

Deliverable 2.3

Report on the decarbonisation operational assessment



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1. Introduction

The Erasmus+ Sport GAMES project

The GAMES project (***Green Approaches in Management for Enhancing Sport***), launched in 2022, is funded by the European Union through the Erasmus+ Sport programme and it is coordinated by the research group on Sport and Sustainability of the Institute of Management at Sant'Anna School of Advanced Studies. Its main objectives are to raise awareness on environmental sustainability in the sport sector and to promote the adoption of climate change mitigation practices by sport key actors, in order to improve the sustainability of sporting events. It focuses on three sports, which are increasingly affected by the effects of climate change: **Athletics**, **Biathlon** and **Floorball**. The project Consortium is composed of World Athletics (WA), the International Floorball Federation (IFF), the International Biathlon Union (IBU), the Swedish Floorball Federation (SFF) and Touchline, communications company specialised in sustainability topics for sports. The three international federations partners of the project are key actors in the dissemination of sustainability guidelines to national and local sport organisations, and can promote the replicability of the project actions to different sport contexts: from sporting events that take place outdoors, to those that take place during winter seasons, to sporting events that take place in indoor venues.

Objectives and Methodology of this report

In order to reach its goals, the GAMES project Consortium analysed the climate change governance and management models adopted by the partner sport organizations, to assess the current state of the art and the improvement opportunities, in line with the project's Work Package 2, "Assessment of the decarbonisation potential of participating sport organisations".

This document focuses on the **environmental and decarbonisation on-site visits** performed as part of Task 2.3, aimed at analyzing the decarbonisation practices implemented and possible improvement opportunities of a sample of athletics, biathlon and floorball sporting events. Three on-field decarbonisation and environmental sustainability assessments were carried out, one for each sport.

The on-site visits focused on the whole life cycle of the sporting event, including aspects such as mobility of supporters, and were conducted by the researchers of the Sustainability Management research laboratory of Sant'Anna School of

Advanced Studies, lead applicant of GAMES, and representatives of the sport organisation partners of the project.

The **methodology** adopted was the same for all three assessments. First, an initial preliminary analysis of the environmental aspects was performed through desk research, as preparatory documents were collected ahead of the assessment. Then, the actual assessments were conducted through on-site visits. To have a more detailed picture of the state of the art of the operational management of the sporting event, in some cases the on-site visits were coupled with semi-structured interviews with the actors engaged in the management of the events. As a result of the assessments, the good environmental management practices adopted during the event were highlighted and possible improvement actions to be implemented in order to improve the environmental management of similar future events were also identified.

The findings of this study supported the drafting of the “Guidelines on decarbonisation practices in sport organisations”, a collection of best environmental management practices focused on the operational management of the sporting events of Athletics, Biathlon and Floorball. Moreover, the results will help sports organisations develop of a Roadmap for the decarbonisation of their activities, through the definition of a strategic set of objectives, programs and a coherent operational framework of actions aimed at mitigating, neutralising or offsetting greenhouse gas emission.

Below we summarise the three events selected for the assessments:

ENVIRONMENTAL ASSESSMENTS CONDUCTED IN THE FRAMEWORK OF THE GAMES PROJECT				
Assessment	Sport	Event	Place, Date	Characteristics
1	ATHLETICS	Diamond League final 2022	Zurich (Switzerland), 7-8 September 2022	The Diamond League final was chosen since it is a multi-day event and different venues were assessed: both the Arena (stadium) and the square, an urban context set ad hoc for the event.
2	BIATHLON	IBU Biathlon World Championship (WBCH) 2023	Oberhof (Germany) February 9th, 2023	This event was chosen as it is a sporting event which takes place in an arena used throughout the year for various winter sports.
3	FLOORBALL	Men’s World Floorball Championships (WFC) 2022	Zurich & Winterthur (Switzerland) November 10th, 2022	This event was chosen as it is a sporting event that takes place in big indoor venues.

The three events were chosen for their international scope and high relevance as they are annual top competition series for the sport disciplines involved in the GAMES project: the Diamond League is a top-level annual athletics series of elite outdoor tracks and field athletic competitions, the WFC as an international floorball competition involving men's national floorball teams, and the BWCH is one of the main international biathlon winter competitions that takes place in February and March. Moreover, the choice of three sport venues with different characteristics allowed to gain a broad understanding of the environmental and climate change practices adopted in different contexts and the observations are not limited to the single event or discipline examined, but have a wider potential as they may help the future management of similar events and promote the replicability of the good practices in other contexts.

Scope of the assessment

The environmental aspects investigated were those targeted by the GAMES project influencing directly or indirectly the carbon footprint of the sporting event. The results emerged from the assessments were classified according to these environmental topics and activities:

- **Mobility** (of supporters, athletes and staff)
- **Use of materials** (sport equipment, temporary infrastructures, etc.)
- **Water management** (consumption and discharge)
- **Energy management**
- **Food & Beverage activities** (at the bars & kiosks, VIP catering, etc.)
- **Waste management**

Limitations and exclusions

The on-site visit process took place through a sampling approach. In the case of the Diamond League assessment, although the auditors were allowed to visit the different venues (i.e. the accommodation structures for staff and athletes, the square and the stadium), it was not possible to cover all the environmental aspects, due to the event complexity and to time constraints: for example, interviews with key actors such as food & beverage suppliers were not carried out and the post events catering area was not assessed.

In the case of the WBCH and the WFC, the auditors visited the facilities and different aspects about the environmental management of the event were discussed during the interview with the event director; however, due to time constraints it was not possible to visit accommodation structures (hotels) for

staff and athletes and interviews with some key actors such as food and beverage suppliers were not carried out.

2. Decarbonisation and environmental sustainability assessment of the Diamond League Finals

Context

This Chapter describes the Environmental Management Trials of the Diamond League¹ final held in **Zurich, Switzerland, on September 7th-8th, 2022**. The Diamond League is a top-level annual athletics series of elite outdoor tracks and field athletic competitions, co-organized by World Athletics, GAMES project partner. The series sits in the top tier of the World Athletics one-day meeting competitions. It consists of four athletics competitions, involving the best athletes from around the world. The competitions run throughout the year and take place in different locations around the world. The 2022 Diamond League was the 13th edition and comprised 32 Diamond Disciplines events and 14 meetings, the last two of which were held in Zurich (the final). The Final was a two-day competition held at two different venues: the Sechseläutenplatz square on the first day and the Letzigrund stadium on the second day. In addition to the high relevance of the competition for athletics disciplines, the dual venue was another reason why this competition was selected for the assessment of the GAMES project, as it provided more insights and potential for the replicability of the results. The final competition was organized by the Weltklasse Zurich. GAMES partner World Athletics co-organized and sponsored the event.

Participants

Event organiser: Bob Ramsak (Head of Sustainability, World Athletics)

Auditors: Tiberio Daddi (Associate Professor, Scuola Superiore Sant'Anna) and Alessio Novi (Researcher, Scuola Superiore Sant'Anna)

Dissemination activities: Matthew Campelli (Head of Sustainability, Touchline)

¹ The full sponsorship name is the **Wanda Diamond League**, the result of an agreement with Wanda Group since December 2019.

Assessment findings

2.0 Accommodation for staff and athletes

Before delving into the details of the findings from the environmental assessments conducted at the two sporting venues of the Diamond League final, we briefly describe the accommodation structure that was selected for the staff and the athletes that participated to the event.

Staff and Athletes were hosted at the Crowne Plaza hotel in Zurich (Figure 1). To reach the hotel, athletes used public transports such as trains and, in the case of flights, business class flights were avoided to minimise their carbon footprint.



Figure 1 - Crowne Plaza Zurich

The hotel itself was not assessed according to the selected environmental aspects since it was fully booked and the auditors stayed in a different accommodation.

Nonetheless, it was possible to identify some relevant practices for the promotion of environmental sustainability. First of all, the hotel was an excellent choice from a mobility point of view, since it is just 5 minutes walking distance from the stadium (Figure 2). The location also offered fast routes to the heart of the city. The first nearby tram stop is only five minutes away by walk and it reaches the old town of Zurich in just 10 minutes. It takes 20-25 minutes to get to the Sechselautenplatz square, where the event took place on the first day

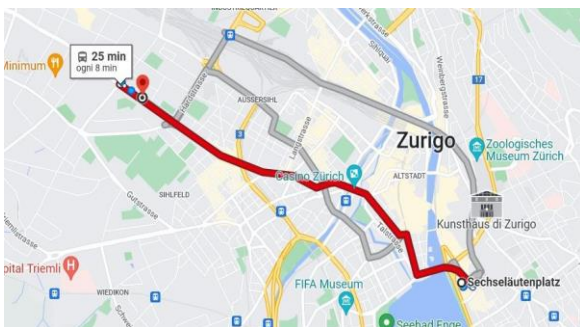


Figure 2 - Hotel distance to the square (first day event).

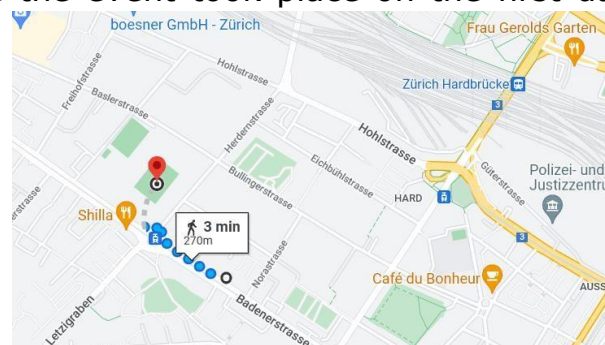


Figure 3 - Hotel distance to the stadium (second day event)

(Figure 3). Moreover, it is possible to walk 15 minutes to the Hardbruecke train station and drivers enjoy easy access to motorways. Zurich Airport is just a 15-minute drive away.

The hotel is part of the IHG Green Engage™ system, which foresees the implementation of some environmental criteria. However, there is no evidence of the criteria for the selection process of the hotel for this 2022 edition, and we cannot assume that green or sustainability criteria were put in place in the selection of this specific hotel.

As emerged from one of the interviews within World Athletics, this hotel will no longer serve as the official meeting hotel for the future editions. The hotels that will be used for the next Diamond League final editions are also located within walking distance from the competition venues, and were in part selected for their sustainability practices.

A) First day: Sechseläutenplatz square

The first day of the Diamond League final was organised at Sechseläutenplatz square, next to Zurich Lake, with the aim of bringing the sporting event closer to the fans. Usually, the square appears as in Figure 4.



Figure 4 - Sechseläutenplatz square in normal days.

During the final of the Diamond League the square was equipped and transformed to host the event, as shown in Figure 5.



Figure 5 - Sechselautenplatz square during the final of the Diamond League

World Athletics has recently developed a ranking system to evaluate the sustainability of its events. Zurich organisers agreed to pilot the system in 2022 and in 2023. However, it was not clear how the system was used to evaluate this specific location; thus, it is not known the role that such system had in the selection of the location itself.

2.1 Mobility of supporters, athletes and staff

The Sechselautenplatz square is located in the city center, and it is directly served by several tram and bus lines. In general, the transportation system in Zurich is efficient and allows for a sustainable mobility from every part of the city. Therefore, cars were not needed for supporters to get to this event. It takes around 20-25 minutes to reach this venue by bus or tram from the hotel where the staff and the athletes stayed, as shown in Figure 2.

Follow up studies after the event took place confirmed that most of the audience used public transports to reach this venue, although more detailed data is not available.

2.2 Use of materials

The whole Sechselautenplatz square was equipped with the necessary sporting infrastructure: grass fields, athletics tracks, temporary grandstands, toilets, food stores, etc.

The structure of the grandstands is reusable, and it was clearly used several other times before this event (Figure 6); thus, this is definitely a good practice from an environmental point of view. However, it is not known the type and possible past uses of the material used to cover the structure (Figure 7).



Figures 6 & 7 - Views of the grandstands and LED lights.

The square where the event took place was already equipped with LED lights, so there was no need to provide additional lighting systems for the event.

The Athletics track shown in Figure 8 looked brand new and not reused from previous years' competitions, and it did not seem to be made of recycled materials. The same goes for the supporting infrastructure made of wood, which looked new, although it could be reused for future competitions.



Figure 1 - Athletics track



Figure 2 - Banners

The branding materials appear to be new as well (Figure 10), although some of them could have been reused from previous years. Considering how they are designed, it is unsure whether they are recyclable (i.e. the kind of plastic used) or reusable at all.



Figure 10 – Branding materials

The selection of the grass (Figure 11) is unknown, and the growing methods used or its destiny after the end of the event are not known.



Figure 11 - Grass field

The pallets and containers (both made of wood and plastics) in the stands next to the grandstands appeared to be reused and are surely reusable (Figure 12).



Figure 32 - Pallets and containers

It was noted that many gadgets, such as hats (Figure 13), were probably gifted to a larger extent than needed. Banners with environmental sustainability claims for the awareness raising of supporters were not present, except for the one at the stand of World Athletics, focused on air pollution.



Figure 13 - Hats provided as gifts

Finally, an interview with event organisers clarified that about 80% of all the materials and equipment used during the event were reused from the previous year, and only about 20% of the materials used were brand new. A similar percentage of the materials used this year will be stored and reused again during future events. However, it was not clear which specific materials were already reused during this event and which ones are now stored to be reused next year in the different disciplines contested outdoors. A monitoring system is not present.

2.3 Water management

The event did not need an extensive use water. Water consumption was related only to the use of standard event toilets. It is not sure which kind of water was used or where it was discharged. Figure 14 shows how the water discharge from

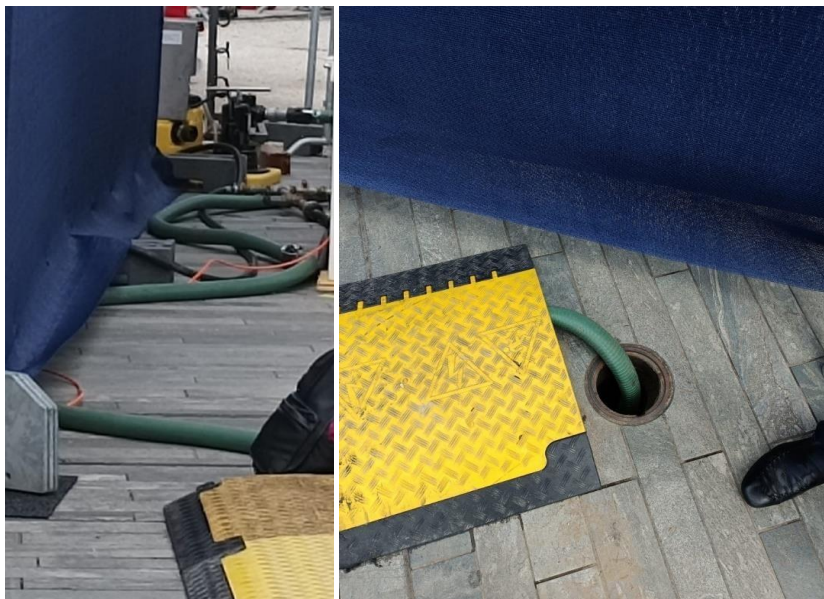


Figure 14 - Toilet water discharge

the toilets was managed: first, there was a shredding-like step (left Figure); then, the water was discharged into a hole (right Figure) which was not clear whether it was linked to the sewage system or not.

The discharging hole (right Figure) did not look like a dirty water discharge. This consideration is also supported by:

- (I) the fact that the square could not need a sewage system (considering for example the standard use of the square, which sometimes hosts water games)
- (II) the proximity to the lake (about 30 meters).

However, no information was given on this aspect.

In addition to standard toilets, it is to highlight the presence of wood toilets at this venue (Figure 15). This is a good environmental practice since wood toilets do not use water flows, so they avoid the consumption of many liters of water that would otherwise end up in the water discharge process. At the same time, the organic solid waste used in wood toilets is compostable. However, it was noticed that traditional toilets outnumbered the wood ones, as the number of wood toilets was quite low. Apparently, organizers requested more compostable toilets to be placed in the event venue, but they were not available.



Figure 4 - Wood toilets

2.4 Energy management

The energy needed for the event was probably taken from the grid, as electricity generators were not visible and their sound was not heard at the venue. No information was present on whether renewable energy was purchased for the event.

LED lights installed in the square were a good environmental practice since they are more energy efficient than standard light bulbs (Figure 6). In order to save energy, digital screens could be switched off before the event (Figure 16); however, as shown by the figure below, the screens turned on at midday, four hours and half before the first event in the square took place at 16:30.



Figure 56 - Screens turned on at midday

2.5 Food & Beverage

The event was located in the heart of the city, and many restaurants and supermarkets were available at walking distance from the square. Nonetheless, some bars and kiosks were specifically arranged for the event inside the square. It was noticed that some refreshment points located inside the square served drinks in paper cups. Usually, paper cups are not reusable and they are managed as waste. It was not sure whether they were compostable according to international standards, since they did not show any label providing this information.

Water refill stations (Figure 17) were available. However, all water stations were located in a specific area (next to the athletes' dressing rooms) instead of being located in different points of the squares; this limited their accessibility.



Figure 17 - Water stations next to athletes' dressing rooms

2.6 Waste management

Separated waste collection was available (Figure 18). However, different waste bins were found only in a few spots of the venue, and they probably were not enough compared to the high number of fans present at the event. Moreover, glass was not collected separately, although it was an open event where people could bring glass containers from outside.



Figure 68 - Separated waste bins.

B) Second day: Letzigrund Stadium

Most of the disciplines competed in the Diamond League final during day two, which took place at the stadium. The stadium has a capacity of 26.800 seats and it is very versatile, as it can host different events, including football and athletics competitions as well as music concerts. The stadium has a very modern infrastructure, renovated in 2007. Figure 19 shows the stadium on the 8th of September.



Figure 79 - Letzigrund Stadium

As mentioned, World Athletics has recently developed a ranking system to evaluate the sustainability of its events. Zurich organizers decided to pilot the system in part in 2022 and in 2023. However, as in the case of the square, it is not clear whether this new system was used to evaluate this event/location; thus, it is not known the role that such system had in the selection of the location itself.

2.1(b) Mobility of supporters, athletes and staff

The stadium is outside the city centre. However, it is directly served by several tram and bus lines. In general, fans take 20-25 minutes using the public transportation system to get from the city center (where the day-one event took place) to the stadium, as shown in Figure 20. The hotel where the event staff and athletes stayed was 5 minutes walking distance from the stadium. Therefore, supporters, athletes and staff did not need to use cars to get to this event.

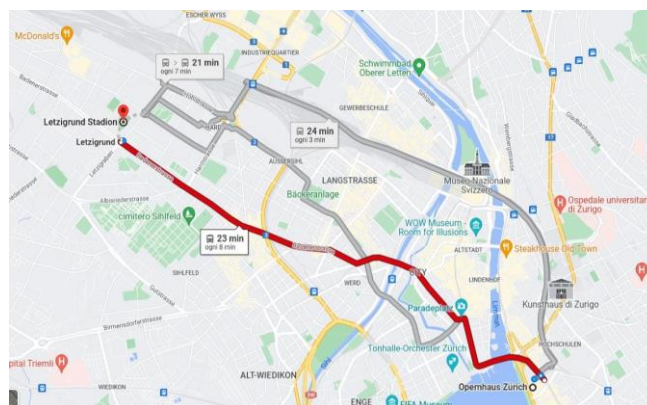


Figure 20 - Stadium distance from the first day event

Figure 21 shows that fans took public transports to leave the event.



Figure 21 - Fans taking the public transportation system

A follow-up study on the overall carbon footprint of the event confirmed that at the Letzigrund Stadium, 75% of the audience used public transportation and only 25% reached the stadium by car. This was also due to the fact that organisers decreased the availability of parking lots nearby to discourage the use of cars and encourage the audience to take public transportation.

2.2(b) Use of materials

Paper clappers were clearly one of the most used materials during this event. They were used by supporters to create noise (for rhythm purposes) during athletes' performances. Clappers were placed in each seat of the stadium by the event staff (Figure 22).



Figure 22 - Paper clappers

The paper clappers were declared as "FSC recycled 100%, CO₂ neutral". Considering this environmental claim printed on the clappers and their high number, Scuola Superiore Sant'Anna (SSSA) calculated their climate change impact using the European Commission Product Environmental Footprint (PEF) methodology. SSSA measured the carbon footprint of a recycled paper clapper weighting 50 grams (SSSA weighted it directly) taking into account the

production of recycled paper, the printing process, its transportation to the venue, the waste generated and its end-of-life. The results are the following²:

- 0,0546 kgCO₂eq. if sent to recovery (considering 75% of material recovery and 25% incineration with energy recovery, following PEF criteria)
- 0,0668 kgCO₂eq. if sent to landfill

Below it is calculated the climate change impact of all the paper clappers used for entertaining purposes during the Diamond League final at the stadium (considering the stadium capacity of 26.800 people):

Kg of CO₂ eq. (75% material recovery and 25% energyrecovery)	Kg of CO₂ eq. (100% Landfill)
1.463,28	1.790,24
Which is equivalent ³ to the CO ₂ eq. emitted to travel 32.662,50 km by train (more than two times the street distance travelled on the road between Lisbon and Hong-Kong)	Which is equivalent ² to the CO ₂ eq. emitted to travel 39.960,71 km by train (three times the streetdistance between Lisbon and Hong-Kong)

As shown by the above data, the waste management of these materials is fundamental to determine their climate impact. As the post event phase was not in the scope of this assessment, it is unsure how the paper clappers were separately collected to be recycled. Moreover, the above data do not take into account the impact related to the use of the ink, therefore the overall impact of the clappers is expected to be higher than we measured. Nonetheless, the calculations highlight how the choice of “unnecessary” materials (the same purpose can be achieved by clapping the hands), even if recycled, leads to significant environmental impacts.

² The average transport to disposal (both recovery and landfill) is 50 km. The specific data sets for Switzerland refer to the following processes: waste transport vehicle, paper incineration, paper recycling, paper landfill, natural gas, electricity, paper printing. The other processes were modeled with European average data.

³ Life cycle communication tool: <https://www.lifeeffige.eu/en/a-tool-to-communicate-clearly-the-environmental-impact-hasbeen-released/>

Moreover, in the Press & Media area, many documents with the athletes' biographies were printed and distributed to journalists and press staff (Figure 23). An interview with a member of the Press elucidated that there were roughly 40 one-side papers with the biography of all the athletes, 2 per each discipline, and all the papers were not recycled. A good environmental practice in this case would be for journalists to use the digitized version of these documents.



Figure 23 - Biographies printed and provided to journalists and press staff

Another interview highlighted that this practice of printing paper documents is due to a generational gap among young and senior journalists: younger generations are keener to use digitalized data, but older journalists still rely on information printed on paper.

As it happened for the square, we noticed that many plastic gadgets were gifted (Figure 24). They were probably unneeded, especially considering that they are made of paper and plastic, and they have a plastic packaging. As in the case of the paper clappers, even small gadgets like these have a significant climate change impact when we consider their whole life cycle.



Figure 24 - Plastic gadget

Lastly, it was noticed that in the bathrooms there were refillable detergent containers, which can be considered as a good practice from an environmental point of view. However, no Ecolabel detergents⁴ (i.e. compliant with European environmental criteria) were present. Cleaning materials were also assessed, noticing that there were many hazardous labels (Figure 25), which could be replaced with eco-friendlier and less harmful cleaning materials.



Figure 25 - Hazardous labels on cleaning materials

2.3(b) Water management

It was not possible to assess the management of this environmental aspect.

2.4(b) Energy management

It was not possible to conduct a complete assessment of the management of this environmental aspect. As a positive aspect, the presence of LED lights and LED screens in the stadium were noticed by the assessment team. However, they were switched on during daylight, thus consuming unnecessary energy (Figure 26).



Figure 26 - Led lights turned on with sunlight

⁴ <http://ec.europa.eu/ecat/category/en/10/laundry- detergents>

2.5(b) Food and beverage

During the event it was noticed some good environmental practices and some possible improvement areas related to the food and beverage activities. Napkins were made of recycled paper (Figure 27 left) and spoons were made of wood (Figure 27 right).



Figure 27 - Paper napkins and wooden spoons

Plates were also made of paper (Figure 28). However, it was uncertain whether they were compostable (since there was no specific label); they were surely not reusable.



Figure 28 - Paper plates

Another good practice noticed by the assessment team was the use of refillable sauce containers (Figure 29 left). However, Figure 29 (right) shows that this good practice was not applied in all the stadium kiosks, as single-use sauce packages were placed together with the bigger refillable containers. The use of bigger containers would be preferred from an environmental point of view, since they avoid the use of single-use material (i.e. packaging dematerialization), and they allow for reuse.



Figure 29 - Refillable sauce containers and single-use sauce packages

Glasses were made of plastic material, and they were not reusable (Figure 30 left). An overuse of plastic bottles (Figure 30 right) by the media area was observed. Moreover, an interview highlighted that only plastic glasses were allowed to be sold at the event, following policy criteria.

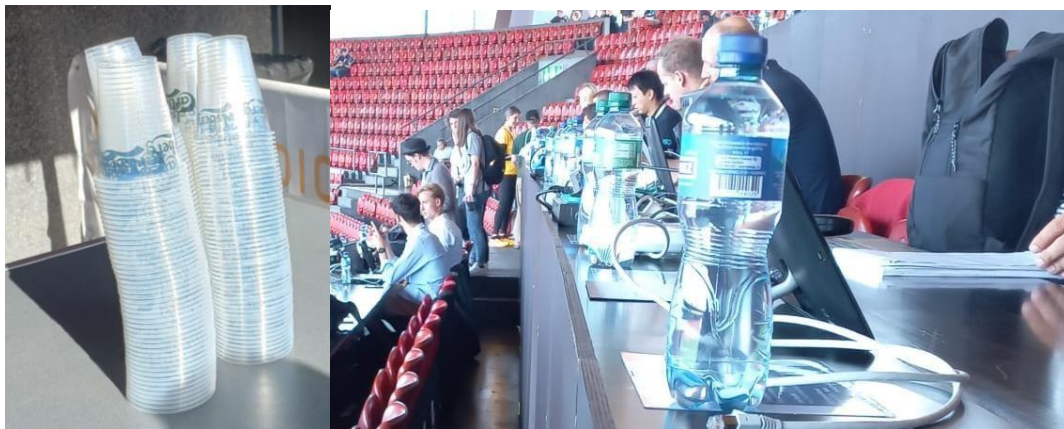


Figure 30 - Plastic glasses and plastic bottles

The origin of the fruits distributed in the food & beverage areas was not known. Sandwiches and panini packaging was made of plastics; instead, they could be made of paper to lower the environmental impact (Figure 31). Finally, we noticed that the water refill stations installed at the ground floor were accessible only to volunteers, staff and athletes, whereas they were not available for fans inside the stadium (Figure 32).



Figure 31 - Sandwiches and panini packaging made by plastic
Figure 32- Water refilling stations

2.6(b) Waste management

From a waste management point of view, some matters emerged. It was noticed that separated collection within the stadium was mainly set for plastic glasses, but not for paper and cardboard; collection of organic waste was instead extremely rare (Figure 33 left).



Figure 33 - Separated collection bins (left) and paper in undifferentiated waste bin (right)

Since there were no separate collection bins for paper and cardboard, these materials were found in the undifferentiated waste bin (Figure 33 right). However, even plastic glasses were found in the undifferentiated waste bin, with paper & cardboard (Figure 34 right). One of the most common items in the undifferentiated waste bins, together with plastic glasses and papers, were the beer holders made of cardboard (Figure 34 left).



Figure 94 - Plastic and paper waste in the undifferentiated bin.

It must be said, though, that some conscious people hesitated in disposing paper and cardboard in the undifferentiated bin, having no other option (Figure 35).



Figure 35 - Paper waste left next to an undifferentiated bin

Fortunately, when investigating the waste management practices implemented at the kiosks, it was found that paper & cardboard collection was properly carried out (Figure 36).



Figure 36 - Paper & cardboard collection next to a kiosk.

According to the Zurich waste collection program⁵, paper and cardboard separated collection is normally carried out. This is indeed confirmed by the collection site visible next to the kiosks. The hope is that at least all the cardboards & papers out of the bins (beers holders, paper fans, media papers etc.) were collected separately after the end of the event. In fact, even though Switzerland has a low use of landfills and about 50% of its municipal solid waste is sent to energy recovery, a proper separated collection of papers and cardboards allows for material recovery (recycling).



Figure 107 - Figure 3.19. European Commission waste hierarchy

In case they are not collected separately, these materials will go to energy recovery. However, as shown by the European Commission's waste hierarchy (Figure 37), recycling is preferred to energy recovery.

⁵ <https://www.localcities.ch/en/disposal-recycling/zurich/609>

Not all kiosks were managing waste in the same way. For example, in some kiosks plastic bottles were collected (Figure 38 left), whereas in others they were disposed into undifferentiated waste bin (Figure 38 right).



Figure 38 - Details of plastic management in two different kiosks

As within the stadium, there were often only undifferentiated bins next to the kiosks (Figure 39). It was also noticed that when present, the plastic bins were way smaller than the undifferentiated ones.



Figure 119 - An undifferentiated bin next to the kiosk

In general, it is likely (considering the Swiss waste management system) that all or a higher percentage of the undifferentiated waste is sent directly to energy recovery. Even though it is a better solution than landfill, the separated collection allows for material recycling, which would be the preferred option both in terms of circular economy and decarbonisation.

Finally, Figure 40 shows the huge post event catering area, which was excluded from this assessment due to its complexity, sampling approach and limited time. As emerged from an interview with event organisers, the event adopted the good practice of selecting local food suppliers within 80kms from the city.



Figure 40 - Not audited post event catering area

2.7 Awareness raising initiatives

Finally, one last aspect regards sustainability awareness raising activities. No open sustainability awareness raising activities or sustainability-related panels were present at the stadium. However, organizers screened several times two sustainability-related videos on the in-stadium screens, one featuring environmental messages from high-profile athletes and another featuring World Athletics' Air Quality campaign. In addition, we highlight that World Athletics organized an excellent and successful talk on sustainability and decarbonisation in Athletics on the morning of the competition. Tiberio Daddi from Sant'Anna School of Advanced Studies and Matthew Campelli from Touchline, both involved in the GAMES project, participated to the event. It was also an opportunity to disseminate the GAMES project's mission and objectives.

Overall, the operational assessment of the Wanda Diamond League final provided a total of 14 implemented good practices and 27 improvement opportunities, considering both locations where the event took place - the stadium and the square.

The main good practices and recommendations identified during this environmental assessment are summarized in Table 1.

Table 1. Good practices and improvement opportunities (Diamond League assessment)

Good Practices		
Environmental aspect	Day 1 (square)	Day 2 (stadium)
Mobility of supporters, athletes and staff	- Selection of a location with excellent transportation system	- Selection of the location with excellent transportation system - Selection of the athletes and staff accommodations next to the stadium
Use of materials	- Use of reusable infrastructures use of reusable pallets and containers	-Presence of refillable detergent containers -Sustainability awareness raising videos on screens
Energy management	- Presence of LED lights	-Presence of LED lights and screens.
Food & Beverage activities	- Presence of paper cups - Presence of water stations	-Use of paper plates -Use of paper napkins and wood spoons -Sometimes presence of large and reusable containers for sauces, instead of single-use small packages
Waste management	- Presence of innovative wood toilets that do not need the use of water	/

Improvement opportunities		
Environmental aspect	Day 1 (square)	Day 2 (stadium)
Mobility of supporters, athletes and staff	- Evaluate and choose the location also based on environmental criteria	- Evaluate and choose the stadium also based on environmental criteria
Use of materials	- Select and/or design reusable materials such as banners, athletics tracks - Select and/or design recycled materials such as banners, athletics tracks - Reuse the grass - Evaluate the necessity of gadgets and gifts and reduce or eliminate these products if not needed - Increase sustainability communication activities (e.g. awareness raising panels and stands such as the one of World Athletics).	- Possibly eliminate of paper fans for supporters. From our calculations, even if with recycled material, they have a significant climate change impact - Dematerialize paper documentation for media and press staff and reduce/eliminate the use of paper entertaining materials during the competition - Increase sustainability communication activities directed to fans (e.g. awareness raising panels, page); -Reduce the use of plastic gadgets - Promote the use of Ecolabel cleaning products -Evaluate suppliers also through environmental criteria (i.e. selection of

		cleaning suppliers that use of less hazardous and more ecological cleaning materials, ..)
Water management	- Consider the destination of the water when it is discharged from the toilets	/
Energy management	- Switch on screens and other energy consuming devices only when it is needed, to save energy	- Switch on lights only when needed, avoiding their use during daylight
Food & Beverages activities	- Evaluate whether for the Zurich waste management system is better to have compostable cups (managed as organic waste) or non-compostable ones (managed as paper), according to waste management facilities capacity; - Increase the number of water stations	- Evaluate whether for the Zurich waste management system is better to have compostable plates (managed as organic waste) or non-compostable ones (managed as paper), according to waste management facilities capacity - Increase the use of bigger and reusable dispensers for sauces (mayonnaise, ketchup etc..) and reduce of single-use containers - Reduce the use of plastic bottles for media and press staff - Provide panini and sandwiches packaging of different materials than plastics - Introduce water refill stations also accessible to supporters in different stadium areas
Waste management	- Increase the number of waste bins and separate collection bins - Include a differentiated bin for glass waste	- Increase the number of cardboard and organic bins in the whole stadium, thus limiting the undifferentiated waste bins - Increase supporters' and staff's attention on waste disposal to reduce the waste disposed in the undifferentiated waste bins, setting up common practices among all the kiosks

3. Decarbonisation and environmental sustainability assessment of the Biathlon World Championships

Context

The 58th IBU World Championships Oberhof 2023 took place in **Oberhof, Germany** from **8th-19th February 2023**. In total, 37 countries registered for the tournament – 30 from Europe, 5 from Asia Oceania, and 2 from America. The program includes sprint, pursuit, mass start, individual and relay races for both men and women, a mixed relay and a single mixed relay.

A total of 310 athletes were involved, 976 volunteers, 750 people belonging to the nations' staff and 785 people for the press and media.

The following nations have registered for the BMW IBU World Championships Biathlon 2023 in Oberhof:



Figure 12- All national teams involved to the IBU World Championships Oberhof 2023

The competitions took place in the same arena, the **LOTTO Thüringen ARENA** on the Rennsteig, which is also the venue for the annual IBU Biathlon World Cup. The competitions in Oberhof are the most popular among IBU World Cup's series. For years, more than 151,700 sports fans have visited the holiday region to cheer on their biathletes. The well-known sports facility was originally built in 1982 and completely renovated from 2001 to 2003, and again since 2019 until the 2023 World Championships. The world's biathlon elite regularly test their skills on this track. And up to 25,000 daily spectators can attend. Outside of competition and training times, tours are also possible to make the most of a visit to Oberhof and get a taste of World Cup air at the sports facility.



Figure 132- The entrance to the LOTTO Thüringen ARENA and the pavilion dedicated to the German Ski Federation

The on-site visits were carried out during **February 9, 2023** in the places where the competitions took place and in the venues often used during the post-competition for the delivery of the medals.

The structures visited were the following:

- **LOTTO Thüringen ARENA** am Rennsteig, Tambacher Straße / Am Grenzadler, 98559 Oberhof
- **Medal Plaza**, Oberhofer Kurpark

During the assessment, the arena was visited during a training day between the competition period.

The event organiser was the Oberhofer Sport & Event GmbH in cooperation with the German Ski Association (Deutscher Skiverband, DSV).

Participants

Auditors

Tiberio Daddi (Associate Professor, Scuola Superiore Sant'Anna)

Daniele Casiddu (researcher, Scuola Superiore Sant'Anna)

Interviewees/participants

- Thomas Grellmann, CEO Oberhof 2023, Oberhofer Sport & Event GmbH
- Klaus Rambach, Managing Director DSV-V GmbH, German Ski Association
- Lilli Schmitt, Sustainability Manager, German Ski Association
- Marie-Luise Schumak, Sustainability Manager, Oberhofer Sport & Event GmbH
- Riikka Rakic, Head of Sustainability, International Biathlon Union

Guests

- Marlen Marconi, Swiss Ski Federation

- Elke Gundermann, FIS International Ski and Snowboard Federation

Assessment findings

- Environmental practices of the event and improvement opportunities as emerged from the interview with the CEO of the event

The basis for the envisioned energy targets is the Energy Concept for the Oberhof Sports Facilities (2018), the extended photovoltaic study (2019) and the update of the Energy Concept (2022). The focus is on the long-term and sustainable use of the sports facilities in Oberhof all year round – for sports, education and culture, the region and its people. The Energy Concept relies on four modules.

1. Cold network: the waste heat from the condensers of the winter sports facilities is used to heat all functional and social buildings.
2. Warm network: (which will be installed in the next years) The bioenergy centre will include two large heat pumps, two biomethane thermal power stations, one biomass boiler powered by wood chips from the surrounding area, and a cogeneration plant. This bioenergy centre will make 4,065,900 kWh of heat surplus available to the various consumers annually from 2025
3. Photovoltaic: more than 2000 modules will cover between 18 and 21 % of the total required energy.
4. Grid operator: Oberhofs Technisches Wintersportzentrum already has its own area power network to become more self-sufficient

For the World Championships, the energy supply of the winter sports centre is covered by certified green energy from renewable hydropower.

Snow management at the venue has been completely redefined through the implementation of state-of-the-art methods to maximise efficiency, as described in IBU website. The venue can now store up to 45'000 m³ of snow over the summer and has worked diligently to minimise volume loss even during hot summers such as in 2022. Oberhof, like all IBU organising committees, benefits from the latest expertise and knowledge in sustainable snow management generated by the IBU Snow Network which brings venue snow experts together with leading scientists and IBU snow tech partners. Snow management practices are also accompanied through DSV and their foundation SIS in cooperation with other German facilities.

3.1 Mobility of supporters, athletes and staff

Oberhof 2023 has created a sophisticated mobility concept to reduce the impact created by travel to and from the Championships.

- The mobility of spectators, team members and officials are the main emissions driver at sports events in general.
- Transportation by public transport and shuttles was included free of charge in the entrance tickets for spectators within a 50 km radius of Oberhof.
- Spectators arriving by car are shuttled for free from several Park & Ride lots some 10-15 km outside the town of Oberhof to the event, replacing individual journeys and reducing the volume of vehicles. Private cars have not been provided access to the event area.



Figure 4314- The shuttle for spectators

It is recommended for future events to have a more systematic approach in facilitating the selection of *hotels with green features* (e.g. certified EU Ecolabel) by the participating teams. A possible further improvement could be to communicate the existence of the selected “green hotels” also to the supporters, for example including the list on the website of the event, preferably in relation to the green goal section.

3.2 Use of materials

One of the key characteristics of the Biathlon World Championships, also compared to other events in other sports of the GAMES project, is the considerable use of **temporary structures** to expand the permanent stadium facilities for the purposes of the major event. Inside the arena, there were various temporary infrastructures: from exhibition spaces for sponsored vehicles, to infrastructure for the VIP area and food stalls for fans.



Figure 44- The presence of different temporary structures

One issue that has been discussed in this regard related to the thermal insulation of these temporary buildings. It would be recommended to better understand if the suppliers of these structures allowed to choose between structures with more or less advanced thermal insulation. Thermal insulation of these infrastructures seems to be a key issue to save CO₂ emissions derived from the heating system.

Another issue is related to the heating system of these temporary infrastructures. The temporary infrastructures are heated with diesel. It was not possible to visit the heating centrals but diesel is probably not the best choice under economic as well as environmental perspectives. On this regard, a possible improvement for future events is to investigate the possibility to adopt heating systems based on more sustainable sources of energy such as biomass (e.g. boilers fed by wood pellets) also taking into account the large availability of biomass in the region.

Among the temporary structures there are also the toilets for spectators, whose water discharges are conveyed into the public sewage system. During the visit they appear well collected and connected to the sewage (figure 45 right side). This is an important aspect and a good practice. Biathlon events are often organised in remote areas (i.e. mountains) so the public sewer may not be available to manage the water discharges of toilettes and these discharges could impact on the local quality of superficial water and biodiversity.



Figure 45 - The events stage and the spectators' toilets water discharges

A temporary stage was set near the forest, potentially impacting local biodiversity (figure 45 - left side). For instance, concerts and events carried out in the stage arena may be a source of noise and may impact the surrounding wildlife. Although there are already some fixed sound barriers in the arena that allow to partially mitigate this impact, it could be suggested to adopt specific management measures (e.g. limit events only to a certain time in the evening, limit the volume to a certain threshold) to avoid the impacts on biodiversity.

A large quantity of wood was used to build some of the temporary structures (e.g. VIP area, Figure 46), to reduce plastic usage and for its thermal insulation capacity; this is surely a good environmental practice. However, it would be important to better understand if this wood has been supplied by sustainable sources (e.g. wood with forest certification FSC).



Figure 46 - The VIP area and the wooden stairs

Again, related to the use of sustainable materials it was observed how the branding materials often were made of recycled cardboard to facilitate recovery at the end of their life and to reduce the use of plastics (figure 47 – left side).

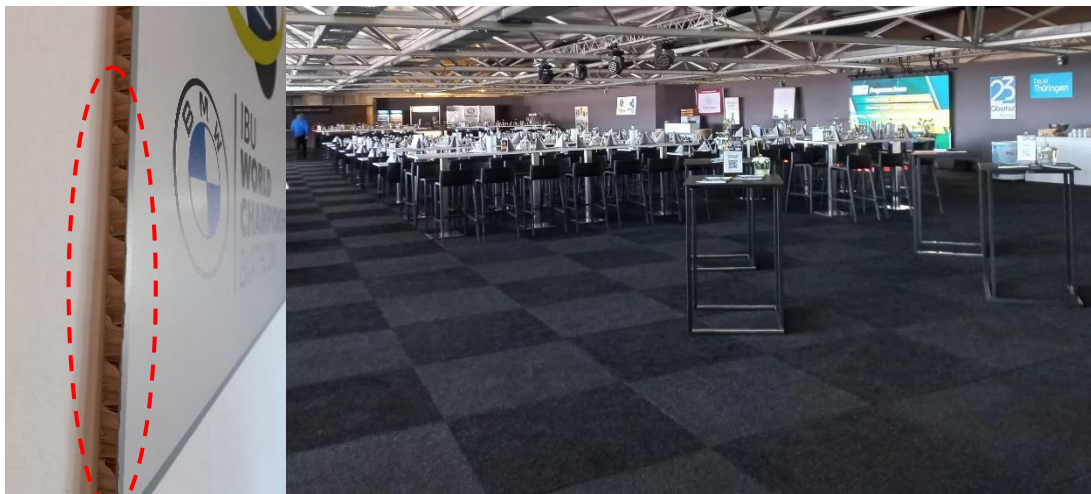


Figure 47 - Branding Materials easy to recycle and reusable materials for catering service into the VIP area

3.3 Water management

Rainwater was collected and used for producing snow. Figure 48 shows the collection basin that allows to store large quantities of water to be destined for snow production. However, the amount of water stored on the day of the assessment was significantly lower compared to the actual potential. Only 10 percent of the available water for snow production was used to produce snow.

Since the event consumes a huge amount of water, mainly to produce snow, it would be worth to assess the feasibility to also reuse the water that currently is treated and discharged. This water could further contribute to feed the snow production or can be reused for the toilets.



Figure 48 - (Rainwater) collection pond for artificial snow production

Since the competition site at Grenzadler is a drinking water protection zone, the protection of nature and drinking water must be secured. Therefore, the rainwater retention basin at the ARENA-slope had a downstream separator system to filter pollutants. A throttled discharge system ensured the appropriate recirculation of the filtered water masses.

3.4 Energy management

Over the last three years, the IBU has implemented several initiatives that will serve as the foundation for achieving its objectives of being climate neutral by 2030 and net zero by 2040. The IBU drives sustainable action within the global biathlon family, with a focus on its events where most of the sport's climate impact comes from.

Minimising energy consumption and greenhouse gas emissions from the sports facilities has been a key consideration for Oberhof in its preparations for this World Championships. In terms of electricity, the event has planned to install more than 2000 modules of photovoltaics on the venue facilities; however, during the visit only few of them were installed, so it could be recommended to pay attention also to be compliance with the deadlines

communicated externally related to this goal (e.g. 2000 modules to be installed by Spring 2023 cited in the document "Foundation for a sustainable future").

When the installation will be completed, adopting some systems to **remove the snow from the photovoltaic panels**, which impairs their ability to produce energy during sunny winter days, could be ideal (figure 49). For the World Championships, according to the interviews carried out with event organisers, the **entire energy supply is covered by certified green energy from hydropower**. Also, the grooming machines were run by HVO fuel, almost odourless and non-toxic, biodegradable, practically free of sulphur and aromatics, reduced particulate matter and water hazard class 1 (figure 48), 4000 litres of HVO fuel were used instead of Diesel.



Figure 159- On top, photovoltaic panels in the Arena.
Below, the snowploughs alimented by Avia HVO Fuel, and the diesel vehicles

3.5 Food and beverage

The organising committee volunteer staff canteen was evaluated, identifying the following good environmental practices: distribution of reusable glasses (figure 50-left side), non-single use refillable sauce containers (figure 50 right side), availability of vegetarian meals (figure 50 – central picture). Reusable cups for beverages were also used in the VIP area.



Figure 50- Reusable cups, refillable sauce containers and vegetarian options

3.6 Waste management

Concerning waste management, for some areas there was no separate collection of waste. For example, in the outdoor catering area (figure 51) only unsorted collection bins were present (figure 51 – left side) and also the big container was not differentiated (figure 5 - right side).



Figure 16- In the outdoor catering spaces, there was no separate waste collection

However, in other areas the separate collection was in place. For example, there was separate paper collection in the canteen. A possible improvement opportunity could be to use napkins produced with recycled paper instead of virgin paper in the canteen (figure 52 – right side).

An emphasis has also been placed on **waste avoidance** through the distribution of reusable cups, biodegradable cutlery and biodegradable napkins, and the reduction of printed advertising materials. Food and drinks at the venue have been sourced locally to contribute to saving emissions from transport, and there is an increase of vegetarian and vegan menu options available.



Figure 172- Separate paper collection in the canteen and normal napkins

3.7 Awareness raising initiatives

Inside the arena there were also many giant LED screens. These, even during the day of rehearsals - in the absence of spectators - were in operation.

The LED screens were used during events to advertise the work of the tree sponsorships, which will reforest destroyed forest areas; LED screens could be further used as an opportunity for awareness raising to convey environmental messages to supporters during the break of the events.



Figure 183- - The giant LED screen: a resource to convey sustainability messages

Medal Plaza, Oberhofer Kurpark

Medal Plaza was also visited on February 9, during a day off for competitions. Some temporary infrastructures to welcome fans and offer food & beverage services were set up.



Figure 54- Medal Plaza area and the internal part of some temporary structure for fans

The visit to Medal Plaza was quick and no interviews were carried out. Therefore, no observations emerged, apart from the ones related to the temporary infrastructures of the Arena that could be considered applicable also to the Plaza.

The main good practices and recommendations identified during this environmental assessment are summarized in Table 2.

Table 2. Good practices and improvement opportunities (WBCH assessment)

Good practices	
Environmental aspects	Arena
Mobility of supporters, athletes and staff	<ul style="list-style-type: none"> - Transportation by public transport and shuttles was included free of charge in the entrance tickets for spectators within a 50 km radius of Oberhof - Provision of the shuttle service for the transport of fans from the parking spot cars to the arena
Use of materials	<ul style="list-style-type: none"> -The choice of easy-to-recycle branding materials -The use of wood when possible, to avoid plastics -The extensive use of wood to reduce plastic usage and for its thermal insulation capacity

Water management	-The presence of a collection basin that allows to store large quantities of water to be destined for snow production
Energy management	- A holistic renewable energy concept, including photovoltaic panels on the venue's facilities
Food & Beverage activities	-Reusable glasses -Refillable sauce containers -Availability of vegetarian options in the canteen
Waste management	-Separate paper collection in the canteen -Biodegradable cutlery for the canteen

Improvement opportunities

Environmental aspects	Arena
Mobility of supporters, athletes and staff	-Introduce a more systematic approach for the selection of hotels with green features (e.g. certified EU Ecolabel) by the participating teams -Communicate the existence of these selected "green hotels" also to supporters, for example by including a list of green hotels on the event's website in the green goal section, or create a separate "accommodation section"
Use of materials	-Investigate if the wood used comes from sustainable forest practices (e.g. FSC certified)
Water management	-Display video messages in the giant screens during the event with the aim to increase the environmental awareness of spectators on waste disposal
Energy management	- Collect more information about the thermal insulation of temporary infrastructures and the possible options that can be implemented to improve the energy efficiency of these structures - Find alternative solutions to diesel to heat temporary infrastructures (e.g. biomass)
Waste management	-Introduce the separate collection of waste in all external areas (e.g. food area close to the concerts area)

4. Decarbonisation and environmental sustainability assessment of the Men's World Floorball Championships 2022

Context

The **14th Men's World Floorball Championships** took place in **Zurich & Winterthur, Switzerland** between **5th – 13th November 2022**. In total, 36 teams registered for the tournament – 24 from Europe, 9 from Asia Oceania, 1 from Africa, and 2 from America. From the regional qualification events held in May 2022, 16 teams were qualified to the World Championships held in Zurich that were split in the following groups:

GROUP A	GROUP B	GROUP C	GROUP D
Finland (2)	Sweden (1)	Estonia (9)	Denmark (10)
Switzerland (4)	Czech Republic (3)	Canada (11)	Poland (12)
Norway (6)	Latvia (5)	Thailand (14)	Australia (13)
Slovakia (8)	Germany (7)	Singapore (16)	Philippines (24)

Figure 55- International Floorball Federation report's cover

The matches were played in two different arenas:

- **Swiss Life Arena:** It is located approximately 7 kilometers west of city centre Zurich. The arena officially opened in October 2022. The arena currently serves as the home for the ice-hockey team ZSC Lions of the National League (NL) and seats up to 12,000 spectators for hockey games;
- **AXA Arena:** Winterthur Central Sports Hall (German: Hallensport-Zentrum Winterthur), known as AXA-Arena for sponsorship reasons, is an indoor sports arena, home to handball club Pfadi Winterthur and floorball club HC



Figure 56- The entrance of Swiss Life Arena and a view of AXA Arena visited during the audit

Rychenberg Winterthur. The arena opened August 2018 and has 2000 seats.

This Chapter describes the result of the on-site visit carried out in the frame of the GAMES project in Zurich during the Men's WFC 2022. The visit was carried out on **November 10th, 2022** in three different venues, that is, in the two arenas where the competition took place and in an additional arena used as a practice facility by floorball national teams:

1. **Swiss Life Arena**, Vulkanstrasse 130, 8048 Zürich
2. **AXA Arena**, Grüzefeldstrasse 36, 8400 Winterthur
3. **Sporthalle Stighag**, Sportweg 1 8302 Kloten (practice facility)

The event organiser was the Swiss Floorball Federation.

Participants

Auditors

Tiberio Daddi (Associate Professor, Scuola Superiore Sant'Anna)

Interviewees:

- Tero Kalsta (Head of Sustainability, International Floorball Federation)
- Daniel Kasser, CEO of Men's World Floorball Championships 2022 and Swiss Floorball Federation
- Ioanni Kaldis (Sporthalle Stighag)

Assessment findings

A) Environmental practices and improvement opportunities during the event

Before focusing on the three facilities, we report the environmental practices adopted during the event.

The environmental initiatives of Men's WFC 2022 have been resumed under the initiative called "GREEN GOAL".

The organisers declared that the event aimed to be the first climate-neutral World Floorball Championship in history. The climate fund *myclimate* is the dedicated partner of the LOC and has made the CO₂-emission calculations based on the GHG-protocol. The baseline was created on the basis of information delivered by WFC 2018 organisation and the actual CO₂-emissions of the WFC

2022 are calculated based on information delivered by the LOC. Mitigation of the unavoidable emissions is done via myclimate offsetting projects (the specific projects have not been defined yet but myclimate has dozens of projects, all verified by third party organisations such as Gold Standard, Plan Vivo, Verra VCS). A final report of the CO₂-emissions, based on the GHG protocol, will be produced by myclimate during Q1 2023.

4.0 (a) Accommodation for staff and athletes

Accommodation for players and staff of the teams was an important aspect. Hotels were needed for around 16 teams, 11 nights per team with around 30 people per team: a total of 5,280 overnight stays (without considering the overnight stays of the supporters). The organiser drafted a list of possible hotels to communicate to the participating teams according to some criteria such as price and distance from the event. A large variety of accommodation options were listed as a requirement of the IFF as the financial resources of the participating teams differ substantially. In drafting this list green labels and certifications of the hotels were not fully



Figure 57 - Novotel offered possibility to avoid room cleaning in benefit of the environment.

considered. Nonetheless, a hotel operator (ACCOR) was selected as a sponsor also for its sustainability characteristics and it was communicated as a possible hotel to the travel agencies that arranged travel packages for the visitors that participated to the event. All IFF staff and officials (referees, referee observers, jury, commentators) stayed at the ACCOR hotels (Novotel/Ibis).

It is recommended for future events to adopt a more systematic approach in facilitating the selection of hotels with environmental certifications (e.g. EU Ecolabel) by the participating teams. A possible improvement could be to communicate the existence of these selected "green hotels" also to supporters, presenting the green hotels suggestions in relation to the green goal section on the website of the event.

4.1 (a) Mobility of supporters, athletes and staff

In relations to mobility, with a specific focus on the facilitation of the use of public transport, overall the event has been particularly effective. Thanks to the LOC and the involvement of some sponsors the event has:

- integrated the ticket for public transport within the canton of Zurich directly into the WFC ticket;
- facilitated the visit of Zurich from Bern arranging four extra trains from Bern to Zurich Altstetten for the period of the event (with a strongly discounted price of ticket);
- offered to 25,000 Swiss school children the ticket to and from Zurich Altstetten and Winterthur by public transport



Figure 58-. Event ticket with integration of public transport ticket.

The mobility initiatives were designed after a survey of 2,500 people aimed at understanding the expected mobility behaviours.

4.2 (a) Use of materials

The event adopted some innovative initiatives for the reduction of the environmental impact of materials.

First, the interviews with the event organisers highlighted that about 5,000 individual pieces of *clothing* were produced for the volunteers of the WFC 2022. All volunteers clothing consisted of a blend of *recycled polyester and recycled cotton*, which is obtained from “waste” from textile production. The clothing provider operates its own PET recycling plant. The energy for the production is obtained from windmills and a solar power plants. All these measures save up to 95% of GHG emissions. In addition, the production process also uses less energy (-78%) and less drinking water (-99%). The softshell jacket was deliberately produced in Europe to reduce CO₂ emissions from transportation.

Broken balls and stick blades were recovered through specific collection boxes in retail stores and practice venues. The plastics waste from the material collection at the WFC 2020 was also used; to obtain a sufficient amount of plastic, this material was supplemented with plastics waste from the sea. Thanks to the involvement of IWK, the Plastic Institute at the Eastern Switzerland University of Applied Sciences, the collected plastic was shredded and melted using a special process and extruded to filaments for 3D printers. New products were then produced by 3D printing.



Figure 59 - All-Star Team prizes and memorabilia items were produced from broken balls and stick blades.

Another initiative was referred to the recovery of branding materials. Different branded materials were used in the event. They were mainly constituted by textile (e.g. banners) composed by polyester and cotton. The event then used these materials to produce and sell bags and other souvenirs.

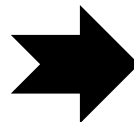


Figure 60-. Example of branding material converted into event souvenirs.

People interested in buying these bags were able to order them on a specific website already during the event. All of the textile branding materials were converted into new products with the support of the event's sponsor Fleurop.

Another topic connected to the use of materials are the free gifts and gadgets given to supporters, that risk to generate unnecessary waste. The CEO of the event said that at present they used apples provided from their sponsor Lidl, so



Figure 61 -.Compostable fan clapper

no particular waste was generated. In addition, they provided plastic flags to Swiss supporters. These flags were made from virgin plastic. We suggest the possibility to use flags made of recycled plastics (see for example LIFE Tackle project's best practices). Clappers (Figure 61) were distributed on each seat before the matches, to create a supporting atmosphere in the arena. The clappers were made of compostable materials and specific collection bins were placed in the venues for their disposal.

With regard to the chemical products used to clean the sports facilities, the event organiser declared to have no role in the selection of the suppliers of cleaning services; nonetheless, it is suggested to collect some information through the Arena manager in order to verify if it is possible to influence the selection of low pollutant chemical detergents.

4.3 (a) Environmental information and awareness initiatives

Environmental awareness raising initiatives were mainly concentrated before the event. For future events, it could be suggested to plan and implement some specific initiatives aimed at raising the environmental awareness of spectators throughout the whole duration of the event, especially for example during the matches attended by school children. Different tools could be adopted such as: the display of video messages on environmental sustainability in the giant screen of the Arena with players as testimonial; the display of informative panels and banners with environmental messages, and any other action that targets and informs spectators on environmental good practices (e.g. promote separate waste collection).

An important post-event initiative to highlight is the drafting of a report of the event with a specific section dedicated to sustainability initiatives. In this report the strengths and weaknesses of sustainability actions are evaluated to facilitate the communication of lessons learnt and ensure a sustainability legacy for future events. This report will be drafted by *myclimate* and will include the five areas identified before the event, where concrete emission reductions can be achieved: Arena, Teams, Travel for Fans, Food, Materials&Waste. These best procedures and results will be summarised as a Sustainability Guide for IFF Event Organisers.

B) Environmental practices and improvement opportunities emerged from the assessment of the Swiss Life Arena

4.1(b) Mobility of supporters, athletes and staff

The Swiss Life Arena was easily reached by public transport. In addition, outside of the Arena there were options to encourage sustainable mobility.



Figure 62 - Sustainable mobility options at Swiss Life Arena

4.2(b) Use of materials

The information provided in the paragraph above also apply to this facility.

4.3(b) Water management

It was not possible to assess this specific environmental aspect.

4.4(b) Energy management

The Swiss Life Arena adopted several good practices in terms of energy consumption and use of renewable resources. In particular, the electricity consumed derives from suppliers that use 100% renewable sources. In addition, a 400 KWp photovoltaic system is also installed on the roof.



Figure 63 - Photovoltaic panels on the roof of Life Swiss Arena

Another good environmental practice was the use of LED lighting in the hospitality area (Figure 64). LED lights were also used for the lighting of the Arena and for the giant screens.



Figure 64 - LED lights in Swiss Life Arena bars and hospitality area

4.5(b) Food & Beverage

Some good practices were identified regarding food and beverage; for example, bars used dispensers for ketchup and mustard to avoid single-use doses (Figure 65).



Figure 65- Dispensers to avoid single-use doses

Moreover, the event organiser required the Arena to include vegetarian meals in the menu of the hospitality area (Figure 66). This is certainly a good practice from an environmental point of view, but we suggest to adopt some monitoring actions aimed at elaborating quantitative indicators to understand its performance – i.e. how many vegetarian meals were distributed? In which % compared to non-vegetarian meal? etc. In addition, the CEO of the event declared that they have not decided how to manage *food leftovers* from the hospitality area and the catering of the Arena. In this case, a possible improvement action would be to understand the quantity of the leftover food and to avoid that this food becomes waste through food donation. For example,

agreements with parishes or NGOs to donate food to poorer people could be established as part of the event organisation, or other alternatives could be promoted, such as the use of the App "to good to go", that allows to sell the remaining food at lower prices to the general population.

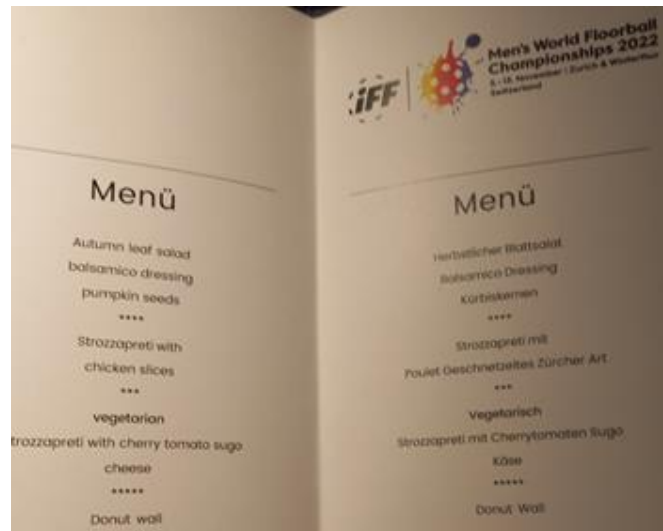


Figure 66 - Hospitality area menu with vegetarian options

Single-use plastic cups were used to serve beverages in bars. In this case, a possible environmental improvement opportunity would be to totally avoid single use plastic cups and use *reusable cups*. Considering the huge capacity of the Arena (12,000 seats), the adoption of reusable cups could significantly reduce the production of plastic waste.



Figure 67 - Use of single use plastic cups

4.6 (b9) Waste management

With regard to waste management, it was observed that there was not separate collection of waste in the Arena. Despite the bins were structured with 3 different holes to be used to differentiate the waste, all waste was collected in an unsorted way. Also, after the end of the matches some people started to collect waste in the Arena between the spectators' seats and these people were using black bags to collect waste from the floor, allowing to suppose that this waste was not managed separately.

Considering what was observed, it is recommended to implement separate collection of waste during future events.

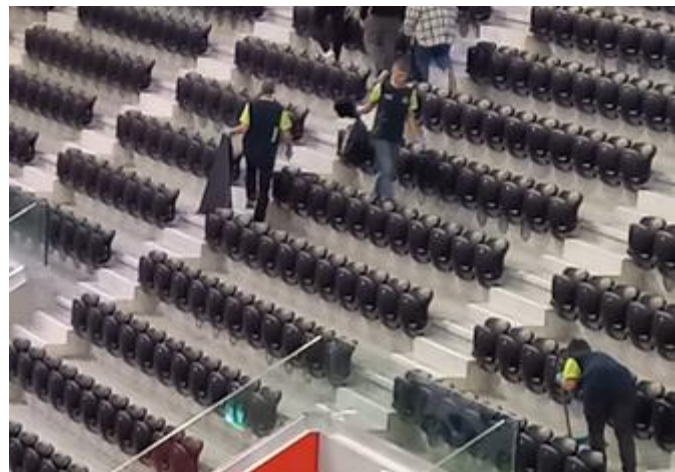


Figure 68 - Waste management: absence of separate collection and people after the end of the match collecting waste from the floor with black bags (presumably bags for unsorted waste).

C) Environmental practices and improvement opportunities emerged from the assessment of the AXA Arena

4.1(c) Mobility of supporters, athletes and staff

The general observations made in the previous paragraph also apply to this facility.

4.2(c) Use of materials

The general observations made in the previous paragraph also apply to this facility.

4.3(c) Water management

In the toilets of the AXA Arena there was a specific system that automatically mixed water and soap to reduce their consumption.



Figure 69 - Automatic dispenser of water and soap to reduce their consumption in the toilettes of the AXA Arena.

4.4(c) Energy management

Regarding energy consumptions, the AXA Arena uses LED lights and has a remote-control system that checks if some lights remain switched on after the end of the competitions.

4.5(c) Food and beverage activities

Similar to the Swiss Life Arena, single use plastic cups were distributed at the AXA Arena and reusable cups were not used at the bar or in the hospitality area.

4.6(c) Waste management

The AXA Arena had separate collection of waste. Different bins were provided to collect PET, aluminium and unsorted waste. Paper collection was only possible in the bar area.



Figure 70 - Separate collection in AXA Arena and cardboard collection of the bar

An interview with a waste operator of the Arena revealed that also organic waste was collected separately but only in the kitchens; then the organic waste was sent to local farmers probably to feed the animals or for composting.

An improvement action would be to provide bins for the separate collection of paper also in the spectators' area, while the separate collection of organic waste in this area does not seem to be a priority since this kind of waste is produced in low quantity in this area.

After the end of the match some operators were collecting the waste left on the floor between seats of the Arena but, on a positive note and contrary to what happened at the Swiss Life Arena, they were collecting waste separately. However, we noticed that one of the operators put the bag of aluminium cans in the unsorted waste collection bin (figure 71, right side). This demonstrates the importance of monitoring activities to prevent such negative behaviours. The assessor asked the operator the reason of this action, and the operator responded that there was a problem in the recovery plant of the aluminium, therefore they could not collect it separately. In this case, it is recommended the following possible improvement action:

- first, during future events it would be important that the event organiser monitors what happens after the match and how waste is managed by the operators;
- second, aluminium is an "expensive" type of waste, investigating other opportunities to find another plant where to send aluminium waste was needed. In general, it could be useful to identify possible environmental issues to be solved before the event takes place (as the problem at the aluminium plant) and activate corrective action to sort the problems emerged.

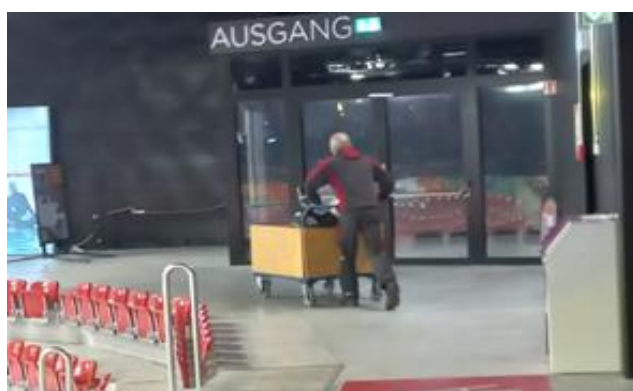


Figure 71 - Waste operators collecting waste after the match.

D) Environmental practices and improvement opportunities emerged from the assessment of the Sporthalle Stighag

The Sporthalle Stighag was visited as an example of practice facility. The facility was the place where some national teams such as Singapore, Thailand, Finland, Poland, Australia, Slovakia carried out their trainings.



Figure 72 - Training facility Sporthalle Stighag

4.1(d) Mobility of supporters, athletes and staff

The facility is very well connected through public transport. Moreover, covered parking for bikes are available outside the facility.

4.2(d) Use of materials

This aspect was not assessed.

4.3(d) Water management

It was not possible to assess this environmental aspect.

4.4(d) Energy management

The Arena was opened in the year 2019. It is a very modern Arena with high standard of energy savings such as LED lights and passive protection against heat losses.

4.5(d) Food & Beverage

It was not possible to assess this environmental aspect.

4.6(d) Waste management

Bins for the separate collection of all kind of waste were available at this venue.



Figure 73 - Waste deposits in Sporthalle Stighag

The main good practices and recommendations identified during this environmental assessment are summarized in Table 3.

Table 3. Good practices and improvement opportunities (Men's WFC 2022)

Good Practices		
Environmental aspects	Swiss Life Arena	AXA Arena
Mobility of supporters, athletes and staff	<ul style="list-style-type: none"> - The ticket for public transport was integrated with the WFC ticket - The visits of Zurich from Bern were facilitated thanks to the arrangement of four extra trains from Bern to Zurich Altstetten during the period of the event (+ strongly discounted price of ticket) - The ticket to and from Zurich Altstetten and Winterthur by public transport was offered to 25,000 Swiss school children - The sports facilities were easily reached by public transport. In addition, outside of the Arenas there were options to encourage sustainable mobility (e.g presence of bike racks) -The hotel operator ACCOR was selected as a sponsor also according to its sustainability characteristics and it was communicated as a possible hotel to the travel agencies that arranged travel packages for the visit to the event 	
Use of materials	<ul style="list-style-type: none"> -All volunteers clothing consisted of a blend of recycled polyester and recycled cotton, which is obtained from "waste" from textile production - Broken balls and stick blades were recovered through specific collection boxes in retail stores and practice venues. The waste plastic from the material collection at the WFC 2020 was also utilised. To obtain a sufficient amount of plastic, this material was supplemented with plastic waste from the sea. - Recover branding materials. Different branded materials were used in the event. They were mainly constituted by textile (e.g. banners) composed by polyester and cotton. The event has then collected those materials which have been used to produce and sell bags and other souvenirs. 	
Water management	/	<ul style="list-style-type: none"> -In the toilets of the Arena there was a specific system that automatically mixed water and soap to reduce their consumption.
Energy management	<ul style="list-style-type: none"> -The hospitality area was equipped with LED Lights - The electricity consumed comes from suppliers that use 100% renewable sources. In addition, a 400 KWp photovoltaic system is also installed on the roof 	<ul style="list-style-type: none"> -The Arena used LED lights and according to the statement of the local manager, it has a remote-control system that verifies if some lights remain switched on after the end of the competition
Food & Beverage activities	<ul style="list-style-type: none"> - Bars used dispensers for ketchup and mustard to avoid single use doses - Vegetarian options are offered and well indicated in the food and beverage menu 	<ul style="list-style-type: none"> - The event organiser required the Arena to include <i>vegetarian meals</i> in the food distributed in the hospitality area

Waste management	/	<ul style="list-style-type: none"> -Separate collection for PET, aluminium, and unsorted waste in any sector -The organic waste collected was sent to local farmers probably to feed the animals or for composting -After the end of the match operators collected the waste left on the floor or on the seats but, contrary to what happened at the Swiss Life Arena, here they separated the waste collected into different bags
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Improvement opportunities

Environmental aspects	Swiss Life Arena	AXA Arena
Mobility of supporters, athletes and staff	<ul style="list-style-type: none"> - Adopt a more systematic approach in facilitating the selection of <i>hotels with environmental certifications</i> (e.g. EU Ecolabel) by the participating teams. - Inform supporters of the existence of selected "green hotels", for example including this list in the website in the green goal section. 	
Use of materials	<ul style="list-style-type: none"> -Verify if it is possible to influence the chemical use by cleaning companies by choosing for example less pollutant detergents - Use plastic flags made of recycled instead of virgin plastics 	
Food & Beverages activities	<ul style="list-style-type: none"> -Adopt reusable cups to limit the production of single-use plastic waste 	<ul style="list-style-type: none"> -Adopt reusable cups to limit the production of single-use plastic waste - Adopt <i>monitoring actions</i> aimed to elaborate quantitative indicators to understand the performance of the vegetarian choices (i.e. how many vegetarian meals have been distributed? In which % compared to non-vegetarian meal? etc.). - Understand the quantity of the leftover food and avoid that this food becomes waste, for example through food donation (putting in place agreements with parishes or NGOs), or through the use of Apps such as "to good to go" that allows to sell the remaining food at low prices to the population
Waste management	<ul style="list-style-type: none"> -Monitor the implementation of waste separation by employees after the event 	<ul style="list-style-type: none"> -Implement separate collection of waste and monitor its implementation

5. Conclusions

This report represents the Deliverable 2.3 – *"Report on the decarbonisation operational assessment"*, in line with the objectives of task 2.3 *"Assessment in decarbonisation operational management"*, under the frame of Work Package 2 *"Assessment of the decarbonisation potential of participating sport organisations"*.

The report analyses the results of three environmental and decarbonisation assessments on 3 different sport contexts, one per each involved GAMES's sport: Athletics, Biathlon and Floorball.

The assessments highlighted the state-of-the-art in the management of the environmental aspects of three international events carried out in Europe: Diamond League final 2022 (Athletics), IBU Biathlon World Championship 2023 (Biathlon) and Men's World Floorball Championships 2022 (Floorball).

Each event was assessed through desk analysis, on-site visits and interviews. Each environmental aspect with a direct (i.e. energy consumption, mobility, etc.) or indirect (i.e. waste management, material use, etc.) impact on climate change was operationally analysed, identifying good decarbonisation practices as well as recommendations to further mitigate environmental and climate change impacts during the single events.

The results show a high level of awareness on the management of environmental aspects (from mobility to the management of water, energy, material and waste resources) during events by the event organizers and the respective international federations. Each event has its own characteristics, and this provided the possibility to identify sector specific as well as widely applicable and replicable good practices in the whole sport industry. However, each event also showed improvement opportunities in terms of decarbonisation potential.

After providing the results for each single event, this report synthesis and presents in table 4 all the good operational practices identified in the management of the three sporting events assessed, and the improvement opportunities – i.e. good practices that could be implemented to reduce the environmental and climate change impacts of the event.

The total of all good practices already implemented in the three events is 26, whereas the total suggested improvement opportunities are 26.

Thus, this GAMES's report proposes **52 good practices to the sport community**: 50 are widely applicable in the whole sport industry, whereas 2 are specific for winter-sports. These good practices can be implemented by any

sport organization and event organiser which seek to improve environmental and decarbonisation performances during sport events.

Table 4. Summary of the good practices applicable to sport events as identified during the GAMES's operational assessments

Environmental aspects	Summary of the good practices already implemented in the three sport events
Mobility	<ul style="list-style-type: none"> - Select event locations with good public transportation systems - Select accommodations for athletes and staff close to the event venue - Integrate the ticket for public transport (train, subway, bus) with the event ticket for spectators free of charge within a 50 km radius of the venue - Organise shuttle services for spectators from the event venue to the main public transport locations - Arrange extra train and bus lines connecting neighboring cities during the period of the event with a discounted ticket price - Offer a number of free public transport tickets for school children to attend the event - Include options that encourage sustainable mobility such as bike racks outside the event venue
Use of materials	<ul style="list-style-type: none"> - Reuse old infrastructures - Use wood to reduce plastic usage - Use wood for its thermal insulation capacity (<i>applies to winter sports only</i>) - Choose branding material that is recovered (e.g. banners) and recycled (e.g. t-shirts made of recycled polyester and recycled cotton obtained from waste from textile production) - Recycle sporting equipment (e.g. broken balls and stick blades) and use the plastic waste to make gadgets and branding material. - Create gadgets and branding materials with plastics collected from the sea
Water management	<ul style="list-style-type: none"> - Provide innovative wood toilets that do not need the use of water - Store rainwater through a collection basin for snow production (<i>applies to winter sports only</i>)
Energy management	<ul style="list-style-type: none"> - Choose LED lights instead of traditional light bulbs to light up venue facilities - Introduce photovoltaic panels on the venue's rooftops - Choose electricity suppliers that use 100% renewable sources - Introduce a remote-control system that automatically checks and switches off the lights that remain on after the end of the competition
Food & Beverage	<ul style="list-style-type: none"> - Install water refill stations inside the venue - Use of paper plates and cups and wooden or biodegradable cutlery to reduce the use of plastics - Use large refillable dispensers for sauces (mayonnaise, ketchup, mustard etc.), instead of single-use small packages - Include vegetarian options in the menus - Choose local food products for the kiosks and canteen
Waste management	<ul style="list-style-type: none"> - Provide waste bins for the separate collection of plastics and paper

	- Provide separate collection bins for organic waste in the canteen areas. Send the organic waste to local farmers.
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Environmental aspects	Summary of improvement opportunities as identified during the three sport events
Mobility	<ul style="list-style-type: none"> - Choose the sporting venues according to environmental criteria - Adopt a systematic approach for the selection of the accommodation for staff and athletes with environmental certifications (e.g. certified EU Ecolabel hotels) - Inform spectators of the list of "greener" hotels to choose during their stay in a section of the website
Use of materials	<ul style="list-style-type: none"> - Choose reused materials such as banners, athletics tracks, and other specific equipments etc. - Reduce the purchase and distribution of gadgets and gifts for supporters, especially those made of plastics - Choose suppliers based on environmental criteria (i.e. selection of cleaning suppliers that use of less polluting and more ecological cleaning products such as those marked Ecolabel) - Use plastic flags and similar products made of recycled instead of virgin plastics - Possibly eliminate paper clappers for supporters (apply only to certain contexts) - Dematerialize paper documentation for media and press staff and reduce/eliminate the use of paper entertaining materials during the competition - Use wood from sustainable forest practices (e.g. FSC certified) for temporary structures, when present - Display sustainability awareness raising videos on (the stadium's giant) screens directed to supporters and increase sustainability communication activities
Water management	<ul style="list-style-type: none"> - Consider the destination of the water when it is discharged from the toilets
Energy management	<ul style="list-style-type: none"> - Switch off the lighting system and the screens during daylight and when not necessary - Collect more information about the thermal insulation of temporary infrastructures and the possible options that can be implemented to improve the energy efficiency of these structures - Find alternative solutions to diesel to heat temporary infrastructures (e.g. biomass)
Food&Beverage	<ul style="list-style-type: none"> - Install water refill stations in different areas to be accessible to supporters and reduce the distribution of plastic bottles to staff and supporters - Increase the use of large reusable containers for sauces (mayonnaise, ketchup etc..) and eliminate single-use small packages - Provide sandwiches packaging of different materials than plastics - Use reusable cups for distributing beverages to supporters to limit the use of single-use plastic cups - Adopt <i>monitoring actions</i> aimed to elaborate quantitative indicators to understand the performance of the vegetarian choices (i.e. how many

	<p>vegetarian meals have been distributed? In which % compared to non-vegetarian meal? etc.).</p> <ul style="list-style-type: none"> - Understand the quantity of the leftover food and avoid that this food becomes waste, for example through food donation (putting in place agreements with parishes or NGOs), or through the use of Apps such as "to good to go" that allows to sell the remaining food at low prices to the population - Evaluate whether it is better to use compostable cups (managed as organic waste) or non-compostable ones (managed as paper), according to the waste management facility of the municipal waste management system.
<p>Waste management</p>	<ul style="list-style-type: none"> - Provide waste bins not only for the separate collection of plastics and paper, but also for aluminum and glass in all internal and external areas of the venue - Increase the number of bins for the separate collection of waste and reduce the number of unsorted waste bins - Monitor the implementation of waste separation by employees after the end of the event - Display video messages in the giant screens during the event with the aim to increase the environmental awareness of spectators on waste disposal