Deliverable B.1.3

Pilot test reports

Version 3.0

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Document history

Version	Date	Description
1.0	07/02/2020	1st version of the document with the proposed structure and format
2.0	10/12/2020	Modified structure, chapters and format; collection of all available pilot test reports
3.0	29/01/2021	Relocation of pilot test reports in different chapters according to their completeness; conclusions added

Glossary

Abbreviation	Meaning
TACKLE	Teaming up for a Conscious Kick for the Legacy of Environment
ACR+	Association of Cities and Regions for Sustainable Resource Management
LIPOR	Intermunicipal Waste Management Service of Greater Porto
AMIU	Multiservice and Urban Hygiene Company of Genoa
SSSA	Sant'Anna School of Advance Studies
FGIC	Italian Football Association
FRF	Romanian Football Association
SvFF	Swedish Football Association
RBFA	Royal Belgian Football Association
FAI	Football Association of Ireland
IRFU	Ireland National Rugby Union
FC	Football Club
HDPE	High Density Polyethylene
EMS	Environmental Management Standard
UV	Ultra Violet
LED	Light Emitting Diode
PP	Polypropylene
KPI	Key Performance Indicator
PMC	Polyvinyl Carbonate
PET	Polyethylene Terephthalate
PMC	Plastic, metal and cardboard packaging

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1. Introduction

The main objective of the LIFE TACKLE project is to increase the environmental awareness and to improve the current practices in environmental management during football games, including a whole range of different stakeholders. The project focuses on all phases of a football game's life cycle (i.e. conception, organisation, staging and closure) and targets necessary competences and organisational structures within the National Football Associations (NFAs) which are necessary or in charge of undertaking those activities in different phases of a football game. Moreover, the project promotes a continuous improvement of environmental management of football games even after the end of the project through benchmarking and setting targets, as well as via the peer influence of the NFAs committed to environmental sustainability.

One of the deliverables of the LIFE TACKLE project are the Guidelines, which were previously drafted through a desk research and on-site visits and interviews. These Guidelines contain nearly 100 existing good practices in organising sport events, including football matches. It serves as a compendium of good practices and an overview of what solutions exist already out there, their complexity when it comes to implementation and potential benefits. They cover a whole range of various aspects of environmental management – from mobility to energy, water, waste management and other operational aspects to governance.

This particular deliverable reports on the pilot tests, their development, implementation and impact. It also reports on the training of organisations and actors involved in the tests. The pilot tests which took place in the pilot stadiums had the objective to assess the feasibility of the application of the previously identified practices included in the Guidelines.

2. Pilot stadiums as hosts of pilot tests

The list of pilot stadiums presented in the deliverable B.1.1 "List of pilot stadiums to involve in the governance and operational pilot tests" provides all the necessary and key background information on where the pilot tests would take place. That list presents the starting point of conducting the pilot tests. The list contains a good mixture of stadiums both in terms of ownership, capacities, geographical distribution and their purpose. This mixture was considered to contribute to the pilot test in case some of them took place in two or more different stadiums, as we would be able to compare the efficiency and the complexity of a certain pilot test under different circumstances.

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A summary of the pilot stadiums is given in the Table 1 below:

Table 1. List of pilot stadiums and their key properties

Stadium	Capacity	Opened	Owner	Purpose
Aviva, Dublin	51700	2010	Co-owned	Football, rugby, concerts
Luigi Ferraris, Genoa	36599	1990	Co-owned	Football
Anghel Iordanescu, Voluntari	4500	2012	Municipality	Football
Olimpico, Rome	72698	1990	Olympic Committee	Football, rugby, concerts
National Arena, Bucharest	55634	2011	Municipality	Football, concerts
King Boudouin, Brussels	50093	1995	Municipality	Football, athletics, concert
Friends Arena, Solna	54329	2012	Co-owned	Football, concerts
Benito Villamarin, Betis	60720	2017	FC Betis	Football
Dragao stadium, Porto	50033	2003	FC Porto	Football
S.P.A.L., Ferrara	16134	2018	Municipality	Football
Tele2 Arena, Stockholm	35900	2013	Municipality	Football
Renzo Barbera, Palermo	37619	1990	Municipality	Football

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3. Identification and overview of the pilot tests

Upon the selection of the pilot stadiums, the initial baseline assessment was carried out in each of the stadiums. This assessment, apart from the baseline data, already presented in the deliverable B.1.1 "List of pilot stadiums to involve in the governance and operational pilot tests" also included trainings of organisations and actors involved in the tests. These trainings had the objective to enhance the effectiveness of the tests through a specific knowledge transfer from one stakeholder to another, but also from LIFE TACKLE project technical partners to stadium managers and National Football Associations. The trainings also featured some of the particularities of the LIFE TACKLE project such as the way pilot tests should be structured, the project's timeframe, the European context of the project and the previously drafted Guidelines. All this was necessary to be done, so various stakeholder involved in the pilot test could understand their place and role in the project and above all, their contribution to the project.

The identification of the pilot tests included an initial assessment of the current performances and practices, both through data collection but also an environmental audit. The environmental audits were being undertaken by LIFE TACKLE technical partners (Lipor, AMIU, SSSA and ACR+) and they brought together stadium managers, waste management operators and event organisers (football clubs and/or football associations). The audits allowed the technical partners to collect as much qualitative and partly quantitative intelligence as possible which were an indispensable step before going back to the table to identify the pilot tests and deliver trainings. The audits and the baseline assessment in general, looked at various aspects of environmental management in football games, as predefined by the project – mobility, energy management, water management, waste management, general public procurements and governance. 67 pilot tests were identified prior to the implementation phase. The Table 2 below presents an overview of these pilot tests per stadium and per category.

Table 2. Overview of all the pilot tests identified in the pilot stadiums

	Mobility	Energy	Water	Waste	GPP	Gov.	**TOTAL**
AVIVA Stadium, Dublin				1			1
Benito Villamrin, Sevilla	2			1		1	4
Anghel Iordanescu, Voluntari		2		2		2	6
Friends Arena, Solna		2		1	1		4
Olimpico, Rome		2	1	2	1	1	7

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Dragao, Porto		1	1	2		3	7
Roi Baudouin, Brussels	3			2	1		6
Tele2, Stockholm				2		2	4
Luigi Ferraris, Genoa		1		3			4
Paolo Mazza, Ferrara	2	2		2	2		8
National Arena, Bucharest	1			3	1		5
Renzo Barbera, Palermo*	2	1		2	1		6
TOTAL	10	11	2	23	7	9	62

** Renzo Barbera in Palermo did not conduct any pilot tests as their adherence to the rest of the pilot stadiums took place right before the pandemic thus proper audit and definition of pilot tests and their subsequent implementation never took place*

Furthermore, the identification of the pilot tests was done in a way to have them reflecting the previously published "Guidelines for Environmental Management of Football Events". Since these Guidelines were structured in a way to reflect all the various fields of environmental management, the aim of this identification phase was to match the pilot tests with practices listed in the Guidelines in order to be able to compare the results and achievements and modify and improve the Guidelines publication itself. The fields of environmental management examined and practices analysed included:

- Governance of Football Events
- Operational Management of Football Events
    - Context of the Event
    - Event
    - Stadium Management
    - Procurement
    - Mobility and Logistics

The following part of the report presents the descriptions of the pilot tests based on the baseline assessment, obtained through the audits, interviews, observations and data collection followed by the specifying the aspects of environmental management they are targeting and the practices from the Guidelines these pilot tests are referring to. Each pilot test contains the reference chapter and template of the existing practice elsewhere previously identified in the Guidelines. Furthermore, the report describes the implementation phase through key aspects:

- Designing the pilot test
- Success factors vs inhibitors
- Economics and feasibility
- Impact assessment

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- Potential replicability

Each pilot test report will also suggest potential modification of the respective practice in the Guidelines.

Most of the subchapters of each pilot tests, namely designing the pilot test and success factors and inhibitors will be described based on observations, chronological order of activities undertaken and everything that led to the pilot test itself. The objective of this approach was to facilitate the understanding of how a pilot test was set up and what aspects of preparations were necessary to pay attention to and help the readers to understand what a particular pilot test implied. Economics and feasibility will look at cost, simply put, if the costs were disclosed but also the efficiency and "money for value" aspect of a pilot test.

Finally, the impact assessment, being the most important part of each pilot test report will be in most cases based on empirical findings, such as CO_2 savings (in production or operations), amounts of waste avoided or recycled and similar. The impact assessments for each pilot test and the accompanying calculation method, where data was available, were chosen according to the nature of the particular pilot test. The sources included publications, studies and other previously conducted researches.

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4. Aviva Stadium, Dublin

Environmental issues and environmental governance in general are covered by the sustainability department which currently has 2 employees. The stadium has its own Sustainability Policy which is based on the mission "to operate a first-class international stadium, on behalf of the Rugby Union (IRFU) and the Football Association of Ireland (FAI), providing an outstanding venue for matches, concerts, conferences and events, offering exceptional customer experience in a sustainable manner."

The figures on recycling were being provided by Greenstar, the company responsible for waste management in the stadium. One of the achievements the stadium wanted to make was to have an average recycling rate per month of 75%. This rate at the beginning of the project was 67% (2018 average).

4.1 Reusable cups for drinks; Section of the TACKLE guidelines: event (ch. 3.2.2.12, OM/E 18)

Most of the recyclables collected during games at AVIVA stadium are plastic cups, especially in case of rugby games. However, although a proper treatment is ensured for them by Greenstar (if they end up in the recyclables), some of them end up in the streets around the stadium, putting pressure on the local community and city council. At the same time, the stadium would like to decrease the use of single use plastic cups. They already run a test with reusable cups, where the consumer would pay €1 for the cup as a deposit and get it back once he/she return the cup. However, there were issues with the design as the beverage provider wasn't satisfied with the solution. This is why the pilot test had to include Diageo, the beverage provider.

Pilot test

This pilot test would run another test with reusable cups. It would be necessary this time to ensure the design, size and other characteristics with all beverage providers/caterers in order to have both sides agreeing on it. The plan is to run the test at a football game in November or rugby game in December but only in one part of the stadium in order to be able to compare the amount of waste collected in that part of the stadium with the others.

Designing the pilot test

While AVIVA wanted to introduce reusable cups for some time already, it was Diageo who decided to take over this task of developing and coming up with the appropriate design. They presented the design they

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developed that met their requirements and the new reusable cups were used during the Ireland – Wales rugby game. The cups were branded with the IRFU logo. In order to maximise the use and the resources a discussion was necessary between several different stakeholders involved in this pilot test, namely FAI, IRFU, AVIVA stadium, Compass (caterers) and Diageo. Both FAI and IRFU were happy with the solution as long as both logos were displayed. Due to this slight delay, the full implementation which was planned for November was pushed back to February 2020 and the Rugby 6 Nations Cup.

However, the system was already tested in September during a rugby game only in one part of the stadium with 20.000 deployed cups. According to the stadium manager and Compass representatives, there weren't any complaints neither from the customers, nor the caterers' side and the scheme was considered as an easy one to deploy with minimal requirements for additional trainings and briefings for people working behind the bar.

Preparation for the full deployment started on time in order to have the cups introduced for the Ireland – Scotland rugby game on 1 February. The supplier was EcoFriendly Cup which is a subdivision of Racedisplays. Racedisplays are a printing company who cover a wide range of events and industries. The owner saw the likes of Ecocup and Green goblet on the continent and saw an opportunity in Ireland as there was no one yet doing the cups. The choice of material was Polypropylene cups which can be washed up to 300 times.

65000 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.

Success factors vs Inhibitors

Customers had very positive feedback after the first game and appreciated the efforts the stadium was making to eliminate single use plastics. They have received feedback that there was not enough signage so they had to increase this from the Scotland game going into the Wales game. This seemed to work and they had less complaints from people who said that they did not know about the initiative. The signage which was developed for the pilot test are below in Figure 1:

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Figure 1. Signage used in AVIVA stadium during the pilot test

While we unfortunately didn't obtain any data on the loss rate, meaning how many cups were left unreturned in this pilot test, we could report on one observation we made. A lot of cups were left in the stands (a large share still collected by some visitors, not necessarily the original owners of those cups). The reason behind this could be found in the drink vs deposit rate. While a drink, in our case a pint, could cost somewhere between €2 to €4 in southern or central Europe, a pint in Ireland is between €6 and €7. The usual deposit price for a cup, on the other hand, is €1 in both cases. This leads to a conclusion that the deposit elswhere could be a half or a third of a price of a new drink, while in Dublin it's way less. This is only an observation we made, thus we can't prove it with numbers. The images in Figure 2 below show this occurrence at AVIVA stadium:

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Figure 2. Two extremes of the return of used cups

Economics and feasibility

Just like the majority of reusable cup schemes in events, the customer pays an extra €1 when buying the first drink. The money that doesn't 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.

For this pilot test, it wasn't the stadium neither the Football Association/Rugby Union who bear the costs, but Compass, who is subcontracted to provide beverages. This included the full cycle – delivery and cleaning.

Unfortunately, we were not able to obtain any commercial figures, as Compass was unable to share them.

Impact assessment

At the very end of the Ireland – Scotland game, 52360 reusable cups were returned to the washing facility. If these 52360 were replaced with single-use plastic pint cups, they would amount up to 418.88 kg.

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In terms of CO_2 savings, this pilot test achieved a saving of above 2 tonnes of CO_2eq. 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. The results are presented in Table 3 below.

Table 3. Emission savings from the pilot test

AMOUNT DIVERTED	EMMISION SAVED BY AVOIDING INCINERATION	EMISSION LOST BY AVOIDING INCINERATION	EMISSION SAVED BY REUSING AND LOST BY WASHING	TOTAL
418.88 kg	1250.35 kgCO_2eq	46.08 kgCO_2eq	924.88 kgCO_2eq	**2129.15 kgCO_2eq**

Furthermore, thanks to the data obtained from Greenstar, one could look at the total amounts of collected waste. Since the stadium hosts the home games of the FAI and IRFU only, it means that the stadium is not visited regularly each month as if it was the home ground of a football club or similar, hosting games every two weeks. Therefore, instead of looking at the 2019 average amount of collected mixed packaging waste where single-use cups end up, this impact assessment looks at the months of March, September and November 2019. The stadium hosted the same number of matches in those months like in February 2020 when the pilot test was conducted. In addition to the mixed packaging waste, we looked at the dry mixed recycling rate, too, which indicated the purity of mixed waste. The Table 4 below shows the achievements of this pilot test.

Table 4. Collected waste amounts per months of interest (Greenstar)

	MARCH 2019	SEPTEMBER 2019	NOVEMBER 2019	FEBRUARY 2020
Games hosted	2	3	2	2
Mixed packaging (t)	4.54	3.02	3.96	3.1
Dry Mixed Recycling rate	14%	10%	14%	17%

The success of this pilot test is obviously reflected in two different manners, yet very much interlinked. 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.

Replicability potential

This particular pilot test was proved to be rather easy to run and the entire practice easy to be implemented. Several different important factors played an important role in its enrolment. Above all, reusable cups recently became a staple principle in organising festivals, concerts and any other kind of mass events. This implies that

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the visitors are rather accustomed already to this practice. Furthermore, the key factor that was proven to have driven this pilot forward was the fact that a company which has experience in this particular practice was brought in. There is a large pool of national or international companies providing such services, something that can facilitate everyone's effort in "greening" a sport or a music event. A mutually beneficial business model can easily be achieved and it can greatly improve the environmental performance of events.

The replicability potential can be even bigger if sponsorship and similar deals are considered. Many multinational companies operating in Europe are looking for potential opportunities to present their products and services as a green one. Their sponsorships can easily cover certain costs that might occur during the implementation of such a practice.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					3

5. Arena Nationala, Bucharest

The National Arena (Arena Națională) is a retractable roof football stadium in Bucharest, Romania, which opened in 2011, on the site of the original Stadionul Național, which was demolished from 2007 to 2008.

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The stadium hosts major football matches including matches of the Romanian national football team, and the Romanian Cup Final. The stadium is also the home of Liga I football clubs Steaua and Dinamo București. With 55.634 seats, it is the largest football stadium in Romania.

Although equipped with the latest technology and facilities which offer a remarkable experience to the game and concert goers, the stadium is continuously improving its environmental performances. The management of the stadium is responsible for mobility and other environmental performances such as waste and energy management.

The current practice of serving drinks in single use plastic cups generates large amounts of such waste. The concert of the American rock band Metallica served as the very first event where reusable cups were tested as a scheme.

5.1 Reusable cups for drinks; Section of the TACKLE Guidelines: Event (ch. 3.2.2.14, OM/E18)

During the matches of Steaua and Dinamo plastic cups are currently used. However, in August 2019, during a Metallica concert, for the first time in the National Arena reusable cups were used upon request of the concert organiser.

Pilot test

Based on the experience of the Metallica concert, the pilot aims to adopt reusable cups in certain areas of the stadium during the matches of Steaua and Dinamo

Designing the pilot test

Knowing that the stadium is owned by the city of Bucharest which rents it to whatever team wants to use it, this pilot test, which would involve the local football clubs Steaua and Dinamo would therefore require their involvement, too. Instead, it was decided to use matches of the Romanian national team for the pilot test, as the Romanian Football Association (FRF) was already involved in the project.

It is important to mention here that the pilot test itself did not see a return scheme in place, where a deposit is paid for a cup, thus this pilot test did not imply proper reusable cups but only cups made of different material, harder plastic, suitable for reuse. The cups, once given to the visitors stayed with them and could be taken back home.

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The pilot test was imagined as an opportunity to assess the visitors' habits when it comes to cups for beverages and if they were ready to switch to reusable cups. One of the national team's sponsors, Penny, stepped up to sponsor the pilot test with 20.000 cups. Penny was responsible for food and beverage serving within the stadium's perimeter and were closely working on setting up the pilot test. They took care of choosing the appropriate cups, being guided by the best price offer while FRF was there only to confirm the choice.

The photo below on Figure 3 shows the chosen solution. The selected 0.5 l cups were made of polypropylene.

Figure 3. The design of PP cups used in National Arena

The cups featured the sponsor logo, the FRF logo and the game details, which made the cup memorabilia, in some way. The 20.000 cups were distributed across the stadium, without a particular part of the stands in focus. Prior to the distribution, no training or briefing were organised for the bars and the staff at the bars, as these cups only replaced the old ones, as well as since there was no proper return scheme in place. The introduction of these cups, even if slightly heavier that the other did not require any security modification in the stadium, either. The game which saw the use of these cups was a home game against Spain on 5 September 2019 in front of an attendance of 50.000.

The leftover cups from this particular game were used in the following one.

Success factors vs Inhibitors

While some cities, regions and countries in Europe started phasing out single use products and introduced accompanying strategies and bans, Romania doesn't have such a thing, yet there is a national strategy for waste reduction and increased recycling.

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When it comes to the pilot test itself, no communication activities were done prior to the game in order to announce the new cups, however, there was some basic information in the stadium for fans to understand why the new cups were being served.

The fact that the cups were imagined as a piece of memorabilia, made it more attractive for the visitors to keep them. However, on the other hand, the fact that once given to the fans, the organiser loses track and trace of the cups and their "reusability" can't be assessed properly and therefore, nor the impact assessment.

As for the inhibitors, the fact that the sponsor took over the choice of the material for cups prevented the game organiser to assess the different models and material for the cups which, if done properly, could increase the overall success of the pilot test. The Table 5 below shows the comparison between different materials (Beverage and eating utensils at events, OVAM, 2017) and we can see that the chosen polycarbonate cups score the worst among all plastic cup types, especially due to low recyclability and impossibility to be composted, unlike some newly available cups, such as recycled PET or biogenic polyethylene.

Table 5. Comparative LCA of plastic cups made of various material

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	hergebruik hoog (>150)	hergebruik beperkt (<150)	selectieve inzameling voor recyclage	restafval of compost
Tweedehands vaatwerk (glas, keramiek, metaal)	A	A		C
rPET (gerecycleerde PET)	A	A	B	C
PLA (polymelkzuur) & C-PLA	A	A	B	C
Bio-PE (biogene polyetheen)	A	A	A	B
PP (polypropeen)	A	B	C	D
PET (Polyethyleen Tereftalaat)	A	B	C	D
PS (polystyreen)	A	B	C	D
PC (polycarbonaat)	B	C	D	E
Copolyester	B	C	D	E
Gemodificeerd zetmeel				D
Karton (gerecycleerd)			B	C
Vormkarton (moulded fibre)				B
Suikerrietvezel (bagasse)				B
Hout				C
Cellulosepulp				D
Glas (gerecycleerd)	B	C	E	G
Metaal	B	D	G	G
Keramiek	C	E		G

Economics and feasibility

The fact that the national team's sponsor took over all the costs, which could not be disclosed, made no economic impact on FRF. Some minor savings were recorded in the amount of waste after the game which further brought savings to FRF as the event organiser. Symbolically, a pilot test like this also improved FRF's image, according to them.

Impact assessment

A comprehensive impact assessment for this pilot test is difficult to be conducted, since once served, the cups stay with the visitors and the trace is lost for further impact assessment as we can't know how many times were the cups reused nor how were they disposed of. The only observation that was done during the game was visually assessing the number of cups left in the stands which was rather marginal, below 5%.

However, according to FRF, this pilot test if turned into a regular practice could lead to certain opportunities, such as an introduction of a proper reusable cup scheme including a return mechanism.

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This particular pilot test resulted in the following environmental impact, as presented in the table below, taking into consideration the production of virgin polypropylene (PlasticsEurope, Eco-profiles of the European Plastics Industry, 2005). We compared the regular single use polypropylene cups and the sturdy ones used for this pilot test in table 6. This analysis and the figures come from a 2005 PlasticsEurope publication and include the total energy required for: fuel production and delivery energy, energy content of delivered fuel energy use in transport and feedstock energy. The three types of energy taken into account here were electricity, oil fuels and other types of fuels.

Table 6. The comparison of the energy required for producing single use PP cups and PP cups used for the pilot test

MATERIAL	WEIGHT OF ONE 0.33 L CUP	WEIGHT OF 20.000 UNITS	GROSS ENERGY REQUIRED TO PRODUCE 1 KG	TOTAL ENERGY REQUIRED FOR THE PILOT TEST
Single use Polypropylene (PP)	3.6 g	7.2 kg	73.37 MJ	**528.3 MJ**
Sturdy Polypropylene (PP)	50 g	1000 kg	73.37 MJ	**73370 MJ**

We can easily conclude that without a proper return scheme, where cups are collected at the end of a game, the destiny of the reusable cups (number of times they were reused, the way they were disposed of and treated etc.) is difficult to be assessed. This is why that part of the impact assessment had to be left out for this pilot test. Furthermore, pilot tests like these can end in much higher environmental impact than single use cups, something we will further discuss in chapter 16.2.

Replicability potential

This pilot test was proven to be very easy to replicate, especially with a support of a sponsor. Since no return scheme was implied, no additional training and briefings were required nor additional staff.

However, as it can be seen in the comparison with previously identified practices, this approach can result in higher environmental impact.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.25

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5.2 Separate waste collection and recycling; Section of the TACKLE guidelines: event (ch. 3.2.2.12, OM/E4)

As there were no bins for separate collection in the National Arena and taking into account that UEFA was requiring to adopt this system by the beginning of Euro 2020, the timing of the pilot actions of TACKLE was fully compatible with this aim.

Pilot action

This pilot test would see testing separate waste collection within the stadium's perimeter. TACKLE partners would provide support in networking with other stadiums that had already adopted bins for separate waste collection overcoming some issues that can be linked with them (e.g. anti-terrorism security).

Designing the pilot test

The way waste was collected in the stadium was always in the hands of event organisers as they were responsible for that task when renting the stadium from the city, through hiring a contracted waste collecting company. For this particular pilot test, FRF did a market research looking for suitable companies to step up for it. It was the city owned waste collection company that was hired for the pilot test.

One of FRF's sponsors – Penny supermarkets, stepped up with sponsoring the pilot test and providing 40 waste bins, 20 of them for paper and cardboard and 20 for residual waste. They were allocated in different parts of the stadium, excluding the VIP area. The third waste stream, which included glass and plastic was left to the waste collection company to collect from the stands and other visitors' areas.

This pilot test required a new procedure to be agreed on. It was prepared by the waste collection company and confirmed by FRF. Furthermore, the pilot test also required a briefing with the waste collection staff in order to introduce the new procedures.

Success factors vs Inhibitors

National, regional and local strategies help a lot in motivating various entities to shift towards more sustainable practices just like the Romanian strategy for increased recycling and waste prevention.

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The market research and the call for offers reflected in one challenge that was identified which was the fact that not many waste collection companies are ready to catch up with collecting waste in stadiums, as reported by FRF.

When it comes to communicating the new practice and the separate collection, there were no indications or signs provided for the visitors, apart from the signs on the bins themselves. This hindered the pilot test to some extent, since a lot of paper waste was still observed on the ground and in various areas, even if one type of the bins was dedicated to paper and cardboard. According to FRF, the reason for this could be the fact that Romanian households still aren't used to separate waste collection.

When it comes to the inhibitors which affected the pilot test and especially its impact assessment were the absence of any measurements and quantitative assessment in terms of waste quantities before the pilot test and after the pilot test. Furthermore, according to FRF, once the different waste streams leave the stadium, there are no reports on how the waste was treated. This hinders the assessment of the CO_2 emissions based on treatment options.

Economics and feasibility

The fact that one of the sponsors covered the costs of purchasing and installing the 40 bins meant that nor FRF as the event organiser nor the city as the stadium's owner had to bear any costs. The cost of purchasing and installing the bins could not be disclosed, though.

The costs that still incurred were those covering the costs of waste collection and waste treatment. As reported by FRF, the pilot test did not result in higher costs, but rather stayed the same as the one applied to the old practice.

FRF tried to maximise the economic gains, with the new separate collection, but previous attempts to reach out to collectors and recyclables handlers such as ROREC came to no conclusion, as there are not many matches of the national team in a year and the games can often be played outside of Bucharest.

Impact assessment

A comprehensive impact assessment was difficult to be conducted, as no samplings or measurements were done prior or after the pilot test. Furthermore, as no reports were given to the event organisers by the waste collection company, it was impossible to quantify the CO_2 savings through recycling or other waste treatments.

On the other hand, according to FRF, this pilot test improved the reputation and the image of the Association.

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Replicability potential

Separate waste collection, as a rather common practice in many European households is making its way into stadiums, too, as it is proven by the TACKLE project. However, in order to properly assess its potentials and impact, entities introducing separate collection should set up appropriate monitoring schemes or even key performance indicators which would enable the event organisers to follow, modify and adjust the separate collection in order to maximise the gains.

The fact that other clubs hosting their home games in the National Arena can access the available bins which are put on their disposal, depending on the attendance, already increases the replicability potential quite a lot.

On the other hand, the technical and economic potential was proven to be favourable in this case as the sponsorship secured a donation of the bins and their installation, which led to avoided costs. The fact that synergies and cooperation with recyclers could not be set up hindered higher economic gains. Since modern stadiums are rather spacious, the technical solutions were not difficult to be found either.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test		n/a			2.25

5.3 Seats made of recycled material; Section of the TACKLE Guidelines: Stadium Management (ch. 3.2.3.1, OM/SM24)

During the previous 2 years, prior to the pilot test, over 10.000 seats ended up piling up due to being old or broken in the storage areas of the stadium. Seats are therefore being replaced regularly.

Pilot action

This pilot test would look into a possibility and assess a purchase of seats made out of recycled plastics that would replace the damaged and old ones. The feasibility study will aim to demonstrate economic, environmental and technical feasibility to adopt recycled plastic seats but also the possibility of recycling the seats removed from the stands.

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Designing the pilot test

At the time of completing this report, all seats were replaced in the stadium with new seats. However, the new seats were not made of recycled material, but virgin plastic. Instead, the pilot test focused on the possibility of recycling the old ones.

As the stadium is the city of Bucharest's property, the seats belong to the city, too, thus it had to play a big role in this pilot test. Due to the pandemic, this pilot test did not advance for a while but the seats were rather kept in a storage room.

Following a market research, 4 recycling companies were contacted and asked to submit their authorisations for collecting and recycling plastics, as well as their offers for the indicated number of chairs to be taken for recycling.

A company was selected based on their offer. 12.000 kg of chairs were sent for recycling. The treatment option implied HDPE seats being transformed into pellets for further reuse.

Success factors vs Inhibitors

The biggest inhibitor for purchasing recycled seats and the reason why they were never purchased was the fact that the foreign company which provides the stadium with this specific type of seats ever since the stadium became operational does not produce seats made out of recycled plastic. According to FRF, the reason why new chairs were purchased from this company was only this company can provide chairs of that model and colours.

On the other hand, the availability of recycling companies locally allowed the pilot test to take place.

Economics and feasibility

The winning offer was based on a price of 0.40 RON (around €0.08) for a kg of HDPE (High Density Polyethylene).

Impact assessment

The main benefits were that the Municipality disposed of the plastics properly and made savings with the transport of the materials. An important aspect of this pilot test was the fact that the chosen company was located in Romania, which led to savings in CO_2 emissions as cross-border shipment of waste was avoided.

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Replicability potential

The replicability potential of such a pilot test heavily depends on the availability of recyclers in the country. Since the recycling technology advanced rapidly, more and more companies are becoming able to provide such services.

Stadium owners who opt for such practices can substantially improve their environmental performances through responsible management of bulky waste. A market research is required but a successful one which ends in finding a reliable recycler can end in good long-term environmental performance.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.25
Pilot test					2.25

5.4 Green procurement guidelines; Section of the TACKLE Guidelines: Procurement (ch. 3.2.4.7, OM/PR7)

The stadium management and the organisation of football events requires the procurement of high volume of products and services. Some of the services (e.g. cleaning, catering, grass cultivation, etc.) could also have an important environmental impact. The adoption of specific criteria could contribute to the green behaviours of suppliers as well as the enhancement of environmental performance of the club.

Some of these services are directly assigned by the Municipality of Bucharest (e.g. cleaning service) other service providers and suppliers are selected by the those who rent the National Arena.

Pilot test

Implementation of procedures/rules in order to adopt green criteria in procurement procedures by the Romanian Football Association.

Designing the pilot test

The entity that was involved in this pilot test was FRF's procurement department. The 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

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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.

The procurement itself would see the procurement department sending the call for offers to three companies (for services and good below €50.000) and then assess the offers.

Success factors vs Inhibitors

The modification of the procurement procedures did not include any additional stakeholders, such as procurement experts, environmental consultants, certification experts etc. The modification was done in-house. Furthermore, no existing green procurement procedures that had been proven to be a good example elsewhere were consulted or looked into. Although the staff was neither sent to any trainings, webinars or other capacity building activities to increase their knowledge on environmental management, certification and similar, this procedure did include several rounds of reflections and evaluations within FRF. The TACKLE project also helped the department to understand the better the need for such modifications and the results that could be achieved.

During the procurement itself, the procurement department wouldn't do any desk research, background check or similar for identifying and mapping providers of greener goods and services, what limits the number of companies potentially suitable for the green criteria competing for the contract and maximise the environmental benefits of the new procedure.

According the FRF, the "green market" is rather small in Romania and the number of offers which could adhere to the green criteria is rather modest.

Economics and feasibility

Due to the fact that the modification of the procurement procedures was done in-house, it did not incur any additional expenses or staff, apart from those already being spent for the procurement department. At the same time, as no external experts were involved no costs were necessary for that, either.

Impact assessment

Impact assessment could not be done for this pilot case, as no procurements using the new criteria took place.

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Replicability potential

Adjusting procurement procedures and making them more suitable to improving indirect environmental performances through procuring greener goods and services was proven to be replicable as it requires only a modification in existing procedures instead of drafting completely new ones.

However, according to FRF, in order to have a successful procedure and maximised benefits, the market of good and services has to be suitable and adjusted o the various green requirements that are featured in the call for offers. The absence of those could hinder all the efforts one makes. Many entities who launch such calls still focus on the price and the quality of the goods/services rather than the environmental performances, leaving those criteria only voluntary.

Another reflection FRF had on this pilot test was the fact that trainings and capacity building activities could be very beneficial for those working on the adjustments, but imitating and blindly adopting various criteria from elsewhere could cause big discrepancies between the requirements and the reality of the available market.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.5

5.5 Supporters' mobility; Section of the TACKLE Guidelines: Mobility and logistics (ch. 3.2.5.6, OM/ML6)

While the city of Bucharest is continuously improving and increasing mobility options in the city by putting new more environmentally friendly solutions on disposal to the local population, a shift in the habits and mobility patterns among the locals is necessary in order to maximise the benefits of these improvements.

Pilot action

The pilot action aimed at increasing the awareness of new mobility options and their proper exploitation. Of course, the target group identified for this pilot test were football supporters and game goers. The pilot test planned a launch of a survey to interview the supporters in order to understand a set of their habits in terms of mobility patterns.

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Designing the pilot test

Due to the COVID-19 pandemic and the strict sanitary conditions, the pilot test as it was imagined could not be conducted, as games were suspended and gamegoers were not allowed to attend games even at a later stage. Nevertheless, FRF together with the city of Bucharest did look into valorising and giving the mobility patterns a wholistic approach. Apart from improving the mobility options, this task saw a launch of a mobility strategy titles "Host City Strategy".

The underlying reason for drafting such a strategy was the upcoming EURO 2020. A stakeholder group made of FRF, the city of Bucharest's EURO 2020 department and the Romanian Government convened with the aim of drafting a wholistic strategy. Additional stakeholders involved mainly in consultations were numerous and ranged from the local transport department (metro, bus, tram operators), police department all the way to national stakeholders such as the Ministry of Interior Affairs' special forces, operational management department, road police, fire brigades etc. or the Ministry of Transport and their airport authorities, railway operators etc.

The comprehensive Strategy includes strategic objectives that were shaping the document, such as accessibility, safety and security, guidance, information and communication, diversity of transport means, quality of urban environment, connection to other points of interest and overall coordination.

While the Strategy in its entirety isn't publicly available it covers all the necessary presumptions, forecasts and potential scenarios which would enable the maximal exploitation of different mobility options and ensure the expected experience for all the game goers. The way this would be achieved are different aspects of bringing the strategy closer to the gamegoers, namely through:

- 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)
- Wayfinding signage - to contribute to the effectiveness of the Mobility plan, the temporary wayfinding signage plan shall be implemented approx. 2 days before the first match and shall be taken down approx. 2 days after the last match disputed in Bucharest.
- Host City Mobility Makers - 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.

Furthermore, the Strategy developed forecasts for key mobility aspects, such as:

- Identified main points of entry to Bucharest (2 airports, train station)

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- Forecasting the pressure on different points of entries (number of arrivals through different points of entry), what would enable the arriving gamegoers and tourists with timely information on mobility options
- Forecasting the pressure on different mobility options on a matchday (metro, buses, taxis, trams, streets etc.), what would ensure a smooth migration of gamegoers from the central fan zone to the stadium and the way back; what would enable a timely adaptation of timetables and the frequency of available public transportation means

This Mobility Strategy would have to undergo continuous development and adaptation throughout different stages of the tournament. While the participants of the group stage are known, one more match during the knock-out phase would be played in Bucharest. Therefore, the current strategy was planned to undergo necessary modifications depending on the national teams playing that 4th game.

Worth mentioning is that the Strategy also has an important part focusing on the COVID-19 pandemic and several potential scenarios that could occur during the tournament.

Success factors vs Inhibitors

Probably the underlying success factor for this pilot test would be the fact that Bucharest was one of the 12 hosts cities of EURO 2020. Receiving more than 100.000 visitors going to a particularly defined perimeter and taking into consideration all the security and safety measures require a timely and well-defined approach.

The fact that the Strategy was drafted within the EURO 2020 framework, people working on it had access to different briefings and trainings provided by UEFA.

Improving mobility options and the availability of environmentally friendlier options in a city need to be accompanied by various intelligence, especially an overview of current local mobility patterns. The current mobility patterns in Bucharest are as presented in the Figure 4 below.

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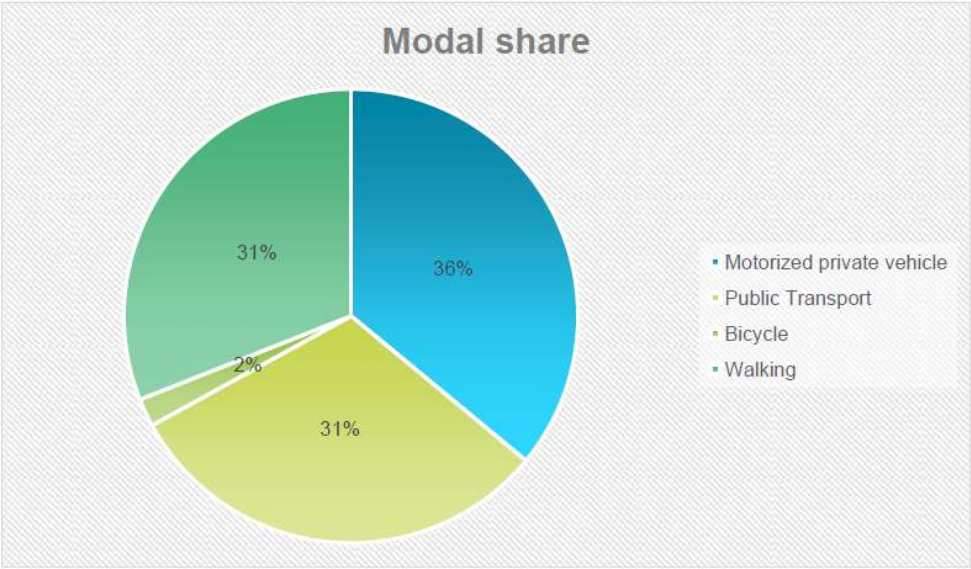

Figure 4. Mobility patterns of Bucharest

Information like this enables to assess better the current situation and identify potential improvements, but also maximise the use of available options. When compared to other EU cities and their modal shares according to the European Metropolitan Transport Authorities (EMTA), we can easily conclude that people in Bucharest are using motorised vehicles above the average in 29 European cities of 33,9% (European Metropolitan Transport Authorities, 2020, data for 2018).

When it comes to the content of the Strategy and the very precise forecasts, what helped the forecasts and the pressure on different points of arrival was definitely knowing what teams would play in Bucharest. Considering that the teams playing at the National Arena would be Austria, Ukraine and Northern Macedonia allowed the Strategy to presume that the majority of Ukrainian and Macedonian supporters would rather be arriving by trains or coaches, considering they are neighbouring countries (to a higher or lesser extent) while Austrian supporters would be arriving on charter or regular flights.

On the inhibitors side, not many of them, except the fact that the train link between the airport and the city centre was not featured in the Strategy, as it was not known when it would become operational. It is now operational as of 14 December 2020. One mobility option that was not featured at all were bikes.

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Economics and feasibility

This pilot test and the entire Strategy was drafted by the staff already hired by the city for its EURO 2020 department. Their contract ends with the end of the tournament. Therefore, the pilot test and the Strategy itself did not incur any extra costs.

Some tasks foreseen by the Strategy would require increased communication activities for what an external communication partner would be hired.

The overall budget for the realisation of this Strategy was accounted to be around €1.276.000, including project management and administration, public transportation costs, communication and signage.

Impact assessment

The effect of this pilot test and the Strategy itself could not take place before the tournament. The impact assessment would see behavioural assessment of the fans conducted by UEFA, behavioural assessment provided by law enforcement entities and through interviews/survey during matches.

Qualitatively speaking, the Strategy was already submitted to UEFA and received the following feedback: "robust and flexible enough to meet the expectations".

Replicability potential

The replicability potential of such a Strategy can be twofold. On the positive side, especially if a Strategy was tested already, can be a gateway not only to organising an event and providing the best possible experience to the gamegoers but also maximise and valorise all the efforts a city puts into improving the mobility locally. Since many cities get to host different events attracting large number of visitors on a regular basis, the reuse of such a Strategy can be quite substantial, with necessary modifications, of course. FRF reported that this Strategy would be already reused in 2023 as Bucharest would be hosting the UEFA U21 EURO 2023.

Nonetheless, beside major European tournaments, this Strategy is also put on disposal for Romanian clubs using the stadium for their European home games or final games of European tournaments which usually result in a large number of visiting supporters.

Worth mentioning is the rather big added value of this pilot test for the local community. While the city of Bucharest wanted to buy 200 new EURO6 buses, this Strategy made the city buy 400 of them, and furthermore,

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150 electrical ones. Once the EURO 2020 is over, these buses will be incorporated into the exiting public transportation fleet.

On the other hand, what makes this Strategy not very replicable is in case of other sporting events. The reason for this is that a big part of the Strategy would not be compatible with another sporting event. The reasons for this are: different stadiums/arenas used for the other tournament, non-existence of a fan zone and similar logistical differences. The same case of difficult replicability could be applied to replicating it in a different city. However, the structure and the elements, aspects and objectives covered by this Strategy could help other cities and event organisers in drafting a suitable Strategy for themselves.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.75

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6. Roi Baudouin/Koning Boudewijn Stadium, Brussels

The Roi Baudouin stadium is currently lacking in several fields of environmental management, including governance, waste management and mobility and the monitoring of performances in this field in general. This could open doors to pilot tests which would have significant achievement compared to the baseline scenario.

As the stadium is public, certain competences are shared between several departments of the city of Brussels. Therefore, any pilot test or improvements of the current state-of-art required the city's participation and approval.

As the stadium's waste management performance is rather basic with one bin per approx. 3.350 visitors), with no separate collection but only general waste collection and litter collection in the stands and around the stadium (Figure 5), both the stadium and RBFA identified this field as a potential one for improvements. The general waste composition mainly features single use plastic cups. There is barely any food waste, as food consumption is not allowed inside the stadium (only outside the stadium, except for VIP guests).

Mobility was also an important topic as there are certain existing solutions in the region of Brussels including some previously tested practices.

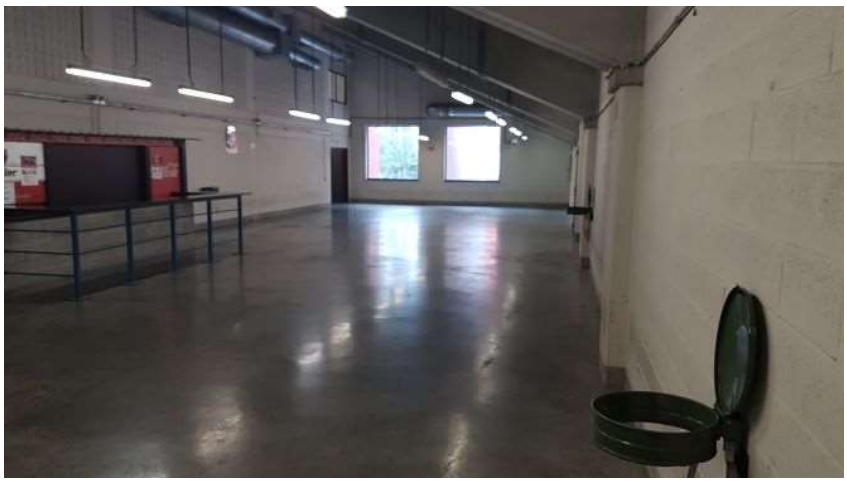

Figure 5. Basic waste collection infrastructure in the stadium – plastic bag holders for residual waste only

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6.1 Separate waste collection and recycling; Section of the TACKLE guidelines: event (ch. 3.2.2.12, OM/E4)

The stadium didn't have any separate collection scheme and all waste generated in the stadium ends in general waste. Although there was no data on waste composition and prevailing quantities of different types of waste, some assumptions were made. Most of this waste was assumed to be plastic waste (single use plastic cups) and litter from the stands and around the stadium (a lot of broken plastic cups). While other types of waste were rather negligible, according to the stadium management and the city of Brussels and while food was not allowed in the stadium (for regular visitors), the VIP areas, press centre and the two teams and staff are catered for. The food is not prepared in the stadium, as there is no equipment nor much space, but only reheated. Therefore, bio-waste from food preparation was nearly non-existent. However, the caterers usually leave the stadium without any leftover food, meaning all the food waste and leftover food stays with the stadium and ends up in general waste.

Pilot test

Bruxelles Propreté, SUEZ and Fostplus were identified for the introduction of adequate containers for separate collection. It was necessary to run a waste composition analysis in order to understand the needs and the way separate collection would be introduced. Furthermore, both pilot tests related to waste management would also require a sensibilisation campaign in order to reach an efficient deployment of the new system.

Furthermore, the survey would also explore the daily habits of game-goers and assess all the added values such a new scheme would bring.

Designing the pilot test

Since the stadium didn't have any separate collection scheme at the time of the beginning of this project and nonetheless no data on total waste quantities, RBFA decided to run a waste composition analysis in order to understand better the needs and potentials of a separate collection scheme. SUEZ and Bruxelles Proprete (Brussels Public Cleanliness Company) run a sampling of the waste generated inside the stadium's premises (A), waste bins outside the stadium's premises (B) and litter (C). The total amounts of waste collected and analysed for their mass composition were as shown in Table 7 below.

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Table 7. The amounts of waste collected and analysed for their composition after

ZONE	COLLECTED AMOUNT	ANALYSED AMOUNT	SHARE OF ANALYSED VS COLLECTED
A	1380 kg	287 kg	20.7%
B	780 kg	192 kg	24.6%
C	470 kg	165.5 kg	35.2%
Total	**2630 kg**	**644.5 kg**	**24.5%**

The three different areas of collection gave different results in mass composition. The findings are presented below in Figures 6, 7 and 8.

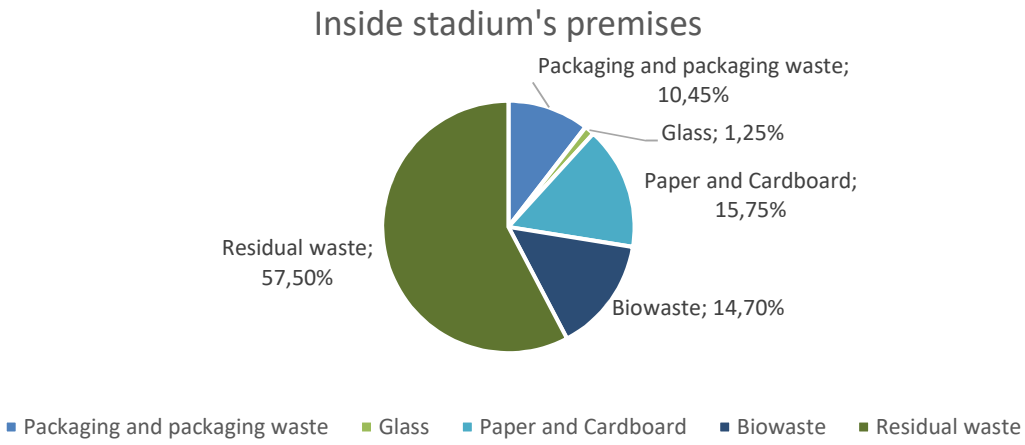

Figure 6. Mass composition of the waste sample collected inside the stadium's premises (Category A)

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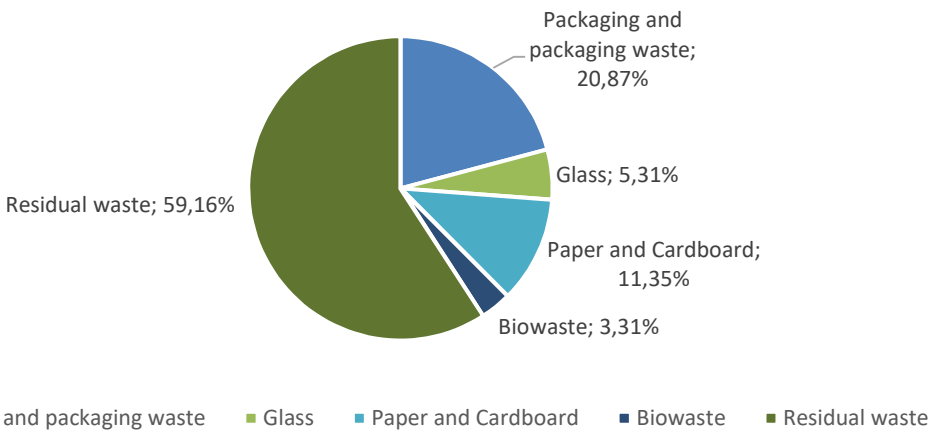

Figure 7. Mass composition of the waste sample collected outside the stadium's premises in public area in public trash bins (Category B)

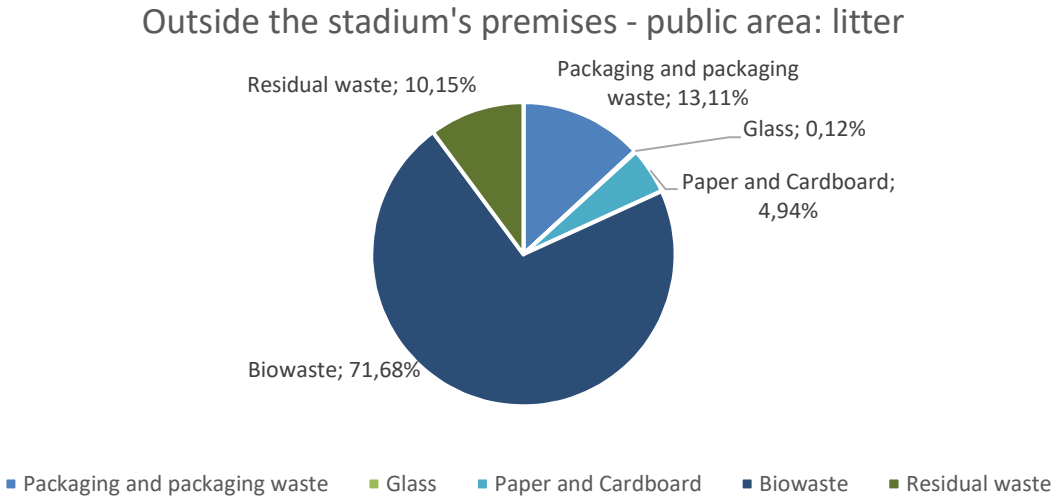

Figure 8. Mass composition of the waste sample collected outside the stadium's premises as litter (Category B)

As the objective of this analysis was to identify hotspots and prevalent waste streams in different areas, further observations were made concerning specific waste streams when the different areas were compared. Packaging and packaging material were of special concern in order to assess quantities of metal, PET and other packaging

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and packaging waste materials. It was found that out of all the collected metal cans in the three areas 64% come from public trash bins outside the stadium's perimeter, while PET bottles were prevailing inside the stadium's perimeter (76%). The high share of biowaste collected as litter was declared irrelevant as it contained a lot of foliage, as the analysis took place in autumn.

Based on the results of this analysis the pilot test was further defined and it was decided to set up temporary selective collection infrastructure for the first time. It was decided to introduce only one additional bin for packaging and packaging material (PMC).

Further activities related to this pilot were the installation of permanent selective collection infrastructure, as this pilot test only saw temporary bins for selective collection (green for residual waste and blue for PMD). As for the are outside the stadium's perimeter, certain proposals and suggestions will be drafted and forwarded to the local authorities.

Success factors vs Inhibitors

In order to tackle the areas outside the stadium's perimeter, where simple waste bins for residual waste were present only, ABInBev ran a pilot test with its "Eco-Team". The objective was to assess the amount of PMC which is lost in public residual waste bins and as litter. According to the waste composition analysis it was found that 64% of all empty beer cans end up in public waste bins.

It was furthermore decided that Fostplus (Belgian EPR scheme), Coca-Cola, AB InBev would mobilise their eco-teams and organise additional activities in order to give the new selective collection scheme more visibility, as it would be enrolled for the first time. Some images in Figure 9 portray the activities that were taking place during the game.

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Figure 9. Sensibilisation campaigns upon the introduction of selective collection inside the stadium's premises

It is important to add that a survey was conducted over the period of 4 weeks which had the objective to assess and understand the visitors' behaviour when it comes to waste management, their subjective reflection on the current waste management practices and readiness to adhere with new potential practices. The survey did a comparative analysis of behaviour, affinity and expectations from the visitors in regards to waste management. The survey was targeting three groups: visitors from the region of Brussels (B), region of Flanders (F) and region of Wallonia (W); 234 respondents in total. The results are presented on a scale from 1 to 5, where "1" symbolises "never", 2 "very rarely", 3 "sometimes", 4 "very often" and 5 "always".

The survey found that the behaviour and daily habits in the private life (at home and at work) of the three target groups are rather coherent and they all scored very well in terms of separation of waste at home and at work (the score ranged from 4.77 to 5), use of recycled products (3.5 – 4.48), waste prevention (3.48 – 3.93), prevention of food waste (3.64 – 4.28), buying sustainable products (3.18 – 3.64), use of water fountains (3.54 – 3.71).

From the survey's results it can be concluded that certain lacks at the stadium, such as the absence of separate collection, reusable cups prevent the visitors from maintaining their good daily habits.

The survey also wanted to know what improvements would be the most beneficial for the visitors and what improvement could make the biggest impact. The survey resulted in the list of following preferences in order

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of importance: separate waste collection, reusable cups, reusable/biodegradable cutlery and plates, informative panels and banners on good waste management practices inside and outside the stadium and sale of souvenirs and other merchandising made of biological, recyclable or other sustainable material.

Furthermore, when comparing the results of their daily waste management performance and the performance new practices in the stadium would bring, two conclusions could be drawn from the survey results:

- The share of visitors which would decrease their environmental impact during football games with improvements in waste management in the stadium, compared to their daily habits would range from 61.5% in Brussels (relatively low compared to other two regions, because respondents from Brussels already have the highest performance of the three regions) to 71.8% in case of Walloons

In general, the survey results enhanced the motivation of RBFA and the stakeholders for improving certain practices and gave a kind of approval, as the respondents did not express any repulsion nor hostility towards proposed measures.

Few other success factors and inhibitors were observed during the pilot test by the food and beverage providers, as well as Suez, the waste collection operator. The large number of PMC bins allowed the visitors to locate them in their near vicinity quickly without needing to look for one for too long.

Few suggestions which need to be taken into consideration next time are targeting mainly the quality and purity of the collected PMC waste – PMC bins should be moved further away food trucks and other stalls serving greasy food (e.g. fries, burgers) and prevent impurities and decreased quality of the collected PMC, as many greasy food containers, wraps, food leftovers end up in PMC bags, as they are located conveniently close to the consumers. Few other suggestions were related to posters and maps showing location of PMC bins, better labelling of the bins. One challenge Suez faced was the short time for waste collection, as the stadium was shutting down the waste rooms and the tunnels too fast after the game. This could mean that the stadium operators didn't adapt this time to selective collection (as it increases the time needed for all the waste to be collected).

Economics and feasibility

The waste operator who was in charge of this temporary pilot measure was chosen through several offers. SUEZ was chosen based on its offer. This pilot measure incurred in the costs presented below in Table 8:

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Table 8. Costs incurred for the implementation of this pilot test

EQUIPMENT				
Item	**Capacity**	**Pieces**	**Rental price per month per piece**	**Extra fee**
Residual waste bin	240 l	150	€2	€350 in total for their placement €350 in total for their collection
PMC+ plastic cups bin	240 l	150	€2	€350 in total for their placement €350 in total for their collection
+ €0.17 per 240 l bag				

TREATMENT					
Waste type	**Unit**	**Pieces**	**Rental price**	**Transport price**	**Treatment price**
Residual waste	40 m^3	1	Sponsored	€165	€155/t
PMC + plastic cups	40 m^3	1	Sponsored	€165	Free
Paper	40 m^3	1	Sponsored	€165	Index paper value
+ Human workforce: €66/h (for >30 mins of work)					

Since the pilot stadium that run this pilot test serves as the host ground for the home games of the Belgian men's national teams that plays only up to 8 home games per year, repeating this measure could bring certain benefits and improved waste management performances. The only costs that could be avoided with permanent infrastructure for selective waste collection is the price of the equipment (its rental and placement/collection). The savings could be €2000 per game. The treatment costs are expected to remain the same. This is why it is advised that the owner of the stadium – the city of Brussels considers installing permanent infrastructure, as the stadium is also used for athletic competitions and concerts. It could bring added value, as other event organisers could benefit from this already available infrastructure.

Other savings could be obtained through sponsorship deals, whether from the waste operator, or other companies providing food and beverage or are involved in the game organisation elsewhere.

Impact Assessment

The results of this pilot test were more than satisfactory, as the new collection scheme managed to redirect 120 kg of PMC from the residual waste. This basically means that the capture rate of PMC was 83.2%, since 120 kg out of 144.21 kg of PMC was captured. It also reflected in the total amount of residual waste inside the stadium's premises dropped to 1120 kg from 1375.17 kg.

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The result of the sensibilisation and PMD collection pilot test outside the stadium's perimeter were 10550 cans collected which amounted up to 2.85 tonnes of empty beer cans which were redirected for recycling.

These results triggered a larger scale project of installing permanent bins within the stadium's perimeter, requested by RBFA and approved by the city of Brussels. The city would cover all the costs which would result in an immense added value of the new separate collection scheme as it would cover not only football games, but also concerts and different athletic competitions held at the stadium. Furthermore, when it comes to the football games only, dues to larger attendance, RBFA will also look into installing large capacity containers outside the stadium perimeter in order to take the pressure of the public street bins and avoid litter. These containers would be placed at strategic points, mainly along the access streets and right in front of the gates.

Replicability potential

This pilot test showed remarkable achievements and further potential benefits in terms of environmental management could be achieved through its replication. The temporary selective collection pilot test already showed certain improvements in selective collection and collected amounts in general. While the capture rate of packaging and packaging material was 83.2%, the overall amount of residual waste dropped as well compared to the baseline game, even if the attendance was higher in the second game.

The replicability potential increases even more if baseline data is known in advance, which avoids the need of a waste composition analysis. The replicability potential can also be marked as high in case of high environmental awareness among the visitors. In case of cities and regions where the environmental awareness is high, it wouldn't take much for the visitors the get used to selective collection in stadiums and would adhere to the new practice quickly. However, introduction of separate collection needs to be accompanied by communication campaigns, activities and visuals.

In technical and logistical terms, what we observed was the fact that many waste management companies awarded with this job, have the know-how and can cover the needs of waste disposal and assess the number of bins necessary. In terms of space, if the event organiser opts for 2 different bins, the new system can easily comply with the available space. However, the event organiser needs to take into consideration longer times for different operations, as the separate collection might take several rounds.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.75

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6.2 Reusable cups for drinks; Section of the TACKLE guidelines: event (ch. 3.2.2.12, OM/E18)

The city of Brussels decided to ban all single use plastic in events organised on its territory as of 1 July 2019. This puts a pressure on RBFA to improve their performance in this regard during their games. At the same time, two main beverage suppliers – Coca Cola and ABInbev had already expressed their interest in teaming up for this improvement. FostPlus, also had certain schemes that were worth exploring.

Pilot test

This pilot test would see reusable cups deployed in the stadium during the football games of the Belgian men's national team.

Since both Coca Cola and AB InBev were interested in improving the waste management and prevent waste in football games, it was agreed to involve these two in the project.

This pilot measure would bring one important added value to waste prevention. What is well known from experiences in festivals and other music events where reusable cups with a deposit system are already used, is that there is a large number of people who take advantage of reusable cups, still under deposit but discarded somewhere in perfect shape and who return them and get to "win" few euro. This prevents litter not only in the stadium but also around stadium as the visitors could return their cups at several points while leaving the stadium, too.

This pilot action would however need another accompanying action to be developed – the money handling. Since each reusable cup in use would be under a deposit, the event organiser would have to keep that deposit temporarily and pay the customers back upon returning their cups.

Designing the pilot test

This particular pilot test included mainly RBFA as the event organiser who is responsible for setting the rules for what kind of food and beverages are served and how. RBFA included several stakeholders in this pilot test, namely Bevers & Bevers who are serving drinks and OVAM the Flemish waste management authority, as well as ProLeague, the association of professional cubs in Belgium.

ProLeague organised a one-day workshop on reusable cups which gathered not only all the professional football clubs in Belgium but also waste management operators, authorities and beverage providers. The

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workshop looked into existing good practices and potential business solutions. OVAM also shared its study on the LCA of cups made of different material. This study would serve to identify the cups which would ensure the lowest environmental footprint. The study shows that for what the pilot test wants to achieve bioplastics (Bio-PE), thermoplastic (PLA) and compostable thermoplastic (C-PLA) and recycled PET (rPET) give the best scores both in durability (usage above 150 times) and treatment options at the end of their lifetime. The Table 9 below shows the comparison between different materials (Beverage and eating utensils at events, OVAM, 2017).

Table 9. Comparative LCA of plastic cups made of various material

	hergebruik hoog (>150)	hergebruik beperkt (<150)	selectieve inzameling voor recyclage	restafval of compost
Tweedehands vaatwerk (glas, keramiek, metaal)	A	A		C
rPET (gerecycleerde PET)	A	A	B	C
PLA (polymelkzuur) & C-PLA	A	A	B	C
Bio-PE (biogene polyetheen)	A	A	A	B
PP (polypropeen)	A	B	C	D
PET (Polyethyleen Tereftalaat)	A	B	C	D
PS (polystyreen)	A	B	C	D
PC (polycarbonaat)	B	C	D	E
Copolyester	B	C	D	E
Gemodificeerd zetmeel				D
Karton (gerecycleerd)			B	C
Vormkarton (moulded fibre)				B
Suikerrietvezel (bagasse)				B
Hout				C
Cellulosepulp				D
Glas (gerecycleerd)	B	C	E	G
Metaal	B	D	G	G
Keramiek	C	E		G

As the full enrolment of reusable cups was postponed to the spring of 2020, a temporary pilot test took place as a part of the pilot test on selective collection. The pilot test wanted to explore the number and weight of plastic cups that could be taken out of the packaging and packaging material waste stream during a football game.

This temporary pilot test included a return scheme for single-use plastic cups in order to ensure their appropriate treatment and prevent them from ending up in residual waste. The temporary pilot test also had the objective to assess the behaviour of the visitors and see how much would they participate in a return scheme and later in a fully implemented reusable cups scheme.

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Success factors vs inhibitors

The survey that was conducted among the fans showed that the visitors identified reusable cups as the second most favourable change they would like to see at the stadium (after separate waste collection). In fact, the share of the visitors which thinks football games would be more environmentally friendly if reusable cups and reusable/biodegradable plates and cutlery were introduced was rather high as 69.2% of respondents from Brussels thought so 69.2% and 66.9% and 66.7% Flemings and Walloons respectively.

These high scores and the recognition of reusable cups among game goers can be taken as a good success factor, as the acceptance rate is expected to be high. Nonetheless, reusable cups are already a common occurrence and practice at various events in Brussels and Belgium, including festivals, concerts and other mass events.

Furthermore, the ban on single use plastic products that came into place in July 2019 in the city of Brussels initiated event organisers to look for alternatives. The same ban was later made in the region of Flanders, too.

Economics and feasibility

It is difficult to assess the economics and the feasibility at this stage as the full enrolment of the reusable cups didn't take place yet and the stakeholders who would bear the costs are not identified yet.

In any case, for this temporary pilot tests, Bevers & Bevers 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. As a one-time practice, it was sponsored by the beverage and food providers, but in order to replicate this pilot test, the event organiser might need to look at different financing.

Impact assessment

Prior to the temporary pilot test, which took place during the Belgium – Cyprus game on 19 November 2019, a comprehensive waste composition analysis was conducted. It gave date on the total waste collected during the Belgium – San Marino game on 17 October 2019. The results reported 14.21 kg of packaging and packaging material waste generated inside the stadium's perimeter. Bevers & Bevers was the stakeholder who was offering a free drink for each 10 single-use cups returned (Figure 10)

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Figure 10. Bevers & Bevers single-use cups collection scheme

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.

The full impact assessment of this pilot test could not be conducted, as the total CO_2eq savings could not be calculated, as the collected single-use cups were replaced with other single-use cups. The full impact assessment will be conducted once the full enrolment of reusable cups takes place.

This particular temporary pilot test resulted in the following CO_2eq savings due to the diversion of these polypropylene cups from incineration to recycling. The table 10 below gives the results based on the French Environmental and Energy Agency's (ADEME) emission factors:

Table 10. Emission savings from the pilot test

AMOUNT DIVERTED	EMMISION SAVED BY AVOIDING INCINERATION	EMISSION LOST BY AVOIDING INCINERATION	EMISSION SAVED BY RECYCLING	TOTAL
24.2 kg	72.2 kgCO_2eq	2.83 kgCO_2eq	74.1 kgCO_2eq	**143.44 kgCO_2eq**

This pilot test, which was supposed to mark the start of introducing a proper reusable scheme turned out to be the last football game with supporters before the pandemic. Thus, the new reusable cups never saw their implementation. Instead, RBFA together with their partners, sponsors and stakeholders and the city of Brussels as the stadium owner, developed a comprehensive plan for 2020/2021 which will provide an extensive research, information gathering and evaluation of various options. Such an approach would eventually guarantee the best possible solution chosen for the needs of RBFA.

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The workplan includes:

- November 2020
  - Information gathering and focus on criteria: hygiene, storing, logistics, washing, quality control, branding etc.
- February 2021
  - Benchmarking; assessing the results from the TACKLE pilot test in Dublin, as well as case studies from the Netherlands and Germany, as well as EURO 2020 case studies
  - Focusing on setting up the logistics and best practice
- July 2021
  - Market research and subsequent development of a factsheet with RBFA's partners
  - Call for offers and decision making
- November 2021
  - Introduction of reusable cups with the accompanying communication activities, signage and more

Potential replicability

As the full enrolment of the reusable cups didn't take place yet, we are unable to comment on potential replicability. However, it was already proven that in western countries, visitors are already used to reusable cups and the introduction of reusable cups would not be alien to them. Many festivals, concerts, sport events and similar are already good examples of how such schemes work in practice.

In any case, for a successful implementation of such a project, the event organiser should ensure a tailor-made solution which would comply with different yet specific circumstances that a football game implies.

6.3 Secured bike parking; Section of the TACKLE guidelines: mobility and logistics (new practice)

The stadium is well accessible by bikes from all parts of Brussels and even the neighbouring Flanders and several towns in the imminent neighbourhood. However, the stadium does not have any infrastructure to welcome cyclists.

One negative occurrence, quite notorious in fact, in Brussels is bike theft and tentative theft. This turns down many cyclists from cycling to mass events, such as concerts, sport events and similar.

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Pilot test

Since it was proven to work, the RBFA would look into the logistics and the necessary equipment, staff, material for replicating this practice during its football games, too. A 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. It would be also worth looking at regional funds available for such an infrastructure which could result in savings and creating a permanent bike park.

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 RBFA would need to provide is staff that would make the bike park secure.

Designing the pilot test

The stadium had already designated a space for such temporary bike park, as it was the case for the two concerts in June and July 2019. Therefore, this wouldn't be a new practice when it comes to events organised at the stadium. RBFA had several consecutive meetings with Brussels Mobility, the regional mobility authority. The good response from stadium visitors during the two concerts lead to an acquisition of a mobile secured bike parking which can be installed temporarily for various events. The owner of this mobile bike parking is Brussels Mobility.

RBFA and ACR+, as the technical partner on the project, had meeting with the cabinet of Benoit Hellings, Brussels' vice-mayor, in order to discuss the deployment of the bike parking, among other topics.

Due to winter conditions, the full implementation of this pilot test has been postponed to 2020, only to be postponed again due to the pandemic. The city now has the objective to launch the secured bike parking in June 2021, which will be rather late for this publication to assess its impact assessment. The launch as it is currently imagined will see a peloton (a group of cyclists cycling together) leaving from the centre of the city and cycling 7 km to the stadium. RBFA will identify a potential home game of the national team which would serve as the perfect occasion for that and a participation of Belgian celebrities and/or athletes is planned, too. The whole launch would include an extensive media coverage, too.

Success factors vs Inhibitors

While Brussels is known to be a city with a remarkable number of cyclist and an annual increase of cyclist of around 15% it also has a successful cycling strategic plan in place which saw the number of cyclists in the

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streets doubling since 2013. The infrastructure in the region is improving on a monthly basis and many associations are included and involved in this mission.

In June 2019, during a Metallica concert at the very same stadium, a temporary bike park was set up on the band's demand. More than 1000 spots were available for bikes and according to the stadium management it was very well perceived and nearly full. The visitors who came by bike also received a little present from the band (a guitar pick). Another large-scale concert – Rammstein, which took place in July 2019 also had a temporary bike park. This shows that cyclists are happy to cycle to the stadium, despite its location, if there was a secured bike parking.

Furthermore, when we asked the game-goers in the survey about their cycling habits, they all responded with considerably high marks on the rank from 1 to 5, 3.33 and 3.67 in case of respondents from Brussels and Flanders respectively but only 2 in case of Wallonia. However, if there was a secured bike parking at the stadium, 61.5% of respondents from Brussels would consider cycling to the stadium, but only 56.4% and 30.4% from Wallonia and Flanders, respectively. The numbers were expected to grow with the implementation of this pilot test.

Economics & Feasibility

Apart from the mobile bike park owned by Brussels Mobility authority, the city owned non-profit entity, Prosport, which is in charge of non-sporting events at the stadium will procure for a second secured bike park and put it on disposal for event organisers at the stadium. This means that RBFA would have to bear any costs. The deployment of the secured bike park however would require RBFA to provide and ensure required security and staff. The city of Brussels together with Prosport would take care of the communication campaign and provide necessary signage.

Impact Assessment

The overall impact assessment of this particular pilot test cannot be conducted at this stage, as the pilot test itself did not happen yet. The impact assessment at a later stage will reflect on the number of cyclists attending the pilot test, their expectations vs reality and most importantly – their habits prior to the installation of the secured bike park and after.

The impact assessment will be done through interviews and a survey.

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Replicability Potential

While building and installing a permanent secured bike park could result in certain costs. Before a football club, football association or a stadium decides to build one, it is worth including public authorities in a project of this kind. It is known that many European cities have in place strategies for a more sustainable city which often includes mobility as well. Therefore, private entities (clubs, associations, stadiums) should consult the local or regional authorities and ask for support exploring potential opportunities for collaboration (funds, financial or technical support, campaigning, etc.). While the environmental aspect would definitely be highlighted in case of this pilot test, the economic and technical aspects are something a club or stadium would need to elaborate well. The overall replicability potential definitely lies in the daily behaviour and habits of the people living in different countries and the backing strategies, available funds and similar support available for boosting cycling in cities.

As it was the case of this pilot stadium, the city of Brussels understood the fact that football games attract more than 50000 visitors thus participating in this pilot test would enable them to contribute to their objectives and targets regarding green mobility.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					n/a
Pilot test					2.5

6.4 Green Procurement Guidelines; Section of the TACKLE guidelines: Procurement (ch. 3.2.4.7; OM/PR6)

Single-use cups weren't assumed to be the only cause of a high share of plastic waste. Certain practices were identified to contribute to this, such as the sale of food and beverages. External food and beverage providers are responsible for this through contracts between RBFA and service/good providers. It was difficult to change any of these practices while the contracts were running. The waste these providers were creating was ending up in the general waste and was becoming a responsibility of the event organiser.

Important to highlight is the fact that the procurements and contracts signed by RBFA refer only to good and services provided for matchdays only, as they are coordinated by the events department. The stadium is owned by the city of Brussels which limits the types and nature of different procurements.

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Prior to this pilot test, the contracts signed with goods ad service providers did not contain any environmental provisions.

Pilot test

As the contracts were ending with the end of the European Qualifiers, it was decided to look into improvements in the contracts and introduce new requirements for food and beverage providers which would impose more responsibility concerning waste management upon the subcontractors and also introduce few improvements in the quality of the service and its environmental impact.

Designing the pilot test

The pilot test was decided to be focusing on the food and beverage providers within the stadium and matchday perimeters. The procurement document was upgraded with several various environmental provisions mainly focusing on waste handling and transferring certain responsibilities onto the winning bidder. The call was launched on 25 May 2020 for the period between 1 July 2020 and 31 December 2022 for RBFA's home games and, as well as the Belgian Cup Final and other events in and around the King Baudouin Stadium organised by RBFA.

The most important newly added provisions were added to the "Other services to be provided as part of the catering services" section which obliged the bidders to submit and ensure proper waste separation within their premises (kiosks, food stalls, food trucks, bars). It was expected to see the winning bidder providing separate waste collection bins, aligned with the new waste collection practice in the stadium. While the winning bidder would bar the costs of doing so, RBFA would cover the costs of waste handling. However, as the other pilot test on separate waste collection (ch. 6.1) resulted in a major shift in terms of waste management in the stadium, the costs of waste handling might at one point be taken over by the city of Brussels.

As an added value of this pilot test, RBFA was also able to include important sanitary conditions in the document, such as in the "Project Management" section of the call which required:

"Appropriate quality control and compliance with l'Agence Fédérale pour la Sécurité de la Chaine Alimentaire (AFSCA) / Federaal Agentschap voor de veiligheid van de voedselketen (FAVV), hygiene regulations and Sustainability requirement"

"In case of (health) crisis like COVD 19 (or other pandemics), all sanitary and staff measures concerning exploitation have to be taken in charge by the public catering company"

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Furthermore, the "Exploitation conditions" described in details what steps were expected from the winning bidder in order to comply with RBFA's requests, such as:

"Environmental practices: an "eco responsibility team" has to be appointed within the stadium and in the stands: sufficient staff to collect and recycle waste (collection of waste before the match, after kick-off, after half-time and after the game). The waste will be grouped in containers, the rental of which will be charged to the public catering company for each event following the agreement between the public catering company and the RBFA. The use and handling of cups have to comply with the eco and safety regulations imposed by the acting government"

"The public catering company undertakes to ensure that the pipes and taps at the Points of Sale are cleaned regularly via its own service or by HTS. A control document will be provided for each drink outlet installation at the Points of Sale in order to allow at any time to check the last cleaning (date of this and responsible)"

"The public catering company undertakes to take into consideration complaints concerning the quality of his products in order to satisfy supporters as much as possible"

As an annex document, the call for offers also asked for the bidders' corporate sustainability document for the first time. The selection criteria, in the end, clearly stated that the selection would be based on eco-responsibility as one of the 6 major selection criteria.

Three offers were received.

Success factors vs Inhibitors

Although the new call for offers was done in-house without any consultations with external experts or existing exemplary documents, the pilot test benefitted from the previous pilot tests conducted in the stadium in 2019 and ended up being a document and a step forward well integrated in the overall efforts RBFA was putting into "greening" their games.

As a great advantage for ensuring sufficient eco-responsibility, the winning call for offers also had a person allocated for ensuring the delivery of the requested environmental performance. This person's tasks was to finetune all the operations with RBFA which would result in better environmental performance.

Apart from the fact that call for offers initiated by RBFA cover only matchday services and goods, as the stadium is owned by the city and used by various entities one inhibitor linked to this fact played a role in the

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call for offers, which hampered the number of bidders. As the stadium doesn't have permanent infrastructure for food and beverage, the winning bidder was expected to provide it in forms of temporary bars, food trucks, stands, kiosks, containers, etc. And according to RBFA, not many companies can provide such temporary infrastructure for large crowds and nevertheless.

Economics and feasibility

The updated and modified procurement document was done in-house by the events department; thus, the test did not incur any extra costs, neither for the work itself nor extra staff. No costs incurred for the publication and launching the call either.

Unfortunately, no financial details could be disclosed for this report.

Impact assessment

The fact that this call for offer was based on previously acquired experience, observations and results on other TACKLE pilot tests that took place in 2019 not only resulted in a substantial impact on RBFA's sustainability transition but also served as a great added value for previously conducted pilot tests.

The selected offer by Bevers & Bevers included all the required provisions. Since they were a part of the pilot tests in 2019, they now officially adapted the practice of having eco-teams which would ensure proper waste selection and prepare it for handling as well as work on sensitising the visitors' habits towards waste management.

Replicability potential

Just like other similar pilot tests concluded in other pilot stadiums, it ended up being an "in-house exercise". This means that such processes can result in no added costs and the procedure itself /launching, reviewing and selecting) do not have to change. However, this particular test in Brussels was based on the previous audit and the identification of key potential improvement areas and ended up perfectly fitting into the overall TACKLE activities at the stadium.

When compared to the call for offers launched by Betis in chapter 8.3 we could see that the better different provisions and requirements are explained, the better the offers are – what can ultimately bring the desired changes in operations.

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Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.75

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7. Dragão Stadium, Porto

Dragão Stadium was always paying attention to the improvement of environmental performances, from the project's conception to the present day, being therefore an example of good environmental management and sustainability.

Environmental aspects such as water, energy, waste, noise and gas emissions have been adequately monitored in order to minimise the environmental impacts of infrastructure, reduce consumptions and increase recycling levels.

Dragão is certified by the ISO 9001 (Quality) and ISO 14001 (Environmental Management) Standards since 2007. Among other distinctions in this sector, FC Porto received certificates like Greenlight from European Commission (2003), UEFA Five-Star Stadium (2004), Best Achievement (non-sporting) by European Club Association (ECA) (2010) and EDP Energia Elétrica e Ambiente (electricity and environment for service buildings) (2017). In this way, FC Porto has a higher level of process control, increases the levels of satisfaction of all stakeholders, carrying out your social duty and influencing the people who accompany FC Porto daily.

Usually, FC Porto involves fans in environmental initiatives:

- Sensitise the community on environmental issues, through advertising campaigns;
- Celebrate World Environment Day,
- Organize talks and visits to the Stadium.

Since the Estádio do Dragão has a good history of environmental management, it was very interesting to conduct pilot tests as an improvement. The first one identified was Carbon Footprint calculation to identify the footprint, which will allow to set goals for reduction of the GHG emissions. In addition, other opportunities for improvement were identified that would be interesting to share in this project, such as reducing water consumption, purchasing clean energy, further improving waste management (either in the administrative areas, in the separation of waste or the use of advertising panels for upcycling).

7.1 Improving Waste Management; Section of the TACKLE guidelines: Event (ch. 3.2.2.6, OM/E4)

Waste management is one of the themes that FC Porto has been working on over the last few years, having a very interesting history in adopting good practices. FC Porto has a habit of participating in the European Week for Waste Reduction and marking the European Day of Recycling with actions or awareness campaigns aimed

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either at supporters or at employees and service providers. An example was an awareness campaign aimed at fans with images of the state of the stands at the end of a game, calling for the separation and cleanliness of the space. This was a campaign that had a big impact.

Other examples of waste management prevention are the phasing out of paper tickets as fans can enter the stadium using a digital application instead and the replacement of single use cups with porcelain cups in the administrative areas as the latest awareness campaign.

Another relevant example is the collection of food items that supporters bring on match days, but that cannot enter the Stadium. The food items collected are donated to associations and charities. Otherwise, these foods would be deposited in mixed waste and sent for energy recovery.

Pilot test

Since FC Porto was experiencing a significant increase in mixed waste, they decided to start an analysis of the possible causes. In this sense, the pilot test consisted of the following steps in characterizing waste and defining and implementing measures to improve waste sorting.

This pilot project involved different entities: FC Porto, LIPOR and a service provider that performs waste sorting.

Designing the pilot test

LIPOR carried out a characterisation of residues and samples were collected from different areas of Estádio do Dragão, including benches, food courts and stands. Two analyses were carried out:

1. Analysis of recyclable waste in order to verify the level of contamination of waste selectively disposed of;
2. Analysis of the mixed waste in order to estimate the share of recyclables in this waste.

The types of waste evaluated were plastic and metal packaging, glass packaging, paper and cardboard and mixed waste. This analysis excludes the quantification and analysis of food waste. For the analysis, a characterization point was improvised where bags were opened, and waste sorted, as shown below in Figure 11:

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Figure 11. Waste sampling desk

As a result of this analysis, there was a good separation of the waste that was being selectively disposed of. This conclusion was proven by the contamination rates identified in glass (0.3%), followed by paper and cardboard (5.9%) and plastic and metal packaging (6.3%). Examples of these are in Figure 12.

Figure 12. Examples of waste sampled

When it comes to the mixed waste, as a result, there was a high percentage of waste that could be more adequately addressed, especially waste coming from areas dedicated to visitors.

The results were very conclusive and proved the high recyclability potential of mixed waste. In a sample of 128 kg of unsorted waste, 79.5% of the waste was mixed waste, with a recyclability potential of 20.5% of recyclables that can be sent for recycling. The Figure 13 below shows the exact shares of different wastes.

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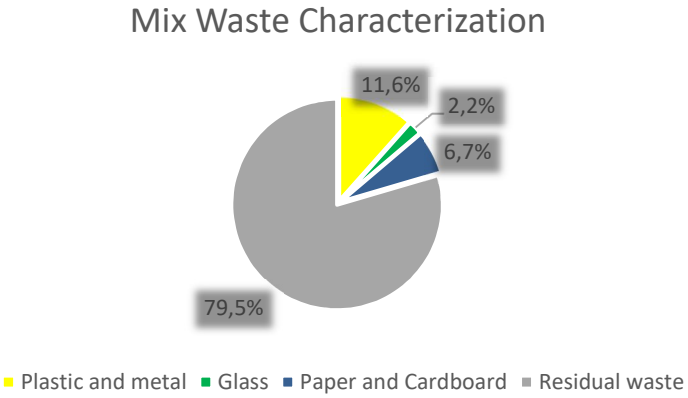

Figure 13. Results of the residual waste sampling

Out of all the areas analysed, there was a worse separation rate of waste where there is a greater circulation of visitors.

The next phase focused on defining and implementing new measures to improve the results of separate waste collection. The following measures were taken:

1. Installation of equipment for selective waste collection in the administrative areas
2. Acquisition of a mixed waste sorting station

To enhance selective collection, LIPOR installed bins for selective collection of plastic and metal packaging, glass and paper and cardboard packaging in the administrative area, as shown in Figure 14 below:

Figure 14. Separate waste collection in the office areas

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Since FC Porto had already installed various equipment for the selective disposal of waste (e.g. areas for visitors, bars and restaurants and others) and had carried out actions and awareness raising campaigns over several years. However, the recent increase in the amount of unsorted waste and the results of its analysis showed a large potential of capturing even larger quantities of recyclables. This is why FC Porto decided to go for setting up a sorting station. For this purpose, a market research was carried out, and an external entity was hired to design the sorting station according to available space. The sorting station in shown below in Figure 15:

Figure 13. The installed sorting station

As this equipment needed human resources, 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.

The equipment is currently in the testing phase. Due to the pandemic period, it was not possible to carry out tests on full scale with waste produced by the supporters since the games started to be carried out without visitors.

Recyclables are destined to be sent to recyclers and the residual waste would be incinerated at LIPOR's energy recovery plant.

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Success factors vs Inhibitors

A success factor of this pilot test was all the work previously done by FC Porto. FC Porto has been devoted to the topic of waste, having already a history of improvements and actions and awareness raising campaigns developed over the years. This was essential to have a critical spirit and make the right decisions.

The installation of the sorting station was a logical step after identifying a large recyclability potential within the unsorted waste collected in the stands.

One of the inhibiting factors was proven to be the economics of this pilot test, as it required investment, but since it was identified as one of the priorities of the club's sustainability agenda, the decision was positive.

Economics and feasibility

In economic terms, the club had to make an investment, but it would return in the coming years. One of the potential advantages is that the smaller the amount of unsorted waste produced and the higher the percentage of recyclable waste, the faster the return on investment. Savings would also reflect in the decrease of waste sent for energy recovery, and gains from the sale of some materials. The cost of installing such a waste separation line was €4250.

Having a sorting station requires allocated human resources, not only for the pilot test itself but also for keeping this new practice running. One person was allocated to this task. Regarding human resources, the employee who sorts the waste is an existing employee. As n alternative, the table was designed for 2 employees, if necessary.

Impact assessment

In terms of waste management, this pilot test facilitated the selective collection in the administrative areas. Together with the sorting station the stadium is boosting the collection of recyclables, diverting it from the unsorted waste fraction and consequently from being incinerated. In this way, more effective and efficient waste management helps to move up the waste management value chain.

Due to the current pandemic, the sorting station didn’t start to operate yet, so no data is available at this very moment for a full impact assessment.

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Replicability potential

This pilot test can be replicated in any sports facility including administrative areas. However, it requires some financial investment and the allocation of human resources periodically to sort the waste produced.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot Test					2.5

7.2 Green Power Acquisition from Renewable Energy Sources; Section of the TACKLE guidelines: Procurement (ch. 3.2.4.1, OM/PR1)

During the last several years, FC Porto highlighted their concerns about energy consumption. This led to carrying out studies with an objective to optimise the stadium's energy efficiency as well as other club structures' ones. Solar panels installed at Dragão, already allowed a reduction in gas consumption for heating water.

Pilot test

The pilot test aimed at assessing the possibilities of acquiring green energy for the Estádio do Dragão and consequently reduce its carbon footprint. FC Porto needed to start a new energy supply contract in 2019. To this end, the club prepared a call for offers, specifying the requirements for the purchase of clean energy before they would start receiving proposals from suppliers.

It is known that there are companies in Portugal who guarantee that the electricity they sell indeed comes from renewable sources. For strategic reasons, FC Porto did not advance with a new contract, but made other investments in the energy efficiency area of the building.

Designing the pilot test

Within the scope of the new call for offers, FC Porto decided to give advantage to offers based on renewable sources, which, simultaneously, would not imply an increase in energy supply costs. A call for offers was prepared in January 2019 with the desired specifications - acquisition of 100% clean energy. This was released, so the companies could make their proposals.

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FC Porto received proposals from different suppliers. It evaluated the different proposals to close a new contract with 100% clean energy provider.

Since the arrived offers had a higher annual cost, FC Porto decided, for strategic reasons, not to award any offers. Instead, FC Porto preferred to keep the same type of contract as before and boost the investment for energy efficiency solutions and passive air conditioning (placement of sunscreen films on the windows). Films that allow high visible light transmission and neutral appearance, providing an increase in the thermal insulation performance and heat rejection were placed. Simultaneously, by reducing harmful UV rays, the films would protect the condition of the materials inside and the well-being inside the building.

On the positive note, the current energy supplier already contemplates an energy supply mix which includes renewable energy sources and non-renewable energy sources, as shown in Figure 16:

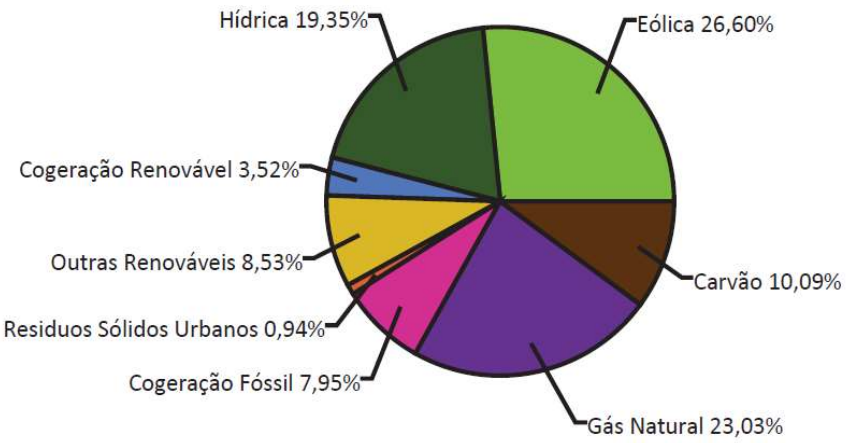

Figure 16. The energy supply mix at the Dragao stadium

58% of the electricity supplied came from renewable energies, with emphasis on wind power (26.6%).

Success factors vs Inhibitors

Electricity from renewable sources in Portugal is more expensive than others on the free market. The companies justify price difference by the need to purchase guarantees of origin to ensure that the electricity is 100% renewable.

Suppliers of 100% green energy purchase the electricity they supply to customers through contracts with producers of renewable energy (mini-hydro, wind, solar) which allows them to guarantee for the origin of the

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energy they sell. Certificates have a cost associated with their acquisition and processing, which is naturally reflected in the tariff. Currently the system in force in Portugal, obliges traders to buy guarantees of origin abroad to ensure that their electricity is green.

Considering these, FC Porto compared the pros and cons of acquiring green energy. This resulted in a conclusion that it would be more advantageous to boost the investment in passive air conditioning, as it has immediate and lasting effects on the energy efficiency of the building.

Economics and feasibility

The purchase of clean energy from a supplier is highly dependent on the costs associated with the purchase of clean energy from the producers by the supplier. Therefore, decision making is clearly affected by the acquisition cost and the strategic decisions of each entity and club.

Impact assessment

Regarding passive features such as the UV redactors, FC Porto made some investments (which is still ongoing), not only in the Stadium, but also in other areas such as the Training Center, Dragão Arena and Campanhã Pools.

In the stadium, blackout systems were installed, and the autonomous LED blocks were replaced (the installation is still in progress). As a result, so far, and compared to the previous season, there has been a 9.2% reduction in electricity consumption, which is equivalent to less 405 MWh.

Replicability potential

In addition to the increased costs, the transition to clean energy supply is dependent on current electricity supply contracts and the availability of clean energy in a given country. These can be long and the transition to a new contract may take some time to take effect.

The replicability potential will also depend on the number of suppliers and how the certification system works in each country where the purchase of clean energy is intended.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2
Pilot test					2.5

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7.3 Evaluate the reuse of banners; Section of the TACKLE guidelines: Event (new practice)

FC Porto has already had experience in the valorisation of some materials, equipment and turf combined with good environmental practices.

A good example of this was the 2017 Christmas campaign: “A Dragon, a Tree”. The campaign's claim was “Our flame will give life to the forest” and aimed to promote reforestation and upcycling. Porto fans were able to contribute to the cause at FC Porto Stores, with a donation, receiving an exclusive gift that Dragon Force students (Sports training for boys and girls between 4 and 14 years old) helped to produce: magnets made with pieces of a carpet used in the “Golden Dragons 2017” event.

FC Porto has many other examples in this context, such as the reorganisation of material and equipment between different companies in the group (office furniture such as chairs, tables, desks, sofas), locker rooms, training machines. The same thing happens with goal nets, tartan and the synthetic and natural turf that is donated to institutions and associations that are interested in reusing it.

Pilot test

Advertising and information dissemination in stadiums may involve promotional objects that may come in physical or digital formats. Over the past few years, FC Porto has privileged digital communication.

However, some physical banners and other accessories still exist and FC Porto is clearly aware that this material can be valued and thus has been working in recent years to find more environmentally friendly solutions beyond disposal. The material of these advertising banners is mostly made of PVC (polyvinyl chloride), with physical characteristics of durability, flexibility, and low flammability.

Designing the pilot test

The pilot test focused on the quantification and classification of advertising screen production. The Figure 17 shows examples of advertising banner at the stadium.

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Figure 17. Examples of advertising banners at the Dragão Stadium.

During the analysis period, by estimate, it was concluded that 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.

The analysis found that FC Porto manages this type of resources well. The banners are presented in percentage terms as shown in the following diagram in Figure 18:

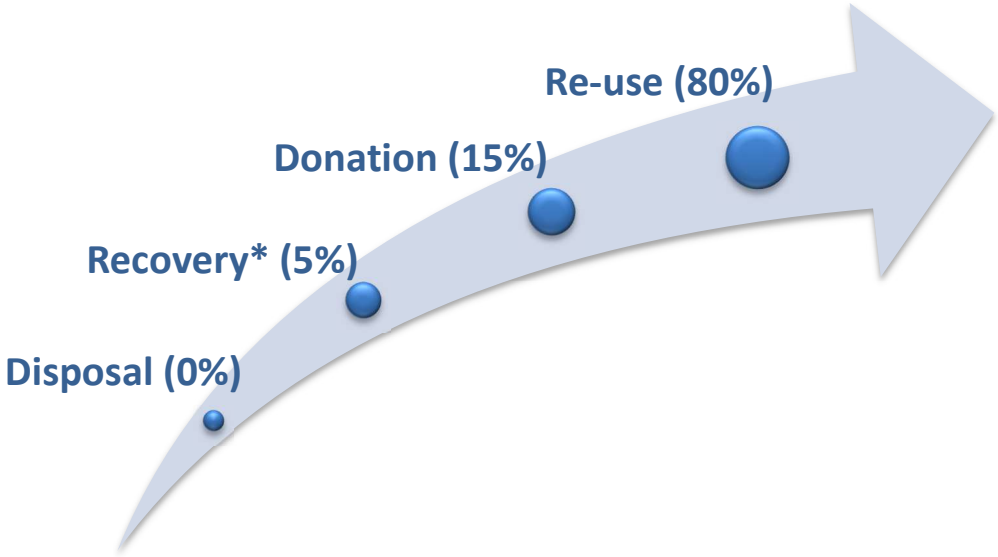

Figure 18. Types of advertising banners disposals

FC Porto is prefers not sending banners to landfills, always focusing on advanced treatment and disposal options.

- 5% for Energy Recovery (Waste recovered at the LIPOR Energy Recovery Center - Intermunicipal Waste Management Service of Greater Porto);

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- 15% for donation (FC Porto donates banners with the image of FC Porto to employees or entities and institutions that are interested in the reuse of this material);
- 80% for reuse in FC Porto's own facilities (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).

Despite the good management of this type of material, this pilot project was also intended to test alternatives and other initiatives such as upcycling. But due to the pandemic (COVID-19), it was not possible to establish partnerships for this purpose. In any case, the FC Porto will continue to study new solutions for the best use of these materials.

Success factors vs Inhibitors

Waste must be avoided: this means that some ecological criteria must be established with waste prevention measures. Therefore, the valorisation of materials and equipment must be maximized, extending its life cycle. In this sense, actions such as reuse and donation, energy recovery or merchandising will always be a great solution. This way, in addition to reducing the production of waste, it is possible to use it for longer and simultaneously help other institutions.

Economics and feasibility

The results of this project are encouraging since any stadium or club that has advertising banners can take advantage of this material as a resource, not needing investments or having to add costs for its reuse or donation, thus avoiding its landfill.

One of the success factors in the region where FC Porto is located (Northern Portugal - Greater Porto), is that the entity that values and treats waste has an energy recovery centre. In this sense, shipping costs are reduced, but in other places where there is no energy recovery plant it may be a limiting factor.

Impact assessment

As it was proven, FC Porto avoids the deposition of waste in landfills, with a better routing of advertising banners for reuse, donation or energy recovery. In this sense, there was a decrease in the environmental impact, having moved up the value chain and reducing greenhouse gases.

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Replicability potential

This project is easily replicable in other locations and for any stadium or club that has advertising banners.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guideline					n/a
Pilot test					3

7.4 Water consumption reduction; Section of the TACKLE guidelines: Stadium Management (new practice)

On a daily basis, stadiums record high consumptions of water in bathrooms, changing rooms, for lawn watering, washing benches and floors, among others. As these operations do not require the use of drinking water, FC Porto has adopted, over the past few years, sustainability solutions in terms of water management.

To tackle this issue, the Estádio do Dragão stadium installed flowmeters in the showers of the dressing rooms and in bathroom taps of the offices for metering and to limiting the water consumption. For the turf maintenance, FC Porto has equipment that analyses irrigation needs, and parallelly, a service provider communicates weather forecasts weekly to adjust the turf treatment management. Watering and cleaning floors and benches are done with water from an artesian well. Complementary to this, FC Porto controls water consumption daily to detect possible leaks. In addition, there are informational posters in the stands, requesting the visitors to report any leaks spotted to a steward.

The Porto Estádio Manual of Good Environmental Practices defines actions to raise awareness among all service providers for the correct management of water consumption. These actions are carried out at least once a year.

Pilot test

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.

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The objective of the pilot project was to reduce water consumption, maintaining a feeling of comfort for users (perceiving water pressure).

Designing the pilot test

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.

Success factors vs Inhibitors

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.

Economics and feasibility

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.

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Impact assessment

It was planned to conduct a study of water saving on match days with visitors. Due to the current state of the pandemic, it was not possible to assess the percentage of water consumption saved on a game day, especially regarding consumption in the bathrooms of fans and cups.

Instead, the results of a simpler test were satisfactory because the application of faucet aerators saved 20%-25% of the water previously consumed. Various equipment was tested to evaluate the real savings with the application of flow reducers.

Water is a precious asset, so the management and adoption of water conservation and efficiency systems are very important, thus contributing to its preservation and sustainable use.

Replicability potential

Any sustainability manager, stadium or club can take advantage of a system like the one presented in this pilot project, allowing to reduce costs related to water consumption and management, as well as avoiding water scarcity.

This practice can be applied to any existing sports facility (visitors' toilets, changing rooms, bars and restaurants, administrative areas, among others). The potential for replicability is linked essentially to the acquisition and installation of equipment, but it quickly generates returns, allowing to reduce costs related to water consumption and management, as well as avoiding water scarcity.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					n/a
Pilot test					2.75

7.5 GHG Inventory; Section of the TACKLE guidelines: Governance (ch. 3.1.6, GOV1)

Sports and the natural environment are closely linked and they both affect each other. Every sport has an environmental impact, and at the same time sports are also highly affected by the anthropogenic activities in the environment. In order to curb the effects of climate change, sports stadiums must assess their ecological footprints and develop creative solutions.

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The United Nations Office included sport in its global climate action framework and is aiming for carbon neutrality for sport by 2050.

Pilot test

The main objective of this study was to calculate the carbon footprint of the stadium and promote the reduction of GHG emissions during big sports events such as UEFA and FIFA matches. The assessment provides a technical summary of work carried out by SSSA to calculate the stadium's direct carbon emissions as well as other carbon emissions associated with the stadium's facilities and activities.

When developing the carbon footprint methodology, SSSA based its activities upon best practice guidelines, most notably the GHG (Greenhouse Gas Protocol on Product Life Cycle Accounting and Reporting Standard) of WRI (World Resources Institute and WBCSD – World Business Council for Sustainable Development, 2004) related to Product carbon footprint.

The methodology rationale was based on the degree of control, influence and management capacity that Dragao stadium had over each identified source of GHG emissions, which was equivalent to the actual ability of the organization to reduce or minimize each of the emission sources' impacts. This methodology would be used to calculate the annual baseline emissions and to update the carbon footprint of the organization in the successive years.

Particularly, the quantification of the Corporate Carbon Footprint would enable the stadium to gain insight about its GHG emission profile, identify the hotspots and the greatest contributors within the Group and improve their emissions management capacity. The results of the study would serve as a baseline to establish the carbon reduction and management plan and to assist the stadiums in decision-making processes to identify the most relevant areas for business engagement.

Designing the pilot test

To design the pilot test, SSSA and LIPOR set up a preliminary meeting with the team responsible for the environment department of FC Porto to identify the needed steps to support them in the measuring and evaluating the stadium' carbon performance.

Afterwards, the pilot test was developed by a team of specialised auditors (strategic sustainability consultant and specialist consultant for the environment). An on-site audit (gap analysis audit), a preliminary information questionnaire was carried out as well as additional calls to share ideas and define some parameters.

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This study was not intended to be certified against any official standard, however, the audit criteria and standards considered were:

- GHG Product-Life-Cycle-Accounting-Reporting-Standard
- GHG protocol corporate guidance for organizational carbon footprint
- ISO 14064-1:2018 on carbon footprint assessments methodology
- Global reporting institute guidelines

The audit objectives were:

- Assess all sources of GHG emissions in relation to installations and distribution on site;
- Evaluate the representative service (correspondence) to identify a specific functional unit and KPIs;
- Assess the availability of data from the scope 3 emission sources and gather all the information necessary to define specific assumptions.

Once FC Porto information and restricted areas were assessed, all information and data viewed and eventually collected and recorded during the entire audit process, or received before or after the site visit, were covered by the strictest confidence and were used exclusively for the performance of the audit.

The data collection strategy and the calculation method were represented by a double entry matrix that considers the Scope of the emission (1, 2 and 3 according to the GHG Protocol) and the degree of control and influence that the organization has over the source. Figure 18 presents the double entry matrix with the different data categories considerations.

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	Full control and management capacity *Emission sources that the company can directly manage and control. The company has direct influence over the quality and/or quantity of the emissions.*	Guideline Control and limited management capacity *Emission sources that are not managed or controlled by the company, but for which the company can have a great influence*	No control and limited influence capacity *Emission sources over which the company has no control or very limited influence*
SCOPE 1 DIRECT EMISSIONS	Stationary and mobile emission sources from direct fuel combustion located at PORTOESTÁDIO facilities (boilers, furnaces, energy generation) or used for operation (fleet)	X	X
SCOPE 2 INDIRECT EMISSIONS	Emissions from electricity or steam generation that occur off-site. PORTOESTÁDIO has control over the quantity consumed (i.e. by implementing energy efficiency programs) and the electricity mix purchased.	X	X
SCOPE 3 OTHER INDIRECT EMISSIONS	Emissions generated offsite but connected with PORTOESTÁDIO 's operation, and for which PORTOESTÁDIO can a full control over the quantity generated. *Example: business travel, location of suppliers, type of raw materials purchased*	Emissions generated offsite but related to PORTOESTÁDIO 's operations. PORTOESTÁDIO has the capacity of influencing these sources. *Example: logistics, employees commuting, waste management*	Emissions generated offsite and generally related to PORTOESTÁDIO 's operation where it has no possible control or influence power. *Example: contractors business travel, suppliers' emissions, waste emissions in landfills.*

Figure 18. Data collection matrix and different data sources used for the pilot test

The reference year for this analysis was the operational year 2018-2019 (1st July to 30th June). The reason for choosing the operational year over the civil year is to use and include all the primary data analysis and evaluation that the company already perform that are based on this timeframe. This methodology responds to the necessity of developing an effective framework protocol to collect and manage the emission sources data

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for all the stadium's activities. The effort was focused on collecting primary data but it was also necessary to establish a prioritisation scheme to guide the process in a consistent, accurate and transparent way. The rationale of this simplified methodology was based on the degree of control, influence and management capacity that the stadium had over each identified source of GHG emissions.

The proposed approach focused on the efforts of data collection on the areas in which the organization has the greatest ability to reduce or minimize emissions. In this sense, the methodology had some similarities with an environmental impact assessment or risk analysis, as the second goal was to anticipate significant carbon risks so that they could be avoided, reduced or shared where possible.

Success factors vs Inhibitors

Good data archiving and recording was proven to be a huge enabling factor for a successful pilot test. FC Porto had a track of their data for the last 3 years which helped a lot to have this pilot test successfully conducted.

On the other hand, as an inhibiting factor, it is worth highlighting the definition of boundaries, as well as some extrapolations and assumptions that had to be made. The boundaries issue was reflected in the first step towards determining the data collection strategy system boundaries of the organisation had to be defined.

Form the GHG emissions point of view in order to follow the pilot test's objectives, the stadium's activities assessment could be divided into several business areas as shown in Figure 19:

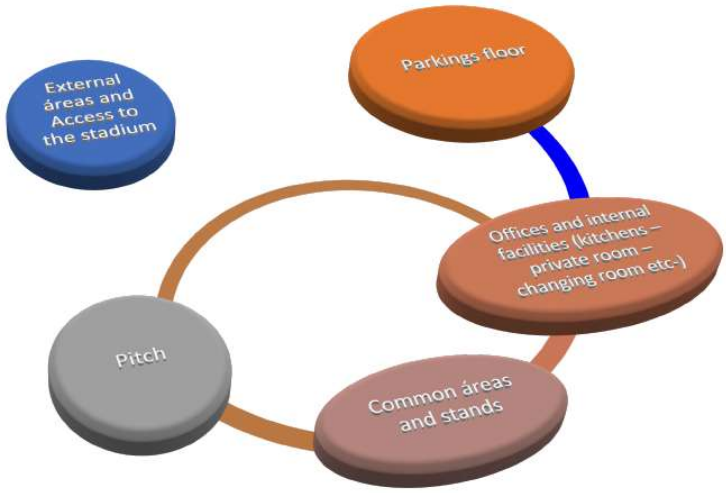

Figure 19. Organisation's Boundaries by Unit

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The Figure 20 below summarizes the definition of System Boundaries as defined by using the operational control approach in the stadium's scheme.

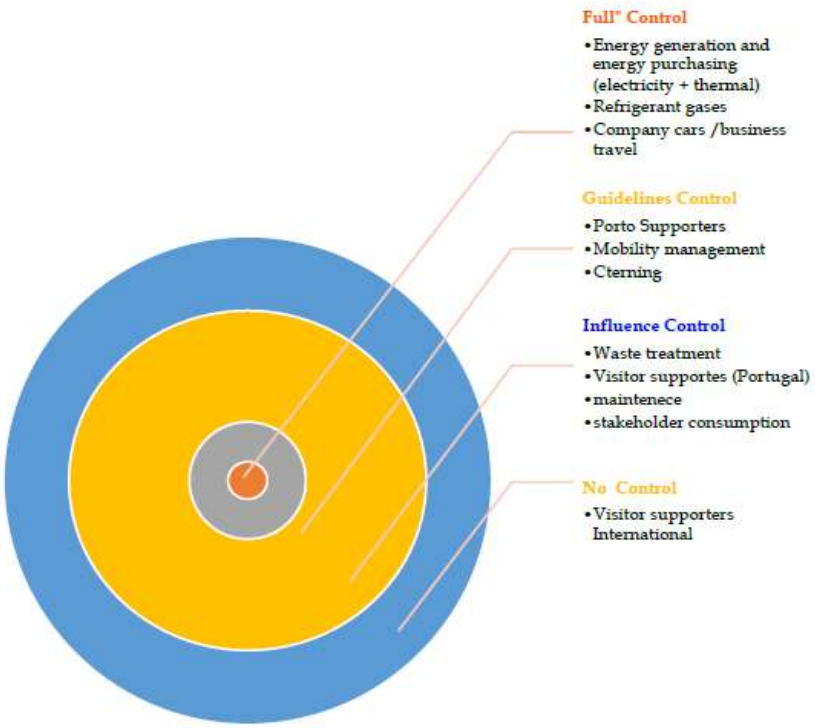

Figure 20. Organisation's Boundaries by Unit

Economics and feasibility

The elaboration of a GHG inventory usually requires some time and effort: it is quite common to outsource it to an external consultant, as in the case of this pilot test. In addition, if the owner wants to certify it, some additional costs, time and effort would have to be taken into consideration.

However, the costs related to building a GHG inventory and potential certification can be considered quite negligible in comparison to the overall investments usually required for a club or a major sport event.

As an important added value, the club can easily communicate and disseminate the results obtained, as well as calculate the carbon footprint of each game, and consequently define strategies to mitigate greenhouse gas emissions, both from the stadium and on matchdays, thereby improving its image.

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Impact assessment

This pilot test resulted in FC Porto having a good baseline assessment and a template for updating the carbon footprint of the organisation in the coming years. The quantification of the Corporate Carbon Footprint enabled FC Porto to gain insight about its GHG emission profile, identify the hotspots and the greatest contributors and improve their emissions management capacity. The results of the study will serve as a baseline to establish the stadium's carbon reduction and management plan and to assist FC Porto in decision-making processes to identify the most relevant areas for business engagement.

An inventory of emission factors was developed to characterize the GHG emissions from each source identified. When available, specific emission factors were used. When it was not possible, emission factors were obtained from scientifically reliable and internationally recognized databases, considering the quality of the data criteria such as geographic, technological, and temporary representativeness.

The main observations made through the GHG assessment were:

- Indirect emissions produced by supporter's mobility patterns play an important aspect for improving carbon footprint. International flights, the main choice of arrival to Portugal for foreign visitors represents in absolute terms the most pollutant activity in terms of GHG's emission; however, this particular aspect of mobility is something out of the stadium's control; according to data, the overall GHG emission depend on the teams allocated to travel to Porto for their games (greater distances = bigger GHG emissions)
- Energy consumptions had a significant impact on the carbon footprint and choosing the right energy provider (that provides energy from renewable sources) can help improving the carbon footprint

Figure 21 below shows the results:

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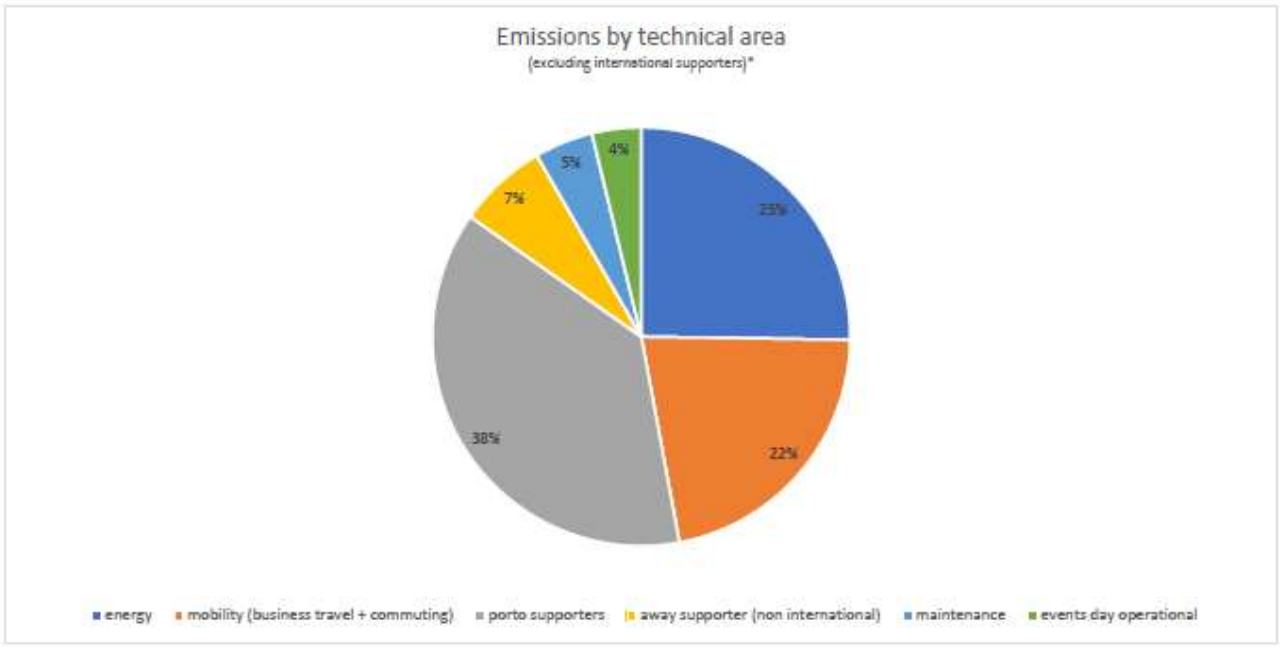

Figure 20. Greatest contributors to GHG emissions

A GHG inventory itself does not have any direct environmental impact, as it is a management and monitoring tool aimed at measuring the environmental performance. However, since measuring is the first step for managing and improving performance, a GHG inventory represents a key tool for understanding which activities are the most impactful under an emissions point of view, and thus where the reduction strategy should focus on.

Finally, the quantification of the GHG emission caused often leads to the adoption of offsetting strategies, such as chapter 7.6.

Replicability potential

GHG inventory can be elaborated for any club (considering different infrastructures and areas), stadium or event (matches, sporting event or other type of event). If prepared according to the international standard ISO 14064, it can also be certified: this ensures a proper level of reliability and comparability of different events' carbon management overall performance.

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Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					3
Pilot test					2.5

7.6 GHG Emissions Offsetting; Section of the TACKLE guidelines: Governance (ch. 3.1.5, GOV2)

As in the case of waste, GHG emissions are among the most detrimental environmental externalities associated with a wide array of activities carried out in the day-to-day management of the club, stadium, matches or in the organisation of sporting events, reflecting in the most carbon-intensive and energy-intensive activities such as heating, cooling, mobility and transportation.

To reduce the impact of sport clubs 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 allowance markets, purchasing renewable energy credits, or funding tree plantations.

A carbon offset is a reduction in emissions of carbon dioxide or other greenhouse gases emitted in order to offset an emission made elsewhere. Carbon offsets are measured in tonnes of carbon dioxide-equivalent (CO_2eq). One tonne of carbon offset represents the reduction of one tonne of carbon dioxide or its equivalent in other greenhouse gases. Compensation works to neutralize emissions produced with an equivalent amount of carbon reduced or removed from the atmosphere.

As it was verified over the years, FC Porto had a history of environmental awareness raising and sustainability. FC Porto carried out some environmental actions, such as planting trees in 2010 in the Serras do Porto. However, these actions were not monitored and quantified in terms of compensation for greenhouse gases.

Pilot test

This pilot test would follow the previous one in ch. 7.5, GHG Inventory. Having calculated carbon footprint and identified the greenhouse gases from the stadium and a game, it would be in club's interest to compensate for those same emissions and act concretely or partially in the fields of climate change fight, biodiversity loss, unsustainable management of water resources and consequently the impacts on the population's health.

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Pilot was based on the Portuguese market study on greenhouse gas compensation initiatives. In this sense, it was noticed that there were some entities that promoted participation in voluntary markets for carbon emission licenses, purchase of renewable energy credits or financing tree plantations.

Designing the pilot test

FC Porto met with LIPOR in order to evaluate the results of the GHG Inventory pilot test, which resulted in the calculation of the carbon footprint. It was concluded that:

- Indirect emissions produced by supporters' mode of transportation played a key contribution to be managed in order to improve the club's carbon performances. Due to aviation, the specific transportation of international visitors represented in absolute terms the most pollutant activity in terms of GHG emissions; however, on this specific emission source, the stadium had no control and annual calculations were inconsistent as visitors were coming from different parts of Europe as allocated by draws.
- Energy consumption and specific electricity consumption had a significant impact on the carbon footprint.

Subsequently, the market and the possibilities that exist in Portugal for the offsetting of greenhouse gas emissions were assessed.

The FC Porto technical team, after analysing the possibilities and the different compensation scenarios, would analyse with the management the best options for investing in the acquisition of reforestation credits or certificates. It was necessary to define the scope, e.g. what emissions to offset? There were several possibilities, such as compensating for either direct or indirect emissions.

In Portugal, the compensation grant consists of forest areas that meet at least the following criteria:

- They have native species
- Do not have species classified as invasive
- They are managed according to a Forest Management Plan that guarantees a minimum exploitation period of 30 years and that, in addition to the legal requirements, integrates additional measures for fire prevention and environmental protection
- They have a specific plan for monitoring carbon sequestration throughout the exploration period

Until the publication of this document, it was not possible to close the contract for the compensation of greenhouse gases. FC Porto will continue to work on the topic.

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Success factors vs Inhibitors

After calculating the carbon footprint, a task with a high technical investment, thinking about compensations is simple. However, investing in credit may be an investment that not all clubs are willing to have. Thus, it is crucial to define the scope.

On the other hand, compensation will be somewhat dependent on the existing market in each country. In Portugal, few entities are available.

Economics and feasibility

Apart from the reduction of CO_2 emissions after the offsetting activity, additional benefits can be related to the improvement of the corporate reputation of the organisations that offset the emissions, since they can communicate the arrangements for a carbon neutral event or infrastructure. This practice requires an investment which depends on the event organiser or the sport club.

Often, the GHG offset is carried out after an evaluation of Carbon Footprint.

Impact assessment

As the contracts were not completed yet, the impact assessment was not possible to be described.

Replicability potential

The practice can be applied in any country and for any stadium, match or event. Often, the GHG offset is carried out after an evaluation of Carbon Footprint (see above pilot test – GHG Inventory).

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.75
Pilot test					2.75

7.7 Sustainability report; Section of the TACKLE guidelines: Governance of Football Events (ch. 3.1.14, GOV5)

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A sustainability report is a report published by a company or organisation covering the economic, environmental and social impacts caused by its everyday activities. A sustainability report also presents the organisation's values and governance model and demonstrates the link between its strategy and its commitment to a sustainable global economy.

Pilot test

FC Porto, aware of the importance of communicating the performance and activities carried out in terms of sustainability to its stakeholders, decided to start a process of preparing its first sustainability report, aligned with the latest international sustainability reporting guidelines of the Global Reporting Initiative (GRI), following the GRI Standard version and contributing to the Sustainable Development Goals.

In 2007, the Stadium and its management were certified under ISO 9001 (international standard implementing a quality management system) and ISO 14001 (international standard implementing an environmental management system). Since 2016 that FC Porto has been prapering the Annual Report and additionally considers aspects of corporate social responsibility in its strategy.

The preparation of a sustainability report demonstrates the integration of sustainability in the company's strategy through the management of risk and the opportunities generated. The objective is to have a Sustainability Report transparently conveying corporate values and principles, management practices and the organisation's performance.

Designing the pilot test

In the process of preparing the sustainability report, it was important to have the technical knowledge of the GRI standards, enough time to access data collection, to interact with stakeholders, as well as to write the document. These resources companies usually do not have available for preparing their first report, which is why companies usually resort to subcontracting.

After selecting the supplier, a work plan was prepared that included the following tasks:

- Identification of the work team;
- Conducting a materiality analysis;
- Selection of key indicators for reporting
- Conceptualisation of the report
- Collection, analysis and processing of data
- Writing the report

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The sustainability categories addressed covered economics (economic performance, purchasing practices, among others), environmental categories (several aspects such as energy, water and waste, among others) and social categories (involvement with the community, inclusion and diversity, among others).

In this process, all stakeholders were involved, such as, management and support bodies, outsourced entities and supporters among others, to reflect their expectations and to ensure the quality of the report.

Success factors vs Inhibitors

As a success factor, the existence of a history of data that FC Porto already had under its responsibility stood out. Since FC Porto has been producing the Annual Report and Accounts annually and is certified by ISO 14001, the data availability was an important success factor.

The involvement of stakeholders and their expectations could be considered an inhibiting factor, since listening to all interested parties required some time.

Economics and feasibility

The economic benefits are mostly intangibles as the benefits mainly revolve around corporate reputation.

The preparation of the sustainability report required significant efforts in terms of human resources and expertise. Hence FC Porto's hiring of an external entity. Such a decision entailed some financial investment.

Impact assessment

For FC Porto, the Sustainability Report brought several benefits such as:

- Greater ability to control the evolution of KPIs
- Increase the capacity to manage environmental objectives and targets
- Identify sustainability practices and share them publicly - spreading information on the sustainability strategy
- Increase awareness, both internally and externally, of Sustainable Development
- Improve reputation and credibility through greater transparency
- Ensure FC Porto's long-term success about sustainability.

Replicability potential

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This pilot test would be easy to replicate, as long as there is a good history of data on environmental, economic and social aspects. It would also be essential to have specialised people or, if it is impossible, it would be necessary to hire an external entity.

Having a department dedicated to sustainability will increase the likelihood that your club will produce a sustainability report.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines GOV5					2.5
Pilot test					2.5

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8. Benito Villamarín, Seville

Regarding the governance and organisational aspects, environmental issues are planned and managed by the business area, which includes also the marketing department. There are meetings every month (one per month) in which the progress of single projects and milestones achieved are discussed. (e.g. carbon neutrality is an important issue for the club).

The main reasons which stimulate the sports club to adopt environmental criteria and convert to a green management, are linked to the importance of football as a communication channel, which could be the mean for awareness raising on environmental issues. The management stressed the need for introducing specific environmental policies that would reward the club on the basis of its environmental practices and not only on their financial resources. In the past, the club concluded some agreements with Ecoembes, which is the local wasting company, in order to make supporters more aware of recycling actions.

The home club, Real Betis Balompié established a Foundation which works under the parameters driven by the club's historical and philosophical values, and the Club's universal social dimension, but always adapting to the new challenges set out by Sustainable Development Objectives.

The club showed interest in pilot test mainly targeting governance, mobility and logistics, green procurement, as well as event management.

8.1 Identification and implementation of environmental KPI (Key Performance Indicators); Section of the TACKLE guidelines: Governance (ch. 3.1.7, GOV14)

Real Betis is not using any kind of KPI in order to monitor the different environmental aspects. Invoices are the only method to verify their consumptions. A proposal which would include KPI for energy-related and water-related consumptions as well as food and material waste would need to be developed. These indicators would be monitored in absolute terms or relative values, depending on the productivity and/or the total number of supporters per season.

Pilot test

This pilot would design and implement a specific method for a systematic and periodical collection and elaboration of environmental data with the aim to monitor the environmental performance of the organisation.

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Designing the pilot test

The KPI monitoring system was drafted by SSSA and directly submitted to the Real Betis' management board. The proposal of Environmental KPIs for football clubs takes its cue from 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). The definition of the KPI monitoring system was conducted by SSSA which meant that no extra costs occurred. Data collection would be performed by Real Betis. However, at this level of analysis, it is not possible to estimate the efforts in terms of person/day to fill in the monitoring system. The performance indicators, elaborated by TACKLE project that will be discussed with Real Betis managers in order to build an environmental monitoring system of the club, cover the following environmental aspects:

- Energy consumptions
- Water consumptions
- Waste production
- Emissions
- Material efficiency

Success factors vs Inhibitors

The development of the environmental KPI monitoring system did not include any additional stakeholders, such as procurement experts, environmental consultants, certification experts etc. The creation was done in-house on the basis of 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).

Considering that the Real Betis' staff was neither sent to any trainings, webinars or other capacity building activities to increase their knowledge on environmental management and similar, the monitoring system requires several rounds of reflections and evaluations in order to draft a "tailor-made" version of the KPI based on the club's needs and activities. The TACKLE project also helped the club to define a long-list, but further meetings would be necessary to select the most suitable for the club.

During the monitoring itself, the club would do data collection, background check or similar for identifying and mapping the quantitative impact connected with the selected environmental aspects.

This may require additional efforts considering that some of the environmental aspects are not yet monitored by the club. Moreover, in order to have a holistic overview of the KPI monitoring system, data should cover at least a 3-year period.

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Economics and feasibility

Due to the fact that the development of the environmental KPI monitoring system was done by SSSA, it did not incur any additional expenses or staff, apart from those already being spent for the project. At the same time, as no external experts were involved no costs were necessary for that, either. Data collected will be performed by Real Betis, but, at this level of analysis, it is not possible to estimate the efforts in terms of person/day required by this action.

Impact assessment

Impact assessment could not be done for this pilot case, as Real Betis's management board has not yet taken a final decision on the adoption of the KPI monitoring system.

Replicability potential

Adjusting environmental KPIs and making them more suitable to improving environmental monitoring through structured KPI monitoring system was proven to be replicable as it requires only a modification in KPIs instead of drafting completely new ones.

However, according to Real Bets, in order to have a successful monitoring system and maximised benefits, the efforts connected to data collection have to be reasonable and adequate to the effective benefits deriving from the measurement. The absence of some data or even the enormous amount of time needed to collect them could hinder all the efforts one makes. The selected KPIs should be customise according to the club's needs.

Another reflection Real Betis had on this pilot test was the fact that trainings and capacity building activities could be very beneficial for those working on the monitoring system. Imitating and blindly adopting various KPIs from elsewhere could cause big discrepancies between the requirements and the reality of the environmental impacts.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.5

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8.2 Supporters' mobility; Section of the TACKLE guidelines: mobility and logistics (ch. 3.2.5.6, OM/ML6)

The club expressed the need for more intelligence on the mobility patterns in order to increase the knowledge about mobility behaviour of supporters and boost the use of bikes through installing bike racks around the stadium.

Pilot test

This pilot test would see a launch of a survey among Betis supporters. Through interviews, the club would be able to understand how visitors arrive to the stadium, barriers for using bikes or public transport and similar insights.

Designing the pilot test

A game on 21 February 2020 between Betis and Mallorca served as a good opportunity to conduct the survey among 200 gamegoers.

These questionnaires were analysed by Sant'Anna School of Advanced Studies (SSSUP). A report that would reflect the survey results was prepared. Upon submitting it to the stadium management, it would consider certain improvements. These improvements were not announced nor implemented by the time of writing this report.

2 news articles were published by Real Betis FC on their website and their September 2020 Newsletter. The main results highlighted in the survey were analysed and discussed by the club in order to decide what actions could implement and accompany other initiatives carried out by the club within the project's framework.

Success factors vs Inhibitors

The survey resulted in a substantial number of respondents, 208 of them precisely, with 70% of males and 30% of females. A big majority of the respondents, 85.4% were regular visitors to the home games of Betis.

Before going to the results, an important fact to be mentioned is that the Benito Villamarin stadium is located in the very south of the city, around 7 km from Sevilla's city centre.

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Economics and feasibility

The survey was conducted by volunteers and the results were interpreted by SSSA which meant that no extra costs for conducting such a survey occurred. Conducting such a survey also increases the supporters' happiness with the club taking into consideration that the club wants to hear their opinions.

Impact assessment

The survey in general showed answers which were leaning towards more sustainable and eco-friendly means of transport.

The daily habits of the respondents, in terms of their mobility patterns showed that driving dominated among 65.5% of them who always or usually use their cars. It was followed by 33.7% of them who preferred to use public transportation. 25.1% of them always or usually walk. Only then those who use bicycles, always or usually, emerged with only 7.9% of respondents saying so.

Comparing these results to those reporting on the gamegoers access to stadium and attending games showed similar results in case of cars, with 65.2% of the respondents always or usually using cars for going to games. Walking was expected to be a less common way to access the stadium as 75.3% of the respondents said they never walk to the games. Interestingly enough, while on a daily basis 28.3% of the respondents admitted they never used public transportation, even 49.5% said they never use public transportation to access the stadium. The survey showed that cyclists among gamegoers on match days are rather a rare occurrence, with only 3% of the respondents saying they were going to games on bikes. Car sharing turned out to be the alternative to those who don't use public transportation on match days or their bikes.

The survey further wanted to explore why such a low number of cyclists attend the home games. It turned out that finding a place to park is much more difficult for cyclists than drivers, with 83.3% of respondents saying they always or usually have difficulties finding a place to park, compared to only 24.7% of respondents who always or usually had difficulties parking. When it comes to other barriers for cyclist most of the respondents highlighted the fact that the stadium is far from other parts of the city (54.8% of them), followed by being afraid of having their bikes stolen (25%) and unavailability of safe parking spaces for bikes (13.9%). Other barriers were road safety and lack of cycling lanes.

When the respondents were asked about potential improvements and their effectiveness, on the scale from 1 (being the least effective) to 5 (being the most effective), they highlighted secured bike parks (3.59), video surveillance (3.34) and safe bike lines around the stadium (3.23) among others. Interesting proposals also included discounted tickets and other financial incentives.

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Replicability potential

A survey like this was proven to be a good way of getting insight in supporters' mobility habits and the challenges they are facing when attending games. While the survey itself doesn't bring any environmental benefits before certain improvements or modifications are actually carried out it can pave the way to effective solutions. Technically speaking, a survey is easy to be conducted, but should take place well before the game, upon the arrival of supporters as the closer the time is to the kick off the less willing the supporters are to participate. It is very important to include different age groups, gender in the survey in order to get balanced results. Surveys like these are usually well accepted by gamegoers and they are willing to participate, especially regular supporters who do the same trip at least once in two weeks.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.25

8.3 Green procurement guidelines; Section of the TACKLE guidelines: procurement (ch. 3.2.4.7, OM/PR 6)

The Stadium management and the organisation of football events require procurements of high volumes of products and services. Some of the services (e.g. cleaning, catering, grass cultivation, etc.) have also an important environmental impact. The adoption of specific criteria could contribute to the transition towards green behaviours among suppliers, as well as enhance environmental performances of the club.

Pilot test

This pilot would result in designing and putting in place a procedure which would further result in taking green criteria into consideration when selecting cleaning services provider.

Designing the pilot test

After the initial analysis of the main products and services and their corresponding providers which looked at the presence of suppliers holding some environmental certification (EMS) or label (Ecolabel), Betis agreed to apply the criteria.

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The stadium management and the organisation of football events require a procurement of many products and services. Some of the services (e.g. cleaning, catering, grass cultivation, etc.) have also an important environmental impact.

The call for offers for the cleaning services for the buildings hosting sport events and offices was launched in October 2020. The call was addressing a 1.5 years period (2 seasons), from 01/11/2020 to 30/06/2022 with the allocated budget of €250.000 - €280.000.

The call was launched by the purchasing department of Real Betis FC. In this case, the RBB Foundation supported and collaborated with them in this initiative in order to ensure the inclusion on environmental criteria.

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, as a part of the collaboration with the TACKLE project.

When it comes to the individual environmental criteria which were included, they were included in different parts of the offer, such as the very subject and title of the call for offers:

"*This activity will be carried out under minimum conditions defined in this call of tender and will be executed with eco-friendly methods, practices and products. Additionally, this activity will include a proper waste management taking into account the Protocol for selective collection of waste established by RBB.*"

The general requirements of the call also listed the following:

"The tenderer should comply with all requirements established in the environmental legislation."

The detailed call, defining the requested documents, services and other listed the following:

As a compulsory environmental criterion:

"A Coordinator or Responsible for Environmental aspects should be designated by the tender (please, attach CV) […];"

"Eco-friendly products should be used (please, attach List with Ecolabels) […];"

"Air fresheners, aromatic tablets or substances […] should be prohibited;"

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"All packaging for cleaning products should be properly labelled and stored […];"

"The proper management of waste should be encouraged […];"

"Energy, water, raw material and other resources should be efficiently used […];"

"Preventive and corrective measures should be adopted to avoid consequences on the environment and human health […];"

As a voluntary environmental criterion:

"The tenderer systematically carries out Good Practices on Environmental Management during the execution contract, according to the EMS (ISO14001, EMAS or Equivalent) (please, attach accreditation, certification or another evidence) […];"

"Cleaning products have some Ecolabel Tipo I (Ecolabel, Nordic Swan Ecolabel, Der Blaue Engel, etc.)."

While evaluation criteria to select the best offer were proposed, they were not finally included in the call for offers.

After having sent the call for offers to 9 companies, 9 offers were submitted. The first evaluation at economical and technical level was carried out with only 3 companies selected in that phase. The second evaluation at environmental level was applied which resulted in 2 companies complying with these environmental criteria:

- Responsible for Environment
- Environmental Management System (ISO, EMAS or Equivalent)
- Products with Ecolabel

The awarded company was "Limpiezas CASTOR". This company has an Integrated Management System (ISO14001+9001+OSHAS).

Success factors vs Inhibitors

The procurement which took place as a pilot test was coordinated by the club's purchasing department, thus the whole process was centralised without the need to hire any external services of this kind.

Including green criteria was proven not to be limiting for a successful procurement procedure, as all the 9 companies contacted did answer with their offers. The fact that only 3 were shortlisted was due to the economic and technical level. Out of these 3, two companies could comply with the environmental requests laid out in

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the call for offers. This shows that companies providing cleaning services can comply with new models and trends.

Economics and feasibility

Since details of the procurement, costs and procured services/products were not known at the time of writing this report, we were not able to conduct a complete review of the economics and feasibility of this pilot test.

Impact assessment

Since details of the procurement itself were not know at the time of writing this report, we were not able to conduct a complete impact assessment on the products procured.

Replicability potential

An exercise like this can easily improve certain environmental performances of football games and managing stadium and other logistics on the long run. It also allows stadiums and football clubs to reflect on their current practices and identify potential improvements. The success of this exercise depends on the availability of providers of desired services or goods, but also the level of commitment by the club/stadium to eventually allocate a higher budget for environmental friendlier practices.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.5

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9. Luigi Ferraris, Genoa

The stadium's organigram does not list any responsibilities in the field of environmental management and neither the two football teams who use the stadium do not hold such roles within their managing bodies. One of the main reasons for the lack of environmental standards within the management of the stadium is the fact that the arena is rather old - inaugurated in 1911, enlarged for the championships in 1934, and finally brought to its actual shape in 1990. Therefore, most of the efforts are focused on keeping the building functional under an infrastructural point of view.

Inside the stadium there is a waste bin for each of the catering points (18 bars around the whole perimeter of the stadium). These bins collect undifferentiated waste, but the catering company reported that it was making every effort to separate paper and plastic (there were no such obligations in the contracts in this field). Furthermore, the catering policy is to always have enough food available to all kind of visitors (regular and VIP). However, this meant certain amounts of leftover food at the end of each match.

The waste generated by the natural pitch is recycled. Only natural-based fertilizers are used for the pitch. The pitch is composed of two varieties of grass (couch grass and ryegrass); one is dormant in summer and grows in winter, the other does the opposite.

The stadium management decided to focus on several waste prevention measures as well as boosting recycling and separate collection of waste while in the field of energy management the stadium would like to see the use of LED lights for grass growth.

9.1 Separate waste collection and recycling; Section of the TACKLE guidelines: Event (ch. 3.1.3, OM/E4)

Upon visiting the stadium, it could be noticed that waste collection was organized in three different streams. The first stream was the waste produced by the catering service. At each match the catering service provided food and beverages, which it prepared in the kitchen or kiosks and served to visitors. All catering staff was instructed to serve drinks only in single-use plastic cups and food in single-use plastic plates with a paper towel (if the visitor was served at a kiosk) or to serve the drinks and food in glass cups or ceramic dishes with steel cutlery (as was the case in the VIP areas). The second stream of waste was the one produced by the stadium management operations. It included mostly paper from the offices, cartridge from printers, and organic waste from the pitch. The third stream of waste was the one produced by visitors, which was composed of paper

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towels and single-use plastic cups and plates, and snacks' wrappings. The first two streams of waste (from the catering service and from the stadium management operations) included a selective sorting in which organic waste from the kitchen and kiosk, organic waste from the pitch, paper and cardboard, plastic and metals and glass were all collected separately in accordance with the city's indications on waste management. The third waste stream (waste produced by fans) was left completely unsorted.

The waste collection schedule at the stadium was organized as an on-call service in which the stadium's staff would call the waste collection agency, AMIU Genova, and ask the company to empty the waste bins.

Despite the goodwill of the staff working for the catering service and day-to-day operations, who all cooperated to separately collect waste, 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. The stadium had in fact at its disposal 20 large bins (1100 litres) color-coded "green", meaning for unsorted waste.

Pilot test

The pilot test was entirely about implementing a recycling scheme which would see all materials sorted within the stadium. At the time of the implementation only glass was sorted, while plastic, cardboard and paper, organic waste and metals would go in the mixed waste stream.

The stakeholders involved were the stadium management, the stadium staff, the stadium cleaning service (Genova Insieme) and the local waste management company, AMIU Genova. Together with the stadium management, AMIU Genova organized a new waste collection schedule and in order to endow the stadium with the necessary recycling containers.

As the catering service already performed a selective collection of waste it was only necessary to give them the recycling containers. Together with the cleaning association (Open Genova), it was decided that the workers would try to separate recyclables when collecting waste from the stands.

The main aim of the pilot test was to establish a long-term, efficient waste collection scheme in order to increase the recycling performances of the stadium.

Designing the pilot test

The pilot test started in October 2019 and still ongoing. However, the preparations started in September 2019. 2 on-site visits were performed by AMIU Genoa together with the stadium manager in order to understand the

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organization of the waste disposal at the stadium and 1 on-site visit with the catering service in order to understand how the kitchens and kiosks disposed of the waste.

Once the on-site visits were completed the stadium manager included the association Genova Insieme in the pilot test, which was in charge of cleaning inside of the stadium. The association Genova Insieme was included in order to try to recycle as much as possible the trash that fans leave in the stands.

In addition, 2 on-site visits were organized at the stadium with the stadium manager and two heads of operations of AMIU Genova 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, AMIU Genova started looking for the recycling containers to give to the stadium. In the meantime, since September 2019, AMIU Genova started diverting the organic waste from the pitch from landfilling to composting.

In October 2019 AMIU Genova handed over the new waste containers to the stadium and the new recycling scheme started on 11 October.

Success factors vs Inhibitors

The first challenge that appeared was diverting the organic waste from the pitch, which was previously sent to landfilling to composting. The composting plant would initially not accept the organic waste from the pitch because of the enormous quantity of grass produced from the stadium (approximately 12.000 litres per month in the high growing season) would have negative effects on the final product. In order to solve this issue AMIU Genova had to find a new composting plant which had the capacity to treat great quantities of turf.

The second challenge was the evaluation of the amounts of recyclables produced by the stadium before and after the pilot test. The challenge was posed by the fact that it was impossible for the waste management company, AMIU, to bring a scale to the stadium to weigh the containers emptied. Hence, in order to monitor the impacts of the pilot test AMIU had to implement an evaluation scheme based on the number of waste containers emptied (quantified in m^3), the estimated density of the waste, and estimated weight of the waste.

Social acceptance was very positive among all staff members working in the stadium, and thanks to everyone's cooperation the pilot test was well accepted and made possible. Also, thanks to the efficient communication with all actors from the stadium manager, to stadium staff, catering staff and cleaning service staff, it was possible to improve the stadium's recycling performance.

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Economics and feasibility

The pilot test did not have any financial implications for the stadium nor for the waste management company or any other stakeholder involved. This is because the stadium was already paying a waste tax and the waste company was already providing waste collection service to the stadium. The costs of the new waste containers were covered by from AMIU, and financed through the waste tax.

Impact assessment

Prior to the pilot test, the stadium did not perform any selective waste collection, apart from the glass waste. All discarded material, be it paper from the offices, plastic, aluminium or aluminium cans, or even the grass from the pitch, was considered mixed waste. The "business-as-usual" scenario included a proper sorting in the kitchen and kiosks as well as in all day-to-day operations, but eventually a less sustainable waste disposal due to the presence of only large bins for mixed waste.

Together with the stadium manager and catering service manager it was decided to reorganize the waste collection scheme. First, an inspection was made in order to find an adequate space in which to place the waste bins. The location had to be big enough to host 20 large bins of 1100 litres, and have an easy access for the large waste collection truck. Once the location was found the 20 bins dedicated for the unsorted waste were swapped for a total of 20 bins for the collection of paper and cardboard, organic waste, plastic and metals and glass.

The results of the pilot test are startling as the recycling percentage more than quadrupled rising from 7.7% in 2018 (before the pilot test), to 32.9% in 2019, after the pilot test.

Replicability potential

This pilot test is very easily replicable as all EU countries promote the recycling of all recyclable waste. Moreover, this pilot test was based on the optimisation of pre-existing resources. In this case the waste collection scheme was revisited and improved in order to ensure the recycling of all waste produced from the catering service and from the stadium management. This pilot test did not include the waste produced from football fans inside the stadium premises.

The running of the pilot test was relatively easy as waste collection is a necessary service, which the stadium was already paying for. In addition, since the pilot test benefited from much social acceptance the test had a major impact on the results obtained.

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Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					3

9.2 Donation of unused prepared food; Section of the TACKLE guidelines: event" (ch 3.2.2.9, OM/E14)

Each week, prior to a game, the catering service replenishes kiosks and bars with fresh sandwiches, beverages and other delicacies. All packaged snacks are checked for the expiry date and those expiring near the date of the match are taken off the shelves in order to sell only fresher snacks to visitors.

On a matchday, the stadium canteen is full of chefs who fresh food (pasta, vegetables, meat, fish and deserts) which are later served in the VIP areas and to football players. For each serving more than one type of starter, first and second courses and desert are offered. During a match there can be as much as 10000 clients for the catering. At the end of a match leftovers are common and in order to avoid throwing out premium quality food, when possible, leftovers are recuperated by the staff. However, despite the efforts, food waste would always occur.

Pilot test

The pilot test was centred on eliminating food waste, especially hot dishes such as pasta, meat, fish and vegetables cooked for the VIP areas. All stadium kiosks and bars were also part of the pilot test as unsold fresh sandwiches and packaged snacks with near expiry date would have to be thrown out after matches.

In order to eliminate food waste, the stadium catering 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 and the network RICIBO, which connects all charities in order to ensure an efficient organisation of food distribution in the city of Genova. The pilot test was planned in June/July 2019, it started in September 2019 and it ended on 1 January 2020. In order to monitor the results of the pilot test, AMIU Genova and the association RICIBO overlooked and provided assistance to the newly established relationship between the stadium's catering and the local charity.

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Designing the pilot test

Throughout the months of June and July 2019, AMIU Genova and a representative of the association RICIBO visited the stadium kitchen and kiosks in order to understand what types of food were being served, hence what type of leftovers to expect and to estimate the amount of food being wasted. It was established that apart from fresh sandwiches and snacks the freshly cooked food required special containers in order to keep it warm until serving it to the homeless.

Thanks to the association RICIBO a charity was identified – it was located in the stadium's vicinity and had the possibility of driving to the stadium after the matches on a call-by-call basis from the catering.

Good donations are possible in Europe thanks to the Gadda law, which made possible the donation of food to charities from a hygienic and fiscal point of view in 2016.

In order to donate food in Italy donors need to create transport documents, which would contain details on what is being transported, the weight, the beneficiary and the provider. Creating such documents may be burdensome. Hence, in order to make the donation swifter it was decided to use the app Bring the Food, where both the donor and the beneficiary create an account the and the donations are traced.

Three meetings were organised in order to help both the stadium catering and the charity to register on the app, and to ensure they would be using it correctly.

Success factors vs Inhibitors

This pilot test was a success because all stakeholders were onboard, and everyone put 100% effort to make things work as swiftly as possible.

At the very beginning it was hard to make the app work and to calibrate it for the donations as there were certain parameters, such as the type of food, that had to be inserted manually by the association RICIBO. Nonetheless, thanks to the willingness of the stakeholders the donations did not stop and they proceeded using manual documentation.

Economics and feasibility

The financial implications of the pilot test were mainly the cost of the food given to the charity. The catering service was nonetheless very pleased to give the food to charity as they were on board with this good cause.

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Impact assessment

Over four months of pilot test (September-December) 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. Both the Food and Agriculture Organisation (FAO) of the United Nations and several studies, such as the one of Lee Han and Wang (2017)[1] estimate the emissions from landfilling food waste at 2.54 kg Co_2eq per a kilogram of food waste. Therefore, the overall CO_2 savings originating from this pilot test is estimated at 433.07 kg CO_2eq.

On a more qualitative note we were able to create an effective link between the stadium's catering and the charity, which even after the pilot continued to perform the food donations.

Replicability potential

The replicability potential depends on the existing policies and operations in stadiums and those of catering services (sometimes contractors). Nevertheless, people in need and charities are present all over the world, hence, it should be quite feasible for every other stadium to implement a similar pilot test.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.25
Pilot test					3

[1] Evaluation of landfill gas emissions from municipal solid waste landfills for the life-cycle analysis of waste-to-energy pathways; https://doi.org/10.1016/j.jclepro.2017.08.016

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10. Paolo Mazza Stadium, Ferrara

The Paolo Mazza Stadium is owned by the municipality of Ferrara and is the home ground of SPAL football club. The stadium is a multi-use stadium, but is mostly used to host football matches of the home team. In 2015, the municipality implemented a major reconstruction of the stadium's infrastructure. Currently, the stadium hosts up to 16.134 people.

Energy supply constitutes a major challenge in the stadium: during football matches, the stadium relies on a diesel generator (a second generator operates in case of emergency), due to the inability of the electrical substation to supply the stadium's electricity needs.

The ordinary maintenance of the stadium's grass pitch is energy intensive and a major cost item: the mobile lighting rigs used for stimulating growth and regeneration of the grass account for approx. 35% of total energy consumption of the stadium, for a monthly cost of approx. €10000.

Garbage bins are not present within the stadium for security reasons. Therefore, garbage collection and waste sorting (plastic and paper) is operated by the cleaning company. The hospitality area of the stadium is operated by an external company and hosts up to 700 people. Approximately 1300 kilos of unsorted waste are generated in the stadium every year.

The whole stadium is provided with LED lights.

10.1 Feasibility assessment of installing photovoltaic panels on top of the stands; Section of TACKLE Guidelines: Stadium Management; (ch. 3.2.3.11, OM/SM9)

Energy consumption during football matches constitutes a major concern to SPAL. In order to enhance energy efficiency in the stadium, this pilot test was focusing on assessing the feasibility of installing photovoltaic panels on the top of the stands in the certain areas of the stadium.

Pilot test

With the aim of reducing dependence on diesel generators, and enhancing energy efficiency of operations while limiting emissions, SPAL assessed the feasibility, both technical and economical, of installing photovoltaic panels in the stadium to generate solar energy to feed into the power network. In order to support

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the pilot test, the TACKLE team involved a provider of solar panels, which assessed the feasibility of installing panels on top of the roofs of the stadium's North and East stands.

Designing the pilot test

During the first stadium visit and meeting with SPAL's general director and stadium manager in November 2019, TACKLE team proposed to assess the feasibility to install photovoltaic panels as a solution to increase the stadium's energy efficiency and reduce dependence on diesel generators. Consequently, the TACKLE team identified and contacted ESPE Srl, a provider of photovoltaic panels based in Padua, Italy. The TACKLE team organized a web meeting in early March 2020 inviting both ESPE Srl and SPAL to discuss how to proceed with the feasibility assessment. During the meeting, ESPE Srl had the opportunity to access relevant documentation concerning the stadium's infrastructures and energy needs. Based on the documentation, ESPE Srl and SPAL identified the roofs of the Northern and Eastern blocks as the most appropriate locations of the solar panels, estimating a total of 563 kWp (kilo Watt peak, i.e. maximum power that the panels can produce) capacity for the entire surfaces. Following this meeting, in March 2020, ESPE Srl formulated a technical layout of the photovoltaic panels. Given the size of the roofs, ESPE Srl 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. The analysis also assessed the technical feasibility of safely installing the panels.

The Figure 21 below shows the parts of the stadium identified for the pilot test.

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Figure 21. Parts of the stadium identified for the installation of PV panels

However, we can add, as an annex, the tables concerning the power capacity of the three panels in the feasibility study. All the values in terms of energy produced and consumed by the panels are specified. See the attachment. These tables detail the total power that would be produced by the photovoltaic system, given each panel's average contribution (i.e. 220 kWp + 85 kWp + 30 kWp = 335 kWp).

Success factors vs Inhibitors

As for the success factors, it is important to mention that similar preliminary feasibility studies are very easy to conduct if the stadium manager is able to provide all the necessary information regarding the infrastructures of the stadium (such as the location, size, height, capacity of the coverage of the stadium's stands). In SPAL's case, the stadium manager provided all the technical information that were required by the local company. To conduct a similar assessment, the provider of the study does not necessarily need to visit the stadium if required information is already available. Accordingly, the feasibility study is often freely provided by local solar panels installation companies, as they are interested in supplying and installing the solar panels.

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Economics and feasibility

To conduct the feasibility study, a local provider of solar panels (an installation company) was contacted. The feasibility study was conducted by the company pro bono, because in case of a positive feedback from the stadium manager on proceeding with the installation of the solar panels, this supplier will be appointed for the installation.

Impact assessment

The stadium manager was positive about the outcome of the feasibility study. However, to proceed on the installation of the panels (as well as the installation of the electric substation) requires approval from the society's board (and the municipality of Ferrara, which would probably pay for it).

Replicability potential

The replicability potential is very high, since the feasibility study can be easily conducted by a provider of photovoltaic panels free of charge. However, the potential for turning the output of the feasibility study in practice depends on the commitment of the organization and economic availability. Accordingly, before conducting the feasibility study, it is important to assess the interest of the stadium manager in installing a photovoltaic system in the stadium and making sure all the necessary data is known and available.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2
Pilot test					2.75

10.2 Recycled plastic choreographies; Section of the TACKLE Guidelines: Event (new practice)

SPAL did not include environmental criteria in contracts related to the purchase of goods and services, such as cleaning services, sports materials, merchandising etc. The adoption of these criteria in selected supply contracts can improve the environmental profile of the services and processes within the stadium, reducing its environmental impact. SPAL supporters' choreographies during football matches (e.g. flags, banners etc.) imply a large consumption of materials, mainly plastics. SPAL collaborates with supporters with the aim to

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ensure that choreographies comply with safety norms and, sometimes, directly procure materials for choreographies.

Pilot test

The pilot test focused on purchasing and utilising choreographic materials (specifically flags) made from recycled plastics, instead of virgin material, to be showcased during selected football matches. On the occasion of the Serie A SPAL - Bologna match played on 25 January 2020, SPAL supporters utilised six thousand white and blue flags (the colours of the SPAL team) made of recycled polyethylene, as shown in Figure 22.

Figure 22. Detail from the SPAL – Bologna game with choreography made of recycled materials

Designing the pilot test

Given the large amount of waste generated by the supporters' choreography at the end of football matches, the TACKLE team identified the opportunity to reduce the environmental impact of the choreography by using accessories made of recycled and recyclable plastics (recycled LDPE). 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.

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Success factors vs Inhibitors

Some of the success factors which contributed to the successful pilot test were surely the availability of a supplier of choreography that uses recycled plastics for its products. Furthermore, large availability of choreography items made from recycled materials and the opportunity to customize choreography materials made of recycled materials made it easier for the club to go for the pilot test. What drove this pilot test forward was the proactive collaboration between SPAL and its supporters, coordination on choreographies during football matches.

The regenerated polyethylene utilised in the manufacturing of the flags is both recycled and recyclable, after disposing of it in the appropriate waste stream.

No relevant inhibiting factors were detected.

Economics and feasibility

The pilot test is highly feasible and replicable due to the availability and price of choreography items made of recycled plastic. Price and performance of choreography items made of recycled materials are equally comparable to choreography items made of virgin materials. The price of a single flag was €0.08.

Impact assessment

The environmental benefit of the pilot test was assessed by performing an LCA on the flags made of recycled polyethylene, especially focusing on the reduction of greenhouse gases (specifically CO_2). 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 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. The table 11 below summarises the savings.

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Table 11. Comparison of CO_2 achieved by using recycled PE in the production of the choreography material

MATERIAL	CO_2 EMISSIONS PER KG OF MATERIAL	CO_2 EMISSIONS FOR 6000 FLAGS (234 KG)	EMISSION SAVED BY USING RECYCLED PE
Virgin PE	2.78 $kgCO_2eq$	650.52 $kgCO_2eq$	465.66 $kgCO_2eq$
Recycled PE	0.79 $kgCO_2eq$	184.86 $kgCO_2eq$	

Replicability potential

The pilot test is highly replicable, and can be extrapolated to similar practices and procurement contracts for promotional material, merchandise, choreography products. This could lead to even larger environmental benefits. The high replicability of the pilot test reflects in the fact that the use of choreography and promotional materials in football, both by supporters and football clubs themselves is quite common. Nevertheless, this pilot test also showed that products made of recycled materials are available in many countries and are easy to procure for.

Given the high replicability potential, as well as the media attention obtained thanks to this pilot action, SPAL committed to replicate this action in numerous occasions, beyond the scope of TACKLE activities, in order to turn it into a business-as-usual practice.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					
Pilot test					2.75

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11. Stadio Olimpico, Rome

Stadio Olimpico is situated in the Foro Italico park and hosts several sport venues and facilities: swimming pools, tennis courts, athletics track etc. The whole Foro Italico is owned by the Italian National Olympic Committee (CONI), a public company. The stadium is mainly used for football matches as the home stadium of both S.S. Lazio and A.S. Roma and for concerts and events. The stadium can host up to 70.634 people.

As a public owned stadium, Olimpico has to follow the Public Tender Code (D. Lgs. 50/2016) that imposes the inclusion of minimum environmental criteria in all its main tenders and calls for offers, as defined by the Italian Ministry of Environment. However, the definition and evaluation of such requirements is often complicated for the Procurement team since they do not have environmental technical experts.

Water supply also constitutes a major challenge for the stadium: it consumes 100.000 m^3 of water per year and right now, water is taken from the public aqueduct with consequent higher costs and environmental impacts.

The stadium also generates considerable waste: it substitutes around 600 seats every year. Furthermore, separate waste collection and plastic waste prevention should be further encouraged and implemented. Finally, the Stadium consumes impressive amount of energy (around 8 million kWh per year).

11.1 Green procurement guidelines; Section of the TACKLE Guidelines: Procurement (ch. 3.2.4.7, OM/PR7)

Olimpico is a public owned stadium. As such, it has to follow the Public Tender Code (D. Lgs. 50/2016) that imposes the inclusion of minimum environmental criteria in all its main tenders and requests of proposals as defined by the Italian Ministry of the Environment. The Ministry set pre-determined green criteria for certain types of goods and services e.g. detergents, furniture, food and catering service, green maintenance etc. Public entities are supposed to follow these requirements and comply with them in their tenders and take them into consideration during the offers' revision and evaluation. However, the evaluation of such requirements is often complicated for procurement teams since they do not have an environmental technical expert.

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Pilot test

The aim of this pilot test was supporting the procurement team in optimising the addition of the appropriate green criteria as set by the Italian Ministry for the Environment and to properly and easily evaluate the different offers.

Designing the pilot test

To design the pilot test, SSSA and FIGC set up a preliminary meeting with the Procurement manager of Foro Italico to identify the needed steps to support them in the implementation of a more efficient Green Procurement system.

SSSA reviewed the Procurement procedure and added some amendments aimed at ensuring the addition of green criteria where required by law and when appropriate even if not mandatory by law. As a result, 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. In addition, SSSA developed a document with the most relevant ecolabels and a description of the different types of labels and certification to take into consideration when evaluating an offer. As part of the supporting activities, SSSA made also an analysis of the ISO 20400 standard on Sustainable Procurement and on the services offered by ECOVADIS on suppliers' level of sustainability evaluation.

Success factors vs Inhibitors

The fact that national laws and policies existed already, it implied that publicly owned organizations needed to adopt and implement green procurement practices. This pilot test benefitted from two key contributions – the presence of a sustainability manager or environmental expert that could support the procurement team in the addition of relevant green criteria and in the evaluation process of the offers and the presence of an Environmental Management System that includes the procurement procedures. However, a small procurement office with limited personnel inhibited the pilot test to some extent.

Economics and feasibility

Green products and services may be more expensive than regular alternatives. However, the selection of greener products and services could ensure long term cost savings (e.g. energy and water bills). In addition, an external consultant would be necessary if the organization does not have a sustainability manager or an environmental expert.

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When it comes to this particular pilot test, no expenses incurred as the work was done by SSSA for FGIC. Ho

Impact assessment

Difficult to measure because it derives from the multiple lower environmental impacts caused by the greener products and services that will be purchased thank to the green procurement system. For sure, the broader the extension of the green procurement system, the bigger the positive environmental impacts.

Replicability potential

The development of a green procurement system is mandatory in Italy when the stadium is managed by a public entity. In all other cases, it tends to be a voluntary engagement. It definitely requires a significant investment in terms of time and money (especially when an external consultant is needed). However, the selection of greener products and services could ensure long term cost savings (e.g. energy and water bills). And nevertheless, it is a one-time action, since once develop, the same green procurement system can be reused.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.5

11.2 Seats made of recycled material; Section of the TACKLE Guidelines: Stadium Management (ch. 3.2.3.1, OM/SM24)

The stadium has to substitute 600 seats per year. Sometimes, seats are damaged by supporters, otherwise they just need to be replaced du to regular wear and tear.

Pilot test

Complementary to the pilot test on green procurement, this action aimed at finding “green seats” to be purchased and gradually substitute all the seats in the stadium.

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Designing the pilot test

A cooperation with Revet, a plastic recycling company, was established in order to find the right composition of virgin and recycled plastic for ensuring the required technical characteristics (fire resistance, hardness, elasticity etc.) required by international Federations (UEFA and FIFA) for stadium seats. As a result, Revet has developed a seat that contains 40% of recycled plastic.

The general manager of the stadium visited Revet plant in Pontedera to explore the possibility of purchasing this new model of seats. Additionally, a meeting in Rome took place with the recycled seats producer (OMSI) in order to verify the technical and economic feasibility of the supply.

The main outcome of this pilot action is that Stadio Olimpico would start replacing broken and old seats with 40% recycled seats manufactured by Revet and OMSI.

Success factors vs Inhibitors

The availability of these seats in Italy was the underlying success factors. Locally produced and supplied, it already cut certain costs associated with transport. This particular producer appeared to be the unique producer in the EU.

The well-defined criteria and requirements for stadium seats which exist and which are imposed by various governing bodies in football. They include fire resistance, colour codes, elasticity, resistance to sunlight etc.

Economics and feasibility

Recycled plastic seats are not significantly more expensive than regular ones, especially if the stadium orders a large number of seats. Ordering a large number of seats in advance and stocking them could cut the costs and ensure a certain number of seats in reserve. This would also lower the transport costs. The main variable is the location of the seats' producer.

Impact assessment

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 we have estimated the environmental benefits of the adoption of recycled seats compared to virgin plastic seats. As we can see relevant improvement of carbon footprint (-35%) and water footprint (-41%) can be achieved.

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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 comparison gives us the following carbon and water footprint, as shown in table 12.

Table 12. Comparison of virgin plastic seat production vs 40% recycled plastic seat

	CARBON FOOTPRINT	WATER FOOTPRINT
100% Virgin plastic seat	5.34 $kgCO_2eq$	1.65 m^3 water eq
40% recycled plastic seat	3.47 $kgCO_2eq$	0.98 m^3 water eq

Replicability potential

The fact that a provider of seats made of recycled plastics is available in the country facilitates a lot the implementation of such a pilot test and change in stadium management.

Feasibility/Scores	Economic	Environmental	Technical	Replicability	Total
Guidelines					2.5
Pilot test					2.75

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12. Tele2 Arena, Stockholm

Tele2 Arena is one of the world's most accessible venues. It was built using locally Scandinavian materials that give the building a cultural context and reduce its environmental impact at the same time. Its construction spurred the regeneration of the Johanneshov district and contributed to its urban development. Connectivity to neighbouring areas was promoted through environmentally conscious ways to get to and from the Arena: pedestrian connections to nearby subway stations were strengthened and 1,000 new bicycle parking spaces were introduced.

The impact of Tele2 Arena on the local environment was mapped through comprehensive Environmental Impact Assessment; risk and safety, traffic, air quality and noise were assessed and findings incorporated into the stadium's design. Tele2 Arena was awarded the Miljöbyggnad Guld environmental standard.

12.1 Separate waste collection and recycling and composting program; Section of the TACKLE guidelines: event (ch. 3.2.2.6, OM/E4, OM/E12)

Tele2 Arena had a separate waste collection system but, at a certain point, decided to return to a unique unsorted waste collection.
However, given the recent attention paid to the reduction of plastic waste, it is of utmost importance to separate at least plastics and organic waste.

Pilot test: This pilot test would reintroduce separate waste collection at least for plastic waste, organic waste and for liquids. The test would include the installation of bins for separate waste collection in the public space in the imminent surrounding of the Arena, as well as appropriate infographics and signage indicating the different types of waste being accepted in those bins

Designing the pilot test

n/a

Success factors vs Inhibitors

n/a

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Economics and feasibility

n/a

Impact assessment

n/a

Replicability potential

n/a

12.2 Reusable cups for drinks; Section of the TACKLE guidelines: event (ch. 3.2.2.12, OM/E18)

The stadium's owner, Stockholm Live, was strongly committed to get rid of single-use plastic items. They were struggling to achieve this target because of the safety measures that ban the distribution of closed plastic bottles for drinks: this limitation was obliging caterers to serve drinks in single-use disposable plastic glasses. The result was that waste quantities doubled up with plastic bottles and plastic glasses.

Pilot test: The objective of this pilot test was eliminating single-use plastics tableware, bottles, glasses and cups. The underlying idea was to test and take into consideration several possible alternatives. The first one would be the distribution of reusable cups with a return fee: supporters would be incentivised to return the used cup and reclaim the deposit fee or have another drink without paying the deposit again.

Another possibility could be the adoption of biodegradable and compostable cups. They could be disposed of in the organic fraction. Finally, other more innovative types of glasses could be tested (i.e. pcup or others).

Designing the pilot test

n/a

Success factors vs Inhibitors

The option which considered biodegradable and compostable cups was very much relying on whether separate collection of organic waste was implemented or not.

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Economics and feasibility

n/a

Impact assessment

n/a

Replicability potential

n/a

12.3 Life Cycle Assessment; Section of the TACKLE guidelines: governance (ch. 3.1.10, GOV16)

Stockholm Live manages both Friends Arena and Tele2 Arena in Stockholm. The first one has a natural grass pitch whereas the second has an artificial turf pitch. They both require intense maintenance activities. It could be of interest to compare the related environmental impacts of these two types of pitch taking into consideration their whole life cycle.

Pilot test: This pilot test would result in performing a comparative LCA study of the grass pitch of Friends Arena and the artificial pitch of Tele2 Arena.

Designing the pilot test

n/a

Success factors vs Inhibitors

n/a

Economics and feasibility

n/a

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Impact assessment

n/a

Replicability potential

n/a

12.4 Sport events GHG inventory; Section of the TACKLE guidelines: governance (ch. 3.1.6, GOV1)

Stockholm Live developed a rich monitoring system that requires monthly collection of environmental KPIs aimed at measuring its GHG emissions. This evaluation system can be used to calculate the GHG emissions caused by the venue in one year.

Pilot test: The underlying idea was to calculate the GHG inventory over one year of the activities at Tele2 Arena. Based on the outcome, the test would further set a GHG emissions reduction strategy aimed at targeting the most impactful activities.

Ideally, it would be interesting to also calculate the emissions caused by one single match and by one single concert.

Designing the pilot test

n/a

Success factors vs Inhibitors

n/a

Economics and feasibility

n/a

Impact assessment

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Replicability potential

n/a

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13. Friends Arena, Solna

A private company owns the stadium (75% real estate company) with the football associations owning the other 25%. Stockholm Live is the current manager of the stadium. In the organisational chart of the company no specific roles and responsibilities in the field of Environmental Management and CSR are established. The main focus is on energy, grass and media consumption.

For what concerns waste management aspects, only paper, organic waste and special waste are separated, while the rest of the waste is unsorted due to the municipal incinerator. This municipal plant also produces energy for the heating system of the stadium. The grass used is natural, except for the sides of the pitch.

No specific indicators are used for monitoring environmental aspects.

13.1 Green procurement guidelines; Section of the TACKLE guidelines: procurement (ch. 3.2.4.7, OM/PR6)

The stadium management and the organisation of football events requires the procurement of high volume of products and services. Some of the services (e.g. cleaning, catering, etc.) could also have an important environmental impact. The adoption of specific criteria could contribute to the transition towards greener practices among suppliers as well as the enhancement of environmental performance of the club.

Stockholm Live has already implemented some steps in order to include some green requirements in some tenders/contracts (e.g. catering)

Pilot test: The aim of this test would be to develop further the capacity of the stadium manager in green procurement through the design and implementation of a procedure which would further result in taking green criteria into consideration when selecting suppliers of products and services.

The added value that this pilot test could have reflects in benefits beyond the boundaries of Friends Arena, since some contracts/tenders of Stockholm Live include all stadiums managed by them.

Designing the pilot test

n/a

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Success factors vs Inhibitors

n/a

Economics and feasibility

n/a

Impact assessment

n/a

Replicability potential

n/a

13.2 Light management optimisation; Section of the TACKLE guidelines: stadium management (ch. 3.2.3.10, OM/SM5)

General illumination was an important topic for Friends Arena, since it caused relevant environmental and economic impacts. Prior to the project, a suitable technology and management system were not identified to reduce this impact. However, according to the stadium manager opinion, there were some stadiums across the EU which had advanced systems in this field. It was concluded that a possible networking with these stadiums could have beneficial effects on the stadium.

Pilot test: The aim of this pilot test was to establish an exchange of experiences between Amsterdam Arena and Friends Arena in order to identify possible best environmental practices in the field of general illumination, already adopted by Amsterdam Arena that can be replicated in Friends Arena. The action would foresee also an assessment of these practices by the Friends Arena in order to evaluate the technical and economic feasibility to adopt these practices.

Designing the pilot test

n/a

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Success factors vs Inhibitors

n/a

Economics and feasibility

n/a

Impact assessment

n/a

Replicability potential

n/a

13.3 Donation of unused prepared food; Section of the TACKLE guidelines: event (ch. 3.2.2.9, OM/E4)

The stadium management had previously identified certain potential improvements in the catering sector. The catering sector includes both the catering which is provided inside the stadium prior to a game and the food stalls. When it comes to the food stalls, the pilot test would also look at the opportunities for reducing packaging waste. In particular the food stalls were using small plastic bottles for soft drinks which would be transferred into plastic cups doubling the amount of packaging waste (bottles and cups).

Pilot test: This pilot test would aim at an agreement between Stockholm Live, the catering service provider and some charity associations, parishes, food banks or similar which would regulate the donation of the remaining food at the end of each match. The benefits would be twofold - avoiding the production of food waste and achieving social benefits. Regarding the plastic waste from the food stalls, some specific solutions could be adopted in order to overcome the unnecessary packaging waste.

Designing the pilot test

n/a

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Success factors vs Inhibitors

n/a

Economics and feasibility

n/a

Impact assessment

n/a

Replicability potential

n/a

13.4 Energy consumption – reduction of heat losses; Section of the TACKLE guidelines: governance (new practice)

Heat losses from the stadium, especially when it is covered and heated during the winter is a big environmental and economic issue for Friends Arena.

Pilot test: This pilot test would carry out a study that would give relevance to the issue through defining suitable Key Performance Indicators (KPI) related to heat consumption. They would further be compared with other stadiums for benchmarking reasons. In addition, the study could point out proper management actions and technologies in order to reduce heat losses in the stadium. After the study the stadium owner would assess the suggestions provided by the study in order to evaluate the technical and economic feasibility of these practices.

Designing the pilot test

n/a

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n/a

Economics and feasibility

n/a

Impact assessment

n/a

Replicability potential

n/a

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14. Anghel Iordanecu, Voluntari

15. Other initiatives and their honourable mentions

While the project resulted in a promising number of pilot tests at the initial stage, six-fold the planned, the COVID-19 pandemic hindered to a rather great extent their proper implementation. This chapter reflects on all the initiatives that did start and achieved certain progress, yet ended up being very inconclusive and didn't result in substantial impact assessment and thus no satisfactory replicability potential could be assessed. However, this chapter summarises those as the TACKLE partners, especially the technical ones did put efforts in driving them forward but due to force majeure, they simply couldn't be finalised by the time of the publication of this report. Reasons for this were either the absence of gamegoers, or the difficulties to organise meetings and further activities between the stakeholders, a long period of lockdowns and homeworking and many more. Unlike previous chapters, reflecting on what pilot tests were conducted in each of the stadiums, this chapter was constructed the opposite way, giving an overview of various initiatives grouped according to the aspect of organising football games in order to be aligned with the TACKLE project's Guidelines, namely governance of football events and operational management of football events.

15.1 Governance of football events

n/a

15.2 Operational management of football events

Events

Most of the pilot test that could not see their final stages of the implementation phase and conclusive outcomes were those that were supposed to revolve around the event management. The underlaying reason for that was the absence of supports.

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As it will be further explained, in details, waste management was among the types of pilot tests in spotlight, namely donation of unused food, reusable cups and similar.

Paolo Mazza stadium in Ferrara and Benito Villamarin stadiums, hosting the games of SPAL and Real Betis respectively, wanted to lower the environmental impact of unused and unconsumed food at the end of the games, coming from areas catered for food. While the caterers at Benito Villamarin stadium in Seville, ARAMARK, reported a 20%-40% of surplus food (catering provided to up to 1800 people), a part of it was partially consumed by the caterer's personnel. Still, a big portion of that leftover food was collected as organic waste. Paolo Mazza's caterers, on the other hand, prepare food for up to 700 people with no data on the leftover food's disposal. The caterer was contacted in order to gather some intelligence on type and quantity of surplus food, and the existing way of disposal. Based on the information provided by the catering company, the TACKLE team identified the opportunity to collect and redistribute approximately 30 to 50 kg of unused fresh food deriving from the hospitality area (buffet) of the stadium at the end of each football match.

Both SPAL's and Benito Villamarin's caterers were ready to collaborate with the club and donate the leftover food. The remaining food to be donated had to be, however, consumed within 24 hours. While SPAL's pilot test didn't get far in its implementation due to imposed sanitary conditions and the new reality caused by COVID-19, in Seville, after several contacts made with local charity associations (Hermandad de La Paz, Hermandad de La Estrella and Hermandad de San Juan de Dios) the same issue emerged - they had no resources to collect and pick up the remaining foods. In the end, Real Betis and Banco de Alimentos de Sevilla reached an agreement to donate/collect the remaining food after the matches or the next day within 24 hours. In order to agree on various principles between Betis, ARMARK and El Banco de Alimentos de Sevilla, several calls and meetings took place throughout March 2020. However, due to Covid-19 crisis, the closure and signature of these agreements have been delayed until the matches take up again. Nonetheless, other initiatives were developed by Real Betis FC during the COVID-19 pandemic, such as collaboration with others entities to donate food such as "Los Béticos Van al Super" which saw a donation/distribution of over 300 food packages per day and food preparation by María Trifulca restaurant for sectors most affected by COVID-19.

Reusable cups were also quite present as a possible solution for avoiding waste generation. Paolo Mazza in Ferrara, where the bar and hospitality service are contracted to a local company, which used non-reusable and non-compostable plastic cups for the 6.000 drink they serve per game. The very same pilot test was defined for Stadio Olimpico in Rome, too. The feasibility study was aiming at identifying the most suitable technology or material by evaluating different options, including compostable plastic cups, reusable cups and recyclable paper cups. For each option, in order to identify the most suitable one, the feasibility study examined aspects such as the involvement of stakeholders and/or suppliers necessary for adoption, methods of collection/ disposal of cups and compatibility of these with existing processes and actors, as well as the costs and benefits of each option. With the TACKLE project's support, two suppliers of eco-friendly cups were identified –

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Amico Bicchiere (a brand owned by Ekomon Italia) and PCUP Srl – using different technologies: compostable plastic cups, reusable cups and recycled paper cups. Both suppliers were invited to participate in a web meeting together with SPAL and the catering company to showcase their products, describe advantages, costs and modalities of application associated with these technologies and answer questions from SPAL and the catering company. However, the initative never grew into an applicable solution due to the absence of visitors.

Unfortunately, due to the circumstances, the same destiny occurred in Rome at Stadio Olimpico. In this case, two potential service providers were identified - PCup and Amico Bicchiere, but the pilot test couldn't proceed due to the pandemic. However, the stadium owner, the Italian Olympic Committee together with the Italian Government did announce publicly their efforts in the transition towards a plastic-free stadium.

Stadium Management

Paolo Mazza stadium in Ferrara, for instance identified its electrical substation for regular energy supply of the stadium. The energy needs of the stadium during sport events are supplied by a diesel-powered generator. A second generator is also used in case of energy shutdowns. The use of diesel generators is due to the inability of the current electrical substation to fulfil the energy needs of the stadium. This implies large consumption of diesel, about 300 litres per football match, and a considerable environmental impact in terms of climate-altering emissions. Therefore, with the aim of reducing the stadium's dependence on the diesel generator, and thus reducing emissions of greenhouse gases during sport events, this pilot test aimed at evaluating the feasibility of replacing the current electric substation with a more powerful one, able to fulfil energy needs of the stadium during matches. As the stadium is owned by the Municipality, representatives of the Municipality needed to be involved in this pilot action.

The need to assess the feasibility of replacing the electric substation to reduce the stadium's dependence on diesel generators emerged during the first stadium visit and meeting with the general director of SPAL (Andrea Gazzoli) and the stadium manager (Pietro Pelucchi), in November 2019. Due to the necessary endorsement from the municipality in order to proceed with the feasibility assessment, the stadium manager proposed to involve the municipality by introducing the feasibility assessment as part of a broader maintenance intervention in the stadium scheduled for end of 2020 and beginning of 2021. The stadium management held a preliminary meeting with the municipality and ENEL (Italian energy company) in early March 2020, right before the activities had to stop.

Rainwater recovery systems were also an aspect of interest of the TACKLE pilot tests, as a feasibility study for collecting and using rainwater was initiated at the Rome's Stadio Olimpico.

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Water supply constitutes a major challenge for the stadium - Olimpico consumes, on average, 100.000 m^3 of water per year and water was taken from the public water supply network with consequent higher costs and environmental impacts. The aim of this pilot test was to verify if there was a possibility to utilise rainwater to water the pitch and the green areas around the stadium, as well as using it in the toilets for instance.

Prior to defining and drafting the contract with the external expert, the initial properties of the stadium and the surrounding existing facilities were assessed. The stadium roof and the athletic tracks were identified as the main sources of rainwater source. Considering the size of these, rather a large quantity of water was expected which led to a conclusion that a storage would be uttermost necessary to accommodate that amount of rainwater. Four wells were identified, which belonged to the local authorities, among which one collapsed some time ago as they were quite outdated. The rest of the wells were kept as an option for the feasibility study but would undergo a thorough evaluation considering the surrounding clay terrain. The underground water was assessed by a geologist, too.

An external consultant was hired for the feasibility study which had the objective of finding the best solution for rainwater management, from its availability, collection though its storage and finally – use. The external consultant was an M.Sc. Hydraulic Environmental Engineer.

Upon the start of this feasibility study, the consultant highlighted the following activities. The volume of recoverable water and the intensity of the inflows must first be evaluated. Subsequently, the short and / or medium-long term storage possibilities (i.e. Aquifer Storage and Recovery techniques through infiltration wells or trenches), creation of underground basins, use of existing infrastructures, i.e. the moat surrounding the sports area. Finally, the recovery and distribution techniques of the collected water would need to be addressed. Precipitation infiltration measures would also be assessed as compensation measures for any groundwater pumping and also through techniques for the extraction of sub-riverbed waters of the River Tiber (Induced Riverbank Filtration). The feasibility of sustainable drainage management techniques (Sustainable Drainage Systems) would also be assessed for the purpose of recovery for the improvement of urban green areas.

A set of data was requested by the consultant in order to conduct the feasibility study. These included: digital maps and plans of the area, meteorological and climatic variables (precipitation, temperatures, etc.), presence of any environmental constraints, trend of the surface drainage network, status and conditions of existing piping, green areas potentially subject to irrigation, demand for service water (cleaning, toilets etc.), intensity of water use for irrigation, subsoil stratigraphy and hydrodynamic parameters, hydro chemical parameters, information on oil extraction from groundwater and the chemical quality required for irrigation water.

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The pilot test could not be fully assessed at the stage of compiling this report, as the feasibility study was not completed and the stadium owner couldn't go through the decision-making process which would eventually turn this study into reality.

Mobility and logistics

Mobility and logistics, as an emerging aspect of environmental management made its way into the TACKLE pilot tests, too. As such pilot tests rely heavily on gamegoers not only in order to have them conducted but also in order to have them assessed, many of them were heavily compromised due to the pandemic.

The Royal Belgian FA, together with the city of Brussels as the home stadium's owner, identified three promising improvements in the field of supporter's mobility. While one of them, previously described, only needs the gamegoers to return to the stadium, two more are in the pipeline.

During the initial audit, baseline scenario assessment and subsequent ACR+'s meeting with Brussels city's vice-mayor for environment and sports, Benoit Hellings, two pilot tests were identified for which the city took the lead of turning them into reality.

One of the well-known negative feedback, already acknowledged by RBFA, is driving to games and finding a place to park. While the neighbouring park can welcome all the cars, it was reported to be expensive and the fact that everyone was parking there, it was creating big traffic jams and late departures from the area. The city, together with RBFA would explore the possibilities of encouraging alternative models of going to games, such as coaches and car-sharing schemes. In order to assess how much would this be of an interest for the visitors, a survey was conducted which included this option. After a meeting with Benoit Hellings and his cabinet, it was concluded that a part of the parking space dedicated to car-sharing could incentivise some slightly more environmentally friendly practices of going to games and reduce the number of cars. Car-sharing implies a private vehicle or a rented bus which transports smaller or larger groups of people. The survey on mobility that was conducted among the gamegoers, showed that this way of travelling to games is not very common ad popular, much less than using a private car. In range of 1 (never) to 5 (always), respondents from almost all three regions replied with 2.24 (Brussels), 2.67 (Wallonia) and 1.87 (Flanders), which is rather a bad indicator. However, apart from those who are using car-sharing, 71.8% of respondents from Flanders would consider opting for car-sharing solutions, 61.5% of respondents from Brussels and 48.7% from Wallonia. The city now wants to put emphasis and facilitate the arrival and departure of organised coaches from remote cities and regions which could encourage gamegoers to use such option for attending games in Brussels. Considering the data obtained from RBFA, around 10.4% of the supporters arrived by organised coaches during the last qualifying cycle, with the Belgium – Russia game recording the highest share of coach arrivals – 12.1%.

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When it comes to people arriving to Brussels by trains or people living in Brussels, incentivising the use of public transportation was a way to facilitate inter-Brussels mobility. Nearly 70% of the visitors come to RBFA's games by car and park at the nearby parking previously mentioned. On the other side, the stadium is perfectly served by public transportation, both by the Brussels region's and the Flemish lines. The stadium can be accessed through 3 metro stops which give access to three different stands. This is even more enriched by 5 tram lines, 3 bus lines as well as two train stations. The Flemish public transportation network has more than 10 bus lines serving the stadium and linking it with the neighbouring region of Flanders. The local trams and buses connect the stadium with the centre of Brussels and all other corners of the capital region. The Brussels region's public transportation company STIB/MIVB already has in place an "event pass" which is often featured on concert tickets, but not football games tickets. Visitors who arrive from the neighbouring Flanders or even Wallonia could benefit from it and avoid traffic jams when entering and/or leaving Brussels. This pilot action would explore the possibility of adding the "event pass" to tickets for RBFA games in Brussels. Since this already exists, RBFA would only need to assess the financial consequences, if any and explore the best way to cooperate with STIB/MIVB. Additionally, De Lijn and SNCB/NMBS (railways) would be contacted in order to explore a similar scheme. This measure would also allow us to monitor how many visitors used this advantage and obtained event passes from STIB/MIVB. The survey, previously mentioned, showed that if there was an event-pass system in place, 77.4% of Flemings would consider using it, 66.7% of Walloons and 53.8% of Brussels residents. Since many Brussels residents already have their monthly or annual subscriptions, the lowest feedback of the three was expected. When it comes to inhibitors, the same survey showed some concern over public transport which was said to be unreliable and especially useless at the late hours when the games end. What was underlined by the respondents, especially from Wallonia and Flanders is that trains rarely run at those hours even to key hub cities in the two provinces (e.g. Gent, Brugge, Antwerp, Namur, Liege). This inhibits the increased use of public transport for going away from the games.

A number of meetings took place resulting in the city of Brussels taking over the initiative and negotiating possible solutions with STIB. Several solutions were on the table, but no conclusive one was made prior to compiling this report. The enrolment of the chosen solution would come during the season 2021/2022.

16. Conclusions

The period allocated and intended for the implementation and the conduction of the numerous pilot tests across the 11 pilot stadiums was heavily compromised by the COVID-19 pandemic. This affected many pilot tests in the most different ways – either through the absence of visitors what made many pilot tests impossible to complete due to being heavily dependent on visitors, either through many types of lockdowns where businesses could not perform as usual (absence of contacts, meetings etc.) what hampered the progress of those pilot tests

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already started. Excluding Renzo Barbera stadium in Palermo and its 6 pilot tests, as highlighted in the second chapter, the pilot test phase of the TACKLE project still resulted in a 53.5% of the envisaged pilot tests being completed or, at least, commenced. 30 pilot tests, out of 56 started or got completed, a score which could be considered successful given the circumstances.

However, on the bright side, the pilot test – their identification, design and finally implementation resulted in some very important and substantial conclusions for the purpose of this publication. Given the fact that many of these pilot tests could be considered rather ground-breaking, given their nature, novelty and being a new way of thinking in the world of football. The key observations and conclusions that could be made by the TACKLE technical partners who worked closely with the pilot stadiums could be grouped into the following:

- Key entities in the world of football, such as stadiums, football clubs and football associations are more than open and interested in exploring potential environmental management improvements in their governance or operations. Many of them already have their CSR departments which have a long running record of various social projects on topics such as poverty, integration, anti-racism, local community empowerment and similar social initiatives. Many of them are either initiated by the CSR departments themselves, while many of them are implemented as a part of national initiatives or those coming from UEFA/FIFA. On the other hand, improving environmental management aspects on the other side are not the most common ones being explored by these football entities. However, the approach used by the TACKLE project resulted in many of them opening up and happily getting on board of such an adventure. Many of them admitted that the absence of the know-how, the baseline scenario (their current performances), lack of environmental performance indicators or similar prevented them from changing their business as usual in this field. The support and expertise offered by the TACKLE technical partners ended up to be crucial for many of the improvements in stadiums brought by the project.
- Football game-goers, either regular or occasional, expressed encouraging voices in terms of environmental performances of the stadiums they are visiting or teams they are supporting. Several different surveys proved this observation. By conducting these surveys, we could see that the respondents expect and want to be part of the whole process of "greening" the world of football. They would especially welcome changes and improvements they could see, feel and participate in. The rationale for this could be the fact that many people are already experiencing improved environmental management in their cities, including transport, household activities, but also outdoor activities like festivals, concerts and similar. The feeling TACKLE technical partners had was that football gamegoers would feel too alienated from environmental management improvements as they are experiencing them in their everyday lives already.
- At the beginning of the pilot test designing stage many different challenges emerged. One of the most common and recurring one revolved around the complicity of identifying different stakeholders

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involved in the organisation of football games. The complexity and number of different stakeholders usually implied clubs or football associations using stadiums owned by the local municipality (city). Being only the renting party, football game organisers often weren't able to influence much the stadium management practices as the stadiums weren't theirs. If cleaning companies, suppliers, contractors etc. are added to the lot, the complexity, previously mentioned, could be understood easier. What this project showed is that bringing all the stakeholders (or only those involved in a certain aspect – waste management, mobility, energy etc.) around the same table can do miracles.

- An added value this project brought to football game organisers was the enhancement of peer-to-peer learning. The fact that several stadiums were implementing similar environmental management improvements initiated a valuable process of comparison, benchmarking and learning from each other in general. This is why this publication is not using the terms "failure" and "underachievement" because each lesson learnt from one pilot tests served as a valuable input for others. One must understand that many stadiums in Europe still didn't dive into the world of environmental management and each and every effort made was already a ground-breaking step towards sustainable football games. The fact that the project had many other activities that enhanced this exchange of experiences through capacity building activities, dissemination of results, physical meetings and conferences only contributed to this important aspect of the pilot tests.
- What many pilot tests showed as a crucial step towards a successful implementation of a particular improvement were various communication activities. Be it mobility or waste management, energy savings or rainwater recovery or something completely fifth, a communication campaign accompanying various environmental performance improvements turned out to be crucial in achieving the maximal results possible. Signages, press releases, public events, participation of celebrities and many other types of announcing certain improvements or new practices turned out to substantially facilitate the introduction of these improvement and practices. Those tens of thousands of game-goers who attend games are the one who make the real difference – their habits and their participation. Making them aware of the changes will also make them more willing to participate in them through complying with the new rules and efforts.
- Environmental monitoring, preferably continuous is the only way forward to be able to quantify the environmental benefits a stadium is making by introducing new practices. It all starts with assessing the baseline scenario, or "business-as-usual" scenario in order to acquire the data which would later be compared to new situation. This quantifying must continue over a longer period of time, too, in order for the stadiums to be able to further modify their practices if necessary.

Speaking of the specific pilot test belonging to the governance of football events or their operational management, we need to look into the outcomes and lessons learnt from every single pilot test.

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16.1 Governance of football events

While improvements in the governance of football events might not be the most visible ones to the external audience, they can ensure long term improvements in the field of environmental management as they set up the basics for responsible and sustainable practices around the organisation football games. These improvements can range from internal modifications of the way clubs/football associations/stadiums work on a daily basis to the extent of how much focus is given to various environmental management practices on the long run – all coming from and based on decisions made by the actors and stakeholders high up in the world of football value chain, namely management, executive boards and similar.

We could see in the case of Benito Villamarin that the management wanted to set up new rules for a long-term environmental management that would ensure continuous tracking of the way certain practices are conducted during football games through environmental key performance indicators. Once set up, such indicators can allow the stadium management to track and identify the hotpots for improving overall environmental management in the stadium.

Similar initiatives and major shift towards better environmental management was observed in Porto, as well, where FC Porto advanced very much in the field of environmental governance. Beside all the certificates they obtained before, the club wanted to set a good long-term strategy for recording and monitoring its environmental performance through a set of indicators and assessment methods. These recording wouldn't only serve as datasets for sustainability reports and communication purposes but also for identifying the most carbon-intensive operations and react accordingly.

The replicability potential of such practices depends very much on the top management. Very often such improvements require not only an initial research or hiring an external consultant/expert but also assigning a permanent staff member to continuously monitor the performances and modify them on the go. This could eventually result on substantial economic savings and decrease in carbon footprint on the long run. Furthermore, such intelligence can serve as a valuable source for environmental reporting, too.

16.2 Operational management of football events

Operational management improvements are often the ones the most visible to external observers. While certain savings and results per game can look modest and minor, if those are multiplied by the number of games per season, the overall savings can surpass a lot of expectations.

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Some of the most common pilot test in this field revolved around the topic of events and the football games themselves. Three clusters of pilot tests emerged as the most interesting for the pilot stadiums:

- Reusable cups for beverages
- Separate waste collection
- Donation of unused food from the catering services

While reusable cups made their way into practice in many festivals, concerts and other events, they seem to be appearing in football games only now. Numerous service providers exist in many parts of Europe providing the transport of clean cups, their collections, washing, storing and repeating the procedure as long as the cups meet the requirements for reuse in terms of wear and tear, hygienic criteria and more. We saw Luigi Ferraris, AVIVA stadium, Roi Baudouin stadium, Bucharest's National Arena, Olimpico in Rome and Paolo Mazza in Ferrara wanting to test these cups. Some of them were successful in testing them only because they did it before the pandemic hit. The key conclusion in this case is that game goers in most cases are already used to reusable cups based on their previous experience elsewhere. While some stadiums didn't reach the full testing phase, 2 successful tests in Dublin and Bucharest happened where a proper return scheme was implemented in Dublin and just a one-time delivery of reusable cups to customers took place in Bucharest. It is very important that reusable cups reach their full potential and the stadium ensures proper collection and reuse of them. Producing sturdy PLA, PP or other type of plastic cups is more demanding both energy and resource wise. A study by ZapConcepts and HopeSolutions in Figure 21 perfectly summarises why reusable cups are environmentally speaking a worse solution that single use cups if used only once.

Figure 21. Environmental impact and costs per number of uses of reusable vs single use plastic cups

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We can see that both environmental impact and costs increase drastically the less times the cup is used. This is why stadiums and game organisers must look into implementing a proper return scheme in order to ensure long term benefits.

Separate waste collection, an occurrence more and more common in many households, is still not as common once people leave their houses. Whether on holidays, on a night out, in a park, at a festival or at a football game, their waste management habits change and separating waste doesn't necessarily become their top priority anymore. However, studies (both TACKLE studies and other studies) showed that people do want to maintain their good waste management habits outside their homes. This is why stadiums should be encouraged to provide permanent separate waste collection infrastructure to the stadium visitors. Stadiums in Genoa, Brussels and Bucharest went for upgrading their waste management performances with a permanent waste separation infrastructure. While the pilot test in Bucharest didn't result in any quantifiable data, the cases of Brussels and Genoa showed impressive saving only after one game. Improvements like this require clear agreements with the waste management operators (collectors and recycles) dealing with the waste coming out of the stadium in order to ensure proper treatment of the different fractions. The stadium in Porto even went a step further by installing a waste separation station inside the stadium which would decrease even more the amount of residual waste by manual sorting of recyclables captured within the residual waste.

Donation of food was a pilot test identified in Genoa, Ferrara and Seville. Unfortunately, this practice never saw the light of the day in Sevilla and Ferrara due to the pandemic, but the 4 months long test in Genoa showed that a collaboration is possible between the game organisers, charities and caterers. A strong social aspect is woven into this practice which brings a big added value to the environmental savings.

While improving mobility and logistics practices around football games can result in less visible achievements, they can provide precious long-terms results in direct and indirect CO_2 savings. An immense added value to these improvements is the fact that they mainly reflect in increased visitors experience as new mobility options and diversifying the existing offer facilitates their arrival and departure from a stadium to a great extent. While many cities are including car sharing, cycling and unconventional transport means into their mobility strategies, stadiums are rarely taking advantage of these. The examples of the stadiums in Brussels, Sevilla and Bucharest showed good efforts in working together with the visitors and their respective local authorities on opening up new offers to their visitors.

General stadium management practices in some cases where the game organiser is not the owner of the stadium were proven to be somewhat limiting. Bringing together different sides around the table, however, showed the way forward in overcoming these obstacles. Examples from Rome, Bucharest where the national football associations were not the owners of the stadiums they use and Ferrara where it was the opposite case showed

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that improvements in stadium management practices are possible. These improvements are certainly not those that take place only once (like mobility and logistics or event practices) but require a strategic approach. Here we saw quite major infrastructural changes and improvements such as producing own green electricity, installing seats made of recycled material and recycling stadium equipment or recuperating rainwater. Thanks to the TACKLE project many of these had both technical and financial support from the technical partners which made these infrastructural changes possible. Unfortunately, since these changes are feasibly on a rather long-run, the imminent savings or quantifiable data were difficult to be obtained.

Beside all the previously described direct impacts, we must highlight another aspect of operation management which can result in indirect environmental benefits – green procurement. Many stadiums recognised this aspect as a hidden gem where they can transfer many of the responsibilities and roles for achieving better environmental performances onto their contractors, which could vary from cleaning, catering, transport services or many other. Procurement is a common occurrence in many fields where the expertise or service can't be secured in-house. Even before carefully choosing the company to be awarded with the contract, those sending out the calls for offers – either game organisers or stadiums (or both) have the possibility to filter out the offers by "greening" their calls for offers. We saw the Royal Belgian FA, the Italian FA, the Romanian FA, Betis FC and Porto FC modifying their existing procurement procedures by adding green criteria and requirements. On the other side, we see that many of them still need to highlight technical and economic criteria first, with environmental criteria coming in later on, being only voluntary. This implies that even if there were "greener" service providers among the six companies that were eliminated from the procedure during the first review phase, they could have been eliminated due to higher costs of being environmentally friendlier.

Overall, the key conclusion that could be drew from this lengthy phase of conducting various pilot tests is that the world of football must be further encouraged to a great extent by circular economy and environmental management practitioners since it was obvious that such expertise is rarely existing within their own structures. Yet, football games attract tens of thousands of people and thus recreating a living city for 3-5 hours with all the food, beverages, transport, waste generation, energy and water consumption aspects included. The motivation is there, benchmarking potentials exist, game goers are ready to adhere to new practices, local and regional authorities offer various support for improvements, expertise is more available than ever – it is now the time for football entities to take the lead and immerse themselves into the various possibilities for environmental management improvements. Being the most popular sport in Europe, they can create a domino effect in the field of sports.

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