Plan for Sport)
- Expo 2015 SpA, 2012, Sustainable Solutions Guidelines, Milan, Italy
- Expo 2015 SpA, 2013, Green Procurement Guidelines, Milan, Italy
- Expo 2015 SpA, 2015, Waste Management Guidelines, Milan, Italy
- Federation Equestre Internationale, 2014. FEI Sustainability Handbook for Event Organisers. Switzerland.
- Fédération Française de Rugby, 2015. Stratégie de développment durable et responsable - Plan d'actions 2013 – 2020. Paris
- Fédération Internationale de Football Association (FIFA), 2014. Sustainability Report 2014 FIFA World Cup Brazil. Zurich.
- Fédération Internationale de Football Association (FIFA), 2015. More sustainable stadiums. Technical report on the environmental, energy and resourceeffi cient design solutions for the construction and refurbishment of the stadiums for the 2018 FIFA World Cup Russia™. Zurich.
- Fédération Internationale de Football Association (FIFA), 2017. More sustainable stadiums. 3rd technical report on the implementation of environmental, energy- and resource-efficient design solutions for the stadiums of the 2018 FIFA World Cup Russia™. Zurich.
- Fédération Internationale de Football Association (FIFA), 2018. More sustainable stadiums. Fourth technical report on the implementation of environmental, energy- and resource-efficient design solutions for the stadiums of the 2018 FIFA World Cup Russia™. Zurich.
- GEO Foundation, 2017. Phoenix Open Waste Management Report. Scottsdale, AZ.
- Global Reporting Initiative, 2014. GRI Event Organizers Sector Supplement (EOSS). Amsterdam.
- Greenpeace, 2000. Greenpeace Olympic environmental guidelines.
- Hartmut Stahl, Christian Hochfeld & Martin Schmied (Öko-Institut), 2006. Green Goal – the environmental concept for the 2006 FIFA World Cup. Organizing Committee (OC) 2006 FIFA World Cup
- Industrial Technology Research Institute, 2018. Taiwan InnoTech Expo 2018.

• International Academy of Sports Science and Technology (AISTS), 2014. Sustainable Sport and Events Toolkit (SSE Toolkit) - Quick Start Guide. Lausanne
• International Olympic Committee (IOC), 2018. IOC Sustainability Report Sharing progress on our 2020 objectives. Lausanne.
• International Olympic Committee (IOC), 2018. Sustainability Essentials: A series of practical guides for the Olympic Movement. Lausanne.
• International Olympic Committee, 2017. IOC Sustainability Strategy. Lausanne
• International Olympic Committee, 2018. DOW's carbon reduction programmes delivering a positive carbon legacy for the Olympic movement.
• ISO 20121:2012, 2012, Event sustainability management systems
• Juventus Football Club SpA, 2017, Sustainability Report 2016/2017, Turin, Italy
• Landessportverband Baden-Württemberg, 2013. Sport und Nachhaltigkeit - Mit dem richtigen Konzept in eine erfolgreiche Zukunft. Stuttgart
• Local Organizing Committee Russia 2018, 2016, Waste Management Concept 2018 FIFA World Cup, Moscow, Russia
• London Organising Committee of the Olympic Games and Paralympic Games Limited, 2012. Coca-Cola. London
• London Stadium 185, 2015. Waste Management Operational Strategy. Olympic Stadium, Queen Elizabeth Olympic Park. London.
• Mark Borchers, Sheryl Ozinsky, Lize Jennings (Sustainable Energy Africa - SEA) and Lorraine Gerrans (City of Cape Town), 2011. Host City Cape Town 2010 Green Goal Legacy Report. Cape Town
• Martin Schmied, Christian Hochfeld, Dr. Hartmut Stahl, Professor Ralf Roth, Frank Armbruster, Dr. Stefan Türk and Christa Friedl, 2007. Guide to environmentally-sound large sporting event. German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety German Olympic Sports Confederation
• Meetgreen, 2011. Sustainable Event Report 2010. Portland, Oregon 97213, U.S.A.
• Ministère de la Ville de la Jeunesse et des Sports, 2015. Guide pratique pour une gestion éco-responsable des établissements sportifs. Paris
• Ministère de la Ville de la Jeunesse et des Sports, 2015. Kit « Évènement Éco-Responsable» 2015. Paris
• National Hockey League (NHL), 2018. Sustainability Report. Montréal.
• Natural Resources Defence Council, 2014, Guide to composting at sport venues, New York, USA
• Natural Resources Defense Council (NRDC), 2012. Game changer. How the sports industry is saving the environment. New York City.

- RDC Environment, 2013. Etude de l'impact environnemental des gobelets réutilisables dans les évènements - Rapport final. Brussels
- Resource Efficient Scotland, 2015. How to plan and deliver environmentally sustainable events. Scotland.
- Richard Mokua, 2012. South Africa 2010 FIFA Report. United Nations Environment Programme (UNEP). Nairobi
- Rio 2016 Organising Committee for the Olympic and Paralympic Games, 2014, Embracing change Rio 2016 Sustainability Report, Rio de Janeiro, Brasil
- RMIT University, 2018. Sustainable Events Guide.
- Rock in Rio Lisboa 2018, 2017. Plano de sustentabilidade.
- Russian Green Buidling Council, 2016, More sustainable stadium - 2nd technical report (January to November 2016) on the implementation of environmental, energy- and resource-effi cient design solutions for the stadiums of the 2018 FIFA World Cup Russia, Moscow, Russia
- Saubere Veranstaltung, 2016. Zentrale Empfehlungen Für nachhaltige Kultur- und Sportevents. Basel
- Savoiu, G. Butnariu, M., 2014. From sports of recycling to recycling waste in sport activities: a statistical survey and its econometric model for identifying the project's factors. University of Pitesti (Romanian Statistical Review)"
- South Africa Department of Environmental Affairs (DEA), 2011. World Cup Legacy Report (Chapter 7 - Waste)
- Tokyo Organising Committee of the Olympic and Paralympic Games, 2018. Tokyo 2020 Olympic and Paralympic Games Sustainability Plan (Version 2). Tokyo.
- UEFA EURO 2016 France, 2016, Social Responsibility & Sustainability Post-event Report, Lausanne, Switzerland
- Ulrich Wolter & Stefanie Schulte, 2011. Football's footprint. Legacy Report. Final report on the environment initiative of the FIFA Women's World Cup 2011. FIFA Women's World Cup 2011 Organising Committee.
- Union des associations europeennes de football, 2011. UEFA Guide to quality stadiums. Nyon.
- Union des associations europeennes de football, 2016. UEFA EURO 2016 Social Responsibility and Sustainability Post-event report. Nyon
- Union of European Football Associations (UEFA), 2018. Playing for our planet. Nyon.
- Union of European Football Associations, 2011, UEFA Guide to quality stadiums, Lyon, Switzerland
- Unitarian Universalist Association General Assembly, 2014. Sustainability Report 2014. Providence, Rhode Island.
- United Nations Global Compact, 2018. A call to action for sustainable business. New York

• United States Environmental Protection Agency - Region 5 - Materials Management Branch, 2011. A Guide to Recycling at Sports Venues.
• Vancouver Organizing Committee for the 2010 Olympic and Paralympic Games and International Academy of Sport Science and Technology, 2010. Sustainable Sport and Event Toolkit (SSET). Vancouver.
• Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC), 2010. Vancouver 2010 Sustainability Report 2009-10. Vancouver
• Vfl Wolfsburg-Fußball GmbH, 2016. The VfL Wolfsburg Sustainability Report 2016. Wolfsburg.
• Wang, H., Zhang, R., & Tang, L. Green Olympics, Sustainable Buildings.
• Working together for a world without waste (WRAP), 2012. London 2012 Legacy Transfer Report Re-use in Events. Banbury.
• Working together for a world without waste (WRAP), 2012. London 2012 Legacy Transfer Report: Event Waste Management. Banbury.