Apparel Sustainability Baseline

uk sport
powering success
inspiring impact

May 2024

SOENECS
Innovative Sustainable Solutions

UK Sport Sustainability Strategy

The UK Sport Environmental Sustainability Strategy sets out a vision to “accelerate the progress of high performance sport in addressing collective environmental impact”, focusing on three key areas:

1. Operations – including procurement, measurement of impact and policy.
2. Support – providing leadership and coordination, education, partnerships and support for NGBs.
3. Policy – using UK Sport’s influence and platform to drive policy change, promote awareness and create change at an international level.

To reach the long-term goal for British Olympic and Paralympic sport, and Major Events, to have a net positive impact on the environment by 2040, strong foundations for change must be established.

Recognising this, UK Sport assessed their own carbon emissions across 2021/22 and 2022/23, including energy consumption, waste and travel. A pilot project was also launched with NGBs to measure their carbon footprint and other environmental impacts.

However, the environmental impacts of clothing and apparel can often be overlooked, and so UK Sport initiated the Apparel Sustainability Baseline in December 2023.

“86% of athletes on the world class programme want to use their platform to make a difference to society whilst they are still competing.”

UK Sport

Executive Summary - Introduction

UK Sport are keen to understand the environmental impact of its athlete's high performance sport apparel and the apparel the partner organisations use. UK Sport appointed SOENECS to undertake two concurrent apparel sustainability baseline studies; one to consider National Governing Bodies (NGBs), and a second to focus on partner sports organisations. The studies have been combined for the purpose of this report, with distinctions highlighted where relevant.

National Governing Bodies:

- Royal Yachting Association
- British Triathlon
- England Hockey
- Aquatics GB

Partner Organisations

- UK Sport
- UK Sports Institute
- ParalympicsGB
- Team England (Commonwealth Games England)

The apparel sustainability baseline study included two key stages:

- Quantitative data gathering exercise to understand the scale of operations and apparel properties, including material composition and weight. The data gathering exercise was designed to provide insight into the availability of data. This data was used to undertake a "screening LCA" exercise for all data sets that had both weight and material data.
- Interview sessions with representatives from each organisation to explore the procurement processes used, delve into some of the challenges faced and gather first-hand experience.

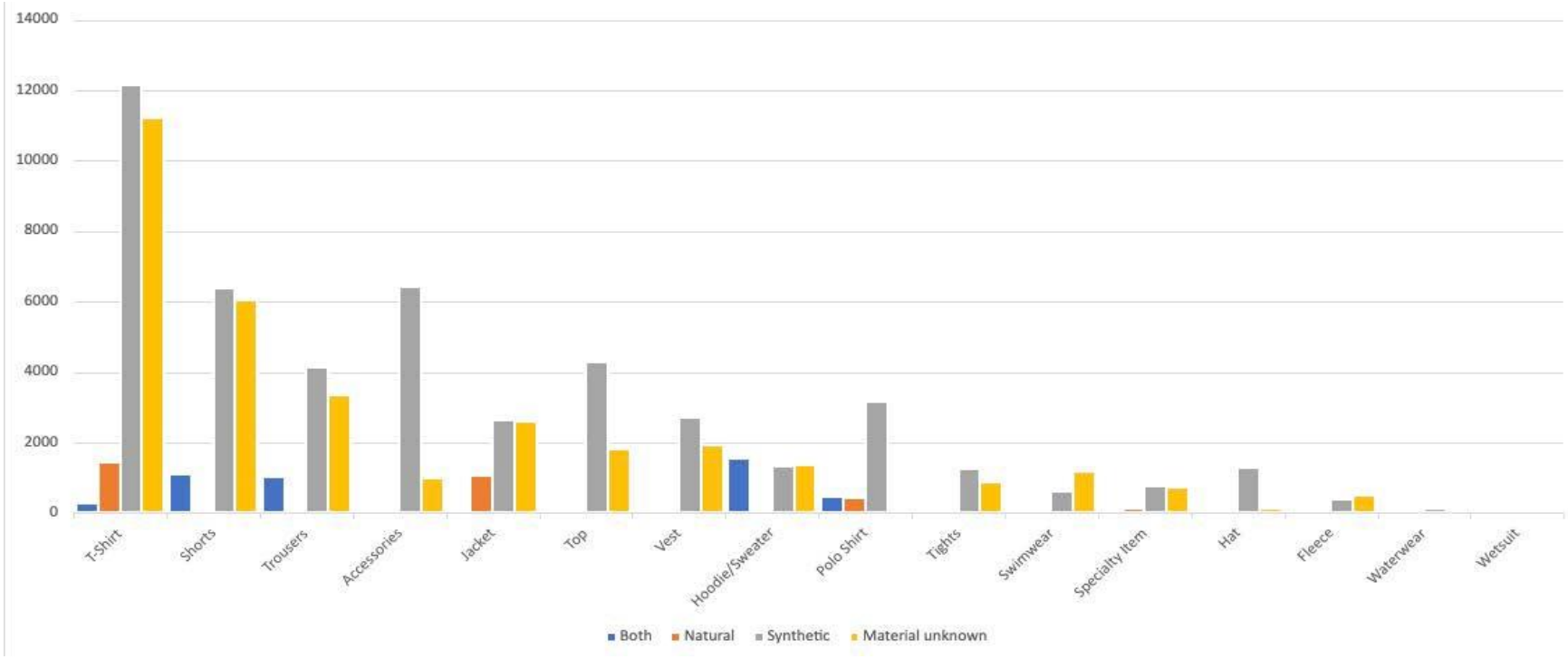
This baseline report outlines the key findings from the data gathering exercise, highlights some of the key challenges and offers a series of recommendations for the future.

This research report is designed to open the discussion to understand the impact of a small proportion of the UK Sport environmental impact. Much more detailed modeling would need to be undertaken to determine the full impact of UK Sport, its partner organisations and NGBs.

Executive Summary- Impact Baseline

The SOENECS team undertook a Life Cycle Assessment (LCA) on the major environmental impacts of materials and processes, in this case applied to sport apparel. This study was modelled using "impact factors" from Ecoinvent Life Cycle Inventory (LCI) databases. The LCA focused primarily on the early stages of the product life cycle, covering three phases: Production, Packaging and Transport.

To enable the LCA to be undertaken a questionnaire was sent to all partners and followed by interviews. The results from the questionnaire, showed that participating organisations in 2022 or (2023 in the case of ParalympicsGB), purchased and distributed 88,131 items to athletes and staff, made up of 989 individual distinct products (e.g. a polyester T-shirt with a UK Sport logo and a Polyester T-shirt with a British Triathlon logo), across 16 high level categories. The table below shows the number of items purchased per category and the material each were made from.



Executive Summary- CO2e Impact Baseline

To enable a detailed LCA to be undertaken, both weight and material type are required to calculate the carbon dioxide equivalent (CO2e) baseline. Whilst the data received was of good enough quality to determine purchasing and categories, there was limited detail on weight and material. Of all the questionnaire responses, approximately 10% had both material and weight data, which was insufficient to conduct a detailed LCA. The SOENECS team therefore created a baseline, based on the item that had the best data; a 200gram T-shirt (control T-Shirt) made of Polyester and was purchased 12,170 times (of different colours, but same make and weight). The team modelled the Production, Packaging and Transport phases of the 'control' T-shirt, exploring how different materials, packaging and transport altered the final CO2e impact. The T-shirt scaled to the 12,170 T-shirts purchased across all organisations T-shirts have an environmental impact of 23,840 kgCO2e, or 23.8 tonnes of CO2e emitted. The table below shows how the polyester T-shirt compares to other materials.

Modelling a change in material shows that the nylon T-shirt has the highest impact compared to the other materials. The LCA also identifies that there is a 26% reduction in CO2e using recycled polyester rather than virgin polyester. If all 12,170 T- shirts were manufactured from organic cotton a saving of 9 tonnes of CO2e could be saved. Further work to factor in cost, usage and availability would be required to understand the feasibility of this switch. The report highlights several individual baselines; Polyester Hoodie, Shorts, Swim Cap, Tri-suit and Wet-suit with between 0.73 and 7.5 kg CO2e emitted. These are just 5 of over 900 items, there are many opportunities to explore reductions in impact.

Production Impact (kg CO2e)				
T-Shirt material	Impact (tonnes CO2e) of 1 T-shirt (weighing 200g)	Impact (tonnes CO2e) of 12,170 T-shirts (weighing 200g)	Tonnes and %age of C02e saved or lost if T-shirt material was changed	
Polyester - (control T-Shirt)	0.0020	23.85	0.00	0%
Cotton	0.0015	18.62	-5.23	-22%
Polyamide (Nylon)	0.0031	37.48	13.63	57%
Recycled Polyester	0.0015	17.65	-6.21	-26%
Organic Cotton	0.0012	14.85	-9.01	-38%

Executive Summary- Key Challenges

In addition to the quantitative data collection and analysis, interviews were conducted with representatives from each of the eight organisations to explore the procurement processes more thoroughly and specifically, as well as drawing out key challenges the organisations face, which have been categorised into:

Procurement: Orders and Distribution: Use-phase: End-of-use: Data and Influence

Summary of Key Challenge findings

The procurement of sport apparel is a process characterised by a multitude of decisions, challenges and considerations. During procurement, decisions surrounding material selection are fraught with trade-offs between sustainability and performance. While organic cotton offers reduced carbon impact compared to virgin polyester, synthetic fibres often prevail due to their superior performance attributes crucial for high performance sport. Supplier selection further compounds the challenges, due to considerations on technical capabilities, scale, transparency, and cost considerations. Additionally, navigating the country-of-origin landscape adds another layer of complexity, as it implicates transportation emissions, environmental regulations, and labour practices.

Orders and distribution challenges relates to decisions on freight methods, lead times, and packaging practices. Long lead times pose challenges for timely apparel delivery, particularly given the dynamic nature of high performance competitions. Moving to shorter and less bespoke clothing ordering would significantly reduce the current environmental footprint.

Moreover, the need for protective packaging conflicts with sustainability goals, leading to significant waste generation. Inconsistencies in sizing create further challenges in the distribution process, requiring contingency planning and customised orders.

The use-phase underscores the sheer volume of apparel distributed and the imperative of proper care. Balancing athlete expectations, brand image, and environmental impact presents a delicate balancing act. Furthermore, addressing microplastic pollution from washing adds another dimension to the sustainability challenge. Similarly with the End-of-use phase, in which barriers to reuse and recycling complicate sustainability efforts.

Executive Summary- Solutions in action

Existing solutions from across the partner organisations and beyond already exist and many of these are reducing the environmental footprint of those items. The report highlights six areas to support a move towards a more circular economy as explained in the diagram for further investigation and adoption, if relevant.

Whilst the examples given go a small way to reducing the environmental impact of the purchasing of apparel, the reality is if the partners were able to adopt circular thinking and reduce ordering in advance (Refuse) and reduce over ordering (Rethink), based upon ParalympicsGB contingency purchasing due to not knowing who to buy for a year ahead of an event, the partners could in one go reduce their environmental footprint by approximately 30%

1. Redistribution of End-of-Life Kit
2. Recycling of End-of-Life Kit
3. Material selection
4. Use of surplus and design of longevity
5. Minimising packaging waste
6. Loan scheme for infrequent kit use

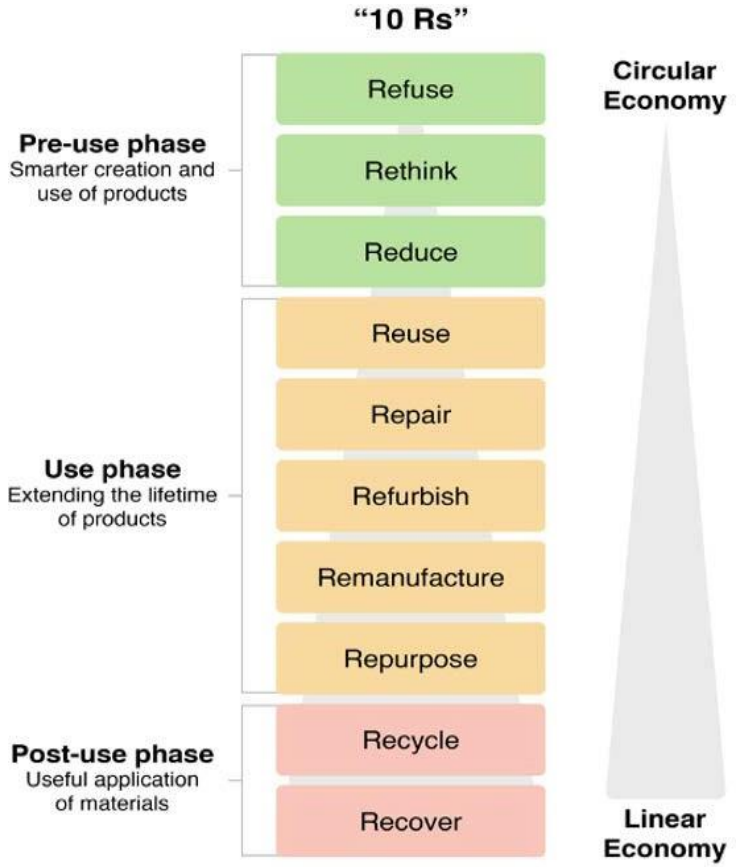
British Triathlon are undertaking a pilot redistribution project of unwanted apparel from both elite athletes and amateur triathlete to be redistributed to increase grassroots participation and remove barriers to participation.

The Aquatics GB Sustainability Strategy (launched April 2024) includes plans to work with suppliers on the reuse or recycling 50% of all apparel by the end of 2024.

Forest Green Rovers have trialled shirts made from a blend of 35% recycled waste coffee grounds and 65% recycled polyester.

The 2022 Northern Ireland Women's Football Team had shirts and shorts made from 50% marine plastic yarn intercepted on remote islands, beaches, coastal communities and shorelines. The other 50% was created from recycled polyester.

During the design process for the Birmingham 2022 Commonwealth Games apparel, Team England decided not to include the year or host city on leisurewear distributed to athletes and staff. This was a conscious decision that allowed surplus and unwanted apparel originally intended for use at the senior Games, to be used by junior athletes at the Trinidad & Tobago 2023 Commonwealth Youth Games.



Executive Summary- Recommendations

This Apparel Sustainability Baseline study documents the status quo with regards to sustainable procurement of high performance sport apparel across the partners.

With these foundations established, SOENECS propose the following recommendations to UK Sport, NGBs & partner organisations, and suppliers & manufacturers for discussion. The full detailed recommendations can be read in the final section of this report.

UK SPORT	1.1 Enable and facilitate collaboration throughout the sector 1.2 Provide leadership, expertise and leverage influence 1.3 Offer training to NGBs, sporting associations and athletes 1.4 Form a sector-wide Apparel Sustainability Taskforce and create an action plan to deliver these recommendations and improve apparel sustainability at all levels
MANUFACTURERS AND DISTRIBUTORS	2.1 Offer greater transparency of environmental impact of products 2.2 Switch to recycled materials where synthetic materials are required, while implementing collection systems to recover end-of-life apparel for recycling 2.3 Establish alternative materials through collaborative R&D with material scientists and engineers 2.4 Offer takeback schemes for end-of-life apparel 2.5 Work with NGBs & sports associations to reduce lead times 2.6 Reduce packaging where possible
NGBS AND SPORTS ASSOCIATIONS	3.1 Work with UK Sport and sustainability professionals to develop frameworks and resources 3.2 Work with suppliers and manufacturers to select low impact materials and products where available 3.3 Reduce distribution of apparel to staff where suitable 3.4 Design apparel for multiple uses 3.5 Collaborate with charities and grassroots sports projects to redistribute end-of-use and excess stock 3.6 Where redistribution/reuse is not suitable, ensure that end-of-life apparel is recycled where possible

Executive Summary- Conclusions

This Apparel Sustainability Baseline study shows that the environmental impacts of clothing and apparel in high performance sport are often overlooked. The study emphasizes the importance of establishing strong foundations for change to achieve the long-term goal of a net positive impact on the environment by 2040. It also highlights the willingness of athletes to use their platform to make a difference to society.

The data collection and analysis undertaken across the eight organisations provide valuable and realistic insights into the sustainability of sport apparel. Despite challenges in obtaining complete data sets, the information gathered sheds light on various aspects, including item details, material composition, purchasing patterns, and environmental impacts.

Key items were selected for LCA based on their high procurement quantities across all organisations, or because they were specialty items which showcase potential variations in CO2e impact across different item types and compositions. It's imperative to contextualize this impact relative to the scale of apparel procurement. Considering the substantial quantity of items procured annually by participating organisations, the collective impact becomes significant. More detailed modelling of the LCA for the whole of the UK high performance sport community would highlight the true environmental impact of high performance sport. Six of the participating organisations listed transparency and the availability of data as a priority issue that must be addressed and felt that they were not fully equipped to assess the environmental sustainability of the products they purchase based on existing data provision.

This report has highlighted the limited pool of suppliers available for specialist sporting apparel (see Supplier Selection). This leads to increased power on the part of the supplier, as there are few competitors capable of (and/or willing to) meeting the technical requirements and higher environmental demands; especially for specialist items such as sailing apparel or tri-suits. There is an opportunity for the eight partners to form a ***Circular Sporting Alliance*** to target more sustainable and less impactful purchasing.

In conclusion, this report underscores the significance of considering the environmental impact of sport apparel and provides valuable insights into the challenges and opportunities for promoting sustainability in this sector. By facilitating and implementing the recommendations outlined in this report, the partners can take meaningful steps towards achieving a more sustainable future for high-performance sport apparel.

The Apparel Sustainability Issue - Main Report

Life Cycle Assessment and the impact of choices

Overview of the Environmental Impact of Apparel

The analysis of apparel, particularly sport apparel, is essential for several reasons. Firstly, the textile and clothing industry is known to have significant carbon emissions and environmental footprints throughout its supply chain, from raw material extraction to manufacturing, transportation, and disposal. The fashion industry is said to be responsible for about 10 percent of annual global carbon emissions. Given the widespread popularity and global reach of sport apparel, the scale of its environmental impact is considerable.

Secondly, sport apparel often utilises synthetic materials and advanced manufacturing processes, which can have higher carbon footprints and environmental consequences compared to conventional clothing. Understanding and mitigating these impacts are essential for promoting sustainability within the industry. Additionally, the influence of athletes and sports brands can catalyse broader societal awareness and action towards more sustainable consumption patterns.

Transportation plays a significant role in the environmental impact of sport apparel. The global supply chains involved in sourcing materials, manufacturing, and distributing these garments often entail long-distance transportation, contributing to greenhouse gas emissions. Additionally, the shipping methods employed, whether by air, sea, or land, further influence the carbon footprint of the apparel.

Moreover, the washing and use of sport apparel can significantly impact its environmental footprint. Regular washing, especially with conventional detergents, consumes water and energy, while also releasing microfibers into water bodies. These microfibers, primarily from synthetic materials like polyester, contribute to marine pollution and harm aquatic ecosystems.

End-of-use considerations, particularly for event-specific apparel, present unique challenges. Specialised garments designed for specific events or seasons may have limited reuse potential, leading to higher rates of disposal. Efficient disposal methods, such as recycling or donation, are crucial to mitigate the environmental impact of these garments at the end of their lifecycle.

Therefore, analysing the carbon dioxide equivalent (CO_2e) and environmental impact of sport apparel is essential for fostering accountability, driving innovation towards greener practices, and ultimately reducing the environmental footprint of the apparel industry as a whole.

Life Cycle Assessment

A Life Cycle Assessment (LCA) is an analysis of major environmental impacts of materials and processes, in this case applied to sport apparel.

This study was modelled using references from Ecoinvent Life Cycle Inventory (LCI) databases. This study focused primarily on the early stages of the product life cycle, covering three phases: Production, Packaging and Transport.

Production
This phase considers the creation of the item, both in terms of material inputs and processes. A unique reference is used for each different material type, which is specific to the country of origin where possible. The material references account for the CO2e impact of the material from the point of creation to the point where it is prepared for use in an item. The process references refer to taking that prepared material and transforming it into the final item. The process reference in this case is the CO2e impact of energy input specific to the country of origin. Due to data availability, the production phase for this LCA does not account for water use, fabric bleaching or dye, or waste material.

Packaging
This phase calculates the CO2e impact of the packaging used for the final item, both in terms of the material of the packaging and the process of creating the packaging.

Transport
This phase represents the impact of taking the final item from the point of manufacture to the point where the product would be ready for use. The transport references represent the CO2e impact of the transport vehicle itself, as well as any essential infrastructure related to the transport of an item (i.e. unloading at a port).

Life Cycle Assessment

Since an LCA can effectively pinpoint major contributors of carbon dioxide and equivalents across the product lifecycle, it can offer insight into opportunities for potential impact reduction in each phase, going further than just looking at material selection. To demonstrate, this baseline study will look at the Production, Packaging and Transport phases of a 'control' item, exploring how different scenarios will alter the final CO2e impact.

The information contained later in this report indicates that polyester T-shirts are the most purchased item across the participating organisations. For this reason, a polyester T-shirt is used as a control, against which we will compare a number of different scenarios to demonstrate the impact of material selection, packaging selection and transport selection.

Figure 1 displays the environmental impact of the control T-shirt.

Control T-Shirt

- Weighs 0.2kg – the average weight of a medium size T-shirt
- Composed of polyester only
- Manufactured in China
- Uses 3.86kWh of energy in production – the average energy input of T-shirt production
- Packaged in a Polybag weighing 0.04kg
- Transported from China to the UK by sea freight and lorry

	Control T-Shirt	
	Material/Process	Impact (kg CO2e)
Production	1 x T-Shirt (Polyester)	1.61
	Polyester (0.2kg)	0.86
	Production energy (3.86kWh)	0.75
Packaging	1 x Packaging (Polybag)	0.12
	Polyethylene (0.04kg)	0.10
	Production energy (0.1kWh)	0.02
Transport	Transport: China to UK (Sea)	0.23
	Sea freight (2 tkm)	0.22
	Road transport (0.1 tkm)	0.01
	Total Impact	**1.96**

Figure 1 – Environmental impact of Control T-Shirt

Material Selection

Considering the production phase, we can look at how material selection can impact the CO2e of the control T-shirt.

In this case, the control T-shirt will be taken through 5 scenarios, based upon the following material variations:

- Polyester
- Cotton
- Nylon (Polyamide)
- Recycled Polyester
- Organic Cotton

In each scenario, the material accounts for 100% of the T-shirt composition, and all other factors remain the same.

Material Selection

	Scenario 1 - Polyester		Scenario 2 - Cotton		Scenario 3 – Nylon (Polyamide)	
	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)
Production	**1 x T-Shirt (Polyester)**	**1.61**	**1 x T-Shirt (Cotton)**	**1.18**	**1 x T-Shirt (Nylon)**	**2.73**
	Polyester (0.2kg)	**0.86**	**Cotton (0.2kg)**	**0.43**	**Polyamide (0.2kg)**	**1.98**
	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75
Packaging	1 x Packaging (Polybag)	0.12	1 x Packaging (Polybag)	0.12	1 x Packaging (Polybag)	0.12
	Polyethylene (0.04kg)	0.10	Polyethylene (0.04kg)	0.10	Polyethylene (0.04kg)	0.10
	Production energy (0.1kWh)	0.02	Production energy (0.1kWh)	0.02	Production energy (0.1kWh)	0.02
Transport	Transport: China to UK (Sea)	0.23	Transport: China to UK (Sea)	0.23	Transport: China to UK (Sea)	0.23
	Sea freight (2 tkm)	0.22	Sea freight (2 tkm)	0.22	Sea freight (2 tkm)	0.22
	Road transport (0.1 tkm)	0.01	Road transport (0.1 tkm)	0.01	Road transport (0.1 tkm)	0.01
	Total Impact	**1.96**	**Total Impact**	**1.53**	**Total Impact**	**3.08**

Figure 2a – Comparing the carbon impact of different materials used to produce a 200g T-Shirt

Material Selection

	Scenario 4 - Recycled Polyester		Scenario 5 - Organic Cotton	
	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)
Production	**1 x T-Shirt (Recycled Polyester)**	**1.10**	**1 x T-Shirt (Organic Cotton)**	**0.88**
	Recycled Polyester (0.2kg)	**0.75**	**Organic Cotton (0.2kg)**	**0.13**
	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75
Packaging	1 x Packaging (Polybag)	0.12	1 x Packaging (Polybag)	0.12
	Polyethylene (0.04kg)	0.10	Polyethylene (0.04kg)	0.10
	Production energy (0.1kWh)	0.02	Production energy (0.1kWh)	0.02
Transport	Transport: China to UK (Sea)	0.23	Transport: China to UK (Sea)	0.23
	Sea freight (2 tkm)	0.22	Sea freight (2 tkm)	0.22
	Road transport (0.1 tkm)	0.01	Road transport (0.1 tkm)	0.01
	Total Impact	**1.45**	**Total Impact**	**1.22**

Production Impact (kg CO2e)	
Polyester	**1.61**
Cotton	**1.18**
Polyamide (Nylon)	**2.73**
Recycled Polyester	**1.10**
Organic Cotton	**0.88**

Figure 2b – Comparing the carbon impact of different materials used to produce a 200g T-Shirt

As Figure 2 displays, the nylon T-shirt has the highest impact compared to the other materials. It also identifies that there is a significant reduction in CO2e using recycled polyester rather than virgin polyester, and similarly, using organic cotton rather than non-organic cotton.

Packaging Selection

The control T-shirt uses virgin polyethylene bags, the typical packaging used in the transportation of apparel from China to the UK.

To demonstrate the impact of packaging selection the following three scenarios will be modelled on the control T-shirt:

- Virgin polyethylene polybag
- Eliminating virgin polyethylene – Recycled polyethylene polybag
- Reducing virgin polyethylene – Bulking items in one polybag to use 50% less material

In each scenario, the polybag accounts for 100% of the packaging, and all other factors remain the same.

Scenario 1 Virgin Polyethylene	Scenario 2 Recycled Polyethylene	Scenario 3 Reduced Polyethylene Packaging
100% Virgin polyethylene	100% Recycled polyethylene	100% Virgin polyethylene
1 count of 0.04kg polybag per item	1 count of 0.04kg polybag per item	0.5 count of 0.04kg polybag per item
No change	Change in material choice	Change in packaging method
0.12kg CO2e	**0.06kg CO2e**	**0.06kg CO2e**

Figure 3 – Packaging scenarios for comparison of CO2e impact

Packaging Selection

	Scenario 1 - Virgin Polyethylene Packaging		Scenario 2 - Recycled Polyethylene Packaging		Scenario 3 - Reduced Polyethylene Packaging	
	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)
Production	1 x T-Shirt (Polyester)	1.61	1 x T-Shirt (Polyester)	1.61	1 x T-Shirt (Polyester)	1.61
	Polyester (0.2kg)	0.86	Polyester (0.2kg)	0.86	Polyester (0.2kg)	0.86
	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75
Packaging	**1 x Packaging (Polybag)**	**0.12**	**1 x Packaging (Polybag)**	**0.06**	**1 x Packaging (Polybag)**	**0.06**
	Polyethylene (0.04kg)	**0.10**	**Recycled Polyethylene (0.04kg)**	**0.04**	**Polyethylene (0.02kg)**	**0.05**
	Production energy (0.1kWh)	**0.02**	**Production energy (0.1kWh)**	**0.02**	**Production energy (0.1kWh)**	**0.01***
Transport	Transport: China to UK (Sea)	0.23	Transport: China to UK (Sea)	0.23	Transport: China to UK (Sea)	0.23
	Sea freight (2 tkm)	0.22	Sea freight (2 tkm)	0.22	Sea freight (2 tkm)	0.22
	Road transport (0.1 tkm)	0.01	Road transport (0.1 tkm)	0.01	Road transport (0.1 tkm)	0.01
	Total Impact	**1.96**	**Total Impact**	**1.88**	**Total Impact**	**1.9**

Figure 4 – Comparing the carbon impact of different packaging scenarios

*0.0097

Transport Selection

The control T-shirt uses the most common method of transport from China to the UK, sea freight. To demonstrate the impact of transport selection the following four scenarios will be modelled on the control T-shirt:

- Sea freight from China to the UK
- Air freight from China to the UK
- Rail freight from China to the UK
- Lorry freight, UK only (products manufactured in UK)

In each scenario, the distance is measured based on average travel distances for each mode of transport. Each scenario accounts for lorry transport once the item is in the UK, based on average travel distances for UK-based lorry freight. All other factors remain the same.

Scenario 1 Sea Freight, China to UK	Scenario 2 Air Freight, China to UK	Scenario 3 Rail Freight, China to UK	Scenario 4 Lorry Freight, UK-based
10,000km Sea Freight	9,000km Air Freight	12,000km Rail Freight	No international freight
500km Lorry Freight, UK	500km Lorry Freight, UK	500km Lorry Freight, UK	500km Lorry Freight, UK
10-12 weeks	3-10 days	2-3 weeks	2-5 days
1.96kg CO2e	**2.36kg CO2e**	**1.84kg CO2e**	**1.74kg CO2e**
Baseline	**20% increase**	**6% decrease**	**11% decrease**

Figure 5 – Freight scenarios for comparison of CO2e impact

Transport Selection

	Scenario 1 - Sea Freight, China to UK		Scenario 2 - Air Freight, China to UK		Scenario 3 - Land Freight, China to UK		Scenario 4 - Road Freight, UK-based	
	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)	Material/Process	Impact (kg CO2e)
Production	1 x T-Shirt (Polyester)	1.61	1 x T-Shirt (Polyester)	1.61	1 x T-Shirt (Polyester)	1.61	1 x T-Shirt (Polyester)	1.61
	Polyester (0.2kg)	0.86	Polyester (0.2kg)	0.86	Polyester (0.2kg)	0.86	Polyester (0.2kg)	0.86
	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75	Production energy (3.86kWh)	0.75
Packaging	1 x Packaging (Polybag)	0.12	1 x Packaging (Polybag)	0.12	1 x Packaging (Polybag)	0.12	1 x Packaging (Polybag)	0.12
	Polyethylene (0.04kg)	0.10	Polyethylene (0.04kg)	0.10	Polyethylene (0.04kg)	0.10	Polyethylene (0.04kg)	0.10
	Production energy (0.1kWh)	0.02	Production energy (0.1kWh)	0.02	Production energy (0.1kWh)	0.02	Production energy (0.1kWh)	0.02
Transport	**Transport: China to UK (Sea)**	**0.23**	**Transport: China to UK (Air)**	**0.63**	**Transport: China to UK (Land)**	**0.12**	**Transport: UK-based (Road)**	**0.01**
	Sea freight (2 tkm)	**0.22**	**Air Freight (1.8 tkm)**	**0.62**	**Rail freight, diesel (1.2 tkm)**	**0.06**	**Road transport (0.1 tkm)**	**0.01**
	Road transport (0.1 tkm)	**0.01**	**Road transport (0.1 tkm)**	**0.01**	**Rail freight, elec. (1.2 tkm)**	**0.04**		
					Road transport (0.1 tkm)	**0.01**		
	Total Impact	**1.96**	**Total Impact**	**2.36**	**Total Impact**	**1.85**	**Total Impact**	**1.74**

Figure 6 – Comparing the carbon impact of different freight scenarios

Summary of Scenarios

As these scenarios highlight, the selection of materials, packaging and transport can have a significant influence on the impact of an item.

In terms of material selection, it is clear that virgin materials have a much higher CO2e impact than alternatives that are either recycled or organic, with nylon (polyamide) apparel having the highest impact.

Analysis of different packaging options shows that either swapping to recycled polyethylene polybags or reducing the amount of polyethylene polybags can decrease the CO2e impact by 50%.

Transport accounts for a large proportion of an item's overall impact, however, the scenarios show that there are opportunities to reduce this impact. Shipping from China to the UK undoubtedly has a large impact, but choosing rail freight over sea or air freight can reduce the CO2e by almost 6%. Should apparel manufacture be swapped to the UK, the carbon impact of the item is significantly lower.

Nevertheless, it is important to note that material selection, packaging selection and transport selection, is most often the choice of the suppliers or manufacturers, and therefore, while not directly determined by the participating organisations, these selections should be crucial considerations during the procurement process.

These findings, alongside the data received from partners on the actual apparel distributed and supplementary evidence from interviews, will inform the recommendations brought forward in this report.

Impact Baseline

Understanding existing apparel and procurement practices

Data Collection

Data requested from organisations

Across the eight partners and NGBs, a standard data request was sent out, with the intention of collecting the following data:

- Item Details – item name, description, apparel type, single or multi-use, and current end-of-life instructions.
- Material Details – item weight, material composition, and use of recycled content.
- Distribution Details – quantities purchased per year, items received or unallocated, and issue frequency.
- Additional Details – cost per unit, supplier/manufacturer, and contract terms.

There were expected barriers to this data collection, notably the fact that it would require information from suppliers and manufacturers.

Data Collection

Data received from organisations

All eight organisations returned data, but it was evident that there was a challenge in collecting full data sets. This is a common challenge in apparel sustainability, as the amount of data available from suppliers and manufacturers differs vastly. In this case, there is no standard expectation for the data that they are required to collect or keep track of, so whilst some could provide all of the data requested, there were data gaps across all areas.

The table below outlines the data received:

Organisation Type	Number of items received	Items with material data
NGBs	170	120
Partners	819	354
Total	**989**	**474**

Figure 7 – Summary of data points received

Data Summary

Items

High level analysis of the data received makes clear exactly what sport apparel we are considering. Across all eight organisations we received 989 items, for which 474 had full material and weight data.

16 item categories were identified across these items. This included generic items purchased and used, such as T-shirts, polo shirts, jackets, hoodies/sweaters, vests, trousers, and shorts; as well as organisation-or-sport-specific items, such as swimwear, waterwear, wetsuits, and sports kits.

All items were categorised as sportwear, non-sportwear items (such as day-to-day wear and staff/team apparel), training items, and presentation items (such as podium kit and ceremony wear).

The data also indicates:

- The country of origin for the majority of items is China, unless specifically stated.
- There is a lot of overlap in the items used by the different organisations.

Apparel Type	Number of items
Accessories	39
Fleece	11
Hat	10
Hoodie/Sweater	19
Jacket	66
Polo Shirt	31
Shorts	164
Specialty Item	99
Swimwear	31
Tights	64
Top	128
Trousers	61
T-Shirt	163
Vest	83
Waterwear	15
Wetsuit	5
Total	**989**

Figure 8 – Summary of apparel purchased

Data Summary

Purchasing

Looking at the purchasing data obtained from all eight organisations, provides insight into the scope of apparel. When paired with the *life cycle assessment data,* it provides an understanding of the scale of impact.

The baseline year for analysis is 2022 across all organisations except ParalympicsGB, for which 2023 data was used.

Across all organisations, 88,131 items were purchased in the baseline year. This includes 39,713 Non-sportwear items (such as day-to-day wear and staff/team apparel), 25,891 Training items, 13,398 Sportwear items, and 9,129 Presentation items (such as podium kit and ceremony wear).

Figure 9 identifies how this breaks down by use.

Apparel Type	Item Count	Quantity Purchased
Non-sportwear (Day-to-Day/Staff)	167	39713
Presentation	21	9129
Sportwear	598	13398
Training	203	25891
Total	**989**	**88131**

Figure 9 – Summary of apparel categories by use

Data Summary

Material

One of the key data gaps from organisations was the material and weight data. As such there is material data available for 474 of the total 989 items.

Across the data, synthetic materials are the most common, used in 446 items (or 47,726 purchased items). Of these, 184 were synthetic blends, and 262 were a single material. Natural materials only account for 13 items (7,539 purchased items). The remaining 15 items are natural-synthetic blends.

Broken down further, there are 25 material categories identified in the data.

Cotton and wool are the only natural fibres. Most synthetic fibres are polyester, but also accounted for are nylon, elastane, polyamide, Lycra, Neoprene, and silicone.

Figure 10 summarises the material types.

Apparel Type	Number of items
Synthetic	446
Acrylic	1
Lycra	3
Nylon	15
Nylon, Elastane	4
Nylon, Lycra	1
Nylon, Polyester	2
Polyamide	2
Polyamide, Elastane	13
Polyamide, Elastane, Neoprene	8
Polyester	239
Polyester, Elastane	123
Polyester, Nylon, Polyurethane	1
Polyester, Nylon, Spandex	4
Polyester, Polyamide	5
Polyester, Polyamide, Elastane	2
Polyester, Polyamide, Polyurethane	1
Polyester, Polyurethane	5
Polyester, Rayon	4
Polyester, Spandex	8
Silicone	5
Natural	13
Cotton	12
Wool	1
Natural-Synthetic Blend	15
Cotton, Elastane	1
Cotton, Polyester	8
Cotton, Polyester, Elastane	6
Total	**474**

Figure 10 – Summary of apparel by material type

Material Choices

Recycled or organic

Based on the data, only one cotton item can be confirmed as organic cotton. As the material scenarios on the control T-shirt shows, switching to organic cotton can reduce the carbon impact of an item by an estimated 20%.

Similarly, of the 392 items containing polyester, only 9% have recycled polyester content. The material scenarios highlight that virgin polyester has a 26% higher carbon impact than recycled polyester.

Descriptions of Recycled Content	Number of items
100% Recycled Polyester	28
83% Recycled Polyester	1
82% Recycled Polyester	2
76% Recycled Polyester	1
Recycled Polyester (% Unknown)	2
Recycled Polyamide and Polyester	2
Total	**36**

Figure 11 – Summary of recycled content in apparel sampled

LCA Examples

Following the same method as with the sample T-shirts, a few key items were identified for the life cycle assessment (LCA).

The first of these were items purchased in the highest quantities by every organisation. For these items, an average weight was used, and the most common material was selected. These items are:

- Polyester Hoodie
- Polyester/Elastane Shorts

Additionally, some specialty items were selected from the data to indicate how the CO2e impact may differ across different items and item composition. These items were selected based on availability of full datasets, so could not cover items from all partners or sports within scope of this report. For these items, the specific weight and material composition provided during data collection was used. These items are:

- Aquatics GB Swim Cap
- British Triathlon Tri-suit
- RYA Wetsuit

Example 1 – Polyester Hoodie
550g
Plastic Packaging
Manufactured in China
Sea Freight China-UK
Purchased by all organisations
100% Polyester

	Polyester Hoodie (550g)	
	Material/Process	Impact (kg CO2e)
Production	1 x Hoodie (Polyester)	3.85
	Polyester (0.55 kg)	2.35
	Production energy (7.72 kWh)	1.5
Packaging	1 x Packaging (Polybag)	0.12
	Polyethylene (0.04 kg)	0.10
	Production energy (0.1 kWh)	0.02
Transport	Transport: China to UK (Sea)	0.23
	Sea freight (2 tkm)	0.22
	Road transport (0.1 tkm)	0.01
	Total Impact	**4.2**

Figure 12 – Estimated carbon impact of a polyester hoodie (550g)

Example 2 – Shorts
250g (average weight)
Plastic Packaging
Manufactured in China
Sea Freight China-UK
Purchased by all organisations
80:20 Polyester-Elastane blend

	Polyester-Elastane Shorts (250g)	
	Material/Process	Impact (kg CO2e)
Production	1 x Shorts (Polyester-Elastane)	1.88
	Polyester (0.2 kg)	0.86
	Elastane (0.05 kg)	0.28
	Production energy (3.86 kWh)	0.75
Packaging	1 x Packaging (Polybag)	0.12
	Polyethylene (0.04 kg)	0.10
	Production energy (0.1 kWh)	0.02
Transport	Transport: China to UK (Sea)	0.23
	Sea freight (2 tkm)	0.22
	Road transport (0.1 tkm)	0.01
	Total Impact	**2.23**

Figure 13 – Estimated carbon impact of elastane shorts (250g)

Example 3 – Swim Cap

52g

Plastic Packaging (small)

Manufactured in China

Sea Freight China-UK

Aquatics GB product

	Swim Cap (52g)	
	Material/Process	Impact (kg CO2e)
Production	1 x Swim Cap (Silicone)	0.55
	Silicone (0.05 kg)	0.17
	Production energy (1.93 kWh)	0.37
Packaging	1 x Packaging (Polybag)	0.06
	Polyethylene (0.02 kg)	0.05
	Production energy (0.05 kWh)	0.01
Transport	Transport: China to UK (Sea)	0.12
	Sea freight (1 tkm)	0.11
	Road transport (0.05 tkm)	0.01
	Total Impact	**0.73**

Figure 14 – Estimated carbon impact of a swim cap (52g)

Example 4 – Tri-Suit

90g
Plastic Packaging
Manufactured in Italy
Air Freight Italy – UK
British Triathlon product

	Tri-Suit (90g)	
	Material/Process	Impact (kg CO2e)
Production	1 x Tri-Suit (Lycra)	1.13
	Polyamide (0.045 kg)	0.45
	Elastane (0.045 kg)	0.25
	Production energy (3.86 kWh)	0.43
Packaging	1 x Packaging (Polybag)	0.12
	Polyethylene (0.04 kg)	0.10
	Production energy (0.1 kWh)	0.02
Transport	Transport: Italy to UK (Air)	0.22
	Air freight (0.32 tkm)	0.21
	Road transport (0.1 tkm)	0.01
	Total Impact	**1.47**

Figure 15 – Estimated carbon impact of Tri-Suit (90g)

Example 5 – Wetsuit
650g
Plastic Packaging (large)
Manufactured in China
Sea Freight China-UK
RYA product

	Wetsuit (650g)	
	Material/Process	Impact (kg CO2e)
Production	1 x Wetsuit	6.8
	Polyamide (0.41 kg)	4.04
	Neoprene (0.13 kg)	0.37
	Elastane (0.05 kg)	0.27
	Polyester (0.04 kg)	0.16
	Aramid (0.03 kg)	0.46
	Production energy (7.72 kWh)	1.5
Packaging	1 x Packaging (Polybag)	0.23
	Polyethylene (0.08 kg)	0.19
	Production energy (0.2 kWh)	0.04
Transport	Transport: China to UK (Sea)	0.47
	Sea freight (4 tkm)	0.44
	Road transport (0.2 tkm)	0.03
	Total Impact	**7.5**

Figure 16 – Estimated carbon impact of wetsuit (650g)

Scaled Example

Throughout this report we have displayed the CO2e impact of individual items, however, as the purchasing data shows, the participating organisations are purchasing and distributing around 88,000 items in just one year (based on the figures from the baseline year examined previously in the report).

As such, it is important to understand what the impact of apparel looks relative to this scale, rather than just individual items.

Figure 17 takes the control T-shirt and scales it to the 12,170 T-shirts purchased, across all organisations in the baseline year.

At this scale, that number of T-shirts alone has an impact of 23,840 kgCO2e, or 23.84 tonnes CO2e.

That impact is equivalent to:

- 14.3 flights from London to New York and back
- 105,000 miles of driving (in the average petrol car)
- 10,885 beef steaks
- 41,900 pints of milk
- To absorb that quantity of CO2, would require 26.4m^3 of trees.

Polyester T-Shirts Purchased in Baseline Year (All Organisations)		
	Material/Process	Impact (kg CO2e)
Production	12,170 x T-Shirt (Polyester)	19,600
	Polyester (2,430 kg)	10,400
	Production energy (47,000 kWh)	9,110
Packaging	12,170 x Packaging (Polybag)	1,400
	Polyethylene (487 kg)	1,170
	Production energy (1,220 kWh)	236
Transport	Transport: China to UK (Sea)	2,840
	Sea freight (24,300 tkm)	2,670
	Road transport (1,220 tkm)	165
	Total Impact	**23,840**

Figure 17 – Scaled impact of polyester T-Shirt purchased across all organisations across the baseline year

Impact Baseline Summary

The data collection and analysis undertaken across the eight organisations provide valuable and realistic insights into the sustainability of sport apparel. Despite challenges in obtaining complete data sets, the information gathered sheds light on various aspects, including item details, material composition, purchasing patterns, and environmental impacts.

Across all eight organisations, a total of 989 items were documented, with 474 possessing comprehensive material and weight data. These items spanned 16 categories, encompassing both generic and organisation (or sport-specific) apparel. Examining purchasing data from all eight organisations offers insight into the extent of apparel procurement. Coupled with life cycle assessment data, this information provides a comprehensive understanding of the overall impact. Material analysis highlights the prevalence of synthetic materials, the limited adoption of organic and recycled alternatives, and the significant carbon footprint associated with apparel choices.

Key items were selected for LCA based on their high procurement quantities across all organisations, or because they were specialty items which showcase potential variations in CO2e impact across different item types and compositions. it's imperative to contextualize this impact relative to the scale of apparel procurement. Considering the substantial quantity of items procured annually by participating organisations, the collective impact becomes significant. Scaling up the impact of a control item, such as a T-shirt, to reflect the total procurement quantity reveals a substantial CO2e footprint – 23.84 tonnes CO2e.

Key Challenges

Identified in collaboration with participating organisations

Challenges breakdown

In addition to the quantitative data collection and analysis, interviews were conducted with representatives from each of the eight organisations to explore the procurement processes more thoroughly and specifically, as well as drawing out key challenges the organisations face.

This next section explores each of the challenges, which have been categorised into:

- Procurement
- Orders and Distribution
- Use-phase
- End-of-use
- Data and Influence

Issues primarily affecting athlete apparel

Issues primarily affecting staff, volunteer and team

Challenge Category: Procurement

Material Selection

The data presented in this report has demonstrated the varying environmental impact of different materials, highlighting the importance of sustainable material selection. The decision to use an organic cotton fibre rather than virgin polyester can reduce carbon impact by 37% (0.74 kgCO2e per unit based on a 200g T-shirt), however the properties of the materials are not directly comparable.

High performance sport requires apparel to meet specific requirements for weight, breathability, moisture-wicking, flexibility and compression. Cotton products are typically heavier, retain more moisture, lack breathability and elasticity when compared to synthetic products.

Moisture (or sweat) retention is of particular concern for athletes due to the increased weight and irritation that occurs. Cotton will hold approximately 2.5x its weight in water when saturated, while polyester will hold only 0.8x its weight. If we apply these figures to the scenario of a long-distance runner wearing a 200g cotton top while competing in the rain, the top could weigh up to 500g by the end of the race.

While these properties may be deemed acceptable for day-to-day use and for staff/volunteer apparel, the more carbon-intensive synthetic fibres are likely favoured for training and competition wear due to the fine margins of competitive advantage/disadvantage.

Challenge Category: Procurement

Supplier Selection

The supplier or manufacturer chosen to provide apparel will have a significant impact on the environmental sustainability of the products and their supply chain.

The material and product options available to each organisation will be determined by the supplier selected, and their manufacturing capabilities (or that of their suppliers). Suppliers will also have varied environmental and social impact with regards to resource efficiency, including water consumption, waste generation and chemical use, as well as labour practices and human rights.

When selecting a supplier of high performance sport apparel, the following challenges may be encountered:

- Technical capabilities – can the supplier meet the technical requirements of high performance sport apparel and ensure that athletes are not disadvantaged by the apparel they wear?
- Scale – can the supplier produce the volume of items required?
- Reporting/Transparency – is the supplier willing or able to provide detailed data regarding the environmental and social impact of products supplied?
- Cost – is the price competitive with alternative supplier options and within budget?

Organisations and NGBs may face one or more of these challenges. For example, one of the greatest challenges for the Royal Yachting Association will be the limited number of suppliers able to provide high-quality sailing apparel. For ParalympicsGB however, the main challenge may be to find suppliers who can reliably provide large volumes of a wide range of different apparel types.

Challenge Category: Procurement

Country of Origin

Closely linked to the selection of suppliers, is the country of manufacture for apparel as this will often be dictated by the supplier's existing supply chain. Most organisations participating in this study found that almost all their apparel is produced in China, with a small amount of production taking place in Europe and the UK.

The country of origin can have a significant impact on a product's environmental impact at the production and distribution phase due to:

- Emissions caused by transportation of materials and finished goods.
- Varying environmental regulations and practices that dictate carbon emissions, pollution and resource depletion.
- Labour practices and human rights violations linked to garment production.

This report does not suggest that environmental methods, fair labour practices and sustainable transportation of goods cannot be achieved in any given country or region but aims to acknowledge differing global contexts and the challenges these may present. Several organisations participating in the study already require suppliers to provide human rights data and sustainable practices within their supply chain.

Challenge Category: Procurement

‘Single Event’ Design

Reusing apparel and minimising surpluses is one method of reducing the environmental impact of the item because the resource consumption is spread over an increased number of uses. However, one barrier to achieving this in high performance sport is the design of apparel for single events or competitions.

For example, athletes representing ParalympicsGB at the Paralympic Games in Paris 2024 will wear a different apparel than was worn at Tokyo 2020. Team England also changed their apparel design from the Gold Coast 2018 Commonwealth Games for the Birmingham 2022 Games, which featured inspiration from the host city’s history. In both instances, the apparel supplier remained the same. So, why does apparel design change between major events and prevent reuse?

Through this research, we have found there can be:

- Commercial pressures to maximise revenue through ‘fan apparel’ and memorabilia sales.
- Sponsorship changes that require different brand partners to be featured or removed.
- Athlete desire to have memorabilia connected to the major events they compete at.
- Technology changes that result in apparel becoming outdated.

These factors can create a significant barrier to the reuse of apparel across multiple events or competitions. It is important to note that this issue is less problematic for government agencies and support providers such as UK Sport and the UK Sports Institute, who do not frequently brand kit for specific events.

Challenge Category: Orders & Distribution

Freight Method

Closely linked to the *country-of-origin* considerations raised in the *procurement* section of this report, is the freight method used to transport materials and finished goods. Each method has advantages and disadvantages, and largely depends on the scenario. Organisations must work with suppliers to select a freight method that has a low environmental impact while meeting their other requirements of cost, time and reliability.

Air Freight

Delivery time (China to UK):
3-10 days

Suitable for a wide range of international destinations

Very reliable

Most expensive method for all distances

Suitable for small volumes and small items

Highest carbon emissions (0.63 kgCO2 China – UK, based a 200g product)

Sea Freight

Delivery time (China to UK):
up to 12 weeks

Suitable for delivery to coastal/ near coastal destinations

Less reliable

Less expensive method for long distances

Suitable for larger volumes and bulky items

High carbon emissions (0.23 kgCO2 China – UK, based a 200g product)

Land Freight

Delivery time (China to UK):
14-21 days

Suitable for all destinations by combining road and rail networks

Very reliable

Cost effective over short-medium distances

Suitable for larger volumes and bulky items

Lower carbon emissions (0.12 kgCO2 China – UK, based a 200g product)

Challenge Category: Orders & Distribution

Lead Times

Once material sourcing, production, quality control and product delivery are taken into consideration, it is not uncommon for lead times (the time between order and receipt of apparel) to be several months. To ensure that apparel arrives on time, Team England, ParalympicsGB, and the Royal Yachting Association are required to place orders 12 months ahead of receipt.

Where apparel designs require minor customisation to “off-the-shelf” designs, such as those distributed by UK Sport and the UK Sports Institute, lead times can be significantly reduced to 1-2 months. This is in part due to suppliers maintaining unbranded stock in the UK and Europe, which requires much shorter production times for customisation.

Ironically, long lead times would be less of a concern for government agencies and support providers who can maintain a stock of apparel for staff and volunteer distribution.

Placing an order up to 12 months in advance can present a major challenge for NGBs and partner organisations because they do not necessarily know who will be competing. For ParalympicsGB and Team England, this requires several assumptions to be made regarding number of athletes and sizes, resulting in a +30% contingency placed on all orders of technical apparel. If contingency apparel is not required, the items and their associated emissions can become waste if alternative distribution options are not found.

However, reduced lead times are not necessarily an immediate solution. In high performance sport, it is not uncommon for qualification or team selection to take place in the 1-2 months prior to the main event. Reducing lead times to 3 or 6 months may allow for more accurate staff and volunteer apparel orders but will not necessarily remove or reduce the contingency on technical apparel for competition.

Challenge Category: Orders & Distribution

Packaging

It is critical that apparel supplied to athletes is protected throughout the transportation and distribution phase of supply. To meet these requirements, many suppliers will individually wrap and seal items in plastic bags. This practice is common throughout the clothing and apparel sector due to the protection offered by plastic against dirt, dust, moisture and contamination in storage.

However, this method creates a large amount of waste when the single-use packaging is disposed of. Unfortunately, while it is possible to recycle ‘soft plastics’ such as bags, the practice is not common and so most will be sent to landfill or incineration.

Clothing designed for retail will often include product information printed onto a cardboard *swing tag*, attached to the product using a small piece of plastic called a *kimble*. This helps shoppers to easily identify products and to keep the barcode attached for sales purposes. Representatives from UK Sport and Team England stated that these tags were not required within their operations (due to items remaining in labelled packaging) and highlighted this unnecessary source of waste.

Challenge Category: Orders & Distribution

Sizing Inconsistency & Athlete Changes

Inconsistent Product Sizing

Despite all apparel being provided by the same supplier, half of the organisations interviewed raised inconsistent sizing across products and ranges as a major challenge. These inconsistencies contribute to the need for contingency orders, and athletes often have to have apparel tailored upon receipt.

Concerns were also raised regarding the suitability of apparel for the variety of body shapes and sizes amongst high performance athletes. For example, the size and shape requirements of a typical male basketball player (averaging at 198cm) will be a significant deviation from the average male athlete from other sports.

Athlete Size & Preference Changes

Procurement teams must stay-up to date with athlete dimension data and cannot assume that an athlete requires the same size apparel as purchased in a previous year. Young athletes may have grown taller, some may have moved between weight classifications for their discipline, and others may be seeking a competitive advantage due to a change in body composition.

Even with accurate athlete dimension data, it would not be appropriate to assume that the preferences of individual athletes have not changed between apparel orders. Whether due to comfort or trend within the sport, these preferences must be taken into consideration. This is particularly challenging for organisations responsible for hundreds of athletes, and those that do not regularly procure apparel (e.g., ParalympicsGB procurement on a 4-year cycle).

Challenge Category: Use-Phase

Volume of Kit

Across the eight organisations participating in this study, we have estimated that 88,131 items of apparel were purchased for athletes, staff and volunteers in a single year.

This is in part due to the number of individuals that require apparel for their role, whether that is competing, providing support or representing the organisation. However, the volume can also be attributed to the number of items supplied to each individual.

Representatives from five of the participating organisations stated their belief that an excessive amount of kit was distributed for the timescale or activity required. With regard to athletes, this included up to 4 identical complete training outfits for use across a two-week competition (where washing facilities were provided for athletes). It was also suggested that the number of different item types; including training wear, podium wear, competition wear and village wear may not be necessary.

For staff apparel in particular, concerns were raised with regard to the volume of apparel supplied to staff in internal roles where the uniform and brand would rarely be seen. Reference was also made to the volume of apparel supplied to staff on short-term contracts (up to 6 months), or for specific events, as it is likely that these items would become waste.

When asked why this volume of apparel was distributed to individuals, three key considerations were raised:

- Volumes distributed should be coordinated across NGBs and partners to ensure athletes do not feel “more valued” by any individual organisation.
- Athlete expectations may have been raised through the increase in apparel supplied so could be difficult to reverse.
- Organisations seek to maximise Value-in-Kind (VIK) benefits from sponsors and suppliers, which may contribute towards the high volumes of apparel supplied.

Challenge Category: Use-Phase

Care for Kit

Currently, the lifespan for sport apparel is relatively short, which can be a result of many factors including durability or poor care. Sport apparel should be designed and distributed with a long lifespan in mind.

The design phase determines many key aspects that can increase the lifespan of sport apparel. High-quality materials and finishings are pivotal in determining how well a garment withstands the rigors of sports activities and repeated wash cycles, as are colour palette considerations, as colour retention and fade-resistant dyes are critical for preserving a garment's visual appeal throughout its lifespan. Moreover, the method of branding and embellishment can impact durability. Embroidery, for instance, tends to be more durable than vinyl printing, which may peel or crack over time.

Despite the importance of proper care for sport apparel, clear instructions to "care for kit" are often not provided to the athletes, or to the partners and NGBs from manufacturers. Without these instructions, many garments deteriorate in quality and durability much sooner in their lifespan. Washing instructions, in particular, are crucial for preserving the fabric's performance characteristics and extending its lifespan. Guidance on water temperature, detergent selection, and recommended washing cycles can help prevent damage such as shrinking, stretching, or colour fading.

The issue of microplastic pollution from washing sport apparel is a growing concern with significant environmental implications. Synthetic materials commonly used in sports clothing, such as polyester and nylon, shed microfibers during washing, contributing to marine pollution. The scale of this issue is substantial, with studies indicating that a single garment can release thousands of microfibers per wash cycle. To mitigate microplastic pollution, strategies such as using microfiber-catching laundry bags, washing garments less frequently, and investing in filtration systems for washing machines can be effective.

Challenge Category: End-of-use

Barriers to Reuse

When apparel can no longer be used by the primary recipient (athlete, staff or volunteer), the next-best option is to ensure it is reused elsewhere. Reuse helps to spread the resources and energy consumed to produce the product over a greater number of uses.

While some of the organisations involved in the study have been involved in projects to donate end-of-use apparel, several concerns have been raised regarding the practice and could be a barrier to the wider redistribution of apparel.

- Brand image – team apparel can be a symbol of unity, identity and pride for athletes and staff. Wearing branded apparel can also imply association with the brand, and there are concerns that this could be used to negatively misrepresent the brand after redistribution.
- Supplier/Sponsorship agreements – suppliers can generate revenue through the sale of merchandise and replica apparel. There are concerns that supplier and sponsorship contracts could prevent the donation of end-of-use kit as it may decrease merchandise sales.
- Hygiene - sportswear used by athletes may become contaminated with sweat, dirt, and bodily fluids during training and competition. Without thorough cleaning and sanitation, these items could pose hygiene risks and leave the donating organisation liable.

Despite these concerns, there are charitable causes already engaging with NGBs and partners to redistribute end-of- use apparel. More details on this can be found in the *Solutions in action*.

Challenge Category: End-of-use

Barriers to Recycling

Where reuse is not suitable, recycling should be considered as a method of retaining material resources and reducing the overall environmental impact of apparel. In a closed-loop system (where products are returned to the original manufacturer for recycling), recycled material can even become feedstock for new apparel orders.

However, the recycling of high performance athletic apparel carries several challenges that must be considered and overcome:

- Complex materials – while mono-material fabrics can be recycled easily, when two or more materials are blended (such as polyester-elastane blends) can require specialist recycling technology. Technical coatings, including those used for durability or waterproofing, and bonding adhesives can also create a barrier to the recyclability of a textile. Unfortunately, the blending of materials, technical coatings and use of adhesives are common in sporting apparel.
- Variety of items – items should be separated by material type for recycling to prevent contamination and to ensure the quality is not compromised. This can be easier to achieve when all items belong to a single brand and clear data is provided on the composition of each product, but much more challenging when multiple brands are bulked together, and materials are not known.
- Bulking – the textile recycling process is more efficient and financially viable when large volumes of apparel can be bulked. However, with limited storage facilities and athletes and staff spread across the UK, it is not always practical to compile large volumes of end-of-use apparel in a single location.

Challenge Category: Data & Influence

Transparency & Data Availability

The data collection phase of this project highlighted the varying levels of data held by the project partners, and the challenges in accessing data from suppliers and manufacturers.

Supply chain transparency provides customers with vital information about how products are produced and distributed. This includes data regarding where and how products are made (referencing labour practices and human rights), the transport methods used to take the product from manufacturer to customer, and the environmental impact of these practices.

6 of the participating organisations listed transparency and the availability of data as a priority issue that must be addressed and felt that they were not fully equipped to assess the environmental sustainability of the products they purchase based on existing data provision.

When asked "*In terms of ease, how would you rank the process of data gathering from suppliers?*", UKSI, Team England, and Aquatics GB responded most positively and ranked the process as either *fairly easy* or *neutral*. When asked to explain their response, the representatives stated that their suppliers had either provided data in advance or that data was readily available upon request.

UKSI and Team England apparel is supplied by Kukri; who have engaged with the Carbon Disclosure Project and Science Based Targets Initiative, while Aquatics GB apparel is supplied by Speedo; named the highest scoring British brand in the 2021 Fashion Transparency Index.

Without transparency and sufficient data, it is difficult for customers to understand the impact of the apparel they purchase and even harder to hold suppliers accountable for their claims.

Challenge Category: Data & Influence

Influence & Power

The complex balance of power and influence complicates the relationships between NGBs, sporting organisations, and the brands that provide their apparel. These dynamics were encountered during the data gathering stage of this study.

Multiple participants felt unable to request material and weight data from their suppliers due to concerns this would imply an increased degree of scrutiny, and how this might impact upon ongoing contract renewal negotiations. The consensus from these organisations was that some suppliers can be fearful of sustainability demands and the impact that it may have on existing business practices and supply chain processes.

This report has highlighted the limited pool of suppliers available for specialist sporting apparel (see *Supplier Selection*). This leads to increased power on the part of the supplier, as there are few competitors capable of (and/or willing to) meeting the technical requirements and higher environmental demands; especially for specialist items such as sailing apparel or tri-suits.

In high-viewership sports, NGBs and sporting organisations have greater influence to change supplier practices because the advertising benefits of apparel supply and sponsorship are important for the supplier. However, when the revenue benefits of apparel supply are less due to reduced viewership and merchandising income, the ability to influence suppliers is also reduced. Sports with low commercial income are particularly vulnerable, as they are heavily reliant on government funding and corporate partnerships to fund their activities and provide equipment.

Influence, commercialisation and impact are closely linked; with increased apparel consumption linked to increased sponsorship or Value-in-Kind. Working with suppliers to reduce the carbon impact of football shirts, of which approximately 400 are supplied to players each fixture week (15,200 per season*) in the Premier League would have a large carbon impact reduction compared to a similar impact reduction in tri-suits, of which British Triathlon distributes less than 150 to senior athletes per year (on average).

*20 players per matchday squad, per team. 2 shirts produced for each player. 20 teams playing 38 fixtures per season.

Summary

The procurement of sport apparel is a process characterised by a multitude of decisions, challenges and considerations.

During procurement, decisions surrounding material selection are fraught with trade-offs between sustainability and performance. While organic cotton offers reduced carbon impact compared to virgin polyester, synthetic fibres often prevail due to their superior performance attributes crucial for high performance sport. Supplier selection further compounds the challenges, due to considerations on technical capabilities, scale, transparency, and cost considerations. Additionally, navigating the country-of-origin landscape adds another layer of complexity, as it implicates transportation emissions, environmental regulations, and labour practices.

Orders and distribution challenges relates to decisions on freight methods, lead times, and packaging practices. Long lead times pose challenges for timely apparel delivery, particularly given the dynamic nature of high performance sport competitions.
Moreover, the need for protective packaging conflicts with sustainability goals, leading to significant waste generation. Inconsistencies in sizing create further challenges in the distribution process, requiring contingency planning and customised orders.

The use-phase underscores the sheer volume of apparel distributed and the imperative of proper care. Balancing athlete expectations, brand image, and environmental impact presents a delicate balancing act. Furthermore, addressing microplastic pollution from washing adds another dimension to the sustainability challenge. Similarly with the End-of-use phase, in which barriers to reuse and recycling complicate sustainability efforts.

Throughout this process, transparency, data availability, and power dynamics emerge as overarching themes. The varying levels of negotiation power, determined by commercial opportunities afforded to the supplier, play a key role in determining sustainability outcomes, and the pressure that individual organisations can exert on their suppliers.

Solutions in action

Existing solutions from across the partner organisations

Redistribution of End-of-Life kit

As highlighted in this report, reuse is a great way to reduce the environmental impact of apparel because it helps to spread the resources and energy consumed to produce the product over a greater number of uses.

Some of the organisations participating in this study have already been involved in projects to redistribute kit, through the following initiatives:

- Team England have been working with Kit Us Out to provide unused, surplus kit to para- athletes, young people and grassroots sporting communities. This initiative not only prevents the apparel from going to waste, but also helps to "level the playing field" for those without access to apparel.
- ParalympicsGB have also been involved in the redistribution of unwanted, excess stock through a partnership with United Through Sport. The collaboration has seen apparel designed for summer and winter competitions redistributed to South Africa and satellite projects across the world.
- When Aquatics GB and the Home Nations signed a partnership with Speedo in 2022, an agreement was reached with the former supplier, Tyr, stipulating that the remaining stock could be donated to Starfish Malawi.
- British Triathlon are undertaking a pilot redistribution project, designed to accept donations of unwanted apparel from both high performance athletes and amateur triathletes. These items will be redistributed through the Swim Bike Run programme, designed to increase grassroots participation and remove barriers to participation.

Recycling end-of-life kit

When reuse and redistribution is not suitable, and for organisations concerned about the risks of reuse, recycling provides a suitable alternative where materials are securely shredded to eliminate branding and IP from the material marketplace.

- The UK Sports Institute changed apparel supplier in 2022, transitioning from Nike to a new deal with Kukri. Coinciding with a name change (formerly the English Institute of Sport) Kukri organised for the old UKSI apparel to be recycled. In total, 7 pallets of apparel were recycled, weighing a total of 1,274 kg.
- The published Aquatics GB Sustainability Strategy includes plans to work with suppliers on the reuse or recycling 50% of all apparel by end of 2024.
- ParalympicsGB are also in conversation with their apparel supplier, Adidas, regarding the recycling of unwanted apparel following the Paris 2024 Games. The proposal includes provision of dedicated recycling bins to collect end-of-use garments in the athlete village.
- England Hockey are currently working on the recycling of legacy apparel from their previous supplier (who supplied apparel for 10 years). This requires permission from the previous supplier.

Material Selection

Recycled Materials

36 items sampled in this study contained recycled polyester (either 100% or part). While this is only 9% of the 392 polyester items, use of these items at a high performance level can serve to demonstrate the technical capabilities of recycled fibres and increase use in future ranges.

Outside of the project partners, Scottish Rugby were amongst national sports teams to introduce recycled polyethylene into their apparel with their Rugby World Cup 2023 shirt. The partnership with Italian manufacturer, Macron, claims to recycle "around 13 recycled half-litre bottles to make every shirt."

In 2022, Adidas unveiled a new kit for the Northern Ireland Women's Football Team ahead of the FIFA Women's World Cup 2023. The shirts and shorts were made from 50% marine plastic yarn intercepted on remote islands, beaches, coastal communities and shorelines. The other 50% of the yarn was created from recycled polyester.

Alternative Materials

Elsewhere, alternative materials have already been introduced into high performance sport apparel. Forest Green Rovers, a professional football club in the English Football league, have experimented with apparel made from natural and recycled fibres. In 2019, the club launched a shirt made from 50% bamboo fibres; helping to reduce the plastic required for each shirt while providing a soft, breathable fabric suitable for use in professional sport. The club have since gone on to trial shirts made from a blend of 35% recycled waste coffee grounds and 65% recycled polyester, which has proven to be lighter, durable, and more breathable than the bamboo kit.

It is important to note that the use of alternative materials can create new challenges for end-of-life processing and recycling, especially when materials are combined. Increased use of these materials must be aligned with improved recycling infrastructure to prevent future waste streams (see *Barriers to Recycling*).

Use of Surplus & Design for Longevity

During the design process for the Birmingham 2022 Commonwealth Games apparel, Team England decided not to include the year or host city on leisurewear distributed to athletes and staff. This was a conscious decision that allowed surplus and unwanted apparel originally intended for use at the senior Games, to be used by junior athletes at the Trinidad & Tobago 2023 Commonwealth Youth Games.

This small change in the design process prevented a large volume of surplus apparel going to waste and helped to reduce the number of items ordered for the Youth Games, reducing the overall environmental impact of apparel across the two events.

Other organisations have designed apparel to allow for and encourage, repeat use by athletes. The Royal Yachting Association apparel supplied by Musto includes minimal reference to individual events or competitions, allowing for repeat use in competition. The result is much smaller ‘top-up’ orders each year, rather than a complete restock.

At Team England, athletes were included in the design process after it was noticed that very few continued to wear their apparel after each competition cycle. Louise Pullan, Kit Operations Specialist at Team England, said “We want to know what they would wear in the gym or for a walk afterwards and I'm always really pleased to see athletes still wearing the kit now…It's about making it desirable”. Including athletes in the process has helped to increase the likelihood of apparel being worn beyond the Games cycle, reducing the need for supplementary training apparel.

Outside of the project participants, Brentford Football Club bucked the trend by moving to a 2-year apparel cycle when the 2021-22 season kit was worn for a second season in 2022-23. Elite football clubs that change their kit each season benefit from increased merchandise sales due to a desire amongst supporters to have the latest design. When Brentford F.C. and Umbro sacrificed this revenue boost, Brentford Chief Executive, Jon Varney, said “This is a step in the right direction to help the environment a little. It can only be good to reduce kit cycles.”

Minimising packaging waste

While it is important to ensure that athlete and staff apparel is protected from dirt, dust, moisture and contamination during transportation and distribution, this does not necessarily require each item to be individually wrapped in plastic.

Small changes implemented at Team England have made a significant impact on the carbon impact of their packaging. These changes include:

- Recycled packaging – recognising that the apparel packaging did not need to be transparent, an opaque recycled plastic is now used in place of clear, virgin plastics
- Reduced volume of packaging – a number of changes have been implemented, including:
    - Apparel folded to fit into smaller bags
    - Bulking of similar products e.g., athletes receive 3 pairs of socks that are now wrapped in a single bag, rather than 3 individual bags
- Removing *kimbles* – with apparel distributed to athletes direct from the packaging (rather than display in a retail environment), Team England identified that product *swing tags* did not need to be attached to individual items with a plastic *kimble.* This small change resulted in the elimination of 33,000 pieces of plastic in the baseline year.

Loan scheme for infrequent use kit

When considering ways to reduce the environmental impact of apparel, the best thing we can possibly do is to remove the need for additional items, therefore producing less.

UK Sport have embraced this idea for staff apparel, especially items that are used infrequently. The procurement team recognised that many items, such as event wear and rain jackets, were not often used by most staff. This meant that the resources in these items, and their durability, were not being utilised to their maximum.

A scheme has now been introduced to loan these items to staff on a “as required” basis, ensuring each item is used to its full potential and reducing the volume of items sitting unused in staff homes. Ultimately, this will lead to a reduced number of items purchased and manufactured.

To prevent any hygiene concerns, a sustainable laundry service is used between each loan period.

Recommendations

This Apparel Sustainability Baseline study documents the status quo with regards to sustainable procurement of high performance sport apparel.

With these foundations established, we propose the following recommendations to UK Sport, NGBs & partner organisations, and suppliers & manufacturers.

Recommendations to UK Sport

- Enable and facilitate collaboration throughout the sector:
  - Develop centralised carbon accounting infrastructure for NGBs to share and compare the impact of products from different manufacturers.
  - Develop centralised inventory and athlete management systems to track athlete apparel dimensions, preferences and kit distributed across all sports – aiding procurement across NGBs and partner organisations.
  - Promote shared expertise and resources where individual NGBs do not have budget for a full-time expert.
  - Encourage a unified approach – implementing minimum environmental standards for manufacturers supplying apparel to NGBs.
- Provide leadership, expertise and leverage influence:
  - Provide frameworks for NGBs to follow – including templates for procurement or tender processes, and guidance on how to hold suppliers accountable.
  - Set standards for apparel suppliers and manufacturers by using the UK Sport voice at government level.
- Offer training to NGBs, partner organisations and athletes:
  - Provide carbon accounting training and services for NGBs, extending beyond carbon literacy training.
  - Disseminate information to athletes and teams/clubs at all levels regarding issues relating to apparel, including examples for grassroots organisations to follow.
- Create a sector-wide Apparel Sustainability Taskforce “Circular Sports Alliance” and coordinate the creation of an action plan to deliver these recommendations and improve apparel sustainability at all levels.

Recommendations to Suppliers & Manufacturers

- Offer greater transparency of environmental impact of products:
  - Provide data on the environmental impact of the apparel supply chain – allowing customers to make informed decisions when selecting apparel.
  - Provide information relating to human rights and working conditions throughout the supply chain.
- Switch to recycled materials where synthetic materials are required and collections systems are supported.
- Establish alternative materials through collaborative R&D with material scientists and engineers.
  - Extend use of alternative materials beyond pilot programmes, offering to athletes at all levels.
- Offer takeback schemes for end-of-life apparel:
  - Offer recycling of end-of-life apparel as standard.
  - Develop refurbishment, reuse and/or repurposing services where possible.
- Work with NGBs & partner organisations to reduce lead times – to allow for increasingly accurate purchase orders and reduce contingency requirement.
  - This may include UK manufacturing.
- Reduce packaging where possible.
  - Where packaging is required, use recycled materials that can be readily recycled in the UK.

Recommendations to NGBs & Partners

- Work with UK Sport and sustainability professionals to develop frameworks and resources:
  - Participate in the Apparel Sustainability Taskforce.
  - Implement Taskforce recommendations and frameworks at a national level and engage with local organisations to apply in grassroots sport.
- Work with suppliers and manufacturers to select low impact materials and products where available.
  - Request environmental impact data from suppliers to support sustainable apparel selection, and to allow for the environmental impact of apparel to be tracked.
- Reduce distribution of apparel to staff where suitable:
  - Implement a loan scheme for infrequently used items – such as event wear, winterwear etc.
  - Reduce the volume of apparel supplied to staff on temporary contracts.
- Design apparel for multiple uses:
  - Work with athletes to design apparel that they will continue to wear beyond a specific event or competition.
  - Where possible, avoid specific dates or locations printed on apparel - to allow for the use of surplus apparel at subsequent events
- Collaborate with charities and grassroots sports projects to redistribute end-of-use and excess stock
- Where redistribution/reuse is not suitable, ensure that end-of-life apparel is recycled where possible:
  - Work with athletes to recover end-of-life apparel

Apparel Sustainability Baseline

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