



Universidade de Lisboa

Faculdade de Motricidade Humana

**THE COMMITMENT OF SPORT TOURISM TO ENVIRONMENTAL  
SUSTAINABILITY: AN APPLICATION TO THE CONSUMPTION OF  
INTERNATIONAL SURFING EVENTS.**

Rute Isabel Grilo Filipe Martins

Orientadora: Professora Doutora Maria Margarida Ventura Mendes Mascarenhas

Coorientadora: Professora Doutora Elsa Cristina Sacramento Pereira

Tese especialmente elaborada para obtenção do grau de Doutor em Motricidade  
Humana, na especialidade de Sociologia e Gestão do Desporto





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## Resumo

Esta tese focalizou-se na temática da sustentabilidade ambiental no desporto. A investigação desta relação foi esquematizada em duas etapas sequenciais. Na primeira etapa foi elaborado um estudo sistematizando o conhecimento científico recentemente publicado sobre o tema, cuja análise foi centrada no contexto do turismo desportivo. Os resultados providenciaram a identificação das lacunas de investigação, das metodologias e dos principais resultados da investigação sobre a inter-relação do turismo desportivo e da sustentabilidade ambiental. Baseada neste conhecimento, a segunda etapa foi elaborada, integrando dois estudos que aplicaram e testaram o modelo Sport Sustainability Campaign Evaluation Model (SSCEM) em eventos internacionais de surf.

Os resultados da revisão sistemática da literatura (primeira etapa) apontam para a proeminência de estudos contextualizados nos eventos desportivos; focados nos praticantes desportivos; e direccionados para investigar os fatores que moldam a adoção / implementação da sustentabilidade ambiental no desporto. As conclusões sublinham a necessidade de uma maior operacionalização de estratégias e ações ambientais, incitando à promoção da atividade desportiva outdoor, e à realização de iniciativas ambientais que atendam às características influentes no comportamento ambiental do consumidor desportivo. A revisão sistemática salienta ainda a falta de estudos: (i) com os espectadores; (ii) contextualizados nos eventos de desportos de natureza; e (iii) suportados por modelos teóricos para a análise das intenções de comportamento ambientalmente sustentável.

A segunda etapa desta investigação foi composta por dois estudos que testaram o Sport Sustainability Campaign Evaluation Model (SSCEM), aplicando-o aos espectadores de eventos internacionais de surf para aferir as suas intenções de

comportamento sustentável relativamente a duas campanhas ambientais realizadas no decorrer dos eventos, através da análise das equações estruturais, com o pacote Lavaan do software R. O primeiro estudo investigou as intenções de reciclagem e reutilização de 625 espectadores de dois eventos internacionais de surf acolhidos em Portugal, o MEO Rip Curl Pro 2019 e o EDP Billabong Ericeira 2019. O estudo confirmou a influência das necessidades, pontos de ligação e constrangimentos internos nas atitudes, bem como o efeito dos comportamentos ambientais passados e constrangimentos (internos e externos) nas intenções de comportamento ambiental dos espectadores. O segundo estudo examinou a intenção de utilização do transporte sustentável de 355 espectadores do evento de surf MEO Rip Curl Pro 2019, testando o SSCEM e segmentando os espectadores com base nas referidas intenções. O estudo identificou a influência dos pontos de ligação e dos constrangimentos internos nas atitudes, bem como o efeito dos comportamentos ambientais passados, constrangimentos externos e pontos de ligação nas intenções de comportamento ambiental dos espectadores. Uma análise de clusters não-hierárquica foi ainda elaborada, da qual emergiram três segmentos de espectadores: “comprometidos”, “indecisos” e “descomprometidos”. Cinco fatores distintivos foram apurados, destacando que os “comprometidos” evidenciam uma maior necessidade estética, uma ligação mais forte à comunidade e comportamentos passados relativos ao uso de transporte sustentável em anteriores eventos de surf; os “descomprometidos” sentem-se mais constrangidos pela falta de acessibilidade e pela falta de tempo, sendo este último fator também inibidor na escolha dos “indecisos” pelo transporte sustentável.

A aplicabilidade do SSCEM ao estudo das intenções de comportamento sustentável dos espectadores nos eventos de surf foi positivamente aferida por ambos os estudos, onde os constrangimentos internos e externos, os pontos de ligação e os comportamentos ambientais passados foram fatores associados à resposta dos

espectadores em ambas as campanhas. As necessidades de autorrealização foram tidas como preditoras das atitudes dos espectadores face às suas intenções de reciclagem e reutilização, mas não se revelaram significativas nas intenções dos espectadores relativamente ao transporte sustentável. Os resultados desta investigação não confirmaram a influência dos valores universais sobre as atitudes, contrariando a hipótese avançada pelo modelo.

Esta dissertação fornece vários contributos, nomeadamente, o aprofundamento do conhecimento científico sobre a sustentabilidade ambiental no desporto, a compreensão das intenções de comportamento ambientalmente sustentável dos espetadores dos eventos de surf, e a formulação de recomendações para que os gestores dos eventos de surf possam desenvolver estratégias ambientais mais eficazes ao combate dos problemas ambientais.

**Palavras-chave:** campanhas ambientais, espetadores, eventos desportivos, sustentabilidade ambiental, turismo desportivo.



### **Abstract**

This thesis focused on the theme of environmental sustainability in sport. The investigation of this relationship was outlined in two sequential stages. In the first stage, a study was carried out systematizing the scientific knowledge recently published on the subject, whose analysis was centred in the context of sport tourism. The results provided the identification of the research gaps, methodologies and main results of research on the interrelation of sport tourism and environmental sustainability. Based on this knowledge, the second stage was elaborated, integrating two studies that applied and tested the Sport Sustainability Campaign Evaluation Model (SSCEM) model in international surfing events.

The results of the systematic literature review (first stage) point to the prominence of studies contextualized in sporting events; focused on sport practitioners; and aimed at investigating the factors that shape the adoption / implementation of environmental sustainability in sport. The conclusions underscore the need for greater operationalization of environmental strategies and actions, encouraging the promotion of outdoor sporting activities, and the realization of environmental initiatives that take into account the influential characteristics in the environmental behaviour of the sport consumer. The systematic review also highlights the lack of studies: (i) with spectators; (ii) contextualized in nature sports events; and (iii) supported by theoretical models for the analysis of intentions for environmentally sustainable behaviour.

The second stage of this investigation was composed of two studies that tested the Sport Sustainability Campaign Evaluation Model (SSCEM), applying it to the spectators of international surfing events to infer their intentions for sustainable behaviour in relation to two environmental campaigns carried out during the events, through the analysis of structural equations, with the Lavaan software package R. The first study investigated the

recycling and reuse intentions of 625 spectators from two international surf events hosted in Portugal, MEO Rip Curl Pro 2019 and EDP Billabong Ericeira 2019. The study confirmed the influence of needs, points of attachment and internal constraints on attitudes, as well as the effect of past environmental behaviours and constraints (internal and external) on spectators' environmental behaviour intentions. The second study examined the intention of using sustainable transport for 355 spectators at the MEO Rip Curl Pro 2019 surfing event, testing SSCEM and segmenting spectators based on those intentions. The study identified the influence of points of attachment and internal constraints on attitudes, as well as the effect of past environmental behaviours, external constraints and points of attachment on spectators' environmental behaviour intentions. A non-hierarchical cluster analysis was also carried out, from which three segments of spectators emerged: "committed", "undecided" and "uncommitted". Five distinctive factors were ascertained, highlighting that the "committed" show a greater aesthetic need, a stronger connection to the community and past behaviours related to the use of sustainable transport in previous surf events; "uncommitted" feel more constrained by the lack of accessibility and the lack of time, the latter being also an inhibiting factor in the choice of the "undecided" for sustainable transport.

The SSCEM's applicability to the study of spectators' sustainable behaviour intentions in surfing events was positively assessed by both studies, where internal and external constraints, points of attachment and past environmental behaviours were factors associated with the spectators' response in both campaigns. Self-actualization needs were predictors of spectators' attitudes towards their recycling and reuse intentions, but were not significant in spectators' intentions regarding sustainable transport. The results of this investigation did not confirm the influence of universal values on attitudes, contradicting the hypothesis advanced by the model.

This dissertation provides several contributions, namely, the deepening of scientific knowledge about environmental sustainability in sport, the understanding of the intentions of environmentally sustainable behaviour of spectators of surf events, and the formulation of recommendations so that surf event managers can develop more effective environmental strategies to combat environmental problems.

**Keywords:** environmental sustainability, spectators, sport events, sport tourism, sustainability campaigns.

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# Chapter 1: Introduction



## Introduction

Currently, sustainability is a concept that has gained strength in the world social and political discourse, around which the Sustainable Development Goals (SDG) (UN, 2015) were developed and published, presenting goals for environmental, economic and social sustainability. Environmental sustainability is integrated into the concept of sustainable development promoted by the Brundtland Report (WCED, 1987), which can be approached more sharply by the environmental pillar, or more holistically, also considering the economic and social pillars. The indiscriminate adoption of the term sustainability does not contribute to the assertive investigation of environmental sustainability (Morelli, 2011). Thus, this investigation adopted the definition of environmental sustainability

as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity. (Morelli, 2011, p.6)

Environmental sustainability in sport is a current topic that must be investigated, on which a growing scientific interest has been evident (Mallen, 2018; Mascarenhas et al., 2021). In parallel, there is an urgent need for strategies and actions capable of promoting its implementation (IOC, 2012; UNFCCC, 2019). In fact, McCullough et al. (2020) suggest that the conceptualization of the relationship between environmental sustainability and sport should present a differentiated approach, coining, for this purpose, the term sport ecology.

In the sports context, surfing proclaims its connection to Nature as an integral part of sports practice and as a distinctive lifestyle (Borne, 2018; Wheaton, 2010), providing

an ideal setting to study the theme of environmental sustainability of nature-based sport events. Since sports tourism is one of the tourism segments with the highest growth rate (WTO, 2020), it is even more important to study the effect of spectators on the environmental impact of events (Moyle et al., 2018). There are studies that monitored and evaluated the ecological footprint, carbon emissions and impacts on soil erosion and fragmentation generated by sporting events (Andersson et al. 2016; Edwards et al. 2016; Salesa & Cerdà, 2019). However, given the increased awareness of environmental sustainability in sport (McCullough et al., 2020), it is important to study what factors contribute to the success of environmental campaigns undertaken by sport organizations, namely, the spectators' response to this type of initiatives (Casper et al., 2020; Trail & McCullough, 2020). The Sport Sustainability Campaign Evaluation Model (Trail & McCullough, 2020) is one of the few models that assesses the intentions of eco-sustainable behaviour associated with environmental campaigns at sporting events. This model uses a wide range of theories to support the presented relationships, namely: on the one hand, the needs, values, internal constraints and points of attachment, as predictive factors of attitudes; and on the other hand, external constraints, past sustainable behaviours and attitudes as predictors of eco-sustainable intentions (Trail & McCullough, 2020).

Supported by SSCEM and the spectators' segmentation, this research contributed to a greater knowledge of the study of the factors that contribute to the success of environmental campaigns in nature-based sport events, which is particularly important to outline how future environmental campaigns should be planned to more effectively change the environmental behaviour of these significant actors in sport consumption.



### **Aim and outline of the thesis**

The objectives of this thesis were guided by the urgency to contribute to the increase of scientific knowledge of the relationship between environmental sustainability and sport. Thus, this investigation assumed the following main purposes:

- ✓ understand how scientific research has recently studied the environmental sustainability in the sports tourism context;
- ✓ test the sport sustainability campaign evaluation model to international surfing events by applying it to the spectators; and
- ✓ identify which factors influence the spectators' sustainable transport intentions of surfing events.

Once the objectives of the thesis are explained, it is still important to expose its structure. So, after the first chapter regarding the introduction:

a) the second chapter consists of a systematic review study, mapping and analysing scientific production on the relationship between sport tourism and environmental sustainability, in order to infer about the current scientific knowledge on the subject (Booth et al. 2016; Weed, 2005). This stage provided a solid theoretical basis for the identification of research gaps, pursued objectives, selection of methodologies and instruments used in the investigation of this theme, guiding the planning and operationalization of the second stage;

b) the third and fourth chapters include the two studies carried out on the environmental campaigns developed in international surf events, through the testing of SSCEM (Trail & McCullough, 2020), in order to analyse the intentions of environmental behaviour of the respective spectators;

c) in the fifth and last chapter the final conclusion is presented, summarizing and analysing in an integrated way the results obtained in the three studies, and exposing the implications of this investigation.

Thus, in order to understand the scientific framework that has been produced in the context of the relationship between environmental sustainability and sport, in the first stage of this dissertation, a systematization of current scientific knowledge on this theme was developed, focusing on its tourist context (chapter 2). The research gap detected in studies on environmental sustainability involving spectators and nature-based sport events justified the rationale of the chosen context for the empirical study of the present investigation.

The second stage was structured according to the application and testing of the SSCEM (Trail & McCullough, 2020). The methodological option of separately inferring the two environmental campaigns was based on the specificity of the corresponding environmental behaviours (Stern, 2000; Tobler et al., 2012). In this sequence, two studies were presented: the first (chapter 3) analysed the eco-sustainable intentions of the spectators of two international surf events in relation to the campaigns aimed at plastic waste prevention and recycling developed in both events; and the second (chapter 4), the eco-sustainable intentions of the spectators of an international surfing event in relation to the campaign on sustainable transport implemented during the event. In this last study, a segmentation of the spectators based on their intentions of using sustainable transport during the event was also carried out, in order to contribute to a more in-depth knowledge about the spectators and to better leverage the success of future campaigns on this topic (Musgrave et al. 2020; Peter & Olson, 2008). Transport is crucially associated with the generation of carbon emissions from events (Edwards et al., 2016) and, consequently,

with climate change, so it is urgent to deepen the approach to the area of sustainable transport.

The final chapter of this thesis developed a reflection on the results presented in the previous chapters, as well as a set of theoretical and practical implications resulting from this investigation. Finally, this chapter also incorporated guidelines for future research on the topic, in order to contribute to the development of the theme of environmental sustainability in sport, and more specifically, in sport tourism events.



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## Chapter 2: How has science highlighted sports tourism in recent investigation on sports' environmental sustainability?<sup>1</sup>

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<sup>1</sup> Mascarenhas, M., Pereira, E., Rosado, A., & Martins, R. (2021). How has science highlighted sports tourism in recent investigation on sports' environmental sustainability? A systematic review. *Journal of Sport & Tourism*, 25(1), 42-65. doi: 10.1080/14775085.2021.1883461



## **Abstract**

The present investigation aimed to understand how scientific research has recently studied the environmental sustainability in the sports tourism market. Thus, a systematic literature review was developed for the time 2013–2019 using Scopus, Sage, ScienceDirect and Web of Knowledge as database resources. The main results were: (a) the sports event context was the most scrutinized with major concentration on mega events; (b) the environmental pillar of sports tourism was predominantly investigated through the sports practitioners and sparsely by the spectators' role; (c) sports practice was the most influencing factor for sports practitioners' greener behaviour, mainly in nature-based activities; and (d) external pressures and perceptions on the environmental organizational efforts were strongly related to the adoption of ecological management by sports events. This study provided practical implications for sports tourism managers such as the need of collaboration within the sports tourism sector to develop environmental strategies and initiatives, tailoring the sports services according to the expertise of sports practitioners in natural areas and promoting environmental education across all sports actors involved in the demand and supply of the sports tourism market.

**Keywords:** Environmental Sustainability; Nature-based Activities; Protected Areas; Sports' Actors; Sports' Organizations; Sports Tourism; Tourism.

## **1. Introduction**

The concept of sustainable development disclosed by the Brundtland report (WCED, 1987) embeds the environmental pillar focused on the Sustainable Development Goals (SDG) defined in the United Nations (UN) Agenda 2030 (UN, 2015). Environmental sustainability presupposes a state of 'balance, resilience, and

interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity' (Morelli, 2011, p. 6). The need to promote environmental sustainability strategies is justified by the weak ecological status of the planet reflected in several international reports (e.g., IPCC, 2018). In pursuing the SDG, the UN (2015) recognize the importance of tourism and sport, defending their interconnection: (a) tourism's role in the path of sports sustainability, especially within the Olympic Games, is recognized by the International Olympic Committee (IOC, 2012); (b) sports tourism is highlighted by the World Tourism Organization (WTO, 2019) for its potential to promote environmental sustainability, both by raising awareness and encouraging the adoption of pro-environmental measures, being one of the fastest growing tourism segments (Alexandris & Kaplanidou, 2014).

Also noteworthy is the recent creation of the Sports for Climate Action Framework (UNFCCC, 2019) which aims to incorporate actions to combat climate change. In the field of tourism, an event entitled Transforming Tourism for Climate Action (UNEP, 2019) was held with the same objective. Sustainable tourism is also envisaged in the One Planet Sustainable Tourism Program (UN, 2019) as a strategy to drive sustainable consumption and production, in association with the themes of lifestyles and education.

Sports tourism is a social, economic and cultural phenomenon that emerges from the interaction of activities, people and places (Weed & Bull, 2004). As highlighted by Hinch and Ito (2018), sports tourism 'is broadly conceived and includes recreational as well as high performance sports and active engagement as well as spectator activities' (p. 96). In addition, the recent work developed by Getz and Page (2016) also enshrines



sporting events as one of the four major classes of the typology of planned events in the tourist context.

Scientific research has given increasing attention to the relationship of environmental sustainability and sport (Mallen, 2018), especially focusing on sports tourism, although more on the destinations' environmental impacts than on those generated by sporting events (Moyle et al., 2018). However, literature reviews on the intersection of sport, tourism and environmental sustainability have followed a fragmented approach, whether analysing the relationship between sports organizations and environmental sustainability from a narrow perspective of the sports sector (Mallen, 2018; Trendafilova & McCullough, 2018), or by researching the relationship between leisure activities and sustainability, leaving a gap in terms of the sports component (Ardoin et al., 2015; Vaugeois et al., 2017).

In this sequence, this study aimed to carry out a systematic review of the literature on the relationship between sports tourism and environmental sustainability, filling an important scientific gap, by expanding the tourist-sports focus to the contexts of recreation and leisure and the respective actors. The prioritization of environmental topics in future tourism research (Buckley et al., 2015), the rapid growth of the sports tourism segment (Alexandris & Kaplanidou, 2014) and the need to increase environmental sustainability in sports tourism (WTO, 2019) justify the systematization of current scientific knowledge to assist future research. This review may also favour sports tourism management, highlighting environmental sustainability strategies that strengthen: (a) the ecological behaviour of sport practitioners and spectators (Lin & Lee, 2020; Trail & McCullough, 2020); and (b) the mitigation of the environmental impact of sports tourism in destinations, caused both by the practice of nature-based sports (Wolf et al., 2019) and by hosting sporting events (Babí et al., 2019).

Specifically, this review intended to summarize existing literature exploring the relationship between sports tourism and environmental sustainability considering the research questions: (i) Which sports tourism contexts and sports actors have been studied? (ii) When and where has research on the topic been conducted and published? (iii) What theoretical frameworks are related to the theme? (iv) How has research been conducted in the field regarding its focus and methodological approach? (v) What results have been found? and (vi) What are the management and theoretical implications for sports tourism?

### **2. Materials and methods**

A systematic literature review is a reproducible methodology ‘to identify, select, and appraise studies of a previously agreed level of quality (...) relevant to a particular question’ (Booth et al., 2016, p. 11). Such methodology permits to approach a large scientific research area and it should be objective, integrating the produced scientific research (Booth et al., 2016). Moreover, the quantitative systematic literature review (Pickering et al., 2015), also adopted by other reviews developed in the context of sports tourism, namely, on sporting events (Thomson et al., 2019) and on nature-based sports recreation (Pickering et al., 2018; Wolf et al., 2017), is an appropriate method for this investigation as a complement to qualitative content analysis (Hsieh & Shannon, 2005).

#### ***2.1. Search strategy and quality assessment***

The review process was carried out sequentially, adapting the recommendations of Pickering et al. (2015). Thus: (a) the theme was circumscribed, namely the relationship between sports tourism and environmental sustainability; (b) the research questions were outlined; (c) the databases – Scopus, Web of Knowledge, ScienceDirect and Sage – were selected for their wide range of scientific areas and peer-reviewed journals, also allowing the data collection sources triangulation and increasing the reliability of the investigation

(Salkind, 2010); and (d) the first author conducted an exploratory study in the designated databases, in order to identify the search terms and the review timeline. From this process the search string was structured as following:

((environmental\*-responsible OR pro-environmental OR environmentally-friendly OR  
environmentalbehavi\*

OR environmental-action\* OR sustainab\* OR low-carbon OR green-consumption OR  
consciousconsumer

OR eco-friendly) AND (sport\* OR recreation\* OR physical-activit\* OR active-leisure)).

Inclusion and exclusion criteria (Table 1) were employed to ensure that the boundaries of the review were clearly defined and the search strategy would identify all relevant literature for answering the research questions (Creswell, 2003). It should also be noted that online databases searching included: (a) all the academic areas, which ensured a greater breadth of the research area and avoided the skewed selection error (Booth et al., 2016); and (b) studies published since 2013, according to the results of Tölkes (2018) that point to a sustained growth of publications from that year, reducing ‘the studies down to a more manageable number’ (Weed, 2005, p. 80).

**Table 1.***Exclusion and Inclusion criteria.*

	<b>Criteria</b>
<b>Inclusion</b>	Peer-reviewed articles; Articles published between 2013 and 2019; Articles containing specific references to sports tourism, with the word tourism or its derivatives in the journal's title, article's title / abstract / keywords. Articles containing specific references to environmental pillar of sustainability or environmental behaviour.
<b>Exclusion</b>	Articles which don't provide the identification data (e.g. authors' name, year of publication); All book reviews and conference proceedings; Articles which relate sports tourism to sustainability without the environmental pillar; Articles addressing sport without any reference to tourism or sports event; Articles investigating recreation without any reference to a sports activity; Articles examining sport through wildlife recreation exclusively, namely, recreational fishing and hunting; Articles exploring physical activity, recreation or sport through a sustainable mobility or walkability perspective; Articles which are not written in English.

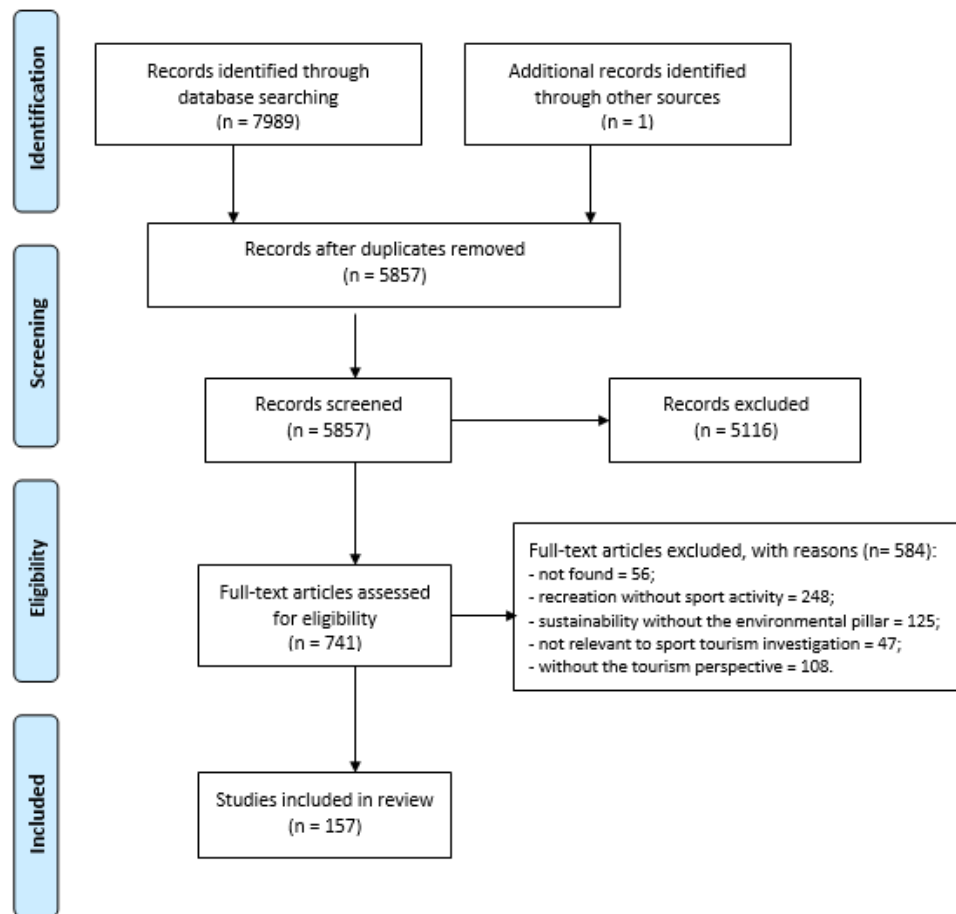
This process involved the review of data and the research process by the research team, who provided support, challenged the researchers' assumptions, including questioning the resulting interpretations (Creswell & Miller, 2000). It took place between the lead researcher (first author) and the second, third and fourth authors, who provided support on the process of conducting systematic reviews. Peer debrief took place throughout this study, by way of regular formal meetings and informal discussions.

## ***2.2. Data extraction and analysis***

The selected protocol to operationalize data collection was PRISMA (Moher et al., 2009). The data were exported using Endnote x7 software and treated with NVivo software – version 11. The flow chart of Figure 1 shows the development of this process.

**Figure 1.**

*PRISMA flow diagram based on Moher et al. (2009).*



This review also relied on content analysis (Hsieh & Shannon, 2005), such as that developed by Cheng et al. (2018) on adventure tourism. Since the conceptual framework for the theme under study is limited, the use of the content analysis into its conventional form allowed the use of the inductive method as a preferred way to design emerging categories of data (Hsieh & Shannon, 2005). Thus, the inductive method was used to define: (i) research focus categories based on the studies' aim – abstract and/or introduction section; (ii) main conclusions subcategories, based on the studies' key-findings – results and/or discussion sections, and (iii) practical implications subcategories, based on the studies' discussion and/or conclusion sections.

### 3. Results

#### 3.1. *Sports tourism contexts, actors and bibliometric analysis*

The results of the 157 articles that met the selection criteria revealed four contexts of study (Table 2): (a) ‘sports events’, including studies on mega-events, such as the Olympic Games and the world football championships; (b) ‘inland natural areas’ (INAs), encompassing research that focuses on natural parks and protected areas, snow tourism and golf tourism; (c) ‘costal and maritime areas’ (C&Ms), covering dive and surf tourism; and (d) ‘general contexts’, containing articles that explore sports tourism in a multiplicity of or without contextual specification. The most studied actors were sports practitioners (43.3%), followed by sports event organizations and sports tourism operators. The remaining actors – spectators, local residents, natural areas organizations and media – were investigated by less than 10% of the studies.

**Table 2.**

*Number of publications by sports tourism contexts and their actors.*

		Publications (n)	%
Sports tourism contexts	Sports Events	63	40.1
	Inland Natural Areas	54	34.4
	Coastal & Maritime Areas	29	18.5
	General Contexts	11	7.0
Total of the publications		157	100
Sports actors	Sports practitioners	68	43.3
	Sports events organizations	35	22.3
	Sports tourism operators	20	12.7
	Spectators	14	8.9
	Local residents	12	7.6
	Natural areas organizations	11	7.0
	Media	2	1.3
	Not applicable	16	10.2
Total of the publications*		157	100

\*Some publications account for more than one sports actor.

Considering the geography of the production of publications, the United States of America (USA) was the country that most studied the topic (20%); however, from a continental accounting perspective, Europe was the largest contributor, with 42% of the total selected studies.

The production of studies on sports events was led by Asia (13.4%), while the rest of the contexts (INAs, C&Ms and general) received the most attention from affiliated authors in Europe (18.5%, 7.6% and 3.8%, respectively).

Between 2013 and 2018, the average number of publications (pubs) was 19 pubs/year; however, in 2019, 42 pubs were obtained, representing a growth of 121% compared to the previous average, which covered all contexts under study with the exception of C&Ms whose peak occurred in 2016.

The selected articles (157) were published in 95 scientific journals (Table 3), highlighting the research in the field of sports tourism, as well as the top position of a sustainability literature journal.

**Table 3.***Number of publications by journals and by research areas.*

<b>Journals</b>	<b>Publications (n)</b>	<b>%</b>
Sustainability	15	9.6
Journal of Sustainable Tourism	13	8.3
Journal of Outdoor Recreation and Tourism	10	6.4
Journal of Sport & Tourism	10	6.4
Tourism Management	8	5.1
Environmental Management	4	2.5
Scandinavian Journal of Hospitality and Tourism	4	2.5
Total of publications in journals with more than 3 publications	64	40.8
Total of publications in journals with 3 or less publications	93	59.2
Total of publications	157	100
Total of publications in journals within the sport and tourism research area	74	47.1
Total of publications in journals within the sustainability and environmental research area	50	31.8
Total of publications in journals within others research area	33	21.1
Total of publications	157	100

### ***3.2. Theoretical framework***

The results showed that 31.2% of the studies presented a theoretical basis (Table 4), highlighting Theory of Planned Behaviour as the most used. This theory, as well as Value-Belief-Norm Theory, was used to infer about the psychological factors that influence the spectators' and sports practitioners' environmental behaviour. The other most used theories were Recreation Specialization Theory, served to investigate the relationship between sports practitioners and the natural space, underlining a positive association between greater sporting experience and pro-environmental attitude/behaviour, and Place-attachment Theory focuses on the positive influence that emotional connexion to space can have on an individual's environmental behaviour.



**Table 4.***Number of publications by theoretical frameworks.*

<b>Theory</b>	<b>Publications (n)</b>	<b>%</b>
Planned Behaviour	6	3.8
Recreation Specialization	5	3.1
Place-attachment	5	3.1
Value-Belief-Norm	4	2.5
Social Exchange	3	1.9
Sport Fan Sustainability Behaviour Model	2	1.8
Outcomes-Focused Management	2	1.8
Principal-agent Model	2	1.8
Tourism Area Life Cycle	2	1.8
Event Portfolio	2	1.8
Total of theories applied once	35	22.3
Total of theories applied	45	28.7
Total publications applying theories	49	31.2
Total of publications without theories	108	68.8
Total of the publications*	157	100

\*Multiple answers included – some publications used more than one theory.

### ***3.4. Research focus and methodological approach***

The objectives pursued by the selected studies were grouped into four categories: (a) ‘Environmental sustainability (ES) shaping factors’, comprising articles on factors capable of influencing the adoption of environmental sustainability in sports tourism (59,2%); (b) ‘ES strategies, practices and tools’, encompassing studies on strategies, practices and tools for the management and promotion of environmental sustainability in sports tourism (36,3%); (c) ‘Environmental impacts evaluation’, including articles on the identification and assessment of environmental impacts in sports tourism (19,7%); and (d) ‘Conceptualizations’, containing articles on theoretical models and concepts exploring the relationship between sports tourism and environmental sustainability (12,7%).

The majority of the selected investigations (82.2%) is empirical, while 17.8% of all studies represent non-empirical research (Table 5).

**Table 5.***Research designs and data collection methods.*

<b>Research design</b>	<b>Data collection methods</b>	<b>Publications (n)</b>	<b>%</b>
Empirical		129	82.2
	Quantitative	57	36.3
	Surveys	49	31.2
	Direct / participatory observations	9	5.7
	Waste / trash	2	1.3
	Documents / Web databases	2	1.3
	Websites / Social networks	1	0.6
	Car ships	1	0.6
	Media reports / Press releases	1	0.6
	Qualitative	38	24.2
	Interviews	27	17.2
	Documents / Web databases	17	10.8
	Direct / participatory observations	7	4.5
	Media reports / Press releases	7	4.5
	Websites / Social networks	6	3.8
	Geographical maps	4	2.5
	Eco-management regulations	1	0.6
	Mixed	34	21.7
	Surveys	27	17.2
	Interviews	20	12.7
	Direct / participatory observations	10	6.4
	Documents	10	6.4
	Geographical maps	7	4.5
	Websites / Social networks	1	0.6
	Waste / trash	1	0.6
	Media reports / Press releases	1	0.6
Non-empirical		28	17.8
	Conceptual	8	5.1
	Theoretical	14	8.9
	Review	6	3.8
	Total of publications with more than one data collection method	63	40.1
	Total of publications with experimental design	4	2.5
	Total of publications	157	100

A larger stain of the empirical literature involved a quantitative research design (36.3%), while 24.2% applied qualitative research methods and 21.7% used a mixed-methods approach. Among the non-empirical research, theoretical papers prevail (8.9%) over conceptual (5.1%), and literature reviews (3.8%).

There is a predominance of survey-based studies, whose respondents were mostly sports practitioners. There is also a prevalent use of interviews and direct/participatory observation as data collection methods. Geographical maps were used to determine the impacts generated by recreation and predominantly contextualized in INAs; media reports were used by studies on sports events to analyse environmental communication.

The use of experimental designs is sparse and mainly applied by studies in the C&Ms context. Among the total of the studies, 40.1% combined more than one data collection method, mainly due to research developed in the context of INAs.

### ***3.4. Selected studies' main conclusions***

#### **3.4.1. Environmental sustainability shaping factors.**

The results showed six factors with more influence on the environmental sustainability of sports tourism actors (Table 6): sports practice, perceptions, external pressures, environmental attitudes, environmental objectives, environmental knowledge and environmental preferences. The remaining eighteen ES shaping factors were examined by less than 10% of the studies, distributed by psychological, contextual, organizational and demographic factors.

**Table 6.***Environmental sustainability shaping factors by sport tourism contexts (n=93).*

Environmental sustainability shaping factors	Publications (n)					Total	%
	Inland Natural Areas	Sports Events	Coastal & Maritime Areas	General Contexts	Association (positive / negative)		
Sports practice	8		13	3	(14/10)	24	25.8
Perceptions	6	12	5		(10 / 13)	23	24.7
External pressures	5	12			(8 / 9)	17	18.3
Environmental attitudes	8	5	2	1	(10/ 6)	16	17.2
Environmental objectives	8	3	3		(8 / 6)	14	15.1
Environmental knowledge	5	2	3		(7 / 3)	10	10.8
Environmental preferences	5	1	4		(6 / 3)	10	10.8
Expectations	5	2	1		(6 / 2)	8	8.6
Place-attachment	3	2	2		(7 / 0)	7	7.5
Collaboration	1	4	2		(5 / 2)	7	7.5
Organizational benefits	4		2		(6 / 0)	6	6.5
Time & financial features	1	4			(0/5)	5	5.4
Values		4		1	(4 / 1)	5	5.4
Education level		1	2		(2 / 1)	3	3.2
Income	2	1			(2 / 1)	3	3.2
Environmental motivations	2		1		(1 / 2)	3	3.2
Organizations' dimension	2		1		(1 / 2)	3	3.2
Past environmental Behaviour context		2			(2 / 0)	2	2.2
Environmental regulations		3			(0 / 3)	2	2.2
Age		2			(0 / 2)	2	2.2
Gender	1	1			(2 / 0)	2	2.2
Psychological ownership		1			(1 / 0)	1	1.1
Political affiliation	1				(1 / 0)	1	1.1
		1			(1 / 0)	1	1.1
Total of publications*						93	100

\*Multiple answers included – some publications have more than one shaping factors.

The results exposed sports practice – including sports experience and the use of sports accessories/equipment – as the factor with the greatest power to influence the sustainability of sports practitioners. One of its benefits arises from the increased environmental awareness provided by nature-based activities. Another important factor for valuing the conservation of the natural space is the sports experience, particularly verified in the context of C&Ms: divers with more sporting experience have shown a

greater predisposition to pay for coral conservation (e.g., Emang et al., 2019); conversely, a more destructive behaviour of the marine biota was more noticeable among less experienced divers. The use of sports accessories and equipment by divers/snorkelers (i.e., cameras/musk sticks) proved to be harmful for the conservation of marine biota, even among the most experienced divers (Giglio et al., 2015).

In sports events' context, when the spectators positively perceived the environmental efforts developed by the events' organization, they exhibited more environmentally friendly behaviours (e.g., Han et al., 2015); the contrary was found when they understood that such initiatives were only a means to increase the profit of organizations. On the other hand, local residents' positive perception regarding the events' environmental impacts at the destination encouraged support for the respective hostage (e.g., Boonsiritomachai & Phonthanukitithaworn, 2019). In INAs and C&Ms contexts, sports practitioners revealed less environmentally friendly attitudes and behaviours when inconsistencies between the destination's environmental message and the respective sports offer were perceived (e.g., Hsiao, 2018). At INAs, local residents negatively perceived the environmental impacts of some tourist options taken by destinations, such as snowmaking practices at ski resorts (Hopkins, 2014). In contrast, at C&Ms, the local community positively perceived the importance of environmental benefits of surf tourism (Towner & Davies, 2019).

External pressures, mostly revealed in the sports events' context and exerted by public sector organizations, imposed the adoption of environmentally sustainable management practices at mega events; however, antagonistic interests to environmental management also constrained the respective operationalization (e.g., Gaffney, 2013). In INAs context, external pressures from stakeholders limited the adoption of good environmental practices by natural management organizations and sports tourism

operators; similar effects occurred due to the pressure of sports demand: for example, Purdie et al. (2020) verified the inconsistency between the promotion of environmental education in a natural park and the use of aerial means to facilitate the sports practitioners' accessibility to remote locations.

The sports practitioners' ecological attitudes positively influenced the intention/adoption of pro-environmental behaviours. Although more prominent in the INAs, this result crossed all sports tourism contexts: for example, golfers' environmental attitudes were preponderant in their intentions to use environmentally friendly golf courses (Lopez-Bonilla et al., 2018). However, an attitude-behaviour gap was also verified, since the environmental attitudes associated with nature-based sports practitioners were insufficient for adopting more ecological behaviours, such as the choice of ecological transport (Wicker, 2018).

The existence of environmental objectives by organizations motivated the adoption of good environmental practices, in the contexts of INAs, sports events and C&Ms. This finding was corroborated by results showing greater constraints in the implementation of environmental management initiatives, both by the sports tourism operators of the INAs, whose strategic objectives were only centred on the economic pillar of sustainability (e.g., Hopkins, 2014), as well as by natural management organizations (Dupke et al., 2019) with conflicting strategic and environmental objectives.

In INAs and M&Cs contexts, the sports practitioners' environmental knowledge about the natural space was positively related to the adoption of good environmental practices; in sports events context, knowledge transfer among sports event organizations fostered environmental sustainability (Samuel & Stubbs, 2013).

Finally, the sports practitioners' environmental preferences contributed to sustainability, due to the attributed valorisation to sports practice in natural spaces favouring biodiversity (e.g., Emang et al., 2019).

### 3.4.2. Environmental sustainability strategies, practices and tools.

The results (Table 7) revealed a prevalence of research around tools (47.4%), followed by strategies (29.8%) and lastly, environmental sustainability practices (26.3%) in sports tourism organizations.

**Table 7.**

*Environmental sustainability strategies, practices and tools (n=57).*

Research focus	Outcomes	Publications	%
Strategies		17	29.8
	Natural resources management	8	14.0
	Carbon emissions mitigation	7	12.3
	Environmental communication	2	3.5
Practices		15	26.3
	Sports events' sustainable planning and infrastructures management	9	15.8
	Environmental campaigns	6	10.5
	Organizational environmental practices	2	3.5
Tools		27	47.4
	Total of publications*	57	100

\*Some publications account for multiple options.

The results revealed a prevalence of strategies addressing the mitigation of carbon emissions and the efficient management of natural resources, such as options for the event's location (e.g., Pereira et al., 2017) and diving tourism management strategy (Augustine et al., 2016). Less expressively, the results revealed environmental communication strategies: at INAs, social marketing was used to promote behavioural changes among sports practitioners and at sports events, for the dissemination of environmental sustainability media content.

In the context of sports events, most practices in environmental management aimed at the elaboration of an adequate planning and consequent execution of the mega events' infrastructure, and also, environmental education initiatives. In the events in natural space, the results revealed the implementation of practices regarding the limitation of the number of participants, redirection of traffic and zoning of the event (Malchrowicz-Moško et al., 2019). At INAs, practices included environmental education campaigns, ecoroutes and signage. Finally, few studies contextualized in C&Ms examined environmental sustainability practices in intraorganizational management, showing the promotion of energy efficiency, consumption of environmentally friendly products and implementation of recycling/reuse programs (Carneiro et al., 2016) of sports tourism operators.

In INAs and C&Ms contexts, most of the tools to assist the implementation and assessment of environmental sustainability was based on the analysis and mapping of the natural space, using new technologies, such as web share services (Campelo & Mendes, 2016). Regarding sports events, the tools were mostly directed to mega events.

### 3.4.3. Environmental impacts evaluation.

Mainly, the assessment of environmental impacts (Table 8) focused on the pressure of recreational sport on the soil (32.3%) and marine biota (25.8%).

**Table 8.**

*Environmental impacts evaluation outcomes (n=31).*

Outcomes	Publications (n)	%
<b>Soil</b>	10	32.3
<b>Marine biota</b>	8	25.8
<b>Transport</b>	8	25.8
<b>Waste</b>	3	9.7
<b>Mix (transport, accommodation, waste, etc.)</b>	2	6.5
Total of publications	31	100



Regarding the INAs, the results showed that the use of trails causes most impacts at the level of soil erosion and fragmentation, pollution, and fauna disturbance (Dixon & Hawes, 2015); soil erosion was also a consequence of trails usage in hosting nature sports events. In C&Ms context, divers' physical contact has caused most of the environmental impacts on marine biota.

The environmental impacts of transport and waste were mostly assessed in the sports events' context, comprising the quantification of carbon emissions generated by the travel of spectators and sports teams (e.g., Dolf & Teehan, 2015) and by the generation of waste (e.g., Costello et al., 2017). The carbon emissions' assessment, by quantifying the contributing areas to such emissions, was also carried out, through the carbon footprint (Andersson et al., 2016) and the life cycle assessment (Edwards et al., 2016), revealing the importance of impacts associated with accommodation and transport. Concerning the INAs, transport's carbon emissions were also assessed, both as regarding snow tourism consumers' traveling (Wicker, 2018) and the operations and ecomobility of snow resorts (Rutty et al., 2014).

### **3.4.4. Conceptualizations.**

The majority (60%) of studies dedicated to conceptualizing the environmental sustainability of sports tourism focused on the sports events' context, regarding to environmental legacies and impacts (Gold & Gold, 2013), for example.

In the general contexts, which obtained 35% of the results, the studies focused on human-nature interaction, introducing several thematic areas and concepts within the scope of environmental behaviour/awareness of sports tourism, such as the recreation

ecology, in the review of the environmental impacts of sports tourism (e.g., Monz et al., 2013).

### 3.5. Selected studies' implications

In terms of recommendations, most studies addressed the implications for management compared to those of a theoretical nature (Table 9).

**Table 9.**

*Implications of the included studies (n=137).*

Implications	Publications (n)	%
<b>Management Implications</b>	128	93.4
<b>Operationalization</b>	68	49.6
<b>Environmental monitoring</b>	34	24.8
<b>Tailoring for sport actor</b>	33	24.1
<b>Collaboration</b>	31	22.6
<b>Communication</b>	31	22.6
<b>Environmental education</b>	31	22.6
<b>Planning</b>	27	19.7
<b>Theoretical Implications</b>	27	19.7
<b>Sports Event context</b>		
(Sustainable Development Goals framework; legacy; post political thinking; events portfolio; environmental evaluation approach; sport sustainability evaluation campaign model; green mind theory; social exchange theory; life cycle assessment)	9	6.6
<b>General Contexts</b>		
(Recreation ecology; sustainable tourism; environmental connectedness; means-ends change theory; participatory ecological approach; outdoor adventure)	8	5.8
<b>C&amp;Ms</b>		
(Triple bottom line; ecosystem services; theory of planned behaviour; co-branding; socio-ecological system framework)	6	4.4
<b>INAs</b>		
(model for the environmental behaviour of sport practitioners; integrative perspective for golfer's experience; theory of the reasoned action and planned behaviour; brief ecological paradigm and revised tourist ecological orientation scales)	4	2.9
Total of the publications*	137	100

\* Some publications account for more than one implication.

### **3.5.1. Management implications.**

Among the implications for sports tourism management evidenced by the results, the operationalization of environmental sustainability prevailed in all contexts. Thus, for sports events, the operationalization of supportive guidelines, measures, regulations and permanent commitments was recommended to: promote the integration of environmental sustainability in strategic and operational management. The sporting events themselves must also be held as vehicles for encouraging environmental sustainability (e.g., Harris, 2013), integrating sustainable management in the use of temporary/existing infrastructure and rehabilitating trails consigned to sporting events in natural space. Finally, the greenest transport options should be operationalized, namely, carpooling, public transport, parking policies (e.g., Triantafyllidis et al., 2018), reduction of long distance travel (e.g., Dolf & Teehan, 2015) and choice of host cities according to the associated carbon emissions (Pereira et al., 2017).

In the INAs, the operationalization of environmental sustainability was oriented to the regulation of access to natural areas, through zoning (e.g., Dixon & Hawes, 2015), limiting the number of visitors, through the use of carrying/bed capacity (e.g., Uusitalo & Sarala, 2016) and entrance fees (e.g., Dumitras et al., 2017). The results also showed that policies should be established to encourage the economic valorisation of the environmental heritage (Wicker, 2018), as well as the management of natural spaces for sports practice; for example, the offer must focus on the specific attributes of the natural space, throughout the year, combating seasonality and the consequent environmental pressure caused by the peaks of sports tourism (Santarem et al., 2015).

In C&Ms, the implementation of measures to mitigate the environmental impact was also recommended, highlighting: the use of artificial coral reefs (Belhassen et al.,

2017); the implementation of specific programs and training to promote low impact behaviour in dive tourism and zoning of marine/coastal areas (Hammerton, 2017). In general contexts, the results recommended the operationalization of the inclusion of the environmental dimension in the development of business models for sports tourism (Perić et al., 2016) and measures to regulate accessibility to natural spaces (e.g., Monz et al., 2013). In addition, there were recommendations to leverage sustainability through nature-based activities (e.g., Varley & Semple, 2015).

As for the remaining implications, the results also distinguished the need for: (a) more environmental monitoring of sports tourism in the natural environment (e.g. Dixon & Hawes, 2015); (b) sports actors' segmentation according to their motivations (Ho et al., 2015); (c) collaboration between all stakeholders and with scientific institutions (Dupke et al., 2019); (d) strengthening the communication of environmental efforts/initiatives (e.g. Han et al., 2015); (e) intensification of environmental education actions (e.g. Kil et al., 2014); and (f) planning for the sustainability of sports tourism (Augustine et al., 2016).

### **3.5.2. Theoretical implications.**

The context of sport events was the most contemplated with theoretical implications (Table 9), which provided new approaches to the study of sport events organizations, sport practitioners, local residents and spectators such as the adoption of the SDG theoretical framework (Crabb, 2018) and events portfolio (Ziakas, 2019), the environmental valuation approach (Saayman et al., 2016), social exchange theory (e.g. Boonsiritomachai & Phonthanakitithaworn, 2019) and life cycle assessment (Dolf & Teehan, 2015), respectively.

The research in the remaining sport tourism contexts provided an addition to the theoretical approaches on outdoor and nature-based sport activities, mainly focused on the environmental impact of recreation in the natural space, i.e., recreation ecology (Monz et al., 2013), as well as on the factors that foster greater environmental awareness and action, i.e., environmental connectedness (Beery & Wolf-Watz, 2014). In turn, the theoretical implications advanced by studies contextualized in C&Ms favoured the management of sport tourism by addressing, for examples, the triple bottom line (Carneiro et al., 2016) and ecosystem services (Drius et al., 2019).

### **4. Discussion**

Similar to previous studies on sport and the environment (Mallen, 2018; Vaugeois et al., 2017), this review has shown that science has given increasing attention to the relationship between sports tourism and environmental sustainability. The clear predominance of Europe and the USA in conducting the investigation had already been verified in the review on natural and protected areas (Pickering et al., 2018). Among the contexts of sports tourism, sports events and INAs stood out in the investigation of environmental issues, consolidating the literature highlighting the importance of sports events in the context of tourism (Weed, 2014) and corroborating the results of review studies on the sport's environmental impacts in the natural environment (Monz et al., 2013; Sumanapala & Wolf, 2019). Compared to the study by Pickering et al. (2018), this review was able to highlight the context of marine areas, through the analysis of the dimension of sports tourism related to C&Ms.

Predominantly, the assessment of environmental impacts focused on the quantification of topics associated with the natural resources of INAs and the carbon

emissions generated by the transport of sports events. Regarding impacts on soil, fauna and marine biota, the results were aligned with the findings of Pickering et al. (2018).

This review also demonstrated the importance that investigation has given to the analysis of environmental sustainability shaping factors.

In this sequence, in the sports events' context, the results showed the positive and negative importance of external pressures in the pursuit of environmental sustainability by sports event organizations, certifying what had already been identified in the sports literature (Trendafilova et al., 2013); in addition, the positive perception of the environmental efforts undertaken by organizations and the environmental benefits provided by sports tourism reinforce the spectators' environmental behaviour (Casper et al., 2020) and the support of local residents (Towner & Davies, 2019), respectively. This finding complements the positive role of perceptions about sponsors in the image, consumption and implementation of sustainable consumption practices, as evidenced by Melovic et al. (2019). However, the negative perception regarding the environmental impacts generated by sports tourism may condition the local residents' support (Boonsiritomachai & Phonthanukitithaworn, 2019), justifying the study of these sports actors in the light of the Social Exchange Theory. The supremacy of these factors underlies the recommendations to: (a) increase environmental communication, covering both sides of the sports tourism market (i.e. supply: organizations; and demand: spectators/local residents); (b) operationalize mitigating measures for environmental impacts, ranging from sports infrastructures to the host city itself; and (c) deepen the investigation of the subject under study (Weed, 2014).

In INAs' context, environmental attitudes have often been associated with increased environmental behaviour, corroborating the literature on sustainable tourists

(Wong et al., 2020). Nevertheless, the attitude-behaviour gap verified in tourism warns of the complexity of analysing this relationship. Thus, as advocated by Wicker (2018), studying the environmental behaviours which are intended to influence has to contemplate the intensity of the effort that has to be undertaken by the spectator/sports practitioner; for example, there may be a greater predisposition to recycle than to use sustainable transport, not because of the underlying environmental attitude, but simply, because it implies less effort. Still in INAs' context, the existence of environmental objectives in sports organizations has propelled environmental sustainability. Yet, the dichotomy of the objectives pursued by natural management organizations – i.e. to conserve the natural space and simultaneously use nature to foster active sport and leisure (Borgstrom et al., 2013; Dupke et al., 2019) – generates a conflict in the adoption of a concerted strategy capable of promoting, at the same time, sports tourism and nature conservation (Malchrowicz-Moško et al., 2019). This is a difficult conflict to reconcile, because although sport does not enjoy immunity in terms of generating environmental impacts (Sumanapala & Wolf, 2019), it was considered one of the main drivers to increase the environmental sustainability (Mullins, 2014; Varley & Semple, 2015), consolidating the results of van Riper et al. (2020). It is also important to highlight the preponderance of environmental education in the role of sport managers (Graham et al., 2018; Mercado & Grady, 2017; Rodrigues & Payne, 2017), since their ecological sensitivity seems to be decisive in the adoption of management practices more oriented towards environmental preservation (Salome, et al., 2013); for this reason, future studies should deepen this line of investigation.

In C&Ms' context, the sports experience and the use of sports accessories were highlighted as factors that influence environmental sustainability. Some studies (Augustine et al., 2016; Tverijonaite et al., 2018) showed recent changes in the profile of

natural areas' tourists, particularly with regard to low sports specialization, foreseeing the massification of tourism in natural spaces and the consequent obstacle to environmental sustainability. Concomitantly, a strong recommendation to promote environmental sustainability in natural areas was to limit accessibility to natural spaces for the purpose of sporting practice, corroborating the tourism literature (Whitelaw et al., 2014). In this sequence, the sustainable marketing approach can bring benefits, focusing on the product development approach, according to which the tourism offer must present sustainable tourism products, based on attributes that, in addition to the environmental ones, are also capable of stimulating sports demand (Font & McCabe, 2017); for example, the offer can promote the quality of artificial reef dives for less experienced practitioners, mitigating the environmental impact on marine biota.

Across all studied contexts, this review highlighted the strong consistency of education in promoting sport tourists' pro-environmental behaviours. Thus, sports events were emphasized as a vehicle for environmental education (Harris, 2013), so the perspective of strategic leverage of environmental sustainability must be considered, case by case, to ensure the effectiveness of its implementation (O'Brien & Chalip, 2008; Pereira et al., 2019). In line with the findings of Ardoin et al. (2015), sports practice in natural spaces also endorses ecological behaviours, so its effective operationalization in nature-based activities and ecotourism was highly recommended.

Additionally, the benefits of environmental communication through social marketing (Borden & Mahamane, 2020) with nature-based sports practitioners were also verified, reinforcing the findings of Martin et al. (2017) and emphasizing the need to segment these sports actors, in favour of the effectiveness of such communication (Font & McCabe, 2017).



This review also underlined the need for political actions to guide the effective shift of environmental behaviour, confirming what was proclaimed by Hofman et al. (2020) in relation to sustainable C&Ms tourism.

In turn, collaboration between stakeholders was another important factor in implementing sustainability by sports tourism organizations, also evidenced in the literature of sports organizations (Trendafilova & McCullough, 2018; Weed, 2014). The extension of collaboration to scientific organizations, facilitating the production/transfer of knowledge on environmental issues to natural areas organizations (Dupke et al., 2019; Wolf et al., 2019) was another recommendation of this review. In this sequence, this review supports the vision of Wäsche and Woll (2013), advising the development of networking in sports tourism, which must manage the acquisition of benefits and the mitigation of negative social, economic and environmental impacts, and attend to the key factors such as mutual trust, planning, innovation, effective communication and a coordinating actor.

In view of the research gaps found in this review, future research should focus on: (i) the least studied sports actors; (ii) the environmental impacts of nature-based sports events; (iii) the carbon emissions generated by sports tourism; and (iv) sports organizations' environmental management practices.

Thus, the results pointed to a predominance of the study of sports practitioners, followed by sports event organizations and a research gap regarding other essential elements of sports tourism's demand (e.g., athletes, spectators and local residents) and supply (sports tourism operators and natural areas management). Considering the scarcity of studies focused on spectators and local residents, cross-contextual spillover should be further investigated, given the importance of results for sustainable sports tourism, not

only as a tourism product, but as a fostering sustainability product across leisure and daily life (Xu et al., 2020). Although playing an important role in the dissemination of information, education and pressure that can be exerted on sports actors in favour of environmental sustainability (Preuss, 2013), the media has also been poorly investigated.

The high capacity of events to attract people to destinations, and the consequent ecological damage, generates a paradox that needs further attention by the investigation. Recognizing the importance of sports events and INAs in the study of environmental sustainability, this review also advises to fill the scientific gap found at the level of specific scrutiny of the environmental impacts related to sporting events in natural spaces. Considering today's great concern about climate change (WTO, 2019) and the sparse research on the topic, with little dedication to the complete study of carbon emissions, this review warns of such a research gap. Alongside, this review stresses that future studies should deepen its knowledge, looking for relational links between the actors involved in the carbon emission of this tourist cluster, reinforcing the recommendations of Orr and Inoue (2019) and Sharpley (2020). Also, underlines the strong recommendation of research on sports events to develop strategies capable of mitigating transport's carbon emissions (e.g., reducing air transport and long-distance travel), reinforcing what was proclaimed in other studies on tourism (Lohmann & Scott, 2018; Scott, et al., 2010).

Although important to implement environmental sustainability (Vaugeois et al., 2017), the study of strategies and tools was broader than the investigation of the sports tourism organizations' environmental practices and their impacts; therefore, future research should focus on this crucial area of environmental management. Also, the prevalence of the use of quantitative research methodologies found in this review, recommends that future research uses qualitative and mixed-methods to increase the

understanding of the processes associated with the development of strategies and practices for managing environmental sustainability.

Additionally, considering the relevance of SGDs in sports tourism (WTO, 2019), this review revealed a gap in their focus, only used to analyse the environmental projects of a mega event (Crabb, 2018). Also, given the potential of sports events to promote environmental education and behaviour, this review only found a model capable of ascertaining the environmental intentions of the sports tourists targeted by the respective campaigns (Trail & McCullough, 2020). This review also underlined the lack of theoretical implications for the study of environmental sustainability in the sports management of INAs, whose substantial focus was the behaviour of outdoor sports practitioners.

Finally, the authors of this review are aware that the studies that specified sports modalities, not mentioning the general words that identify the sports context contained in the search query, were not included in this review, although they may be relevant. This is a limitation of the present investigation.

### **5. Conclusion**

The current consumption patterns, and the consequent environmental degradation and rarefaction of natural resources, underpin one of the greatest challenges facing Humanity. It is therefore necessary to abandon the logic of negligent behaviour towards the imperative of preserving the ecological heritage, both in the production and consumption of sports tourism, in favour of sustainable tourism architecture (WTO, 2019).

This systematic review of the literature allowed to synthesize the scientific knowledge recently produced on the relationship between sports tourism and

environmental sustainability. The growing interest in the topic is evident and researching has been led by Europe and the USA.

The present review highlighted the importance of the sports events and inland natural areas contexts in the relationship between sports tourism and environmental sustainability, and also filled a gap in the literature regarding the context of coastal and marine areas. In addition, it showed a predominance of studies on sports practitioners and sports event organizations and a research gap regarding spectators, local residents, sports tourism operators, natural areas management organizations and media.

The theories of Planned Behaviour and Recreation Specialization were evidenced in the theoretical framework, to infer about the factors that influence the environmental behaviour of sports practitioners and spectators.

Among the sports actors' environmental sustainability shaping factors across the sports tourism contexts, the sports practice, perceptions and demand and supply pressures, stood out for their importance in the adoption of environmental sustainability. Thus, topics such as environmental communication and education should receive more attention, as well as the operationalization of environmental sustainability through the promotion of nature-based sports tourism activities.

The differentiation of sports tourism contexts also exposed interesting results, highlighting the following associations: external pressures at sports events; environmental attitudes of sports practitioners in inland natural areas; and sports practice in natural areas, especially in coastal and marine areas. However, the results related to environmental attitudes emphasized inconsistencies in relation to their ability to predict environmental behaviour, so the attitude-behaviour gap deserves further scientific reflection.

The results on the assessment of the environmental impacts also showed contextual differences, suggesting the deepening of the study of transport as a transversal topic to the various contexts of sports tourism. The analysis of strategies, practices and tools contributed to highlight the need for more research in relation to what is effectively being practiced by the management of sports tourism organizations. In fact, a greater number of studies have presented tools helping the adoption, implementation or monitoring of environmental sustainability, among which the use of new technologies has stood out.

This review reflected on a set of implications for environmental management, namely: the promotion of environmental education across all sports actors, both on the demand and supply sides of sports tourism; at sports events, managers of sports organizations must collaborate with each other in the development of environmental initiatives; as the spectators' environmental behaviours were positively associated with their perception of the environmental efforts developed by the organization of sporting events, the respective leveraging processes should be oriented towards the increase of these behaviours. Also, sports events must adopt supportive guidelines, regulations and permanent commitments, and that both the infrastructure and the trails used by sporting events in nature are managed in order to guarantee their sustainability. In addition, the environmental impacts related to sporting events in natural space have been poorly examined, requiring further investigation. The external pressures exerted by the political sector in mega-events led to the adoption of environmentally sustainable management practices, highlighting the role of governance in increasing sustainability in the management of sports tourism. The relevance of the results regarding the sporting experience in natural areas, justifies that, in certain ecosystems, the sporting practice is

limited to experienced practitioners and that alternatives are created for the less inexperienced.

In conclusion, this review allowed the reflection of a broader spectrum of factors, topics and concepts capable of influencing the environmental behaviour of the players in the sports tourism market, which will facilitate the efficiency of new studies assisting sports tourism in the path of sustainability.

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## Appendix A. Systematic literature review's included studies: identification and characterization.

ID	Study reference	Study context	Sport actors	Research focus subcategory	Implications
1	Abujamous, I. M., Jawabreh, O. A. A., Jahmani, A., Alsarayreh, M. N., & Harazneh, A. A. (2019). Developing tourism through sports events to assist in the rejuvenation of the strategic position of the Aqaba Special Economic Zone Authority (ASEZA). <i>African Journal of Hospitality, Tourism and Leisure</i> , 8(4). <a href="https://www.ajhtl.com/uploads/7/1/6/3/7163688/article_39_vol_8_4_2019_jordan.pdf">https://www.ajhtl.com/uploads/7/1/6/3/7163688/article_39_vol_8_4_2019_jordan.pdf</a>	Sport Events	Residents	[Shaping Factors]	[Management: Operationalization]
2	Akiyanova, F., Atalikhova, A., Jussupova, Z., Simbatova, A., & Nazhbiev, A. (2019). Current state of ecosystems and their recreational use of the burabai national park (Northern Kazakhstan). <i>EurAsian Journal of BioSciences</i> , 13(2), 1231-1243.	Inland Natural Areas	not applicable	[Impacts Evaluation]	[Management: Operationalization; Monitoring]
3	An, H., Xiao, C., & Ding, M. (2019). The spatial pattern of ski areas and its driving factors in China: A strategy for healthy development of the ski industry. <i>Sustainability (Switzerland)</i> , 11(11). <a href="https://doi.org/10.3390/su11113138">https://doi.org/10.3390/su11113138</a>	Inland Natural Areas	Sport Tourism Operators	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Monitoring; Planning]
4	Andersson, T. D., Armbrrecht, J., & Lundberg, E. (2016). Triple impact assessments of the 2013 European athletics indoor championship in Gothenburg. <i>Scandinavian Journal of Hospitality and Tourism</i> , 16(2), 158-179. <a href="https://doi.org/10.1080/15022250.2015.1108863">https://doi.org/10.1080/15022250.2015.1108863</a>	Sport Events	Spectators, Sport Practitioners	[Impacts Evaluation]	[Management: Operationalization]
5	Arnberger, A., Eder, R., Allex, B., Preisel, H., & Husslein, M. (2019). National park affinity segments of overnight tourists differ in satisfaction with, attitudes towards, and specialization in, national parks: Results from the Bavarian Forest National Park. <i>Journal for Nature Conservation</i> , 47, 93-102. <a href="https://doi.org/10.1016/j.jnc.2018.09.005">https://doi.org/10.1016/j.jnc.2018.09.005</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Tailoring]
6	Atcharyasopon, K. (2017). Sustainable solid waste management in sports events: A case study of football matches in Thailand. <i>Journal of Population and Social Studies</i> , 25(1), 69-81. doi: 10.14456/jpss.2017.6	Sport Events	Spectators, Sport Event Organizations	[Impacts Evaluation] [Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Communication; Collaboration]

7	Augustine, S., Dearden, P., & Rollins, R. (2016). Are changing diver characteristics important for coral reef conservation? <i>Aquatic Conservation: Marine and Freshwater Ecosystems</i> , 26(4), 660-673. <a href="https://doi.org/10.1002/aqc.2574">https://doi.org/10.1002/aqc.2574</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Education; Planning; Tailoring]
8	Azzali, S. (2017). Queen Elizabeth Olympic Park: an assessment of the 2012 London Games Legacies. <i>City, Territory and Architecture</i> , 4(1). <a href="https://doi.org/10.1186/s40410-017-0066-0">https://doi.org/10.1186/s40410-017-0066-0</a>	Sport Events	Sport Event Organizations	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Planning]
9	Azzali, S. (2019). Mega sporting events and their impact on the built environment: Lessons learned from the past. <i>A/Z ITU Journal of the Faculty of Architecture</i> , 16(2), 25-37. <a href="https://doi.org/10.5505/ituja.2019.12499">https://doi.org/10.5505/ituja.2019.12499</a>	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	[Management: Operationalization]
10	Babí, J., Inglés, E., & Soler, S. (2019). Trail races in protected mountain areas and their effects on sustainable development. <i>Eco.mont</i> , 11(2), 18-26. doi: 10.1553/eco.mont-11-2s18	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	0
11	Beery, T. H., & Wolf-Watz, D. (2014). Nature to place: Rethinking the environmental connectedness perspective. <i>Journal of Environmental Psychology</i> , 40, 198-205. <a href="https://doi.org/10.1016/j.jenvp.2014.06.006">https://doi.org/10.1016/j.jenvp.2014.06.006</a>	General Contexts	Sport Practitioners	[Conceptualizations] [Shaping Factors]	[Theoretical]
12	Beery, T., & Jonsson, K. I. (2017). Outdoor recreation and place attachment: Exploring the potential of outdoor recreation within a UNESCO Biosphere Reserve. <i>Journal of Outdoor Recreation and Tourism-Research Planning and Management</i> , 17, 54-63. <a href="https://doi.org/10.1016/j.jort.2017.01.002">https://doi.org/10.1016/j.jort.2017.01.002</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Education]
13	Belhassen, Y., Rousseau, M., Tynyakov, J., & Shashar, N. (2017). Evaluating the attractiveness and effectiveness of artificial coral reefs as a recreational ecosystem service. <i>Journal of Environmental Management</i> , 203, 448-456. <a href="https://org.doi/10.1016/j.jenvman.2017.08.020">https://org.doi/10.1016/j.jenvman.2017.08.020</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation] [Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Tailoring]
14	Biggs, D., Amar, F., Valdebenito, A., & Gelcich, S. (2016). Potential synergies between nature-based tourism and sustainable use of marine resources: Insights from dive tourism in territorial user rights for fisheries in Chile. <i>PLOS ONE</i> , 11(3). <a href="https://doi.org/10.1371/journal.pone.0148862">https://doi.org/10.1371/journal.pone.0148862</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Management: Collaboration]
15	Boonsiritomachai, W., & Phonthanukitithaworn, C. (2019). Residents' Support for Sports Events Tourism Development in Beach City: The Role of Community's Participation and Tourism Impacts. <i>Sage Open</i> , 9(2), 2158244019843417. <a href="https://doi.org/10.1177/2158244019843417">https://doi.org/10.1177/2158244019843417</a>	Sport Events	Residents	[Shaping Factors]	[Theoretical] [Management: Operationalization; Communication; Monitoring]



16	Borden, D. S., & Mahamane, S. (2020). Social marketing and outdoor recreational advocacy groups: Lessons from a rock climbing campaign. <i>Journal of Outdoor Recreation and Tourism</i> , 29. <a href="https://doi.org/10.1016/j.jort.2019.100262">https://doi.org/10.1016/j.jort.2019.100262</a>	Inland Natural Areas	Sport Practitioners	[Strategies, Practices & Tools]	[Management: Communication; Collaboration; Tailoring]
17	Borisova, T., Bi, X., Larkin, S., & Longanecker, J. (2016). Assessing nature-based recreation to support economic development and environmental sustainability extension programs. <i>Journal of Extension</i> , 54(5), 5RIB1, ISSN: EISSN-1077-5315	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization]
18	Boukas, N., & Ziakas, V. (2013). Exploring perceptions for Cyprus as a sustainable golf destination: Motivational and attitudinal orientations of golf tourists. <i>International Journal of Sport Management and Marketing</i> , 14(1-4), 39-70. <a href="https://doi.org/10.1504/IJSMM.2013.060639">https://doi.org/10.1504/IJSMM.2013.060639</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Communication; Collaboration; Education]
19	Boykoff, J., & Mascarenhas, G. (2016). The Olympics, Sustainability, and Greenwashing: The Rio 2016 Summer Games. <i>Capitalism, Nature, Socialism</i> , 27(2), 1-11. <a href="https://doi.org/10.1080/10455752.2016.1179473">https://doi.org/10.1080/10455752.2016.1179473</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	0
20	Campelo, M. B., & Mendes, R. M. N. (2016). Comparing webshare services to assess mountain bike use in protected areas. <i>Journal of Outdoor Recreation and Tourism-Research Planning and Management</i> , 15, 82-88. <a href="https://doi.org/10.1016/j.jort.2016.08.001">https://doi.org/10.1016/j.jort.2016.08.001</a>	Inland Natural Areas	Sport Practitioners	[Strategies, Practices & Tools]	0
21	Canteiro, M., Cordova-Tapia, F., & Brazeiroc, A. (2018). Tourism impact assessment: A tool to evaluate the environmental impacts of touristic activities in Natural Protected Areas. <i>Tourism Management Perspectives</i> , 28, 220-227. <a href="https://doi.org/10.1016/j.tmp.2018.09.007">https://doi.org/10.1016/j.tmp.2018.09.007</a>	Inland Natural Areas	Natural Areas Organizations	[Impacts Evaluation] [Strategies, Practices & Tools]	[Management: Operationalization; Monitoring]
22	Carneiro, M. J., Breda, Z., & Cordeiro, C. (2016). Sports tourism development and destination sustainability: the case of the coastal area of the Aveiro region, Portugal. <i>Journal of Sport and Tourism</i> , 20(3-4), 305-334. <a href="https://doi.org/10.1080/14775085.2016.1220863">https://doi.org/10.1080/14775085.2016.1220863</a>	Coastal & Maritime Areas	Sport Tourism Operators	[Shaping Factors] [Strategies, Practices & Tools]	[Theoretical] [Management: Collaboration]
23	Carvalhinho, L., Rosa, P., & Gomes, F. (2015). Hiking trails evaluation in the natural park of serras de aire e candeeiros, Portugal. <i>European Journal of Tourism Hospitality and Recreation</i> , 6(2), 139-156.	Inland Natural Areas	not applicable	[Impacts Evaluation]	[Management: Monitoring]
24	Casper, J. M., McCullough, B. P., & Pfahl, M. E. (2019). Examining environmental fan engagement initiatives through values and norms with intercollegiate sport fans. <i>Sport Management Review</i> . <a href="https://doi.org/10.1016/j.smr.2019.03.005">https://doi.org/10.1016/j.smr.2019.03.005</a>	Sport Events	Spectators	[Shaping Factors]	[Management: Communication; Tailoring]

25	Casper, J. M., Pfahl, M. E., & McCullough, B. P. (2017). Is Going Green Worth It? Assessing Fan Engagement and Perceptions of Athletic Department Environmental Efforts. <i>Journal of Applied Sport Management</i> , 9(1), 106-129. <a href="https://doi.org/10.18666/JASM-2017-V9-I1-7690">https://doi.org/10.18666/JASM-2017-V9-I1-7690</a>	Sport Events	Spectators	[Shaping Factors]	[Management: Operationalization, Tailoring]
26	Cetin, M., Onac, A. K., Sevik, H., Canturk, U., & Akpınar, H. (2018). Chronicles and geoheritage of the ancient Roman city of Pompeiopolis: a landscape plan. <i>Arabian Journal of Geosciences</i> , 11(24). <a href="https://doi.org/10.1007/s12517-018-4170-6">https://doi.org/10.1007/s12517-018-4170-6</a>	Inland Natural Areas	not applicable	[Strategies, Practices & Tools]	[Management: Operationalization; Education; Tailoring; Planning]
27	Chen, T., Ku, K., & Chen, C. (2016). Collaborative adaptive management for bigfin squid applied to tourism-related activities in coastal waters of Northeast Taiwan. <i>Ocean and Coastal Management</i> , 119, 208-216. <a href="https://doi.org/10.1016/j.ocecoaman.2015.10.010">https://doi.org/10.1016/j.ocecoaman.2015.10.010</a>	Coastal & Maritime Areas	not applicable	[Strategies, Practices & Tools]	0
28	Chen, X., Niu, J., Nakagami, K., Zhang, Q., Qian, X., & Nakajima, J. (2018). Green sports supporting a low-carbon society: Inspiration from Japan. <i>International Journal of Global Warming</i> , 14(1), 61-80. <a href="https://doi.org/10.1504/IJGW.2018.088645">https://doi.org/10.1504/IJGW.2018.088645</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	0
29	Chung, S. S., Au, A., & Qiu, J. W. (2013). Understanding the underwater behaviour of scuba divers in Hong Kong. <i>Environmental Management</i> , 51(4), 824-837. <a href="https://doi.org/10.1007/s00267-013-0023-y">https://doi.org/10.1007/s00267-013-0023-y</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation], [Shaping Factors]	[Management: Operationalization; Education]
30	Coglievina, C., Massiera, B., Morales, V., & Ben Mahmoud, I. (2016). Territorial dynamics of the bay of villefranche-sur-mer (french riviera): from commercial and military vocation to tourism and sporting activities. <i>Anais Brasileiros De Estudos Turisticos-Abet</i> , 6(3), 76-84.	Coastal & Maritime Areas	not applicable	[Shaping Factors]	0
31	Costello, C., McGarvey, R. G., & Birisci, E. (2017). Achieving sustainability beyond zero waste: A case study from a college football stadium. <i>Sustainability (Switzerland)</i> , 9(7). <a href="https://doi.org/10.3390/su9071236">https://doi.org/10.3390/su9071236</a>	Sport Events	Sport Event Organizations	[Impacts Evaluation] [Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Communication]
32	Crabb, L. A. H. (2018). Debating the success of carbon-offsetting projects at sports mega-events. A case from the 2014 FIFA World Cup. <i>Journal of Sustainable Forestry</i> , 37(2), 178-196. <a href="https://doi.org/10.1080/10549811.2017.1364652">https://doi.org/10.1080/10549811.2017.1364652</a>	Sport Events	Sport Event Organizations	[Shaping Factors]	[Theoretical]

33	Davies, M., Hungenberg, E., & Aicher, T. (2019). The relationship between runner environmental paradigm and their motives to participate in an urban or rural marathon. <i>International Journal of Event and Festival Management</i> , 10(1), 48-66. doi: 10.1108/IJEFM-02-2018-0013	Sport Events	Sport Practitioners	[Shaping Factors]	[Management: Communication; Collaboration; Tailoring]
34	Demirel, M., Demirel, D. H., & Isik, U. (2016). Environmental sustainability for future generations (A comparison of 2020's candidate cities). <i>Anthropologist</i> , 24(2), 652-656. <a href="https://doi.org/10.1080/09720073.2016.11892060">https://doi.org/10.1080/09720073.2016.11892060</a>	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	[Management: Planning]
35	Dimopoulos, D., Queiros, D., & van Zyl, C. (2019). Sinking deeper: The most significant risks impacting the dive tourism industry in the East African Marine Ecoregion. <i>Ocean &amp; Coastal Management</i> , 181, 104897. <a href="https://doi.org/10.1016/j.ocecoaman.2019.104897">https://doi.org/10.1016/j.ocecoaman.2019.104897</a>	Coastal & Maritime Areas	Sport Tourism Operators	[Shaping Factors]	[Management: Collaboration]
36	Dixon, G., & Hawes, M. (2015). A longitudinal multi-method study of recreational impacts in the Arthur Range, Tasmania, Australia. <i>Journal of Outdoor Recreation and Tourism</i> , 9, 64-76. <a href="https://doi.org/10.1016/j.jort.2015.03.005">https://doi.org/10.1016/j.jort.2015.03.005</a>	Inland Natural Areas	Natural Areas Organizations	[Impacts Evaluation] [Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Monitoring]
37	do Nascimento, P., & de Farias, S. A. (2017). When sustainability of a tourism destination is a requirement: does the consumer perceive sacrifices in diving experiences? <i>Journal of Spatial and Organizational Dynamics</i> , 5(2), 115-126.	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	0
38	Dolf, M., & Teehan, P. (2015). Reducing the carbon footprint of spectator and team travel at the University of British Columbia's varsity sports events. <i>Sport Management Review</i> , 18(2), 244-255. <a href="https://doi.org/10.1016/j.smr.2014.06.003">https://doi.org/10.1016/j.smr.2014.06.003</a>	Sport Events	Spectators, Sport Event Organizations	[Impacts Evaluation] [Strategies, Practices & Tools]	[Theoretical] [Management: Operationalization]
39	Domínguez-Gómez, J. A., & Sánchez, A. V. (2016). Discussing the socio-economic impacts of tourism development projects based on golf courses: The perspective of local stakeholders. <i>International Journal of Sustainable Development and Planning</i> , 11(3), 365-374. <a href="https://doi.org/10.2495/SDP-V11-N3-365-374">https://doi.org/10.2495/SDP-V11-N3-365-374</a>	Inland Natural Areas	Residents	[Shaping Factors]	[Management: Collaboration]
40	Drius, M., Bongiorno, L., Depellegrin, D., Menegon, S., Pugnetti, A., & Stifter, S. (2019). Tackling challenges for Mediterranean sustainable coastal tourism: An ecosystem service perspective. <i>Science of the Total Environment</i> , 652, 1302-1317. <a href="https://doi.org/10.1016/j.scitotenv.2018.10.121">https://doi.org/10.1016/j.scitotenv.2018.10.121</a>	Coastal & Maritime Areas	not applicable	[Strategies, Practices & Tools]	[Theoretical]

41	Drummond, R., & Cronje, J. (2019). Building a white elephant? The case of the Cape Town Stadium. <i>International Journal of Sport Policy and Politics</i> , 11(1), 57-78. <a href="https://doi.org/10.1080/19406940.2018.1508053">https://doi.org/10.1080/19406940.2018.1508053</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	[Management: Collaboration; Planning]
42	du Preez, E. A., & Heath, E. T. (2016). Determining the influence of the social versus physical context on environmentally responsible behaviour among cycling spectators. <i>Journal of Sport and Tourism</i> , 20(2), 123-143. <a href="https://doi.org/10.1080/14775085.2016.1227274">https://doi.org/10.1080/14775085.2016.1227274</a>	Sport Events	Spectators	[Shaping Factors]	[Management: Communication]
43	Duglio, S., & Beltramo, R. (2016). Environmental management and sustainable labels in the ski industry: A critical review. <i>Sustainability (Switzerland)</i> , 8(9). <a href="https://doi.org/10.3390/su8090851">https://doi.org/10.3390/su8090851</a>	Inland Natural Areas	not applicable	[Strategies, Practices & Tools]	[Management: Operationalization]
44	Dumitras, D. E., Muresan, I. C., Jitea, I. M., Mihai, V. C., Balazs, S. E., & Iancu, T. (2017). Assessing tourists' preferences for recreational trips in national and natural parks as a premise for long-term sustainable management plans. <i>Sustainability (Switzerland)</i> , 9(9), 1596. <a href="https://doi.org/10.3390/su9091596">https://doi.org/10.3390/su9091596</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Communication; Monitoring; Tailoring]
45	Dupke, C., Dormann, C. F., & Heurich, M. (2018). Does Public Participation Shift German National Park Priorities Away from Nature Conservation? <i>Environmental Conservation</i> . <a href="https://doi.org/10.1017/S0376892918000310">https://doi.org/10.1017/S0376892918000310</a>	Inland Natural Areas	Natural Areas Organizations	[Shaping Factors]	[Management: Collaboration; Education; Monitoring]
46	Edwards, L., Knight, J., Handler, R., Abraham, J., & Blowers, P. (2016). The methodology and results of using life cycle assessment to measure and reduce the greenhouse gas emissions footprint of "Major Events" at the University of Arizona. <i>International Journal of Life Cycle Assessment</i> , 21(4), 536-554. <a href="https://doi.org/10.1007/s11367-016-1038-4">https://doi.org/10.1007/s11367-016-1038-4</a>	Sport Events	Spectators, Sport Event Organizations	[Impacts Evaluation] [Strategies, Practices & Tools]	[Management: Monitoring]
47	Emang, D., Lundhede, T. H., & Thorsen, B. J. (2019). The role of divers' experience for their valuation of diving site conservation: The case of Sipadan, Borneo. <i>Journal of Outdoor Recreation and Tourism</i> . <a href="https://doi.org/10.1016/j.jort.2019.100237">https://doi.org/10.1016/j.jort.2019.100237</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Collaboration; Tailoring]
48	Ermolaeva, P. (2014). Citizen (dis)engagement during assessment of sports mega-events: The case of the 2013 Universiade in Kazan, Russia. <i>Impact Assessment and Project Appraisal</i> , 32(1), 66-71. <a href="https://doi.org/10.1080/14615517.2014.871810">https://doi.org/10.1080/14615517.2014.871810</a>	Sport Events	Residents	[Shaping Factors]	[Management: Monitoring]

49	Ermolaeva, P. O. (2016). «Green? Cool. yours»: The effect of sports mega-events in post-soviet Russia on citizens' environmental consumption practises (cases of 2013 Universiade in Kazan and 2014 Sochi Olympics). <i>Journal of Organizational Culture, Communications and Conflict</i> , 20(SpecialIssue), 165-174.	Sport Events	Residents	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization]
50	Falk, M., & Hagsten, E. (2019). Ways of the green tourist in Europe. <i>Journal of Cleaner Production</i> , 225, 1033-1043. <a href="https://doi.org/10.1016/j.jclepro.2019.04.001">https://doi.org/10.1016/j.jclepro.2019.04.001</a>	General Contexts	Sport Practitioners	[Shaping Factors]	[Management: Communication; Tailoring]
51	Farndon, D., & Burton, P. (2019). Avoiding the white elephants: A new approach to infrastructure planning at the 2018 Gold Coast Commonwealth Games? <i>Queensland Review</i> , 26(1), 128-146. <a href="https://doi.org/10.1017/qre.2019.8">https://doi.org/10.1017/qre.2019.8</a>	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	[Management: Monitoring]
52	Ferrigno, F., Bianchi, C. N., Lasagna, R., Morri, C., Russo, G. F., & Sandulli, R. (2016). Corals in high diversity reefs resist human impact. <i>Ecological Indicators</i> , 70, 106-113. <a href="https://doi.org/10.1016/j.ecolind.2016.05.050">https://doi.org/10.1016/j.ecolind.2016.05.050</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation] [Strategies, Practices & Tools]	[Management: Operationalization; Monitoring]
53	Gaffney, C. (2013). Between discourse and reality: The un-sustainability of mega-event planning. <i>Sustainability (Switzerland)</i> , 5(9), 3926-3940. <a href="https://doi.org/10.3390/su5093926">https://doi.org/10.3390/su5093926</a>	Sport Events	Sport Event Organizations	[Shaping Factors]	[Management: Planning]
54	Gale, T., Adiego, A., & Ednie, A. (2018). A 360 degrees Approach to the Conceptualization of Protected Area Visitor Use Planning Within the Aysen Region of Chilean Patagonia. <i>Journal of Park and Recreation Administration</i> , 36(3), 22-46. <a href="https://doi.org/10.18666/JPra-2018-V36-I3-8371">https://doi.org/10.18666/JPra-2018-V36-I3-8371</a>	Inland Natural Areas	Sport Practitioners, Natural Areas Organizations	[Strategies, Practices & Tools]	[Management: Collaboration; Planning]
55	Geeraert, A., & Gauthier, R. (2018). Out-of-control Olympics: why the IOC is unable to ensure an environmentally sustainable Olympic Games. <i>Journal of Environmental Policy and Planning</i> , 20(1), 16-30. <a href="https://doi.org/10.1080/1523908X.2017.1302322">https://doi.org/10.1080/1523908X.2017.1302322</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	[Management: Operationalization]
56	Giglio, V. J., Luiz, O. J., & Schiavetti, A. (2015). Marine life preferences and perceptions among recreational divers in Brazilian coral reefs. <i>Tourism Management</i> , 51, 49-57. <a href="https://doi.org/10.1016/j.tourman.2015.04.006">https://doi.org/10.1016/j.tourman.2015.04.006</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Education; Monitoring; Tailoring]
57	Giglio, V. J., Luiz, O. J., Chadwick, N. E., & Ferreira, C. E. L. (2018). Using an educational video-briefing to mitigate the ecological impacts of scuba diving. <i>Journal of Sustainable Tourism</i> , 26(5), 782-797. <a href="https://doi.org/10.1080/09669582.2017.1408636">https://doi.org/10.1080/09669582.2017.1408636</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation] [Shaping Factors] [Strategies, Practices & Tools]	[Theoretical] [Management: Collaboration; Education]

58	Gold, J. R., & Gold, M. M. (2013). "Bring it under the legacy umbrella": Olympic host cities and the changing fortunes of the sustainability agenda. <i>Sustainability (Switzerland)</i> , 5(8), 3526-3542. <a href="https://doi.org/10.3390/su5083526">https://doi.org/10.3390/su5083526</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	0
59	Grichting, A. (2013). Scales of flows: Qatar and the urban legacies of mega events. <i>Archnet-IJAR</i> , 7(2), 173-191.	Sport Events	Sport Event Organizations	[Conceptualizations]	[Management: Operationalization; Education]
60	Gundersen, V., Vistad, O. I., Panzacchi, M., Strand, O., & van Moorter, B. (2019). Large-scale segregation of tourists and wild reindeer in three Norwegian national parks: Management implications. <i>Tourism Management</i> , 75, 22-33. <a href="https://doi.org/10.1016/j.tourman.2019.04.017">https://doi.org/10.1016/j.tourman.2019.04.017</a>	Inland Natural Areas	Sport Practitioners	[Impacts Evaluation]	[Management: Operationalization; Tailoring]
61	Hammerton, Z. (2017). Determining the variables that influence SCUBA diving impacts in eastern Australian marine parks. <i>Ocean and Coastal Management</i> , 142, 209-217. <a href="https://doi.org/10.1016/j.ocecoaman.2017.03.030">https://doi.org/10.1016/j.ocecoaman.2017.03.030</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation] [Shaping Factors]	[Management: Operationalization; Education; Monitoring]
62	Han, J. H., Nelson, C. M., & Kim, C. (2015). Pro-environmental behavior in sport event tourism: roles of event attendees and destinations. <i>Tourism Geographies</i> , 17(5), 719-737. <a href="https://doi.org/10.1080/14616688.2015.1084037">https://doi.org/10.1080/14616688.2015.1084037</a>	Sport Events	Spectators	[Shaping Factors]	[Management: Communication; Education]
63	Hanna, P., Wijesinghe, S., Paliatsos, I., Walker, C., Adams, M., & Kimbu, A. (2019). Active engagement with nature: outdoor adventure tourism, sustainability and wellbeing. <i>Journal of Sustainable Tourism</i> , 27(9), 1355-1373. <a href="https://doi.org/10.1080/09669582.2019.1621883">https://doi.org/10.1080/09669582.2019.1621883</a>	General Contexts	Sport Practitioners	[Shaping Factors]	[Theoretical]
64	Harris, R. (2013). An exploration of the relationship between large-scale sporting events and education for sustainable development: The case of the Melbourne 2006 Commonwealth Games. <i>International Journal of the History of Sport</i> , 30(17), 2069-2097. <a href="https://doi.org/10.1080/09523367.2013.845173">https://doi.org/10.1080/09523367.2013.845173</a>	Sport Events	Sport Event Organizations	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization]
65	Hinch, T., & Ito, E. (2018). Sustainable Sport Tourism in Japan. <i>Tourism Planning &amp; Development</i> , 15(1), 96-101. <a href="https://doi.org/10.1080/21568316.2017.1313773">https://doi.org/10.1080/21568316.2017.1313773</a>	General Contexts	Sport Event Organizations	[Strategies, Practices & Tools]	0
66	Hitchings, R., Surrage, R., & Atkinson, W. (2014). Human activities at the frontiers of ambient climate control: Learning from how UK shoppers and sport spectators currently talk about air-conditioning. <i>Geoforum</i> , 54, 103-110. <a href="https://doi.org/10.1016/j.geoforum.2014.04.007">https://doi.org/10.1016/j.geoforum.2014.04.007</a>	Sport Events	Spectators	[Shaping Factors]	0

67	Ho, C. I., Liao, T. Y., Huang, S. C., & Chen, H. M. (2015). Beyond environmental concerns: using means–end chains to explore the personal psychological values and motivations of leisure/recreational cyclists. <i>Journal of Sustainable Tourism</i> , 23(2), 234-254. <a href="https://doi.org/10.1080/09669582.2014.943762">https://doi.org/10.1080/09669582.2014.943762</a>	General Contexts	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Tailoring]
68	Homma, K., & Masumoto, N. (2013). A theoretical approach for the olympic legacy study focusing on sustainable sport legacy. <i>International Journal of the History of Sport</i> , 30(12), 1455-1471. <a href="https://doi.org/10.1080/09523367.2013.825251">https://doi.org/10.1080/09523367.2013.825251</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	[Theoretical]
69	Hopkins, D. (2014) The sustainability of climate change adaptation strategies in New Zealand's ski industry: a range of stakeholder perceptions, <i>Journal of Sustainable Tourism</i> , 22(1), 107-126, <a href="https://doi.org/10.1080/09669582.2013.804830">https://doi.org/10.1080/09669582.2013.804830</a>	Inland Natural Areas	Sport Practitioners, Residents, Sport Tourism Operators	[Shaping Factors]	[Management: Monitoring; Planning]
70	Hsiao, T. Y. (2018). A study of the effects of co-branding between low-carbon islands and recreational activities. <i>Current Issues in Tourism</i> , 21(5), 529-546. <a href="https://doi.org/10.1080/13683500.2015.1093466">https://doi.org/10.1080/13683500.2015.1093466</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Education; Communication]
71	Huang, F. H., Ye, Y. J., & Kao, C. H. (2015). Developing a novel Intuitionistic Fuzzy Importance-performance Analysis for evaluating corporate social responsibility in sport tourism event. <i>Expert Systems with Applications</i> , 42(19), 6530-6538. <a href="https://doi.org/10.1016/j.eswa.2015.04.008">https://doi.org/10.1016/j.eswa.2015.04.008</a>	Sport Events	Sport Practitioners	[Strategies, Practices & Tools]	[Management: Collaboration]
72	Kil, N., Holland, S. M., & Stein, T. V. (2014). Structural relationships between environmental attitudes, recreation motivations, and environmentally responsible behaviors. <i>Journal of Outdoor Recreation and Tourism</i> , 7-8, 16-25. <a href="https://doi.org/10.1016/j.jort.2014.09.010">https://doi.org/10.1016/j.jort.2014.09.010</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Communication; Education; Tailoring]
73	Kim, H. D. (2013). The 2012 London olympics: Commercial partners, environmental sustainability, corporate social responsibility and outlining the implications. <i>International Journal of the History of Sport</i> , 30(18), 2197-2208. <a href="https://doi.org/10.1080/09523367.2013.845171">https://doi.org/10.1080/09523367.2013.845171</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	[Management: Collaboration]
74	Kim, H. D. (2017). Images of stakeholder groups based on their environmental sustainability linked CSR projects: A meta-analytic review of Korean sport literature. <i>Sustainability (Switzerland)</i> , 9(9). <a href="https://doi.org/10.3390/su9091586">https://doi.org/10.3390/su9091586</a>	Sport Events	spectators, Sport Practitioners	[Shaping Factors]	[Management: Communication; Collaboration]

75	Knowles, N. L. B. (2019). Can the North American ski industry attain climate resiliency? A modified Delphi survey on transformations towards sustainable tourism. <i>Journal of Sustainable Tourism</i> , 27(3), 380-397. <a href="https://doi.org/10.1080/09669582.2019.1585440">https://doi.org/10.1080/09669582.2019.1585440</a>	Inland Natural Areas	Sport Tourism Operators	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Collaboration]
76	Krieger, J. R., & Chadwick, N. E. (2013). Recreational diving impacts and the use of pre-dive briefings as a management strategy on Florida coral reefs. <i>Journal of Coastal Conservation</i> , 17(1), 179-189. <a href="https://doi.org/10.1007/s11852-012-0229-9">https://doi.org/10.1007/s11852-012-0229-9</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation] [Shaping Factors]	[Management: Education; Monitoring]
77	Krugell, W., & Saayman, M. (2013). Running a greener race: Willingness-to-pay evidence from the old mutual two oceans Marathon in South Africa. <i>South African Journal for Research in Sport, Physical Education and Recreation</i> , 35(1), 53-70.	Sport Events	Sport Practitioners	[Shaping Factors]	[Management: Tailoring]
78	Kuščer, K., & Dwyer, L. (2019). Determinants of sustainability of ski resorts: do size and altitude matter? <i>European Sport Management Quarterly</i> , 19(4), 539-559. <a href="https://doi.org/10.1080/16184742.2018.1550097">https://doi.org/10.1080/16184742.2018.1550097</a>	Inland Natural Areas	Sport Tourism Operators	[Shaping Factors]	[Management: Operationalization]
79	Lee, W. S., Kim, J., Graefe, A. R., & Chi, S. H. (2013). Valuation of an Eco-Friendly Hiking Trail Using the Contingent Valuation Method: An Application of Psychological Ownership Theory. <i>Scandinavian Journal of Hospitality and Tourism</i> , 13(1), 55-69. <a href="https://doi.org/10.1080/15022250.2013.771902">https://doi.org/10.1080/15022250.2013.771902</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Communication; Collaboration; Education]
80	Lin, Y. H., & Lee, T. H. (2019). How do recreation experiences affect visitors' environmentally responsible behavior? Evidence from recreationists visiting ancient trails in Taiwan. <i>Journal of Sustainable Tourism</i> , 1-22. <a href="https://doi.org/10.1080/09669582.2019.1701679">https://doi.org/10.1080/09669582.2019.1701679</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Operationalization; Education; Tailoring]
81	Littlejohn, K., Needham, M. D., Szuster, B. W., & Jordan, E. J. (2016). Pre-trip expectations and post-trip satisfaction with marine tour interpretation in Hawaii: Applying the norm activation model. <i>Journal of Environmental Education</i> , 47(3), 202-212. <a href="https://doi.org/10.1080/00958964.2016.1162132">https://doi.org/10.1080/00958964.2016.1162132</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Management: Education]
82	Lopez-Bonilla, J. M., Reyes-Rodriguez, M. D., & Lopez-Bonilla, L. M. (2018). The Environmental Attitudes and Behaviours of European Golf Tourists. <i>Sustainability</i> , 10(7), 2214. <a href="https://doi.org/10.3390/su10072214">https://doi.org/10.3390/su10072214</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Operationalization; Tailoring]
83	Machado, V., Carrasco, P., Contreiras, J. P., Duarte, A. P., & Gouveia, D. (2018). Governing Locally for Sustainability: Public and Private Organizations' Perspective in Surf Tourism at Aljezur, Costa Vicentina, Portugal. <i>Tourism Planning and Development</i> , 15(6), 692-704. <a href="https://doi.org/10.1080/21568316.2017.1415958">https://doi.org/10.1080/21568316.2017.1415958</a>	Coastal & Maritime Areas	Sport Tourism Operators, Natural Areas Organizations	[Shaping Factors]	[Management: Collaboration; Planning]



84	MacIntosh, E., Apostolis, N., & Walker, M. (2013). Environmental responsibility: Internal motives and customer expectations of a winter sport provider. <i>Journal of Sport and Tourism</i> , 18(2), 99-116. <a href="https://doi.org/10.1080/14775085.2013.838145">https://doi.org/10.1080/14775085.2013.838145</a>	Inland Natural Areas	Sport Practitioners, Sport Tourism Operators	[Shaping Factors]	[Management: Communication]
85	Makarychev, A., & Yatsyk, A. (2014). Brands, cities and (post-)politics: A comparative analysis of urban strategies for the Universiade 2013 and the World Football Cup 2018 in Russia. <i>European Urban and Regional Studies</i> , 22(2), 143-160. <a href="https://doi.org/10.1177/0969776414548523">https://doi.org/10.1177/0969776414548523</a>	Sport Events	Sport Event Organizations	[Shaping Factors]	[Theoretical]
86	Malchrowicz-Moško, E., Botiková, Z., & Poczta, J. (2019). "Because we don't want to run in smog": Problems with the sustainable management of sport event tourism in protected areas (A case study of national parks in Poland and Slovakia). <i>Sustainability (Switzerland)</i> , 11(2). <a href="https://doi.org/10.3390/su11020325">https://doi.org/10.3390/su11020325</a>	Sport Events	Natural Areas Organizations	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Monitoring; Planning]
87	McCullough, B. P. (2013). Identifying the influences on sport spectator recycling behaviours using the theory of planned behaviour. <i>International Journal of Sport Management and Marketing</i> , 14(1-4), 146-168. <a href="https://doi.org/10.1504/IJSM.2013.060631">https://doi.org/10.1504/IJSM.2013.060631</a>	Sport Events	Spectators	[Shaping Factors]	[Management: Communication; Education]
88	McNicol, B., & Rettie, K. (2018). Tourism operators' perspectives of environmental supply of guided tours in national parks. <i>Journal of Outdoor Recreation and Tourism</i> , 21, 19-29. <a href="https://doi.org/10.1016/j.jort.2017.11.004">https://doi.org/10.1016/j.jort.2017.11.004</a>	Inland Natural Areas	Sport Tourism Operators	[Shaping Factors]	[Management: Collaboration]
89	Miller, T. (2016). Greenwashed sports and environmental activism: Formula 1 and FIFA. <i>Environmental Communication-a Journal of Nature and Culture</i> , 10(6), 719-733. <a href="https://doi.org/10.1080/17524032.2015.1127850">https://doi.org/10.1080/17524032.2015.1127850</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	[Management: Communication]
90	Millington, R., Darnell, S. C., & Millington, B. (2018). Ecological modernization and the Olympics: The case of golf and Rio's "green" games. <i>Sociology of Sport Journal</i> , 35(1), 8-16. <a href="https://doi.org/10.1123/ssj.2016-0131">https://doi.org/10.1123/ssj.2016-0131</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	0
91	Minoli, D. M., Goode, M. M. H., & Metcalfe, A. W. (2018). Are sport tourists of an environmental mindset to drive the green? The case of golfers. <i>Tourism Management Perspectives</i> , 25, 71-79. <a href="https://doi.org/10.1016/j.tmp.2017.11.007">https://doi.org/10.1016/j.tmp.2017.11.007</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Collaboration; Education]
92	Moharamnejad, N., Laghai, H. A., Arjmandi, R., Alesheikh, A. A., & Bahmanpour, H. (2013). Ecological Capability Evaluation of Outdoor Recreation by Integrating Geographic Information System (GIS) and Index Overlaying (IO): Case Study: Shahrood County, Iran. <i>Arabian Journal for Science and Engineering</i> , 38(1), 121-134. <a href="https://doi.org/10.1007/s13369-012-0398-8">https://doi.org/10.1007/s13369-012-0398-8</a>	Inland Natural Areas	not applicable	[Strategies, Practices & Tools]	[Management: Planning]

93	Montazeri, A., Talebpour, M., Andam, R., & Kazemnejad, A. (2017). Measuring corporate social responsibility in sport industry: Development and validation of measurement scale. <i>Annals of Applied Sport Science</i> , 5(2), 97-114. <a href="http://dx.doi.org/10.18869/acadpub.aassjournal.5.2.97">http://dx.doi.org/10.18869/acadpub.aassjournal.5.2.97</a>	Sport Events	Spectators	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Collaboration; Monitoring; Tailoring]
94	Monz, C. A., Pickering, C. M., & Hadwen, W. L. (2013). Recent advances in recreation ecology and the implications of different relationships between recreation use and ecological impacts. <i>Frontiers in Ecology and the Environment</i> , 11(8), 441-446. <a href="https://doi.org/10.1890/120358">https://doi.org/10.1890/120358</a>	General Contexts	not applicable	[Conceptualizations]	[Theoretical] [Management: Operationalization]
95	Moore, A. (2018). Selling Anthropocene space: situated adventures in sustainable tourism. <i>Journal of Sustainable Tourism</i> . <a href="https://doi.org/10.1080/09669582.2018.1477783">https://doi.org/10.1080/09669582.2018.1477783</a>	Coastal & Maritime Areas	Sport Tourism Operators	[Conceptualizations]	[Theoretical]
96	Mullins, P. M. (2013). A Socio-environmental Case for Skill in Outdoor Adventure. <i>Journal of Experiential Education</i> , 37(2), 129-143. <a href="https://doi.org/10.1177/1053825913498366">https://doi.org/10.1177/1053825913498366</a>	General Contexts	Sport Practitioners	[Conceptualizations]	[Theoretical]
97	Navrátil, J., Knotek, J., & Pícha, K. (2016). The significance of self-guided interpretive trails in protected areas for the environmental education of visitors. <i>Socijalna Ekologija</i> , 24(1), 5-21. <a href="https://doi.org/10.17234/SocEkol.24.1.3">https://doi.org/10.17234/SocEkol.24.1.3</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Education]
98	Palomo, L. E., & Hernández-Flores, A. (2019). Application of the Ostrom framework in the analysis of a social-ecological system with multiple resources in a marine protected area. <i>PeerJ</i> , 2019(8). <a href="https://doi.org/10.7717/peerj.7374">https://doi.org/10.7717/peerj.7374</a>	Coastal & Maritime Areas	Sport Tourism Operators	[Strategies, Practices & Tools]	[Theoretical], [Management: Operationalization]
99	Pankiv, N. Y., & Roik, O. R. (2019). Greenways as a form of sustainable tourism development in Lviv region (on the example of Yavoriv district). <i>Journal of Geology Geography and Geoecology</i> , 28(1), 159-172. <a href="https://doi.org/10.15421/11192001">https://doi.org/10.15421/11192001</a>	Inland Natural Areas	not applicable	[Strategies, Practices & Tools]	[Management: Operationalization]
100	Pereira, R. P. T., Camara, M. V. O., Ribeiro, G. M., & Filimonau, V. (2017). Applying the facility location problem model for selection of more climate benign mega sporting event hosts: A case of the FIFA World Cups. <i>Journal of Cleaner Production</i> , 159, 147-157. <a href="https://doi.org/10.1016/j.jclepro.2017.05.053">https://doi.org/10.1016/j.jclepro.2017.05.053</a>	Sport Events	Sport Event Organizations	[Impacts Evaluation] [Strategies, Practices & Tools]	[Management: Operationalization]
101	Pereira, R. P. T., Filimonau, V., & Ribeiro, G. M. (2019). Score a goal for climate: Assessing the carbon footprint of travel patterns of the English Premier League clubs. <i>Journal of Cleaner Production</i> , 227, 167-177. <a href="https://doi.org/10.1016/j.jclepro.2019.04.138">https://doi.org/10.1016/j.jclepro.2019.04.138</a>	Sport Events	Sport Event Organizations	[Impacts Evaluation], [Strategies, Practices & Tools]	[Management: Operationalization; Communication; Monitoring]

102	Perić, M., Vitezić, V., & Mekinc, J. (2016). Conceptualising innovative business models for sustainable sport tourism. <i>International Journal of Sustainable Development and Planning</i> , 11(3), 469-482. <a href="https://doi.org/10.2495/SDP-V11-N3-469-482">https://doi.org/10.2495/SDP-V11-N3-469-482</a>	General Contexts	not applicable	[Conceptualizations]	[Management: Operationalization]
103	Pickel-Chevalier, S. (2015). Can equestrian tourism be a solution for sustainable tourism development in France? <i>Loisir et Societe</i> , 38(1), 110-134. <a href="https://doi.org/10.1080/07053436.2015.1007580">https://doi.org/10.1080/07053436.2015.1007580</a>	Inland Natural Areas	Sport Practitioners, Natural Areas Organizations, Sport Tourism Operators	[Shaping Factors]	[Management: Collaboration; Communication]
104	Pitts, A., & Liao, H. W. (2013). An assessment technique for the evaluation and promotion of sustainable Olympic design and urban development. <i>Building Research and Information</i> , 41(6), 722-734. <a href="https://doi.org/10.1080/09613218.2013.790590">https://doi.org/10.1080/09613218.2013.790590</a>	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	[Management: Monitoring]
105	Polat, E., Keles, E., Uzun, F., & Gul, A. (2016). Sustainable rafting tourism planning and management. an example of antalya-koprucay rafting area. <i>Journal of Environmental Protection and Ecology</i> , 17(2), 789-795	Inland Natural Areas	NAMOs, Sport Tourism Operators, Residents	[Impacts Evaluation]	[Management: Operationalization; Collaboration; Monitoring; Planning]
106	Preuss, H. (2013). The contribution of the FIFA world cup and the Olympic games to green economy. <i>Sustainability (Switzerland)</i> , 5(8), 3581-3600. <a href="https://doi.org/10.3390/su5083581">https://doi.org/10.3390/su5083581</a>	Sport Events	Sport Event Organizations	[Conceptualizations]	[Management: Operationalization; Communication; Education; Monitoring]
107	Probstl-Haider, U., Lund-Durlacher, D., Antonschmidt, H., & Hodl, C. (2018). Mountain bike tourism in Austria and the Alpine region-towards a sustainable model for multi-stakeholder product development. <i>Journal of Sustainable Tourism</i> , 26(4), 567-582. <a href="https://doi.org/10.1080/09669582.2017.1361428">https://doi.org/10.1080/09669582.2017.1361428</a>	Inland Natural Areas	Natural Areas Organizations	[Shaping Factors]	[Management: Operationalization; Collaboration; Education; Monitoring; Tailoring; Planning]
108	Promjittiphong, C., Junead, J., & Hanpattanakit, P. (2018). Greenhouse gas emission and mitigation from sports tourism in Benja Burapha Cycling Rally, Sa Kaeo, Thailand. <i>Chemical Engineering Transactions</i> , 63, 397-402. <a href="https://doi.org/10.3303/CET1863067">https://doi.org/10.3303/CET1863067</a>	Sport Events	Sport Practitioners	[Impacts Evaluation] [Strategies, Practices & Tools]	[Management: Operationalization]

109	Pueyo-Ros, J., Ribas, A., & Fraguell, R. M. (2018). Uses and Preferences of Visitors to Coastal Wetlands in Tourism Destinations (Costa Brava, Spain). <i>Wetlands</i> , 38(6), 1183-1197. <a href="https://doi.org/10.1007/s13157-017-0954-9">https://doi.org/10.1007/s13157-017-0954-9</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Management: Education]
110	Purdie, H., Hutton, J. H., Stewart, E., & Espiner, S. (2020). Implications of a changing alpine environment for geotourism: A case study from Aoraki/Mount Cook, New Zealand. <i>Journal of Outdoor Recreation and Tourism</i> , 29. <a href="https://doi.org/10.1016/j.jort.2019.100235">https://doi.org/10.1016/j.jort.2019.100235</a>	Inland Natural Areas	Sport Practitioners, Sport Tourism Operators, Natural Areas Organizations	[Impacts Evaluation] [Shaping Factors] [Strategies, Practices & Tools]	[Management: Education; Planning; Tailoring]
111	Queiroz, R. E., Guerreiro, J., & Ventura, M. A. (2014). Demand of the tourists visiting protected areas in small oceanic islands: the Azores case-study (Portugal). <i>Environment, Development and Sustainability</i> , 16(5), 1119-1135. <a href="https://doi.org/10.1007/s10668-014-9516-y">https://doi.org/10.1007/s10668-014-9516-y</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Monitoring; Planning]
112	Rajan, J., & Booth, A. (2016). Sustainability and waste management of the 2015 Prince George Canada winter games. <i>International Journal of Sustainable Development and Planning</i> , 11(3), 255-262. <a href="https://doi.org/10.2495/SDP-V11-N3-255-262">https://doi.org/10.2495/SDP-V11-N3-255-262</a>	Sport Events	Sport Event Organizations	[Impacts Evaluation]	[Management: Operationalization, Monitoring]
113	Rakyatova, I., & Tomcikova, I. (2017). Assessing sustainability in mountain tourism of Demanovska Valley, Slovakia. <i>European Journal of Geography</i> , 8(2), 1-18.	Inland Natural Areas	Sport Tourism Operators	[Impacts Evaluation]	0
114	Reineman, D. R., & Ardoin, N. M. (2018). Sustainable tourism and the management of nearshore coastal places: place attachment and disruption to surf-spots. <i>Journal of Sustainable Tourism</i> , 26(2), 325-340. <a href="https://doi.org/10.1080/09669582.2017.1352590">https://doi.org/10.1080/09669582.2017.1352590</a>	Coastal & Maritime Areas	Sport Practitioners	[Shaping Factors]	[Management: Planning; Tailoring]
115	Rickly, J. M., & Vidon, E. S. (2017). Contesting authentic practice and ethical authority in adventure tourism. <i>Journal of Sustainable Tourism</i> , 25(10), 1418-1433. <a href="https://doi.org/10.1080/09669582.2017.1284856">https://doi.org/10.1080/09669582.2017.1284856</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	0
116	Robeers, T. (2019). 'We go green in Beijing': situating live television, urban motor sport and environmental sustainability by means of a framing analysis of TV broadcasts of Formula E. <i>Sport in Society</i> , 22(12), 2089-2103. <a href="https://doi.org/10.1080/17430437.2018.1558212">https://doi.org/10.1080/17430437.2018.1558212</a>	Sport Events	media	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Communication]

117	Roche, R. C., Harvey, C. V., Harvey, J. J., Kavanagh, A. P., McDonald, M., Stein-Rostaing, V. R., & Turner, J. R. (2016). Recreational Diving Impacts on Coral Reefs and the Adoption of Environmentally Responsible Practices within the SCUBA Diving Industry. <i>Environmental Management</i> , 58(1), 107-116. <a href="https://doi.org/10.1007/s00267-016-0696-0">https://doi.org/10.1007/s00267-016-0696-0</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation] [Shaping Factors]	[Management: Operationalization; Monitoring]
118	Ross, W. J., & Leopkey, B. (2017). The adoption and evolution of environmental practices in the Olympic Games. <i>Managing Sport and Leisure</i> , 22(1), 1-18. <a href="https://doi.org/10.1080/23750472.2017.1326291">https://doi.org/10.1080/23750472.2017.1326291</a>	Sport Events	Sport Event Organizations	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization]
119	Rutty, M., Matthews, L., Scott, D., & Matto, T. D. (2014). Using vehicle monitoring technology and eco-driver training to reduce fuel use and emissions in tourism: A ski resort case study. <i>Journal of Sustainable Tourism</i> , 22(5), 787-800. <a href="https://doi.org/10.1080/09669582.2013.855221">https://doi.org/10.1080/09669582.2013.855221</a>	Inland Natural Areas	Sport Tourism Operators	[Impacts Evaluation] [Strategies, Practices & Tools]	[Management: Operationalization; Education]
120	Saayman, M., Krugell, W., & Saayman, A. (2016). Characterisation of cyclists' willingness to pay for green initiatives at Africa's largest cycle tour. <i>South African Journal of Economic and Management Sciences</i> , 19(3), 432-447. <a href="https://doi.org/10.4102/sajems.v19i3.1305">https://doi.org/10.4102/sajems.v19i3.1305</a>	Sport Events	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Communication; Tailoring]
121	Saito, C. H. (2016). Concept Map for Environmental Education Planning: Capacitation of Volunteers for the FIFA Football World Cup in Brazil. <i>Journal of Education for Sustainable Development</i> , 10(2), 289-308. <a href="https://doi.org/10.1177/0973408216651944">https://doi.org/10.1177/0973408216651944</a>	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	[Management: Education]
122	Salesa, D., & Cerdà, A. (2019). Four-year soil erosion rates in a running-mountain trail in eastern Iberian Peninsula. <i>Geographical Research Letters</i> , 45(1), 309-331. <a href="https://doi.org/10.18172/cig.3826">https://doi.org/10.18172/cig.3826</a>	Sport Events	Sport Practitioners, Sport Event Organizations	[Impacts Evaluation]	[Management: Operationalization]
123	Samuel, S., & Stubbs, W. (2013). Green Olympics, green legacies? An exploration of the environmental legacies of the Olympic Games. <i>International Review for the Sociology of Sport</i> , 48(4), 485-504. <a href="https://doi.org/10.1177/1012690212444576">https://doi.org/10.1177/1012690212444576</a>	Sport Events	Sport Event Organizations	[Shaping Factors] [Strategies, Practices & Tools]	0
124	Santarem, F., Silva, R., & Santos, P. (2015). Assessing ecotourism potential of hiking trails: A framework to incorporate ecological and cultural features and seasonality. <i>Tourism Management Perspectives</i> , 16, 190-206. <a href="https://doi.org/10.1016/j.tmp.2015.07.019">https://doi.org/10.1016/j.tmp.2015.07.019</a>	Inland Natural Areas	not applicable	[Strategies, Practices & Tools]	[Management: Operationalization; Monitoring]
125	Scharr, K., & Steinicke, E. (2013). Soçi-2014 and sustainability: Potential for conflicts-local perception. <i>Mitteilungen Der Osterreichischen Geographischen Gesellschaft</i> , 155, 171-194. <a href="https://doi.org/10.1553/moegg155">https://doi.org/10.1553/moegg155</a>	Sport Events	Residents	[Shaping Factors]	0
126	Schlemmer, P., Blank, C., Bursa, B., Mailer, M., & Schnitzer, M. (2019). Does health-oriented tourism contribute to sustainable mobility? <i>Sustainability (Switzerland)</i> , 11(9), 2633. <a href="https://doi.org/10.3390/su11092633">https://doi.org/10.3390/su11092633</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization;]

					Communication; Tailoring]
127	Schwartz, F., Taff, B. D., Lawhon, B., Pettebone, D., Esser, S., & D'Antonio, A. (2019). Leave No Trace bouldering ethics: Transitioning from the gym to the crag. <i>Journal of Outdoor Recreation and Tourism-Research Planning and Management</i> , 25, 16-23. <a href="https://doi.org/10.1016/j.jort.2018.11.003">https://doi.org/10.1016/j.jort.2018.11.003</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Collaboration; Education; Tailoring]
128	Scolozzi, R., Schirpke, U., Detassis, C., Abdullah, S., & Gretter, A. (2015). Mapping Alpine Landscape Values and Related Threats as Perceived by Tourists. <i>Landscape Research</i> , 40(4), 451-465. <a href="https://doi.org/10.1080/01426397.2014.902921">https://doi.org/10.1080/01426397.2014.902921</a>	Inland Natural Areas	Sport Practitioners	[Strategies, Practices & Tools]	[Management: Operationalization; Tailoring; Planning]
129	Serenari, C., Bosak, K., & Attarian, A. (2013). Cross-cultural efficacy of American low-impact programs: A comparison between Garhwal guide beliefs on environmental behavior and American outdoor travel norms. <i>Tourism Management</i> , 34, 50-60. <a href="https://doi.org/10.1016/j.tourman.2012.03.010">https://doi.org/10.1016/j.tourman.2012.03.010</a>	Inland Natural Areas	Sport Tourism Operators	[Shaping Factors]	[Management: Planning]
130	Shi, F., Weaver, D., Zhao, Y., Huang, M. F., Tang, C., & Liu, Y. (2019). Toward an ecological civilization: Mass comprehensive ecotourism indications among domestic visitors to a Chinese wetland protected area. <i>Tourism Management</i> , 70, 59-68. <a href="https://doi.org/10.1016/j.tourman.2018.07.011">https://doi.org/10.1016/j.tourman.2018.07.011</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Tailoring]
131	Spector, S. (2017). Environmental communications in New Zealand's skiing industry: building social legitimacy without addressing non-local transport. <i>Journal of Sport and Tourism</i> , 21(3), 159-177. <a href="https://doi.org/10.1080/14775085.2017.1298461">https://doi.org/10.1080/14775085.2017.1298461</a>	Inland Natural Areas	Sport Practitioners, Sport Tourism Operators	[Shaping Factors]	[Management: Communication; Monitoring]
132	Sumanapala, D., & Wolf, I. D. (2019). Recreational ecology: A review of research and gap analysis. <i>Environments</i> , 6(7), 81. <a href="https://doi.org/10.3390/environments6070081">https://doi.org/10.3390/environments6070081</a>	General Contexts	not applicable	[Conceptualizations]	[Theoretical] [Management: Monitoring]
133	Svobodova, K., Monteiro, L., Vojar, J., & Gdulova, K. (2019). Can trail characteristics influence visitor numbers in natural protected areas? A quantitative approach to trail choice assessment. <i>Environmental and Socio-Economic Studies</i> , 7(2), 10-20. <a href="https://doi.org/10.2478/environ-2019-0008">https://doi.org/10.2478/environ-2019-0008</a>	Inland Natural Areas	Sport Practitioners	[Impacts Evaluation] [Strategies, Practices & Tools]	0
134	Towner, N., & Davies, S. (2019). Surfing tourism and community in Indonesia. <i>Journal of Tourism and Cultural Change</i> , 17(5), 642-661. <a href="https://doi.org/10.1080/14766825.2018.1457036">https://doi.org/10.1080/14766825.2018.1457036</a>	Coastal & Maritime Areas	Residents	[Shaping Factors]	0
135	Trail, G. T., & McCullough, B. P. (2019). Marketing sustainability through sport: testing the sport sustainability campaign evaluation model. <i>European Sport Management Quarterly</i> , 1-21. <a href="https://doi.org/10.1080/16184742.2019.1580301">https://doi.org/10.1080/16184742.2019.1580301</a>	Sport Events	Sport Practitioners	[Shaping Factors]	[Theoretical] [Management: Tailoring]

136	Triantafyllidis, S., & Davakos, H. (2019). Growing Cities and Mass Participant Sport Events: Traveling Behaviors and Carbon Dioxide Emissions. <i>C-Journal of Carbon Research</i> , 5(3), 49. <a href="https://doi.org/10.3390/c5030049">https://doi.org/10.3390/c5030049</a>	Sport Events	Sport Practitioners	[Impacts Evaluation]	[Theoretical] [Management: Operationalization; Education; Planning]
137	Triantafyllidis, S., Ries, R. J., & Kaplanidou, K. (2018). Carbon Dioxide Emissions of Spectators' Transportation in Collegiate Sporting Events: Comparing On-Campus and Off-Campus Stadium Locations. <i>Sustainability</i> , 10(1), 241. <a href="https://doi.org/10.3390/su10010241">https://doi.org/10.3390/su10010241</a>	Sport Events	Spectators	[Impacts Evaluation]	[Management: Operationalization; Planning]
138	Tverijonaite, E., Ólafsdóttir, R., & Thorsteinsson, T. (2018). Accessibility of protected areas and visitor behaviour: A case study from Iceland. <i>Journal of Outdoor Recreation and Tourism</i> , 24, 1-10. <a href="https://doi.org/10.1016/j.jort.2018.09.001">https://doi.org/10.1016/j.jort.2018.09.001</a>	Inland Natural Areas	Sport Practitioners	[Shaping Factors]	[Management: Operationalization; Planning]
139	Uusitalo, M. T., & Sarala, P. (2016). Indicators for Impact Management of Subarctic Mountain Resorts: Monitoring Built-up Areas at High Altitudes in Northern Finland. <i>Scandinavian Journal of Hospitality and Tourism</i> , 16(1), 1-23. <a href="https://doi.org/10.1080/15022250.2015.1046483">https://doi.org/10.1080/15022250.2015.1046483</a>	Inland Natural Areas	not applicable	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Communication; Collaboration; Monitoring; Planning]
140	van der Merwe, J. H., & Joubert, U. (2014). Managing environmental impact of bouldering as a niche outdoor-climbing activity. <i>South African Journal for Research in Sport, Physical Education and Recreation</i> , 36(1), 229-251.	Inland Natural Areas	Natural Areas Organizations, Sport Practitioners	[Strategies, Practices & Tools]	[Management: Collaboration; Monitoring; Tailoring; Planning]
141	Vanwynsberghe, R. (2015). The Olympic Games Impact (OGI) study for the 2010 Winter Olympic Games: strategies for evaluating sport mega-events' contribution to sustainability. <i>International Journal of Sport Policy</i> , 7(1), 1-18. <a href="https://doi.org/10.1080/19406940.2013.852124">https://doi.org/10.1080/19406940.2013.852124</a>	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	[Management: Monitoring]
142	Varley, P., & Semple, T. (2015). Nordic Slow Adventure: Explorations in Time and Nature. <i>Scandinavian Journal of Hospitality and Tourism</i> , 15(1-2), 73-90. <a href="https://doi.org/10.1080/15022250.2015.1028142">https://doi.org/10.1080/15022250.2015.1028142</a>	General Contexts	not applicable	[Conceptualizations]	[Theoretical] [Management: Operationalization]
143	Viiirret, E., Raatikainen, K. J., Fagerholm, N., Käyhkö, N., & Vihervaara, P. (2019). Ecosystem services at the Archipelago Sea Biosphere Reserve in Finland: A visitor perspective. <i>Sustainability (Switzerland)</i> , 11(2), 421. <a href="https://doi.org/10.3390/su11020421">https://doi.org/10.3390/su11020421</a>	Coastal & Maritime Areas	Sport Practitioners, Residents	[Shaping Factors]	[Management: Operationalization; Collaboration; Tailoring; Planning]

144	Voda, M., Torpan, A., & Moldovan, L. (2017). Wild Carpathia future development: From illegal deforestation to ORV sustainable recreation. <i>Sustainability (Switzerland)</i> , 9(12), 2254. <a href="https://doi.org/10.3390/su9122254">https://doi.org/10.3390/su9122254</a>	Inland Natural Areas	Sport Practitioners	[Strategies, Practices & Tools]	[Management: Communication; Tailoring; Planning]
145	Vujko, A., Plavska, J., Petrovic, M. D., Radovanovic, M., & Gajic, T. (2017). Modelling of carrying capacity in National Park - Fruska Gora (Serbia) case study. <i>Open Geosciences</i> , 9(1), 61-72. <a href="https://doi.org/10.1515/geo-2017-0005">https://doi.org/10.1515/geo-2017-0005</a>	Inland Natural Areas	Residents	[Shaping Factors] [Strategies, Practices & Tools]	[Management: Operationalization; Planning]
146	Wang, H., Ju, P., Xu, H. G., & Wong, D. (2019). Are Grassroots Sports Events Good for Migrant Cities' Sustainable Development? A Case Study of the Shenzhen 100 km Hikathon. <i>Sustainability</i> , 11(1), 256. <a href="https://doi.org/10.3390/su11010256">https://doi.org/10.3390/su11010256</a>	Sport Events	Residents	[Shaping Factors]	
147	Watanabe, N. M., Yan, G., Soebbing, B. P., & Fu, W. T. (2019). Air Pollution and Attendance in the Chinese Super League: Environmental Economics and the Demand for Sport. <i>Journal of Sport Management</i> , 33(4), 289-302. <a href="https://doi.org/10.1123/jsm.2018-0214">https://doi.org/10.1123/jsm.2018-0214</a>	Sport Events	Spectators	[Shaping Factors]	[Management: Operationalization; Education]
148	Webler, T., & Jakubowski, K. (2016). Mitigating damaging behaviors of snorkelers to coral reefs in Puerto Rico through a pre-trip media-based intervention. <i>Biological Conservation</i> , 197, 223-228. <a href="https://doi.org/10.1016/j.biocon.2016.03.012">https://doi.org/10.1016/j.biocon.2016.03.012</a>	Coastal & Maritime Areas	Sport Practitioners	[Impacts Evaluation] [Strategies, Practices & Tools]	[Management: Operationalization; Education]
149	Wicker, P. (2018). The carbon footprint of active sport tourists: an empirical analysis of skiers and boarders. <i>Journal of Sport and Tourism</i> , 22(2), 151-171. <a href="https://doi.org/10.1080/14775085.2017.1313706">https://doi.org/10.1080/14775085.2017.1313706</a>	Inland Natural Areas	Sport Practitioners	[Impacts Evaluation] [Shaping Factors]	[Management: Operationalization; Communication; Collaboration]
150	Wolf, I. D., Ainsworth, G. B., & Crowley, J. (2017). Transformative travel as a sustainable market niche for protected areas: a new development, marketing and conservation model. <i>Journal of Sustainable Tourism</i> , 25(11), 1650-1673. <a href="https://doi.org/10.1080/09669582.2017.1302454">https://doi.org/10.1080/09669582.2017.1302454</a>	General Contexts	Sport Practitioners	[Conceptualizations] [Shaping Factors]	[Theoretical] [Management: Communication; Monitoring; Tailoring]
151	Wolf, I. D., Croft, D. B., & Green, R. J. (2019). Nature conservation and nature-based tourism: A paradox? <i>Environments</i> , 6(9), 104. <a href="https://doi.org/10.3390/environments6090104">https://doi.org/10.3390/environments6090104</a>	Inland Natural Areas	Sport Practitioners	[Strategies, Practices & Tools]	[Management: Communication; Collaboration; Education; Monitoring]
152	Wolf, I. D., Stricker, H. K., & Hagenloh, G. (2015). Outcome-focussed national park experience management: transforming participants, promoting social well-being, and fostering place attachment. <i>Journal of Sustainable Tourism</i> , 23(3), 358-381. <a href="https://doi.org/10.1080/09669582.2014.959968">https://doi.org/10.1080/09669582.2014.959968</a>	Inland Natural Areas	Sport Practitioners	[Strategies, Practices & Tools]	[Management: Operationalization; Tailoring]



153	Yfantidou, G., Spyridopoulou, E., Kouthouris, C., Balaska, P., Matarazzo, M., & Costa, G. (2016). The future of sustainable tourism development for the Greek enterprises that provide sport tourism. <i>Tourism Economics</i> , 23(5), 1155-1162. <a href="https://doi.org/10.1177/1354816616686415">https://doi.org/10.1177/1354816616686415</a>	Coastal & Maritime Areas	Sport Tourism Operators	[Shaping Factors] [Strategies, Practices & Tools]	0
154	Yoon, L., & Wilson, B. (2018). Journalism, Environmental Issues, and Sport Mega-Events: A Study of South Korean Media Coverage of the Mount Gariwang Development for the 2018 PyeongChang Winter Olympic and Paralympic Games. <i>Communication &amp; Sport</i> , 7(6), 699-728. <a href="https://doi.org/10.1177/2167479518811381">https://doi.org/10.1177/2167479518811381</a>	Sport Events	media	[Shaping Factors]	[Management: Communication]
155	Zhang, M., & Zhai, F. (2019). The sustainable development information management of Winter Olympics based on Internet-based wireless sensor network. <i>Eurasip Journal on Wireless Communications and Networking</i> , 2019(1). <a href="https://doi.org/10.1186/s13638-019-1360-1">https://doi.org/10.1186/s13638-019-1360-1</a>	Sport Events	Sport Event Organizations	[Strategies, Practices & Tools]	0
156	Ziakas, A., & Boukas, N. (2016). The emergence of "small-scale" sport events in "small island" developing states: Towards creating sustainable outcomes for island communities. <i>Event Management</i> , 20(4), 537-563. <a href="https://doi.org/10.3727/152599516X14745497664479">https://doi.org/10.3727/152599516X14745497664479</a>	Sport Events	Sport Practitioners	[Shaping Factors]	[Management: Operationalization]
157	Ziakas, V. (2019). Issues, patterns and strategies in the development of event portfolios: configuring models, design and policy. <i>Journal of Policy Research in Tourism Leisure and Events</i> , 11(1), 121-158. <a href="https://doi.org/10.1080/19407963.2018.1471481">https://doi.org/10.1080/19407963.2018.1471481</a>	Sport Events	not applicable	[Conceptualizations]	[Theoretical]



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# Chapter 3: Environmental campaigns in sport tourism events: Testing the Sport Sustainability Campaign Evaluation Model in Surfing<sup>2</sup>

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<sup>2</sup> Martins, R., Pereira, E., Rosado, A., Marôco, J., McCullough, B., & Mascarenhas, M. (under review). Environmental campaigns in sport tourism events: Testing the Sport Sustainability Campaign Evaluation Model in Surfing. (submitted to *European Sport Management Quarterly*).



## **Abstract**

**Research question:** Considering the assessment of environmental strategies and practices as an essential factor in the approach to environmental sustainability in sporting events, it is also important to evaluate the result of environmental campaigns concerning their impact on the sports consumers' behaviour. Thus, the objective of this investigation was to test the sport sustainability campaign evaluation model to international surfing events by applying it to the spectators.

**Research methods:** The sport sustainability campaign evaluation model was applied through a questionnaire to the spectators of two international surfing events, totalling a sample of 625 respondents. The data were analysed with the Structural Equation Modelling Analysis using the Lavaan package from the R software.

**Results and Findings:** The fit of the model to the sample data was acceptable. This investigation confirmed the significant effect of: (i) Needs, Points of Attachment and Internal Constraints on Attitudes; (iii); and (iv) External Constraint and Past Behaviours on Sustainability Intentions. Moreover, this research added the direct effect of Internal Constraints on Sustainability Intentions. Additionally, this investigation has not confirmed the positive effect of the Environmentalism, Tolerance and Social Justice values on Attitudes.

**Implications:** This investigation is a pioneer in testing the sport sustainability campaign evaluation model after its original publication, supporting the adopted theoretical framework and enhancing its use in future investigations. This research confirmed the model's ability to help sports organizations better analyse and understand the results of their environmental campaigns, as well as to gain valuable knowledge about their own sports consumers.

**Keywords:** environmental sustainability campaigns, nature-based sports, spectators, sports consumer's behaviour, sports tourism events.

## 1. Introduction

Sports events are valuable resources to promote environmental awareness (Harris, 2013; McCullough et al., 2016) and their importance is recognized by International Olympic Committee (IOC) and the United Nations (IOC, 2017; UNFCCC, 2018). The IOC has developed several guidelines to assist sports organizations on the path of sustainability, including recommendations to mitigate the problem of plastics and climate change in the management of sporting events (IOC, 2018a, 2018b).

Sports organizations are motivated by strategic and legitimacy factors to adopt environmental management practices (Babiak & Trendafilova, 2011; Kellison & Hong, 2015) and these efforts continue to advance (McCullough et al., 2016). These increased determinations further emphasize the importance to evaluate environmental initiatives' results to legitimize the continuity, justify adjustments, or suppress such initiatives. The implementation of environmental initiatives through fan engagement campaigns, such as the organization of green thematic sports events and environmental education, is one of the most mentioned environmental practices adopted by sports organizations (Barrett et al., 2019). Thus, it is important to evaluate the effectiveness and impacts of such efforts based on organizational outcomes among targeted stakeholder groups.

Spectators are recognized as an important stakeholder group to engage during the implementation of a triple-bottom-line effort among event managers (O'Brien & Chalip, 2008) and in the evaluation of events' sustainability performance (Boggia et al., 2018). Trendafilova and McCullough (2018) identified a lack of research in marketing and environmental communication concerning environmental sustainability campaigns in

sport and recommended the study of the effectiveness of environmental initiatives on fan behaviour. Thus, it is necessary to examine which factors are involved in the spectator's response to environmental campaigns, contributing to the increase of pro-environmental behaviour (Trail, 2016), and justifying the current initiatives and the promotion of future environmental campaigns within various sport contexts (Trail & McCullough, 2020).

Several studies have focused on spectators' behavioural intentions, regarding the sport attendance and the purchasing behaviour, conceiving models, such as the sport spectator consumption behaviour model (Trail et al., 2000), the model of sport consumer motivations, spectator commitment, and behaviour intentions (Kim et al. 2013), and the model of constraints and motivators (Kim & Trail, 2010). Concerning the environmental topic, studies have verified the importance of sports initiatives and campaigns in the adoption of more ecological behaviour by spectators (Casper et al., 2014, 2017, 2020; Inoue & Kent, 2012); however, few studies have advanced with models that explain the spectator's sustainability intentions, such as: (i) the study produced by Casper et al. (2020) reflects on environmental values, personal and sport norms as predictive factors for spectators' sustainability behaviours; and (ii) Trail's (2016) research proposes the sport fan sustainability behaviour model, identifying the various factors that forecast the sport fans' specific attitudes to sustainability campaigns and sustainability behavioural intentions. However, the sport fan sustainability behaviour model has not yet been tested. The Sport Sustainability Campaign Evaluation Model (SSCEM) (Trail & McCullough, 2020) investigates the effect of environmental campaigns on the sport participants' intentions, exposing which factors contribute to their attitudes toward the sustainability campaigns and behavioural intentions. The SSCEM can add valuable knowledge to sport managers since it can be used to better plan future campaigns regarding the target

audience. Trail and McCullough (2020) recommended testing the SSCEM on future applications to other types of sport events.

In particular, nature-based sports provide a context where sport actors are directly connected to the natural space, which has been identified as a promoter of more ecologically friendly attitudes and behaviours (Lin & Lee, 2020; Wolf et al., 2019). For example, there is evidence that surfers' link to the natural environment is one of the factors that endorse ecological behaviours (Larson et al., 2018; Wheaton, 2007). Considering the centrality of the relationship with nature in the surfing experience, a strong connection from the surfing community to the environmental theme has been deduced (Borne, 2017). In fact, the World Surf League (WSL), as the organization responsible for the world championship tour and the world qualifying series, has been committed with several environmental actions (WSL, 2019b; 2019c).

The recognition of the surf community's connection with the natural space, its activism on environmental issues and the environmental initiatives and campaigns proposed by WSL surf events are solid justifications for applying the SSCEM to surfing events' spectators. Thus, taking into account the relevance of evaluating environmental campaigns implemented by sports organizations, the purpose of this investigation was to test the SSCEM on international surfing events' spectators.

## **2. Theoretical framework**

### ***2.1. Sport Sustainability Campaign Evaluation Model (SSCEM)***

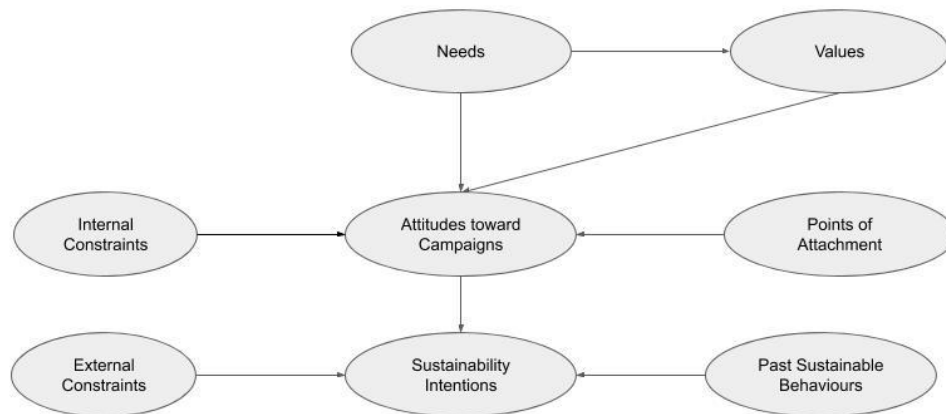
To assess the impact of environmental campaigns on the behaviour of the sports actors, Trail and McCullough (2020) developed the SSCEM. The SSCEM (Figure 1) was grounded on the sport fan sustainability behaviour model (Trail, 2016), expanding its



application context to sports participants and adapting the dimensions proposed by Trail's (2016) model.

**Figure 1.**

*Sport Sustainability Campaign Evaluation Model (Trail & McCullough, 2020).*



The results of the application of SSCEM by Trail and McCullough (2020) showed support for five hypotheses, namely, the hypotheses that stipulate values and needs (only when mediated by values) are predictors of attitudes toward the campaign, and also, attitudes toward the campaign and external constraints are predictors of sustainability behavioural intentions.

**2.1.1. Values and Needs.**

Self-determination theory (Deci & Ryan, 2008), values theory (Rokeach, 1973), Sagiv and Schwartz's (2000) values theories, identity theory (Stryker & Burke, 2000) and the value-belief-norm (VBN) model (Stern et al., 1999), have been used to relate needs and values to environmental attitudes and intentions. Some studies that have specifically focused on environmental behaviour have attested to the positive influence of universal

and biospheric values (de Groot & Steg, 2010), which has been corroborated by studies on the spectators and sport practitioners' behaviour (Casper et al., 2014; Gau et al., 2019; van Riper et al., 2019). In Trail's (2016) research, self-actualization needs, namely, needs for wisdom and inner peace were related to aesthetics and associated with the sports spectators' environmental sustainability intentions when mediated by environmentalism, tolerance, and social justice values. Thus, the following hypotheses are proposed:

**H1:** Self-actualization Needs will influence Universalism Values.

**H2:** Self-actualization Needs will influence Attitudes toward the Campaign.

**H3:** Self-actualization Needs will influence Attitudes toward the Campaign mediated by Universalism Values.

**H4:** Universalism Values will influence Attitudes toward the Campaign.

### **2.1.2. Points of Attachment.**

Trail et al. (2000) stated that identification, as "orientation of the self in regard to other objects including a person or a group that results in feelings or sentiments of close attachment" (p. 165-166), influences the consumption behaviour of sports spectators. Grounded on this definition, the Points of Attachment Index (Robinson & Trail, 2005; Trail et al., 2003) contemplates several points of attachment: identification with the players, the team, the coach, the sport, the level of sport, the community and the university. Some studies have refined the Points of Attachment Index with several subscale adaptations to the context of sporting events. Ballouli et al. (2016), for example, examined a Formula 1 event with adapted subscales of identification to the driver, sport, Formula 1, and place. Given their influence on attendance and purchasing intentions, points of attachment have been recurrently used in the study of spectators (Ballouli et al., 2016; Reams et al., 2015; Rocha & Fleury, 2017; Shapiro et al., 2013; Trail et al., 2005).

Furthermore, Trail and McCullough (2020), adapted and included the attachment to community, to the event, and the self-concept running and environmental identity and found the need to include multiple points of attachment in future investigations to address the sport participants' attitudes toward environmental campaigns. Following the above conceptualization,

**H5:** Points of attachment will influence Attitudes toward the Campaign.

### **2.1.3. Environmental Attitudes and Sustainability Behavioural Intentions.**

Among the multiple theories that contextualize human behaviour, the theory of the planned behaviour (Ajzen & Madden, 1986) has been one of the most used theories when examining the influential factors on environmental behaviours (Klößner, 2013). The literature on environmental behaviour addresses not only the existence of a beneficial effect of environmental attitudes on behaviour, but also the possibility of encounter the attitude behaviour gap (Kollmuss & Agyeman, 2002). Thus, in the sports context, there have been some findings that positively relate attitudes to sport practitioners and spectators' environmental behaviour (Kil et al., 2014; Lin & Lee, 2020; McCullough, 2013; Mullenbach & Green, 2018), and also studies that have denoted the attitude behavioural gap in the sports context (Harbrow, 2019; Minoli et al., 2018); for example, in McCullough and Cunningham's study (2011), the attitude of the spectators did not lead to the consequent environmental behaviour. According to the theories and results above,

**H6:** Attitudes toward the Campaign will lead to Sustainability Behavioural Intentions.

### **2.1.4. Constraints and Past Sustainable Behaviours.**

The stimulation of internal and external factors has been recognized in the study of environmental behaviour (Kollmuss & Agyeman, 2002; Steg & Vlek, 2009). In the

sports literature, several studies on spectators have shown the negative influence of constraints on sports consumption (i.e., sports attendance; Kim & Trail, 2010; Mayer & Hungenberg, 2020; Rocha & Fleury, 2017; Trail & Kim, 2011). Internal constraints have been defined as internal perceptions that can constrain spectators' consumption behaviour, and external constraints as the social and contextual aspects that constrain the adoption of the spectators' consumption behaviour (Kim & Trail, 2010). Kim and Trail (2010) found that the lack of knowledge, lack of someone to attend with, lack of success and no interest from others were internal constraints factors, and parking, location, commitments, financial cost, leisure alternatives, participant sport alternatives and sport entertainment were external constraints. Specifically, for the sports consumer and environmental behaviour, Trail (2016; 2019) found that internal and external constraints influenced sustainability behavioural intentions, a finding that was further empirically supported by Trail and McCullough (2018, 2020). Additionally, the internal constraint, lack of worth, and the external constraint, lack of access, were adopted and identified as influencing the sustainability intentions of sport participants in the investigations developed by Trail and McCullough (2018; 2020). The lack of time was an external constraint in Trail and McCullough's (2018; 2020) studies, but in Trail's (2019) research, this factor was considered an internal constraint as a personal perception and not as an external imposition. Previously, the lack of access was identified as an external constraint in the recycling spectators' behaviour (McCullough, 2013). Also, past sustainable behaviours have been considered important for their positive influence on future environmental behaviours (Klößner, 2013; Kollmuss & Agyeman, 2002; Steg & Vlek, 2009; Van der Werff et al., 2014). In the sports context, some studies have demonstrated the association of past behaviours with behavioural intentions (Chiu et al., 2019), and more specifically,

with sustainability intentions, for example, in spectators' recycling intentions (McCullough & Cunningham, 2011). In accordance, it is suggested,

**H7:** Internal constraints will negatively influence Attitudes toward the Campaign.

**H8:** External constraints will negatively influence Sustainability Behavioural Intentions.

**H9:** Past sustainable behaviours will lead to Sustainability Behavioural Intentions.

Based on this framework, the objective of the present investigation is to test the hypotheses advanced by SSCEM in the context of international surf events' spectators.

### **3. Method**

#### ***3.1. Event Context***

The World Surf League (WSL) is the organization responsible for the world championship tour and the world qualifying series. The WSL has recently joined the Sports for Climate Action Framework (UNFCCC, 2018), which is a platform to promote climate awareness and action among global citizens by the sports community. In 2019, on its website, the WSL pledged its commitment to sustainability, defining three strategic objectives as well as the corresponding operationalization in its events by becoming carbon neutral, cutting out single-serve plastic and restoring coastal habitats (WSL, 2019a). During the 2019 Freshwater Pro event, the WSL repurposed all the event banners into new reusable water bottles for all attendees aiming to promote a circular economy of single-serve plastics (WSL, 2019b). Further, during the Quiksilver & Roxy Pro France

event, the WSL undertook initiatives to protect the French coastline by restoring dunes (WSL, 2019c).

Two international surfing events (namely, EDP Billabong Ericeira 2019 and MEO Rip Curl PRO 2019), hosted in Portugal and organized by the WSL, were selected to test SSCEM. The support for these types of international events is included in the strategic plan for tourism management in Portugal (Portugal Tourism Board, 2017). Following contact with the organizing committee of both events, an inventory of the environmental sustainability campaigns was produced. The EDP Billabong Ericeira 2019 was a world qualifying series, male competition event, involving 112 surfers. The MEO Rip Curl PRO 2019 event occurred at Supertubos Beach - Peniche. This event had a female and male competition and involved 54 surfers. Event organizers at both events ensured operationalization of selective waste collection and water points for refilling bottles, as well as marked paths for beach access. The event sponsors carried out several awareness actions on the topic of waste, namely, campaigns that focused on reducing single-use plastics, such as the “Beat the Plastic - The Unwanted Shapes” campaign at the Peniche event.

### **3.2. Sampling**

For the Structural Equation Modelling (SEM) analysis, the required sample size met the  $\alpha$  error prob of .05 and a desired statistical power level of .05 criteria. Also, the observations that contained 10% or more missing values were not included in the data (Enders, 2010). For analysis, 625 questionnaires remained, of which 354 were collected at MEO Rip Curl PRO 2019 and 271 were collected at EDP Billabong Ericeira 2019. The sample is mostly young, (55.5% of respondents below 30 years of age and 21.7% under 40), educated (a majority of 73.2% with university education) and active (81.8% play a sport, of which 44.3% surf). The sample is 52% female and 48% male.

Data collection was planned to obtain a sample of spectators over 18 years of age who would be present at the events. Thus, considering: a) the timeline of the event - the collection included weekdays and weekends; b) the physical space of the event - the collection was made by a team of collaborators, to cover the various areas available to spectate the event; and c) the characteristics of the event – the collection was carried out *in loco*, during the event using paper and pen. All collaborators who participated in the data collection were familiar with the questionnaire's questions to clarify possible doubts of the respondents. The collaborators were also instructed to make a brief presentation of the investigation to the respondents and to provide adequate time and space to complete the questionnaire. The present study's procedures respected ethical and deontological requirements inherent to scientific research and recommended by the Ethical Board of the Faculty of Human Kinetics of the University of Lisbon.

### **3.3. Instrument**

The questionnaire applied to both events was based on the questionnaire developed by Trail and McCullough (2020), which included eight dimensions, namely, self-actualization needs, universalism values, attitudes toward the campaigns, points of attachment, internal constraints, external constraints, sustainability behaviour intentions, and past sustainable behaviours.

The self-actualization needs dimension was measured through the need for wisdom, inner peace and aesthetics and the universalism values dimension was measured through social justice, tolerance and environmentalism. Both dimensions were measured by three self-reported items with a 9-point scale, with -1 = Opposed to my Needs/Values, 0 = Not Important, 3 = Important, 6 = Very Important, and 7 = Of Supreme Importance, as in Trail and McCullough's study (2020) in accordance with Schwartz (1992). The items were selected for their representativeness (highest factor loader) from the results of

Trail and McCullough's study (2020). The inclusion of the need for Aesthetics and Environmentalism value were justified by the recognition of their contribution to environmental behaviours (Casper et al., 2017; Trail, 2018; van Riper et al., 2019).

Points of Attachment was conceptualized as a second order-factor reflected in Attachment to the Surfers, Attachment to the Sport, Attachment to the Level of Sport and Attachment to the Community. Each one of these factors was measured by three items based on the Points of Attachment Index (Ballouli et al., 2016; Robinson & Trail, 2005) for which previous reliability and validity values of the constructs were good.

The items in Trail (2019) and Trail and McCullough (2020) were adapted for the present investigation, to measure: (i) Attitudes toward the Campaign, through two items that, in general, characterize the attitude towards the specific campaigns and initiatives at each surfing event promoting sustainable behaviour; (ii) Sustainability Behaviour Intentions, through six items, of which three items focus on the recycling behaviour and the other three items specify water bottle reuse behaviour; (iii) Internal Constraints was conceptualized as a second-order factor reflected in Lack of Knowledge, Lack of Worth, Lack-of-Interest-from-Others and Lack of Time, a total of eleven items worded negatively; (iv) External Constraints was measured through four items representing Lack of Access since it is the only factor in Trail and McCullough's (2020) research that adapts to the characteristics of this investigation; and (v) Past Sustainable Behaviours, two items representing the behaviours that linked to the event's campaign. The Attitudes toward the Campaign, Points of Attachment, Internal Constraints, External Constraints and Sustainability Intentions were measured with self-report items on a 7-point Likert-type scale, with 1 = Strongly Disagree to 7 = Strongly Agree and Past Sustainable Behaviours with response format from 0% to 100%, following Trail and McCullough (2020).



The structure of the questionnaire begins with a heading, framing the purpose of the investigation, the institutions that were involved and the confidentiality assurance of the collected data. In the main part, except for self-actualization needs, universalism values and past sustainable behaviours items, all the items appeared randomly. The demographic questions (age, gender, education level) and the frequency of surfing events attendance and sports practice were included at the end of the questionnaire.

Given the events' international context, two versions of the questionnaire were prepared: the English version, based on the original questionnaire of Trail and McCullough (2020) and the Portuguese version, a translation of the English version, adapted for the present investigation, produced by the authors and checked for cross-cultural equivalence by a professional translator using a committee approach (Brislin, 1980).

### ***3.4. Data analysis***

Using IBM SPSS Statistics (v. 25), the normal distribution of the data was assessed through skewness (sk) and kurtosis (ku) measures. Non-severe violations of the normality assumption, with absolute values of the sk and ku lower than 3 and 7 respectively were the thresholds to use SEM analysis with maximum likelihood estimation (Marôco, 2014).

The SEM analysis was performed with lavaan package (v. 0.6.4; Rosseel, 2012) from the R statistical package (v. 4.0.2 for Windows; Team, 2020). To deal with missing values, full information maximum likelihood (FIML) imputation was used. Also, in this investigation, the maximum likelihood estimation with robust standard errors (MLR) estimator was selected in face of the non-severe deviations of the items' normal distributions. The MRL was also chosen because it performs well with missing values (Rosseel, 2012). The Robust fit measures chi-square ( $\chi^2$ ), comparative fit index (CFI),

Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA) and the standardized root mean square residual (SRMR) were used to assess the goodness of fit of the model accepted for CFI > 0.900, TLI > 0.900, RMSEA < 0.080 and SRMR < 0.08 (Hair Jr. et al., 2010; Marôco, 2014). Items with factor loadings < 0.5 and the items that presented problems to the model identification were removed.

As the model presents first and second-order factors, it was necessary to calculate the composite reliability with the coefficient omega ( $\omega$ ) for the first-order factors and the coefficient omega at Level 1 ( $\omega_{L1}$ ) and Level 2 ( $\omega_{L2}$ ) for the second-order factors (Bollen, 1980; Fornell & Larcker, 1981; Green & Yang, 2009). This was performed with the SemTools R package (v.0.5.3; Jorgensen et al., 2020) and analysed considering the reference values for CR and  $\omega \geq 0.7$  (Hair Jr. et al., 2010; Marôco, 2014) as indicative of acceptable internal consistency.

The convergent and discriminant validity of the measurement model was verified using SemTools R package (v.0.5.3; Jorgensen et al., 2020) to compute the average variance extracted (AVE) and the correlations between factors. The AVE value threshold for distinguishing a good convergent validity is  $\geq 0.5$  (Hair Jr. et al., 2010). Discriminant validity was assessed by comparing the values of the AVE factor with squared correlations between the factors. The factors were considered discriminating when the AVE was greater than the square correlations (Fornell & Larcker, 1981).

#### **4. Results**

Although in this investigation, the SSCEM explained 42% of the Sustainability Intentions, falling below the 74.2% obtained by Trail and McCullough (2020), this value is well above the  $R^2 = .25$ , advanced as a good metric for social sciences (Cohen, 1988).

The measurement model had an acceptable fit ( $\chi^2_{(441)} = 948.666$ ; RMSEA = .045; CFI = .924; TLI = .914; SRMR = .052).

The results attested non-severe violations of the normality for all the items as well as good internal consistency reliability within most factors, excepting for the Self-actualization Needs, Attitudes, Lack of Time and Lack-of-Interest-from-Others which presented values slightly below the recommended threshold (Table1).

**Table 1.**

*Items distributional properties (Mean, Standard Deviation, Skewness, and Kurtosis) and loading of items on constructs (Standardized Loadings, Omega Coefficient and Average Variance Extracted).*

	<i>M</i>	<i>SD</i>	<i>sk</i>	<i>Ku</i>	$\lambda$	$\omega$	AVE	
<b>Self-actualization Needs</b>							.67	.41
Inner peace – At peace with one’s self and life.	6.2	1.2	-1.97	4.30	.746			
Aesthetics - Being appreciative of beautiful things in life.	5.7	1.5	-1.53	2.27	.621			
Wisdom – Accumulated knowledge of life gained through experience.	6.0	1.2	-1.54	1.93	.532			
<b>Universalism Values</b>							.73	.47
Environmentalism - Protecting the environment.	6.0	1.3	-1.41	1.38	.696			
Social justice - Fair and dignified treatment of all people within society.	6.1	1.3	-1.91	3.70	.722			
Tolerance - Accepting differing views of other people and treating them fairly.	5.6	1.6	-1.26	0.89	.655			
<b>Attitudes toward the Campaign</b>							.62	.45
I like that this event is trying to promote people’s environmentally sustainable practices.	6.4	0.95	-2.33	7.07	.644			
I like that this event is inspiring people to be more environmentally friendly.	6.2	1.09	-2.01	5.19	.694			
<b>Sustainability Intentions</b>							.80	.43
During this event, I will make sure to recycle all of my waste.	6.2	1.12	-2.01	5.04	.502			
During this event, I am planning to recycle all of my plastic waste.	6.2	1.13	-1.79	3.69	.458			
During this event, I intend to recycle all of my waste.	6.2	1.09	-1.81	4.15	.456			
During this event, I will make sure to refill my water bottle at the provided refill stations.	5.4	1.41	-.94	.63	.756			

During this event, I am planning to refill my water bottle at the provided refill stations.	5.3	1.56	-.92	.27	.734		
During this event, I intend to refill my water bottle.	5.7	1.53	-1.45	1.62	.708		
<b>Points of Attachment (<math>\omega_{L1} = .82</math>; <math>\omega_{L2} = .95</math>)</b>							
<b>Attachment to the Surfers</b>						.78	.64
I am a fan of the surfers on the World Surf League (WSL) events.	4.8	1.77	-.55	-.56	.884		
I am a big fan of specific surfers.	4.1	1.88	-.21	-1.04	.722		
<b>Attachment to the Sport</b>						.85	.54
First and foremost, I consider myself a surfing fan.	4.9	1.76	-.61	-.51	.867		
Surfing is my favourite sport.	4.1	1.93	-.03	-1.12	.716		
Of all sports, I prefer surfing.	4.2	1.93	.01	-1.17	.620		
<b>Attachment to the Level of Sport</b>						.88	.70
I am a fan of WSL events regardless of who is surfing.	4.9	1.67	-.71	-.10	.769		
I consider myself a fan of WSL events, and not just one specific surfer.	4.7	1.76	-.54	-.53	.806		
I am a big fan of WSL events.	4.8	1.72	-.50	-.56	.924		
<b>Attachment to the Community</b>						.79	.60
I feel connected to numerous aspects of the Ericeira/Peniche community.	4.5	1.68	-.26	-.59	.845		
I feel that I am a part of the Ericeira/Peniche community.	4.0	1.92	-.70	-1.04	.801		
I support the Ericeira/Peniche community as a whole.	5.2	1.46	-.61	-.06	.600		
<b>Internal Constraints (<math>\omega_{L1} = .60</math>; <math>\omega_{L2} = .78</math>)</b>							
<b>Lack of Knowledge</b>						.73	.58
I don't understand why this event is worried about water bottle refilling.	2.0	1.65	1.82	2.17	.669		
I don't understand why this event is worried about waste recycling.	1.7	1.38	2.37	5.17	.879		
<b>Lack-of-Interest-from-Others</b>						.62	.36
My friends are not interested in acting sustainably.	2.5	1.58	1.02	.29	.642		
My family is not interested in acting sustainably.	2.4	1.68	1.19	.44	.588		
My significant other is not interested in acting sustainably.	2.4	1.74	1.12	.21	.562		
<b>Lack of Time</b>						.63	.48
I don't have time to find a refill water station when I'm watching surfing events.	2.7	1.63	.79	-.31	.708		

I don't have time to find a waste recycling receptacle when I'm watching surfing events.	2.3	1.56	1.13	.36	.647
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**External Constraints**

When watching surfing events, it is just easier to buy a water plastic bottle than to look for a refill water station.	3.4	1.91	.27	-1.17	
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**Past Sustainable Behaviours**

Approximately what percentage of times do you recycle material that is recyclable?	73.5	29.3	-1.24	.49	
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Legend: For  $p < 0.05$ , all items are significant.

For the high order factors, Points of Attachment showed good reliability, with the two reported CR values above the reference, and Internal Constraints present  $\omega_{L1}$  below the reliability criterion, although the  $\omega_{L2} > .70$  (Table 1).

From the results' analysis, most of the factors displayed weak evidence of convergent validity ( $AVE < .50$ ), excepting Attachment to the surfers, Attachment to the sport, Attachment to the level of sport, Attachment to the community and Lack of Knowledge. The discriminant validity was confirmed in most factors presented, except for Needs, Attachment to the surfers, Attachment to the sport and Attachment to the level of sport, where the AVE was slightly below the squared correlations (Table 2).

**Table 2.**

*Correlations (below the diagonal), Squared Correlations (above the diagonal) and AVE (the main diagonal).*

	1	2	3	4	5	6	7	8	9	10	11
1.Needs	.406	.419	.191	.094	.044	.046	.045	.010	.021	.026	.035
2.Values	.647	.473	.121	.073	.058	.062	.061	.014	.013	.016	.022
3.Attitudes	.437	.348	.453	.157	.077	.081	.080	.018	.074	.089	.123
4.Intentions	.306	.270	.396	.425	.036	.038	.037	.008	.110	.131	.182
5. Attachment to the Surfers	.209	.241	.277	.189	.644	.759	.745	.169	.000	.000	.000
6. Attachment to the Sport	.214	.248	.285	.195	.871	.537	.785	.179	.000	.000	.000
7. Attachment to the Level of Sport	.212	.246	.282	.193	.863	.886	.700	.176	.000	.000	.000
8. Attachment to the Community	.101	.117	.134	.092	.411	.423	.419	.598	.000	.000	.000
9.Lack of Knowledge	-.146	-.116	-.272	-.331	.003	.003	.003	.001	.580	.198	.328
10.Lack of Interest	-.160	-.126	-.298	-.362	.003	.003	.003	0.002	.445	.355	.328
11.Lack of Time	-.188	-.149	-.351	-.427	.004	.004	.004	0.002	.524	.573	.480

The structural model also had an acceptable fit ( $\chi^2_{(503)} = 1092.052$ ; RMSEA = .046; CFI = .913; TLI = .903; SRMR = .060). The applied modification indexes were the introduction of covariance between the items: a) included in Attachment to the sport (“First and foremost, I consider myself a surfing fan” and “Surfing is my favourite sport”), with a significant correlation ( $\beta > .6$  and  $p < .05$ ); and b) Sustainability Intentions items (“During this event, I will make sure to refill my water bottle at the provided refill stations” and the two others refiling intention items).

From the path coefficients identified in the model (Table 3), this investigation found the significant direct effect of (i) Self-actualization Needs on Universalism Values, (ii) Self-actualization Needs, Points of Attachment and Internal Constraints on Attitudes

toward the Campaign and (iii) Attitudes toward the Campaigns, Past Sustainable Behaviours and External Constraints on Sustainability Intentions.

**Table 3.**

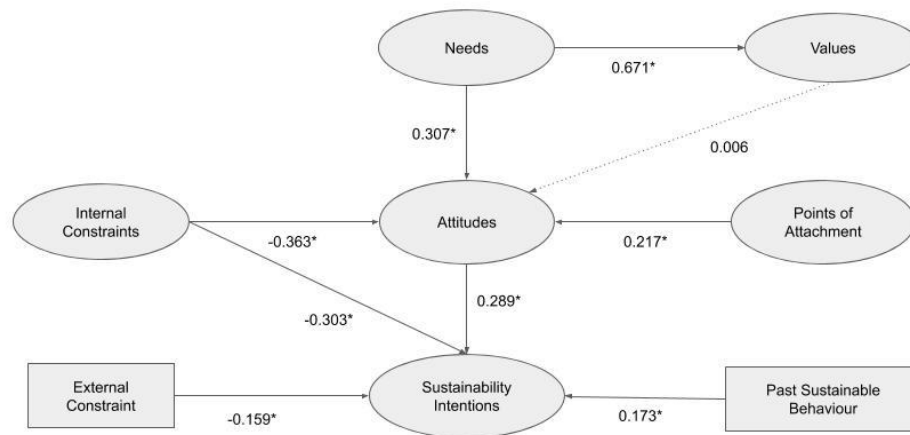
*Path coefficients in the sport sustainability campaign evaluation model.*

	z-value (t)	P(> z )	$\beta$
Self-actualization Needs → Universalism Values	6.181	.00	.671
Self-actualization Needs → Attitudes toward the Campaign	2.400	.02	.307
Universalism Values → Attitudes toward the Campaign	0.055	.96	.006
Points of Attachment → Attitudes toward the Campaign	3.928	.00	.217
Internal Constraints → Attitudes toward the Campaign	-4.128	.00	-.363
Attitude toward the Campaign → Sustainability Intentions	2.604	.01	.289
External Constraints → Sustainability Intentions	-2.882	.00	-.159
Past Sustainable Behaviours → Sustainability Intentions	3.338	.00	.173
Internal Constraints → Sustainability Intentions	-2.808	.01	-.303

However, the positive influence of Universalism Values on Attitudes toward the Campaign was not supported and, consequently, the effect of Needs on Attitudes toward the Campaign mediated by Universalism Values was also not corroborated. The results showed the Internal Constraints as the only factor with significant indirect effect on Sustainability Intentions,  $(a * b) \beta = -0.363 * 0.289 = -.105$ , accounting for a total effect  $\beta = -.408$ . Furthermore, 45% of the variance of Environmental Values ( $R^2 = .450$ ) and 35,6% of the variance of Attitudes toward the Campaign were explained by the model as well as 42% of the Sustainability Intentions ( $R^2=.422$ ) (Figure 2).

**Figure 2.**

*Sport Sustainability Campaign Evaluation Model ( $R^2=.442$ ).*



Legend:  $\beta$  = standardized path coefficients, \*Significant p-value < 0.05

## 5. Discussion

The present study aimed to apply the SSCEM to spectators of international surf events where environmental campaigns focused on the reduction, reuse and recycling of plastic waste were implemented.

Focusing on the SSCEM, the results demonstrate acceptable reliability, convergent and discriminant validity, although it is noted the very low reliability and convergent validity for the Lack-of-Interest-from-Others factor. In Kim and Trail's results (2010) the Lack-of-Interest-from-Others factor obtained better results for reliability and convergent validity, but still, it was the factor that obtained the lowest scores for these indicators across the constraints' scale (Kim & Trail, 2010). Thus, it is important to analyse more carefully the need to introduce this factor in future studies on the spectators' sustainability intentions.



Regarding the hypotheses advanced specific to the SSCEM, this investigation's results support the SSCEM as seven of the proposed hypotheses were validated, namely, the effect of Self-actualization Needs and Points of Attachment on Attitudes towards the Campaigns; the negative effect of Internal Constraints on Attitudes towards the Campaigns, which were not confirmed by Trail and McCullough (2020); and the effect of Past Sustainable Behaviours and External Constraints on Sustainability Intentions. There were only two SSCEM hypotheses supported by Trail & McCullough (2020), which this investigation didn't validate; specifically, neither the influence of Universalism Values on Attitudes towards the Campaigns nor the Self-actualization Needs positive effect on Attitudes towards the Campaigns mediated through Values were supported. It is important to highlight that the results of this investigation also supported one more relation with significant influence on Sustainability Intentions, namely, the direct negative effect of Internal Constraints, which was not conceived in the original SSCEM developed by Trail and McCullough (2020).

In analysing the SSCEM's hypothesis spectrum, the results that confirmed the validation of H1 and H2 (i.e., Self-actualization Needs will influence Universalism Values and Attitude toward Sustainability Campaigns) and the variance of Values explained by the Needs corroborate the theoretical background, supporting the choice of Inner Peace, Aesthetics and Wisdom to reflect the needs related to the environmental theme. Trail and McCullough (2020) included ten different needs that corresponded to various levels, namely, self-actualization, belongingness, safety and physiological needs (Trail, 2018), although the needs were not found to be predictors of Attitudes toward Sustainability Campaigns. The present investigation only used Self-actualization Needs and confirmed its predictive effect on Attitudes toward Sustainability Campaigns. These types of needs appear at the top of the Maslow pyramid (Trail, 2018), inferring that the

needs related to sustainability intentions will only be influential when all other levels of needs are satisfied.

H3 and H4 - predictors of the influence of Values on Attitudes toward Sustainability Campaigns and their mediating role between Needs and Attitudes toward Sustainability Campaigns - were not validated in this research. These results support neither the findings of Trail's (2016) research, where the Inner Peace, Aesthetics and Wisdom needs were related to sustainable behaviour only through values, nor the vast literature that focuses on biocentric and universal values as influencing environmental attitudes and behaviour (Van der Werff et al., 2014; de Groot & Steg, 2010; Casper et al., 2014; Gau et al., 2019; van Riper et al., 2019). It may be beneficial, in future investigations, to also introduce hedonic values since they have also been related to nature-based sports (van Riper et al., 2020).

H5, which forecasted the influence of the Points of Attachment on the Attitudes toward Sustainability Campaigns, showed better results than in Trail and McCullough's (2020) study. The present investigation applied several subscales of the Points of Attachment Index (Ballouli et al., 2016; Robinson & Trail, 2005; Trail et al., 2003), among which the Attachment to the event factor was not supported, inferring that the spectators' identification in relation to the event does not revert in favour of their attitude towards the environmental campaign. Regarding surf as a lifestyle sport where there is a particular social identity (Wheaton, 2010) and the focus on sport subcultures to social / environmental event strategic leveraging (O'Brien & Chalip, 2008), this result highlights the possibility of investing more in promoting the identification of spectators with the surfers, the host community and the surf itself to further enhance its environmental campaigns. In fact, this result corroborates the strategy used in the "Beat the Plastic" campaign at MEO Rip Curl Pro 2019 Peniche, for example, where surfers used boards

made with marine plastic in the special heat. The use of role models to promote environmental behaviour has been suggested in the sports literature (Chen et al., 2018; Martin et al., 2017), and taking into account the results of this investigation, this strategy must be implemented and promoted at international surfing events.

The theoretical framework that underlies the positive relationship of environmental attitudes as predictors of behavioural intentions (Ajzen & Madden, 1986; Klöckner, 2013) was corroborated by this study, since the H6, predicting that Attitudes toward the Campaigns influence Sustainability Intentions, was validated. This result also confirms the findings of Trail's (2016) investigation and McCullough's (2013) study, relating spectators' environmental attitudes to their environmental behaviour. This result underlines, for example, the importance of awareness campaigns and induction of pre-event environmental attitudes to leverage the strategies and actions to be carried out at the event, setting community agenda for environmental issues (O'Brien & Chalip, 2008). This investigation also supported H7 and H8, expecting that Internal Constraints would have a negative effect on Attitudes toward the Campaigns and External Constraints would negatively affect the Sustainability Intentions. In prior research with SSCEM, Trail and McCullough (2020) did not verify the influence of the Internal Constraints on Attitudes toward the Campaigns, so they alerted for the lack of consistency of the result concerning the conceptual framework. However, the results of the present investigation support the importance that has been attributed to the study of constraints in the context of environmental behaviour (Moghimehfar & Halpenny, 2016; Thøgersen, 2005) and, more specifically, regarding the sports consumer's environmental behaviour (Trail & McCullough, 2018), in which Internal and External Constraints have found to undermine the Sustainability Intentions.

The last hypothesis (H9) supported by this investigation considers Past Sustainable Behaviours as predictors of Sustainability Intentions, for which the loading factor was low but the relationship was significant. This result not only corroborates the findings of the previous research carried out with the SSCEM (Trail & McCullough, 2020), but is in line with the literature that attests to the positive effect of past behaviours on the attendance behavioural intentions of the spectator (Chiu et al., 2019), the positive influence of past environmental behaviours on the spectators' recycling intentions (McCullough & Cunningham, 2011), and even in a general consumption context, the positive effect of the past environmental behaviours on the sustainability intentions (Van der Werff et al., 2014).

### ***5.1. Limitations and Future Directions***

Concerning the limitations of this investigation, the collection of data *in loco* and during the occurrence of the events may have interfered with the concentration of the spectators and consequently, increased fatigue in completing the questionnaire. Also, the absence of a post-event assessment of effective environmental behaviours, as advocated by Trail (2016), girded the findings to the sphere of sustainability intentions; however, in this investigation, only 62 respondents (10% of the sample), responded to the email request for a post-survey, so the inclusion of a post-evaluation analysis was not feasible. In fact, acknowledging the bias that exists between intentions and behaviour (Kormos & Gifford, 2014) it is noteworthy that the questionnaire used self-reported items, which only allowed the verification of behavioural intentions and not of observed behaviours.

The results of this investigation have important implications since it upgraded the SSCEM and supported its use in future investigations on the evaluation of environmental campaigns and programs. The application of the model in researching a substantial part of the consumption of nature sports events (i.e., spectators) consolidated its ability for

evaluating the effects of a sustainability campaign on ecological behaviour. In this sequence, the SSCEM can be used as an important strategic management model to explore sustainable marketing, especially with regard to the vector of communication in the sustainable marketing mix (Peattie & Belz, 2010). Furthermore, this research contributed to the strengthening of the knowledge of sport ecology, considered as an important area of sport management (McCullough et al., 2020).

Future investigations must focus on the study of post-events' behavioural intentions as a dimension that should be embraced by the SSCEM, allowing inferences about the effects of the environmental campaigns undertaken by the sporting events (Trail & McCullough, 2020). Future studies should also include the spectators' expectations on the responsibility of the event's organizations to incorporate more effective environmental management practices, as underlined by Casper et al. (2017), which verified a relationship between the expectations of the spectators and their intention to adopt an ecological behaviour.

In turn, the methodological implications of this study advocate for: a) prior knowledge on the needs and values more connected to the environmental behaviour of the sports consumers under study; b) introduction of several Points of Attachment, measured through multi-items; and c) inclusion of the negative influence of Internal Constraints, not only on attitudes but also on the direct effect on sustainability intentions. Subsequently, future investigations should pay attention to a careful choice of needs and values to be measured by SSCEM, the adaptation of the Points of Attachment Index with the introduction of several points of attachment and a redesign for SSCEM, namely, the inclusion of a new path illustrating the direct effect of Internal Constraints on Sustainability Intentions.

## 6. Conclusion

In a post-COVID-19 world, it will be important to question how the sports industry has organized itself, namely, how the balance between the economic and the environmental vector can be achieved (Clevenger et al., 2020). Growing the research on the knowledge of strategic environmental management, with a special focus on environmental marketing and communication, will lead to a deeper understanding of the adoption of environmentally sustainable behaviours as a result of environmental programs /campaigns, which will support the sports organizations' promotion of ecological initiatives more accurately.

The results of this study provide support for the use of the SSCEM in the analysis of the effects of the sporting events' environmental campaigns. In fact, at surf events, the approach to environmental campaigns designed by sports organizations should be more tailored, knowing that not only the wisdom, inner peace and aesthetics are related to the spectators' attitudes, but also the identification with the surfers, sport, level of sport and local community held by the spectators. The findings showed that Internal and External Constraints have found to undermine the Sustainability Intentions, namely the significant effect of Internal Constraints on Sustainability Intentions. Moreover, the knowledge of spectators' points of attachment can help sports managers and marketing experts to develop strategies focusing on increasing spectators' attitudes toward environmental campaigns. At surfing events, the barriers to attitudes and intentions of performing environmental behaviours must be taken care of, implying that the constraints related to the lack of knowledge, interest from others, time and access should be addressed by the respective management. In conclusion, managers of sports organizations have a valuable resource at their disposal, since SSCEM will not only help to better understand the effects

of environmental campaigns on sports consumption but also to better define strategic environmental goals to design future campaigns.

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# Chapter 4: Understanding spectators' sustainable transportation intentions in international sport tourism events<sup>3</sup>

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<sup>3</sup> Martins, R., Pereira, E., Rosado, A., Marôco, J., McCullough, B., & Mascarenhas, M. (under review). Understanding spectators' sustainable transportation intentions in international sport tourism events. (submitted to *Journal of Sustainable Tourism*).



**Abstract**

Studying the spectators' response to environmental campaigns is important to advance the implementation of environmental sustainability. Therefore, the objective of this investigation, composed of two studies, was to identify which factors influence the spectators' sustainable transport intentions of surfing events and segment the spectators based on their sustainable transport intentions.

Data collection included 355 questionnaires applied to a sample of spectators at an international surfing event, which were analysed in two studies: Study 1 tested the Sport Sustainability Campaign Evaluation Model (SSCEM), using the Lavaan package from the R software, to infer about the spectators' sustainable transport intentions; and Study 2 performed a non-hierarchical cluster analysis to segment the sample based on the former intentions, using IBM SPSS Statistics.

The results highlighted the effect of constraints, points of attachment and past sustainable behaviours as predictors of spectators' sustainable transport intentions. Also, differences in aesthetics needs, attachment to the community, lack of time, lack of access, and past sustainable behaviours were found within the three analysed clusters.

Sport managers should develop a tailored approach, attending to the spectators' attachment and constraints, to implement more effective sustainable transportation environmental campaigns regarding the specific context of international surfing events.

**Keywords:** consumer's environmental behaviour, environmental sustainability, sport events, sport tourism, spectators, sustainable transportation.

## 1. Introduction

Transport is one area with larger contributions to carbon emissions in tourism (Scott et al., 2016). For that reason, it is vital to study sport events included in the tourism sector (Getz & Page, 2016), and more specifically, in sport tourism (Hinch & Ito, 2018). The assessment of carbon emissions dictated that the transportation area is one of the main factors associated with the environmental unsustainability in sporting events, mostly related to participants and spectators' transport options (Edwards et al., 2016; Pereira et al., 2019; Triantafyllidis et al., 2018). Long-distance travel, air transport and single-use car mode have been identified as the major influential factors in generating sport events' carbon dioxide emissions (Dolf & Teehan, 2015). Recognized the contribution of the transport sector in developing the carbon footprint of sporting events, it is also essential to highlight the little attention of scientific research to the study of sport spectators concerning environmental sustainability (Mascarenhas et al., 2021; McCullough et al., 2020a). Still, in the context of the demand for sport tourism, in which the spectators are included, research has underlined the value of environmental education and communication as tools to implement environmental sustainability and the need for a tailored approach to sport actors (Mascarenhas et al., 2021).

The recognition of the potential of sport tourism to leverage environmental sustainability, through raising the awareness of sport actors and implementing environmental strategies and measures (International Olympic Committee [IOC], 2012; United Nations Environment Programme [UNEP], 2019; World Tourism Organization [WTO], 2019), led sport organizations to act, for example, producing environmental education initiatives and campaigns in sporting events (Barrett et al., 2019; McCullough et al., 2016; Pereira et al., 2020). However, within the leisure context, the study of transport reveals an increased difficulty since it is harder to anticipate the factors that

influence the adoption of sustainable transportation (Prillwitz & Barr, 2011). Thus, to improve the environmental actions' outcomes, some studies (Martin et al., 2017; Tölkes, 2018) have been recommending the alignment between environmental communication and the target audience's values, motivations, and preferences.

Some studies (Wheaton, 2007, 2010) have highlighted the surf community's connection to nature and its environmental activism. Thus, the theme of sustainable transport is not ignored by the World Surf League (WSL), one of the major organizations in the surfing context (WSL, 2019), committed to being carbon neutral, offsetting its events by taking part in carbon offset projects. Recently, the WSL joined a worldwide platform to promote climate awareness and action among global citizens by the sport community (United Nations Framework Convention on Climate Change [UNFCCC], 2018). Therefore, it is crucial to understand the response of spectators to sustainable transport initiatives in surfing events.

Following the above, the objective of this investigation was to identify which factors influence the spectators' sustainable transport intentions of surfing events (Study 1) and segment the spectators based on their sustainable transport intentions (Study 2).

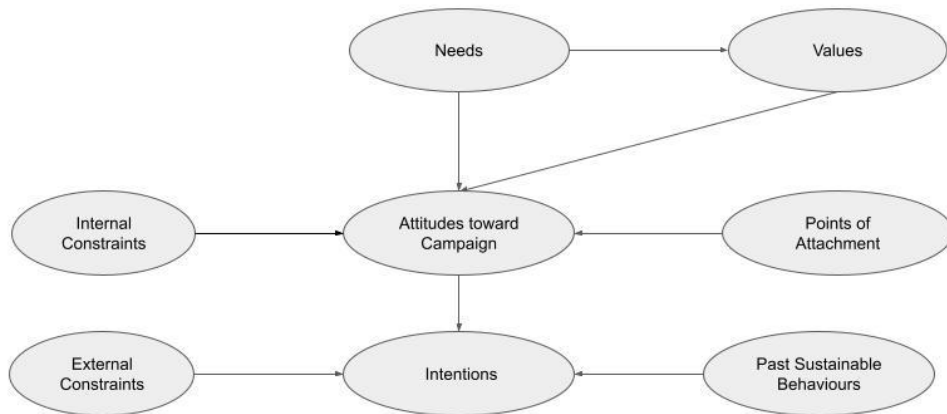
## **2. Theoretical Framework**

Trail (2016) proposed the sport fan sustainability behaviour model to study the spectator's sustainability intentions. This model stipulates the various factors that compete for sport fans' attitudes and behaviour intentions specific to sustainability campaigns but the model has not yet been tested extensively. Following the same research line, the Sport Sustainability Campaign Evaluation Model (SSCEM) was created to study the effect of environmental campaigns on the sustainability behavioural intentions of the

sport actors (Trail & McCullough, 2020). The SSCEM advocates values, needs, internal constraints, and points of attachment as predictors of attitudes toward the campaign, and also, attitudes toward the campaigns, past sustainable behaviours, and external constraints as predictors of sustainability intentions (Trail & McCullough, 2020) (Figure 1).

**Figure 1.**

*Sport Sustainability Campaign Evaluation Model (Trail & McCullough, 2020, p.4)*



To produce the SSCEM, Trail and McCullough (2020) relied on a vast theoretical body, framing the theory of planned behaviour (TPB) (Ajzen & Madden, 1986), value-norm-beliefs (Stern et al., 1999), and identity theory (Stryker & Burke, 2000). These theories inform their model to study the effect of needs, values, points of attachment, attitudes, and past behaviours, and constraints models to substantiate the negative influence of internal and external constraints (Trail & McCullough, 2018).



### ***2.1. Values, Needs and Attitudes***

Explicitly, the universal and biospheric values had been investigated as predictors of pro-environmental behaviour (de Groot & Steg, 2010), in studies with sport spectators and practitioners (Casper et al., 2014; 2017; 2020; Gau et al., 2019; van Riper et al., 2019). Adding Trail's research findings (2016), self-actualization needs for wisdom, inner peace, and aesthetics were related to the sport spectators' environmental sustainability intentions when mediated by environmentalism, tolerance, and social justice values. In a generalist perspective, the TPB (Ajzen & Madden, 1986) determined the attitudes as predictors of intentions and behaviour, and more recent studies contextualized in sport tourism have found the positive effect of environmental attitudes on sport practitioners' environmental activism and educational behaviour (Kil et al., 2014) and spectators' recycling behaviour (McCullough, 2013). Accordingly, this study proposes,

**H<sub>1</sub>:** Self-actualization Needs will influence Universalism Values.

**H<sub>2a</sub>:** Self-actualization Needs will influence Attitudes toward the Campaign.

**H<sub>2b</sub>:** Self-actualization Needs will influence Attitudes toward the Campaign mediated by Universalism Values.

**H<sub>3</sub>:** Universalism Values will influence Attitudes toward the Campaign.

**H<sub>4</sub>:** Attitudes toward the Campaign will lead to Sustainable Transport Intentions.

### ***2.2. Points of Attachment***

Considering points of attachment as the multiple points of spectator identification that consummate a close attachment regarding an exterior object (Trail et al., 2005), several studies established the influence of points of attachment on sport spectators' consumption (Ballouli et al., 2016; Rocha & Fleury, 2017; Trail et al., 2005), for example, the spectators' attachment to the driver, team, event, and place, was found to influence

the Formula 1 attendance intentions (Ballouli et al., 2016). Linking to studies on sustainable transportation, the pro-environmental identity role has been highlighted, concerning sustainable transport options (Whitmarsh & O'Neill, 2010), in a tourism context (Hibbert et al., 2013). As such, this study suggests,

**H5:** Points of Attachment will influence Attitudes toward the Campaign.

### ***2.3. Past Behaviour and Constraints***

The influence of other important factors in the study of human behaviour, such as constraints and habits - which comprise past behaviours – was recognized in environmental behavioural research (Steg & Vlek, 2009). Several sport studies have proved the positive link between past behaviours and the spectators' behavioural intentions (Chiu et al., 2019; McCullough & Cunningham, 2011) and the negative influence of constraints on sport consumption (Kim & Trail, 2010; Rocha & Fleury, 2017). Specifically, for the sport consumer and environmental behaviour, Trail (2016, 2019) exposed the internal and external constraints – following Kim and Trail constraints' definitions (2010) - as influencing factors in the study of sustainability intentions, which were empirically supported by Trail and McCullough (2020). Correspondingly, this research brings forward the hypotheses,

**H6:** Past Sustainable Behaviours will lead to Sustainable Transport Intentions.

**H7:** Internal Constraints will negatively influence Attitudes toward Sustainability Campaigns.

**H8:** External Constraints will negatively influence Sustainable Transport Intentions.

#### ***2.4. Spectator Segmentation***

Segmentation is a powerful marketing tool to gain a deeper understanding of demand (Dolnicar et al., 2018) in the sport context (Funk et al., 2016). The requisite for sport actors' segmentation aimed at the implementation of environmental sustainability (Mascarenhas et al., 2021) and, more specifically, for environmental campaigns (Klöckner, 2015) induce the need to understand not only the factors that contribute to the environmental response of the targeted sport actors, but also the distinctive elements between them. Thus, segmentation can focus on several characteristics to find similarity between groups in a population, namely demographic, geographical, behavioural, and psychographic characteristics, and can be performed *a priori* or *posteriori*, depending on whether the criterion for segmentation is adopted before or after data analysis (Dolnicar et al., 2018) and considering the planned strategic objectives (Klöckner, 2015; Kotler et al., 2006).

From the scarcity of studies that presented distinguishing characteristics of the sport actors based on their sustainable intentions, findings indicate the surfers' intentions and environmental behaviour (Frank et al., 2015) compared to non-surfers (Larson et al., 2018). Within sport events, some results reveal differentiation among the sport actors' environmental intentions and behaviours, such as Trail and McCullough's (2018) findings, which expose differences between the sport participants considering the constraints lack of knowledge, lack of worth, lack of access and no interest from others. Also, the willingness to pay for greener initiatives at sport events was different within the sport participants according to age, level of education and income (associated with the profession) (Saayman et al., 2016). Considering spectators' studies, female spectators were positively associated with the environmental topics proposed in sporting events (Casper et al., 2017). At the intersection between nature sport tourists and the topic of

sustainable transport, the studies produced by Wicker (2018, 2019) inferred about the influence of income and high frequency of sport practice and event competitions with more carbon-intensive modes of transport - air travel and single-use car mode - on the production of the higher carbon footprint of sport practitioners.

Nevertheless, the segmentation based on the socio-demographic characteristics within a tourism context is less predictable (Prillwitz & Barr, 2011) thus requiring a more comprehensive approach. The concept of sustainable marketing also proposes a holistic approach to consumer behaviour to integrate the complexity of environmental behaviour into the marketing strategy (Peattie & Beltz, 2010). In line with this framework, this study proposes,

**H<sub>9a</sub>**: The spectators with sustainable transport intentions will present different results for self-actualization needs, constraints, points of attachment and past sustainable transport behaviours, compared to spectators without sustainable transport intentions.

**H<sub>9b</sub>**: The spectators with sustainable transport intentions will present different results for universalism values, compared to spectators without sustainable transport intentions.

**H<sub>10</sub>**: The spectators with sustainable transport intentions will present different socio-demographic and sport behavioural characteristics, compared to spectators without sustainable transport intentions.

Based on the exposed theoretical framework, the objective of this investigation is two-fold: to identify which factors influence the spectators' sustainable transport intentions of surfing events (Study 1) and segment the spectators based on their sustainable transport intentions (Study 2). In this way, the present investigation presents a macro perspective to understand the spectators' environmental response to the

sustainable transport' environmental campaign, followed by a spectators' segmentation based on the sustainable behavioural intentions criterion.

### **3. Material and Methods**

The design of this investigation is based on the objective of the study, which is divided into two, thus constituting Study 1 to verify hypotheses H<sub>1</sub> through H<sub>8</sub> and Study 2 to verify hypotheses H<sub>9</sub> and H<sub>10</sub>. Therefore, after identifying the context of the event, the sample, and the instrument used in both studies, this research presented the procedures and results for each study, bearing in mind the use of Structural Equation Modelling (SEM) for Study 1 and K-means cluster analysis for Study 2.

#### ***3.1. Event Context***

The MEO Rip Curl PRO 2019 is a stage of the World Championship Tour, hosted in Portugal since 2009. Together with the local council as a co-organizer, which has been involved in the sustainable surf destination certification for Peniche (STOKE, 2020) and several local and international sponsors and suppliers, the WSL organized the MEO Rip Curl PRO 2019 between the 17<sup>th</sup> and 26<sup>th</sup> of October 2019, at Supertubos beach – Peniche. The event involved 54 international male and female surfers and a sport staff team of 300 persons. Among other environmental campaigns and initiatives regarding, for example, plastic pollution, the event also counted with an outsourcing service provider to include a shuttle bus service, which had a stop in the event area.

#### ***3.2. Sampling***

The required sample met the criteria type one  $\alpha=.05$  and a desired statistical power level of .80; medium effect size. The observations that contained 10% or more missing

values were excluded (Enders, 2010). For analysis, 355 questionnaires remained. The sample (Table 1) is mostly young, educated - with the majority having a university education - and active - 39% surf.

**Table 1.**

*Sample socio-demographic and sport activity characteristics.*

		<b>Total (n)</b>	<b>Total (%)</b>
<b>Gender (n=354)</b>	Male	170	48
	Female	184	52
<b>Age (n = 321)</b>	Under 25	107	33.3
	25 - 30	100	31.2
	31 - 40	67	20.9
	41 or more	47	14.6
<b>Level of Education (n=351)</b>	High school	81	23.1
	Undergraduate	125	35.6
	Graduate	142	40.5
	Other	3	.9
<b>Sport Activity (n=354)</b>	Active (other sports)	159	44.9
	Active (surf)	138	39.0
	None	57	16.1

Data collection was carried out *in loco*, with questionnaires, using paper and pen, and included spectators over 18 years of age. It was performed on weekdays and weekends, and was made by a team of collaborators to cover the various areas where spectators' circulation was allowed. Following a brief presentation of the investigation to the respondents, the collaborators were instructed to provide the necessary time and space to respondents complete the questionnaire.

### **3.3. Instrument**

Since the SSCEM (Trail & McCullough, 2020) was the chosen model to measure the spectators' sustainable transport intentions, the formulation of the hypotheses and the measurement instrument was adapted to take into account the specific surfing event context and the sustainable transport campaign. Thus, the questionnaire measured the

Self-actualization Needs dimension through the need for Wisdom, Inner Peace, and Aesthetics and the Universalism Values dimension through Social Justice, Tolerance, and Environmentalism. The items were selected for their representativeness (highest factor loader) from Trail and McCullough's (2020) study. The inclusion of the Need for Aesthetics and Environmentalism values was justified by the recognition of their contribution to environmental behaviour (Casper et al., 2017; Trail, 2019; van Riper et al., 2019). Attitudes toward the Campaign were measured through two items characterizing the attitude toward specific campaigns and initiatives at the surfing event to promote sustainable behaviour.

Points of Attachment was conceptualized as a high order-factor reflected in Attachment to the Surfers, Attachment to the Sport, Attachment to the Level of Sport, and Attachment to the Community. Each one of these factors was measured by three items based on the Points of Attachment Index for which the reliability and validity of the constructs were identified with good results, as in Robinson and Trail (2005) research, where the Points of Attachment subscales had  $\alpha$  from .75 to .85 and AVE .48 to .68.

Sustainable Transport Intentions were measured through three items focusing on sustainable transport behaviours during the event, and Past Sustainable Behaviours through three items representing the behaviours that linked to sustainable transportation. The External Constraints were measured through the Lack of Access since it was the only coherent factor in Trail and McCullough's (2020) study to the characteristics of this investigation. Internal Constraints were measured by the Lack of Knowledge, Lack of Worth, Lack-of-Interest-from-Others and Lack of Time, with a total of six items worded negatively. Although the Lack of Time was an external constraint in Trail and McCullough (2020), in Trail's (2019) research, this factor was considered an internal

constraint as a personal perception and not as an external imposition, as in the present investigation.

Following Trail and McCullough (2020), Self-Actualization Needs and Universalism Values dimensions were measured by three self-reported items with a 9-point scale, with -1 = Opposed to my Needs/Values, 0 = Not Important, 3 = Important, 6 = Very Important, and 7 = Of Supreme Importance. The Attitudes toward the Campaign, Points of Attachment, Sustainable Transport Intentions, Internal and External Constraints were measured with self-report items on a 7-point Likert-type scale, with 1 = Strongly Disagree to 7 = Strongly Agree. The Past Sustainable Behaviours were measured with two response formats, namely, the number of times and percentage. Except for Self-actualization Needs, Universalism Values, and Past Sustainable Behaviours items, all items appeared in a randomly order. The demographic (age, gender, education level) and sport activity questions were at the end of the questionnaire.

The questionnaire had an English and a Portuguese version since the surfing event had an international context and was held in Portugal. The English version was based on the original questionnaire of Trail and McCullough (2020), and the Portuguese version was a translation of the former, produced by the authors and checked for cross-cultural equivalence by a professional translator using a committee approach (Brislin, 1980).

The present investigation's instruments and procedures respected the ethical and deontological requirements inherent to scientific research and recommended by the Ethical Board of the Faculty of Human Kinetics at University of Lisbon.



### **3.4. Study 1**

This study proposed nine hypotheses (H<sub>1</sub>-H<sub>8</sub>) framed by the SSCEM (Trail & McCullough, 2020) to identify which factors influence the spectators' sustainable transport intentions of international surfing events.

#### **3.4.1. Procedures and data analysis.**

Using IBM SPSS Statistics (v. 25), the normal distribution of the data was assessed through skewness (sk) and kurtosis (ku) measures. Absolute values of sk and ku lower than 3 and 7, respectively, were the limits adopted to attest the possibility of using parametric tests, as they indicate non-severe violations of the normality assumption for parametric analysis (Kline, 2010; Marôco, 2014).

The Structural Equation Modelling (SEM) analysis was performed with the lavaan package (v. 0.6.4; Rosseel, 2012) from the R statistical package (v. 4.0.2 for Windows; R Core Team, 2020).

Since the statistical analysis didn't reveal severe violations to the normal distribution, the maximum likelihood estimation with robust standard errors (MLR) estimator was selected for SEM. To attend to the missing values, the full information maximum likelihood (FIML) imputation was chosen. Goodness of fit of the model was assessed with robust fit measures, namely chi-square ( $\chi^2$ ), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Thresholds CFI > 0.900, TLI > 0.900, RMSEA < 0.080 and SRMR < 0.08 were indicative of good model fit (Hair Jr. et al., 2010; Marôco, 2014). Items that were not significant for a  $p < 0.5$ , or presented problems during the fit of the model, were removed.

The SemTools R package (v.0.5.3; Jorgensen et al., 2020) was used to estimate the composite reliability (CR) through the coefficient omega ( $\omega$ ) for the first-order factors and the coefficient omega at Level 1 ( $\omega_{L1}$ ) for the Points of Attachment higher-order factor (Bollen, 1980; Fornell & Larcker, 1981; Green & Yang, 2009) adopting  $\omega \geq 0.7$  reference values (Hair Jr. et al., 2010; Marôco, 2014) as indicative of acceptable internal consistency.

The model's discriminant validity was assessed with the calculation of the Heterotrait-Monotrait (HTMT) ratio of correlations which has proved to be a more sensitive method than the Fornell-Larcker criterion (Henseler et al., 2015). The HTMT<sub>.85</sub> criteria were used considering the threshold value HTMT >.85 for distinguishing a lack of discriminant validity (Henseler et al., 2015).

### **3.4.2. Results.**

The fit of the measurement model was good ( $\chi^2_{(188)} = 286.737$ ; RMSEA = .039; CFI = .954; TLI = .943; SRMR = .049).

The sk and ku measures attested non-severe violations of the normality for all items, except for past sustainable transport behaviour, where 94.6% of the spectators never used a shuttle bus at surfing events and only 19 spectators resorted to that service. Good internal consistency reliability and convergent validity were observed within most factors, except for the Attitudes and Internal Constraints that presented values slightly below the recommended threshold (see Table 2).

**Table 2.**

*Items distributional properties (Mean, Standard Deviation Skewness, and Kurtosis) and loadings of items on constructs (Standardized Loadings and Omega Coefficient).*

	<i>M</i>	<i>SD</i>	<i>sk</i>	<i>Ku</i>	$\lambda$	$\omega$
<b>Self-actualization Needs</b>						.72
Inner peace – At peace with one’s self and life.	6.2	1.19	-2.02	4.76	.810	
<b>Aesthetics - Being appreciative of beautiful things in life.</b>						.740
Wisdom – Accumulated knowledge of life gained through experience.	6.2	1.04	-1.69	2.70	.450	
<b>Universalism Values</b>						.69
Environmentalism - Protecting the environment.	5.8	1.32	-1.25	.745	.643	
Social justice - Fair and dignified treatment of all people within society.	6.0	1.38	-1.73	2.84	.656	
Tolerance - Accepting differing views of other people and treating them fairly.	5.2	1.64	-.96	.161	.640	
<b>Attitude toward the Campaign</b>						.60
I like that this event is trying to promote people’s environmentally sustainable practices.	6.4	.88	-2.01	4.91	.681	
I like that this event is inspiring people to be more environmentally friendly.	6.2	1.02	-1.74	4.13	.653	
<b>Points of Attachment</b>						.74
<b>Attachment to the Surfers</b>						.919
I am a fan of the surfers on the World Surf League (WSL) events.	5.1	1.68	-.721	-.285	.875	
I am a big fan of specific surfers.	4.3	1.84	-.259	-.955	.760	
<b>Attachment to the Level of Sport</b>						.902
I am a fan of WSL events regardless of who is surfing.	4.8	1.67		-.221	.793	
I consider myself a fan of WSL events, and not just one specific surfer.	4.8	1.67	-.487	-.466	.789	
I am a big fan of WSL events.	4.8	1.72	-.543	-.533	.906	
<b>Attachment to the Community</b>						.415
I feel connected to numerous aspects of the Peniche community.	4.2	1.64	-.216	-.527	.821	
I feel that I am a part of the Peniche community.	3.8	1.86	.060	-.967	.822	
I support the Peniche community as a whole.	5.3	1.35	-.503	-.136	.604	
<b>Internal Constraints</b>						.66

Lack of interest from others - My friends are not interested in acting sustainably.	2.4	1.66	1.159	.399	.577
Lack of interest from others - My family is not interested in acting sustainably.	2.5	1.81	1.005	-.095	.665
Lack of interest from others - My significant other is not interested in acting sustainably	2.4	1.45	1.067	.385	.529
Lack of worth - I don't think using sustainable transportation is worthwhile.	2.2	1.49	1.56	1.94	.315
Lack of time - I don't have time to catch a shuttle bus at surfing events.	3.7	1.57	-.031	-.390	.286
Lack of knowledge - I don't understand why this event is worried about sustainable transportation.	2.0	1.48	1.771	2.601	.415
<b>External Constraints</b>					
Lack of access - It is just easier to go to surfing events by car than to catch a shuttle bus.	4.7	1.79	-.634	-.545	
<b>Past Sustainable Transport Behaviours</b>					
How many times have you used a shuttle bus at surfing events?	0	.396	5.393	31.13	
<b>Sustainable Transport Intentions</b>					
During this event, I intend to use sustainable transportation.	3.7	1.72	.192	-.810	

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Legend: For  $p < 0.05$ , all items are significant.

The Points of Attachment showed good reliability, with CR above the reliability criterion  $\omega_{L1} > .70$ .

The discriminant validity was confirmed for all factors, since all HTMT<sub>.85</sub> values are under the reference threshold (Table 3).

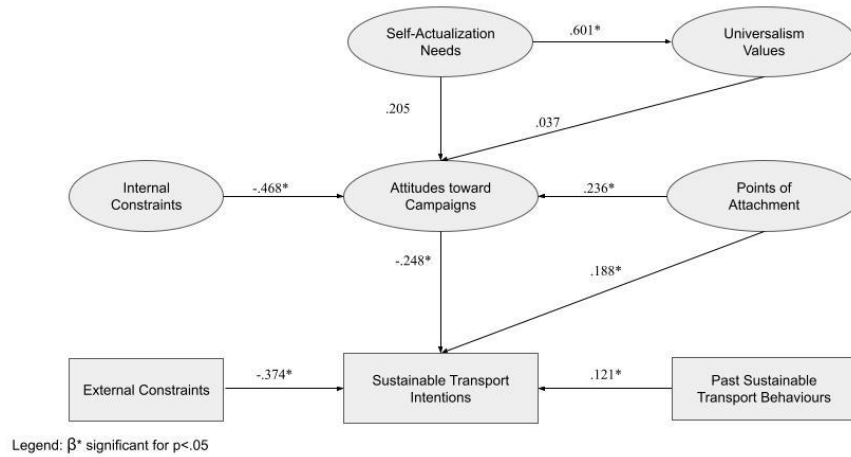
**Table 3.***Discriminant Validity (HTMT below the diagonal).*

	1	2	3	4	5	6	7
1.Needs	-						
2.Values	.61	-					
3.Attitudes	.37	.24	-				
4. Attachment to the Surfers	.15	.09	.26	-			
5. Attachment to the Level of Sport	.15	.09	.25	.83	-		
6. Attachment to the Community	.08	.04	.18	.43	.42	-	
7. Internal Constraints	.23	.13	.52	.01	.01	.01	-

The goodness of fit of the structural model was acceptable ( $\chi^2_{(259)} = 417.053$ ; RMSEA = .043; CFI = .928; TLI = .917; SRMR = .062). This investigation supported the hypothesis H<sub>1</sub>, H<sub>5</sub>, H<sub>6</sub>, H<sub>7</sub> and H<sub>8</sub> as it was found the positive significant direct effect of (i) Self-actualization Needs on Universalism values, (ii) Points of Attachment on Attitudes toward the Campaign, (iii) Past Sustainable Transport Behaviours on Sustainable Transport Intention; and the negative effect of (iv) Internal Constraints on Attitudes toward the Campaign and, (v) External Constraints on Sustainable Transport Intention (Figure 2). The results didn't support the hypotheses H<sub>2a</sub>, H<sub>2b</sub>, H<sub>3</sub>, or H<sub>4</sub>, namely, the effects of Self-actualization Needs and Universalism Values on Attitudes toward the Campaign were not supported and, consequently, the effect of Self-actualization Needs on Attitudes toward the Campaign mediated by Universalism Values was also not verified. In addition, it was found that the Attitudes toward the Campaign had a negative significant effect on Sustainable Transport Intention, contrary to the proposed significant positive effect.

**Figure 2.**

*Path coefficients in sport sustainability campaign evaluation model ( $R^2=.225$ ).*



The results showed the Points of Attachment as the only factor with a significant effect on Attitudes toward the Campaigns and Sustainable Transport Intentions accounting for a total effect  $\beta = .130$ , adding one more significant relationship.

### 3.5. Study 2

To segment the spectators based on their sustainable transport intentions, this study formulated three hypotheses, concerning the several factors of the SSCEM ( $H_{9a}$  and  $H_{9b}$ ), and the socio-demographic and sport activity characteristics ( $H_{10}$ ).

#### 3.5.1. Procedures and data analysis.

The cluster analysis was made using IBM SPSS Statistics (v. 25), and the procedure followed Mooi and Sarstedt's (2011) orientations. The non-hierarchical K-means was the chosen method to compute the cluster analysis given the larger sample size. First, a Two-step cluster analysis was conducted to identify the number of reliable clusters. Then, with the provided number of clusters, a K-means clusters analysis was computed for the

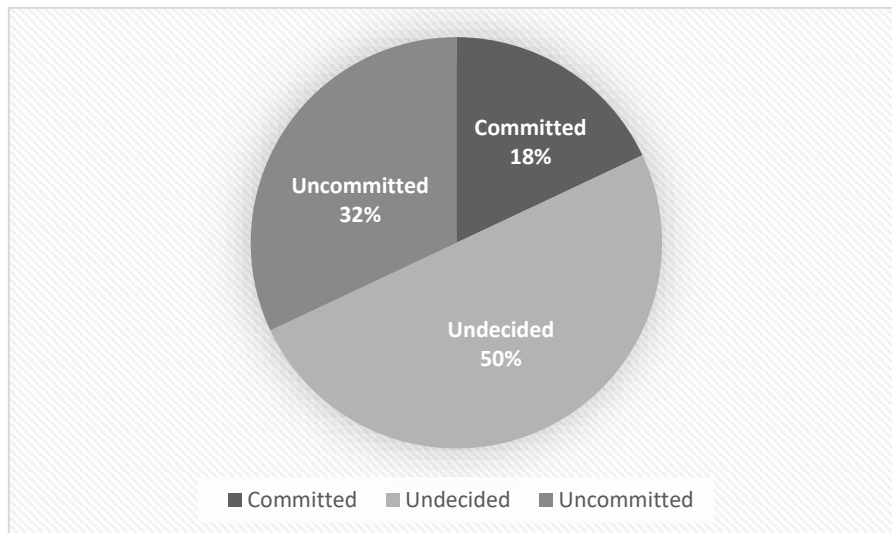
sample. The significant differences in the clusters for the model factors were evaluated with the Kruskal-Wallis test followed by the multiple comparisons of means ranks tests (Marôco, 2014). Higher mean rank corresponds to the tendency of higher values on the response scale. The socio-demographics differences between clusters were evaluated with the Pearson's Chi-square test. Statistically significant effects were those with  $p < 0.05$ .

### 3.5.2. Results.

The Two-Step Cluster Analysis identified three clusters regarding the spectators' Sustainable Transport Intentions. With the number of clusters defined, the K-means cluster analysis classified (Figure 3): (i) the "Committed" to use sustainable transport, ii) the "Undecided" to use sustainable transport, and (iii) the "Uncommitted" to use sustainable transport.

**Figure 3.**

*Spectator segments based on clusters analysis.*



A Kruskal-Wallis test revealed that only six items showed a significant difference between the clusters after testing all the items present in the model (Table 4), namely, Aesthetics Need, Attachment to the community (2 items), Lack of Time, Lack of Access,

and Past Sustainable Behaviour. Focusing the analysis on the significant differences found between the clusters, a Multiple Comparisons of Mean ranks using Fisher's Least Significant Difference (LSD) showed the "Committed" differs in the tendency to a greater appreciation of aesthetics needs compared to the "Undecided"; in the greater identification with the community than the "Uncommitted"; and in having previously travelled by shuttle bus at surf events comparing to the others segments. On the other hand, the "Committed" tend to disagree with the lack of time as a constraint on the use of sustainable transport in the surf event compared to the others. The "Uncommitted" tend to agree on the lack of access to sustainable transport in the surf event compared to the remaining clusters.



**Table 4.**

*Kruskal-Wallis test and Multiple Comparisons of Means Ranks for Aesthetics Need, Attachment to the Community, Lack of Time, Lack of Access, and Past Sustainable Behaviour between clusters.*

		<i>Multiple Comparisons of Mean ranks using LSD test</i>				
	Kruskal-Wallis test	(I) Cluster	(J) Cluster	Mean Difference (I-J)	S.E.	Sig.
Aesthetics Need	$(X^2_{KW}(2) = 7.368;$ $p = 0.025; N = 349)$	“Committed”	“Undecided”	(200.39-164.17)	13.96	.010
Attachment to the community (item1)	$(X^2_{KW}(2) = 6.159;$ $p = 0.046; N = 350)$	“Committed”	“Uncommitted”	(200.82-162.25)	15.50	.013
Attachment to the community (item2)	$(X^2_{KW}(2) = 7.617;$ $p = 0.022; N = 346)$	“Committed”	“Uncommitted”	(201.30-158.36)	15.43	.006
Lack of Time	$(X^2_{KW}(2) = 17.585;$ $p = 0.00; N = 347)$	“Undecided”	“Committed”	(173.81-137.69)	13.99	.010
		“Uncommitted”	“Committed”	(201.80-137.69)	15.03	.000
Lack of Access	$(X^2_{KW}(2) = 46.619;$ $p = 0.00; N = 352)$	“Uncommitted”	“Committed”	(230.60-138.74)	14.79	.000
			“Undecided”	(230.60-158.98)	11.34	.000
Past Sustainable Behaviour	$(X^2_{KW}(2) = 16.518;$ $p = 0.00; N = 352)$	“Committed”	“Undecided”	(196.67-173.47)	5.77	.000
			“Uncommitted”	(196.67-174.91)	6.20	.001

*Legend: mean difference is significant at the 0.05 level.*

Concerning the socio-demographic variables - gender ( $X^2(2) = 1.03; p = .598; N = 351$ ), age ( $X^2(6) = 4.894; p = .558; N = 318$ ), education level ( $X^2(2) = 2.15; p = .905; N = 348$ ) - and sport activity ( $X^2(4) = 2.139; p = .710; N = 351$ ), none were significantly different between the three clusters in view of their sustainable transport intentions.

The findings from the cluster analysis validated  $H_{9a}$ , since the needs, constraints, and past sustainable transport behaviours differentiated the clusters. The  $H_{9b}$  and  $H_{10}$  were

not corroborated, since values, socio-demographic, and sport activity did not significantly differ between clusters.

#### **4. Discussion, implications and conclusion**

The importance of addressing the topic of transportation in sport tourism became even more evident when comparing the accumulated evidence on the environmental impact of pre-COVID-19 sporting events (Dolf & Teehan, 2015; Edwards et al., 2016) and the results of applying restrictive measures to production and consumption of sport events during the pandemic situation: a sharp drop in the generated environmental impact can be inferred, based on the decrease / absence of travel by the sport tourism actors, such as teams, athletes and spectators (Mastromartino et al., 2020; McCullough et al., 2020a; Triantafyllidis, 2020).

Given the importance of transportation in the study of the events' environmental sustainability (Boggia et al., 2018; Chirieleison & Scrucca, 2017) and in particular, of sporting events (Edwards et al., 2016; Triantafyllidis, 2020), this investigation studied spectators' intentions to use sustainable transportation during an international surfing event. The findings exposed that spectators who are guided by Self-Actualization Needs are also guided by Universal Values. However, none of these factors influences them to a more positive attitude towards the use of sustainable transport during the surf event. These results do not corroborate the findings in Trail and McCullough's (2020) study, nor the several studies advocating the positive influence of holding universal values, such as environmentalism, as predictors of greater awareness and environmental behaviour (Casper et al., 2017; de Groot & Steg, 2010; Gau et al., 2019).

Focusing on the needs and values as predictors of environmental attitude and behaviour, a study on recreational cyclists found that not only the environmental values

and motivations influence the choice for a more sustainable mode of transport, such as cycling, but also values such as happiness or self-esteem (Ho et al., 2015). In this investigation, the “Committed” spectators had a greater identification with aesthetics need than the “Undecided”, although both clusters score high on this need. Attending to this finding, sport tourism managers can promote the event sustainable transportation regarding the mitigation of the unaesthetic issues of events' transportation, for example, the excessive parking in areas near the beach.

This study exposes the association between positive attitudes toward the environmental campaign of the spectators with a lower intention to use sustainable transport during the event, contrary to what the SSCEM hypothesizes and to the studies that found the positive effect of environmental attitudes on environmental behaviour in the sport context (Kil et al., 2014; Lin & Lee, 2020; McCullough, 2013). Besides, when focusing on sustainable transport behaviours, sport tourists show difficulties in meeting this type of behaviour even though they exhibit an environmental awareness (Wicker, 2018), with a higher prevalence in individual and nature sports (Wicker, 2019). A plausible explanation can be framed by attending to the specificity of the context, actors, and environmental behaviour (Stern, 2000) under study. As such, the choice for a more environmentally friendly transport can be seen from the effort for its adoption, as a high-cost behaviour compared to other types of behaviour, such as recycling and reuse (Tobler et al., 2012). Therefore, although the spectators had a positive attitude toward the environmental campaign held in the event, they didn't intend to use sustainable transportation, suggesting there are other involved factors, such as the convenience of using the private car in a tourism setting (Collins & Potoglou, 2019; Doran et al., 2017; Juvan & Dolnicar, 2014; Schlemmer et al., 2019) like the sporting events (Malhado & Rothfuss, 2013).

The points of attachment, namely, the attachment to the Surfers, to the Sport, to the Level of Sport, to the Community, were related not only as predictors of Attitudes toward the Campaign, as in the SSCEM design (Trail & McCullough, 2020), but also as predictors of spectators' Sustainable Transport Intentions. Furthermore, the cluster analysis revealed that the “Committed” spectators were those who felt most connected to the event's host community, compared to the “Uncommitted” group. The connection to the community can be understood through the perspective of place-attachment. The bond between the sport practitioner and a specific place is a driver for environmental behaviour (Lin & Lee, 2020; McCullough & Kellison, 2016; Reineman & Ardoin, 2018). Besides, sport tourism event managers must consider strong collaborative ties with the host community (Boonsiritomachai & Phonthanakitithaworn, 2019), aiming at developing strategies and initiatives that promote the use of sustainable transportation. In a more holistic approach, sport tourism managers should consider the strategic leverage of economic, social, and environmental benefits for the host community, developing a connection with the community, its culture and actors (O'Brien & Chalip, 2008; Pereira et al., 2020), in line with the destination governance into a sustainable surfing tourism management (Mach & Ponting, 2018; Machado et al., 2018). Initiatives that enhance sustainable transportation in events, complying with travel to the destination and intra-destination travel - for example, a shuttle bus service – may conduct to a win-win situation: with environmental benefits, due to the reduction of carbon emissions, and simultaneously, social advantages, as a consequence of the decrease of traffic congestion, parking confusion and excessive noise (Chirieleison, et al., 2020). Sustainable transport can also be developed and studied in a locavist approach, which contemplates a low carbon model proposing short distances, low carbon modes of transport and capital investment (financial and social) in local communities (Hollenhorst et al., 2014). A guest

ticket concept (Gronau, 2017), where the tourists are allowed to use local public transport paying a symbolic fee in the price of accommodation or restaurants, food and beverage shops to subsidise the local public transportation, could embody an effective strategy to apply to surfing events destinations, like Peniche, acknowledging a greater effort to plan and operationalize more routes to the surfing event arena.

The positive effect found between the use of a shuttle bus service in past surfing events and the intention to use sustainable transport during the event corroborates the literature on past sustainable behaviours as a predictor of the environmental action (Steg & Vlek, 2009). Notwithstanding, the spectators' mean responses confirmed that they never used a shuttle bus service at surfing events before, inferring the need to leverage such experience at this kind of events. Gamification “is the application of lessons from the gaming domain to change behaviours in non-game situations” (Robson et al., 2015, p.412). It has been employed towards sustainable behaviour and environmental education (Ouariachi et al., 2020) and to foster sustainable tourism (Negrusa et al., 2015). The study by Negrusa et al. (2015) portrays examples of the application of gamification for the sustainable tourism using information and technological communication, among which, the use of a game-play platform with incentive points to reduce carbon emissions, which could be applied to the context of sport events; for example, surfing event's spectators using sustainable transport would earn points to be converted into discounts at local shops commerce or other local events, leveraging sustainable transport and interaction with the community.

Finally, the internal and external constraints factors were negatively related to the spectators' sustainable transport intentions. The internal perception of lack of time had less influence on the “Committed” spectators than in the remaining clusters. Conversely, the external constraint lack of access had more impact on the “Uncommitted” spectators.

Besides these differences, the spectators' mean responses tend to agree on the lack of access to catch the shuttle bus, inferring that spectators didn't know how to take it. This fact could be due to a lack of environmental communication and marketing, acknowledging its importance to the adoption of environmental behaviours (Tölkes, 2019). The availability of information on transport services is an attractive factor for transport usage (Ceder & Perera, 2014). Thus, having the available information on media (e.g., event webpage and social media) about the shuttle bus service with a clear meeting-point characteristic advancing on the logo spot sign, the vehicle colour, and logo, and a real-time actualization schedule, could be a strategic management option to consider.

Sport tourism event managers should also ponder the communication of their environmental campaigns, attending to the profile of tourists (Martin et al., 2017; Tölkes, 2019). Considering the results of this investigation, persuasive communication, incorporating visual information in environmental campaigns (Martin et al., 2017) can be a valuable tool for achieving the desired outcome; for example, images evidencing the pristine beaches and peaceful Peniche village associated with the use of shuttle bus can relate to the spectators' aesthetic needs. Also, the use of role models has been evidenced as a strategy to promote sustainable transport (Hanna et al., 2018). Although this strategy has already been applied in the studied event for other campaign against ocean plastic, it could be replicated, contemplating the example of the competing surfers, in order to promote an extensive use of the shuttle bus in surfing events.

It is important to mention the absence of the influence of socio-demographic variables on spectators' sustainable transport intentions. This result corroborates Prillwitz and Barr's (2011) findings, which envisage the difficulty in predicting environmental behaviour based on socio-demographic characteristics due to the specificity of leisure travel decisions compared to the daily mobility style. Regarding the sport activity, the

results exposed a lack of distinction between surf practitioners and other spectators. However, inverse results have been found in other studies. For instances, in a study developed by Larson et al. (2018), on the adoption of environmental behaviours in relation to the conservation of a seashore in a national park, the results showed that surfers had more environmental behaviours than non-surfers, both with regard to high efforts pro-environmental behaviours (e.g., environmental activism), as well as pro-environmental behaviours involving less personal effort (e.g., picking up trash from the beach). In this sequence, surf event managers should consider increasing the use of sustainable transport through communication strategies that provide a direct link to the effective conservation of the natural space where the event is hosted, for example, through slogans that emphasize the exhortation of adoption of sustainable transport in favour of reducing acidification of the oceans due to the emission of carbon dioxide.

The methodological implications of this study comprised the validation of the SSCEM as an appropriate resource to investigate the spectators' response to environmental campaigns in the context of nature-based sport events. Nevertheless, in future studies, a careful selection of the items must be planned to correspond to the specific sport context under study, namely, the needs and values that best portray the sport subculture (Ford & Brown, 2005; Green, 2001).

Moreover, since this research has only studied attitudes and intentions, future studies should investigate spectators' behaviour (Oates & McDonald, 2014), providing deeper knowledge of sustainable transport behaviour. Additionally, as the used questionnaire only used closed-ended questions, and this type of data collection on the environmentally sustainable tourist behaviour can produce bias responses that influence the results (McKercher & Prideaux, 2011), it is also recommended that future studies contemplate qualitative approaches to address sport events' sustainable transportation.

In conclusion, this investigation identified the several factors that must be analysed to attend to the implementation of sustainable transport campaigns in surfing events, and provided an insight into the distinctive characteristics of the spectators according to their sustainable transport intentions. The findings illustrated the need to mitigate the spectators' internal perception of lack of time, facilitate access to sustainable modes of transport during the event, and focus on the spectators' connection to the community. For these purposes, sport tourism event managers should envisage a combination of a low carbon local approach with the participation of the various event stakeholders, including the local community, inform spectators of conditions and accessibility to sustainable mobility during the event and for the event, and target the environmental communication of the sustainable transport initiatives based on the proposed segmentation of spectators.

Future studies should study the sustainable intentions of sport events' spectators regarding the environmental campaigns, applying SSCEM with a careful analysis of the values and needs to be measured. In addition, the spectators' segmentation, based on their intentions of sustainable transport, must also be replicated in future research, since there is an urgent need for the effective implementation of sustainable transport in the context of sporting events, so it is vital to ensure the success of campaigns and strategies that aim for this behavioural change.

Finally, this study contributed to increasing scientific knowledge in the area of sport ecology (McCullough et al., 2020b), and in particular, addressing the topic of environmental sustainability of transport in sporting events, which is of paramount importance to help mitigate the carbon footprint of sport tourism events.



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## **Chapter 5: General Conclusions**





## General Conclusions

### Main Findings

The results were presented according to the two stages previously defined for the elaboration of this investigation. Thus, firstly, the systematization of scientific research on the relationship between environmental sustainability and sport tourism was exposed and, then, the factors that influence and segment spectators of international surfing events, according to the SSCEM model (Trail & McCullough, 2020), were presented.

### *Stage 1*

The systematic literature review (chapter 2) highlighted the prominence of sport events as the most studied context for the relationship between sports tourism and environmental sustainability. In fact, the greater number of studies on international mega-events and stadium events contrasts with the scarcity of research applied to nature-based sport events, as well as some of their key sporting actors, such as spectators, local residents and the media. In turn, outdoor sport practitioners have emerged as the most studied actors in the environmental theme of sport tourism.

The factors that influence the adoption of environmental sustainability in the context of sport have been the main focus of scientific production, among which the following stood out:

(a) sport practice - more experienced and specialized sport practitioners showed greater awareness and environmental behaviour for nature conservation, unlike those who used sport accessories (such as cameras / musk sticks), whose behaviour caused more damage in the natural space (Hammerton, 2017);

(b) positive / negative perceptions regarding the implementation of environmental sustainability in sport - the perception of environmental efforts undertaken by the offer of

sport tourism increased the adoption of more ecological attitudes and behaviours in sport consumers (Han et al., 2015); conversely, the perception of inconsistencies between the attributes of the offer of sports tourism and the respective environmental message constrained the adoption of the sport consumers' environmental behaviour (Hsiao, 2018);

(c) environmental attitudes - the environmental behaviour of sport actors was positively influenced by their environmental attitudes. However, the attitude-behavioural gap was also identified, for example, the environmental attitude has not converged on a lower sport practitioners' carbon footprint (Wicker, 2018; 2019); and,

(d) external pressures - the adoption of environmental practices by sport actors was positively influenced by peer and society pressure (Harris, 2013), although it was also constrained by the pressure of sporting demand for services that negatively impact the environment (Purdie et al., 2020).

The systematic review of the literature also emphasised a large number of studies that advanced practical recommendations for sport management to develop proactive strategies to foster the implementation and promotion of environmental sustainability. These recommendations converge on the need to create initiatives, such as the promotion of nature-based activities, and on the operationalization of regulations capable of activating a greater environmental behaviour in sport tourism. The results attest to the importance attributed to the promotion of environmental education as a vehicle for promoting ecological attitude and behaviour. The results also value sport demand preferences, corroborating the implications that advocate segmentation and a personalized approach as adequate means to improve the organization and effectiveness of environmental initiatives with the target audience (Dolnicar et al., 2018).

The systematic review highlights the lack of research on climate change and studies that monitor, evaluate and analyse the carbon emissions generated by sporting activities. In this spectrum of suggestions for future studies, the topic of transport acquires special relevance, as one of the areas that contributes the most to the carbon emissions of sporting events. The relevance of this research proposal is in line with the current strategy implemented by the United Nations, through the creation of the Sports for Climate Action Framework (UNFCCC, 2019).

### *Stage 2*

Justified by the research gaps found in the systematic review of the literature (chapter 2), namely on the topic of environmental sustainability in nature-based sport events and the spectators' behaviour, the studies of this stage applied and tested the SSCEM (chapters 3 and 4). In both studies (chapters 3 and 4), the results prove the applicability of this model to the study of surfing events' spectators.

Regarding to the campaign to promote recycling and reuse of plastic waste (chapter 3), the spectators' attitudes towards it were positively influenced by the needs for wisdom, inner peace and aesthetics, as well as the attachment to surfers, surfing and the local community, and also by the practice of surfing; on the other hand, such attitudes were negatively affected by internal constraints, related to the lack of environmental knowledge, the lack of interest of others in ecological action and the lack of time. In turn, consistent attitudes with the promotion of the environmental campaign at the event and past sustainable behaviours had a positive influence on spectators' intentions for recycling and reusing of plastics during the event. In contrast, both the internal constraints mentioned above and the external constraint related to the lack of accessibility are inhibitors of the spectators' intention of environmental behaviour during the surf event.

In relation to the sustainable transport campaign (chapter 4), the results of the application and testing of SSCEM support internal and external constraints, points of attachment, past sustainable transport behaviours and attitudes toward campaign as factors of significant influence of sustainable transport intentions of the spectators of the surf events. Although contrary to the theoretical support of SSCEM, the attitudes toward campaign have a negative influence on sustainable transport intentions of spectators. This result has been found in other scientific studies (Schlemmer et al., 2019; Wicker, 2019), highlighting the particularity of sustainable transport being a high-effort environmental behaviour, when compared to other environmental behaviours, such as recycling or reuse, and consequently, the need to investigate the topic of transportation in a different way (Stern, 2000; Tobler et al., 2012).

This investigation contributed to the increase of knowledge regarding the significant predictive factors of sustainable intentions framed by the SSCEM (Trail & McCullough, 2020). In the campaign aimed at the theme of recycling and reuse, the internal constraints influenced, directly and mediated by attitudes, the eco-sustainable intentions of the spectators of the surf events. In turn, the points of attachment were also predictive factors of the spectators' intentions for the use of sustainable transport during the event.

The insufficient relevance of universal values (i.e., environmentalism, tolerance and social justice) in the eco-sustainable intentions of surfing events' spectators was verified in both studies, indicating the need to broaden the spectrum of values in the study of the predictive factors of the aforementioned intentions.

The study on spectators' sustainable transport intentions (chapter 4) also advanced with a segmentation based on three groups of spectators: 'Committed', 'Uncommitted'

and 'Undecided'. Thus, the 'Committed' segment, including spectators who are willing to use sustainable transport during the event, presents a greater appreciation of aesthetic needs and a superior identification with the community compared to the other segments. This segment also differs from the other segments by the inclusion of spectators with past experience regarding the use of the shuttle bus at other events, and also by the disagreement regarding the lack of time as a constraint for the use of sustainable transport in surf events. On the other hand, in the segment that includes spectators who do not show any intention to use sustainable transport during the surf event - 'Uncommitted' - the lack of access to sustainable transport at the event is highlighted as a significant constraint on the intention of environmental behaviour, compared to 'Committed' and 'Undecided'.

### **Methodological Considerations**

The first stage of this investigation (systematic literature review - chapter 2) was preceded by a set of methodological options, namely regarding the type of systematic review and the inclusion / exclusion criteria for the selection of data:

- The option of preparing a systematic quantitative review of the literature, including content analysis, allowed to deepen the analysis of quantitative results through the inductive method used in content analysis.

- Within the scope of the adopted inclusion criteria, the time limit of the systematic review was chosen in order to emphasize the most current scientific production, with the year 2013 as the reference point regarding the growth of publications on sustainability (Tölkes, 2018). This decision is equally justified by recent studies of sports tourism in relation to sustainability (Jiménez-García et al. 2020; Kersulić et al. 2020). The adopted criterion consciously included the possibility of excluding relevant studies published on a date prior to the chosen time limit.

- In the exclusion criteria, the adopted concept of sport (Council of Europe, 1992) provided a range of search terms that had to be refined in order to support the definition of sport. Thus, data collection was carried out by identifying at least one of the terms in a set of four - i.e., "sport", "recreation", "physical activity" and "active leisure" - and refined by four exclusion criteria, existing the possibility that some relevant studies were excluded if there was only a reference to a specific sport.

In the second stage of this investigation (chapters 3 and 4) the application of SSCEM required several methodological decisions to operationalize the collection and treating of data. In particular, the need to ensure that the sample only encompassed spectators at surfing events led to the decision by an on-site data collection with pen and paper, as they are events in the natural space of free access without prior registration or ticket.

As the data were collected on the spot while the events were taking place, the concentration of respondents and the receptivity to complete the questionnaire may have been affected, enhancing the production of invalid / incomplete responses. In order to mitigate the influence of this type of responses on the results, all questionnaires with more than 10% of blank responses were removed, providing a higher quality of statistical treatment (Enders, 2010).

The selection of self-actualization needs and universal values to integrate SSCEM (Trail & McCullough, 2020) was based on: (a) the results obtained in the study that originally applied the SSCEM (Trail & McCullough, 2020), electing the needs and values that presented the greatest factor load; and (b) in the literature defending the existence of a positive association between self-actualization needs / universal values and environmental action (Trail, 2016). However, given the option for the exclusive

measurement of self-actualization needs and universal values, the results encompassed the risk of not having reflected the totality of needs and values hypothesized in the model applied by Trail and McCullough (2020).

The statistical treatment of the data collected by questionnaire implied that the dimensions related to external constraints and past sustainable behaviours had been measured by single-item, although these factors were planned as formative factors in the initial phase of the investigation.

Finally, it should be noted that the results of the studies that applied the SSCEM (chapters 3 and 4) concern the investigation of behavioural intentions and not observable behaviours, enabling the existence of bias between the behavioural intention and the actual behaviour (Kormos & Gifford, 2014).

### **Theoretical Implications**

The results of the application and testing of the SSCEM obtained in this investigation infer the complexity of the relationship between values and attitudes towards the environmental campaign. The results highlight the need to study values more broadly, namely by integrating other types of values associated with environmental attitudes and behaviours (van Riper et al., 2019), such as, for example, hedonic values (van Riper et al., 2020).

This investigation adds to SSCEM two significant relationships, explicitly, the influence of internal constraints and points of attachment on eco-sustainable intentions. These findings provide theoretical support so that, in future studies, the relationships between such predictive factors and environmental attitudes can be deepened, as mediators of the intentions of environmental behaviour of spectators of sporting events held in natural spaces.



The results also suggest that the use of SSCEM should be differentiated according to the type of environmental behaviour that is intended to be promoted in environmental campaigns, since, as underlined by the literature, it is necessary that the analysis equates the distinction between the low and high effort environmental behaviours (Stern, 2000). The needs influenced the prediction of the spectators' attitudes in the plastic recycling and reuse campaign, which was not verified in the sustainable transport campaign. The internal constraints were predictors of attitudes and eco-sustainable intentions exclusively in the plastic recycling and reuse campaign, and a similar result was found in relation to the points of attachment in the spectators' intentions regarding the use of sustainable transport. Consequently, future investigations should apply SSCEM separately for campaigns that aim to increase low-effort / high-effort environmental behaviours.

### **Practical Implications**

Considering the findings of this investigation, sport tourism management should focus on developing strategies and implementing measures, actions and regulations to prevent / mitigate environmental impacts and leverage environmental awareness and behaviour. In this sense, the offer of sports tourism should promote ecotourism and nature-based sport activities, as well as advancing on strategies based on a tailored approach to the target audience. In particular, sport event organizations must communicate environmental initiatives more effectively, which must be designed according to the characteristics of the target audience, using, for example, social marketing and other persuasive techniques in order to integrate the various factors that influence spectators in the visual format of the information. With regard to campaigns to promote sustainable transport at surf events, the management of the latter should reinforce the link between campaigns and natural beauty highlighting the aesthetics of the destination, as well as the host community. In fact, the focus on connecting with the

community also suggests the potential for collaboration between sport event organizations and the local community in organizing and publicizing the event, especially when environmental campaigns have sustainable transport as the central objective of their realization. The management of sporting events should also develop tools to mitigate the perception of lack of time for the use of sustainable transport, as well as ensuring the appropriate dissemination of information on accessibility to sustainable transport during the event, previously communicating its existence, conditions access, timetables, and emphasize, on the spot, the signage and promotion of the sustainable transport service.

Furthermore, given the evidence of collaboration as a factor that strengthens the implementation of environmental sustainability in the diversity of sports tourism contexts, sport events managers should consider the cooperation of key actors as a strategic focus, jointly defining the strategy and the adoption of more sustainable management, and ensure success in the implementation phase. It is also desirable that the development of these partnerships occurs at all stages of the organization of sporting events, i.e., from planning to implementation.

### **Future Research**

This investigation emphasised the lack of study on various topics within the scope of the relationship between environmental sustainability and sport, namely, future research should deepen the knowledge about climate change and carbon emissions generated in the production and consumption of sports.

Regarding SSCEM, it is necessary, and unavoidable, to deepen the relationship between values, attitudes and eco-sustainable intentions. The analysis of other values will be a good starting point, since there are studies (e.g., van Riper et al., 2020) evidencing the influence of the anthropocentric and hedonic values of the practitioner of nature-based

sport activities in the corresponding behaviour for protecting the natural resources. For example, in the study by Ho et al. (2015), the choice of eco-sustainable sport activities, such as cycling, was associated with the presence of values that promote the search for happiness, health and wellness.

Future investigations should also study the influence of the physical context and the competitive level of the event, as well as the regions of origin of the spectators, on the respective intentions of the environmental behaviour that organizations wish to promote. The study of these aspects may add knowledge to the sport's subculture associated with surfing (Green, 2001; Wheaton, 2010), allowing to infer about the factors that facilitate environmental commitment and behaviour.

The studies developed by Casper et al. (2014; 2017) included in the systematic literature review (chapter 2) attest to the influence of spectators' expectations regarding environmental practices implemented by sport event organizations in their environmental behaviour; a similar effect occurs in relation to the ascription of responsibility for sport organizations. Consequently, this investigation proposes that, in future studies supported by SSCEM, these factors should be analysed.

For a better understanding of the scope of SSCEM's applicability to the context of surfing events, it would also be important that future research be extended to other key sports consumers, such as athletes / sport practitioners. The study of these actors may provide important contributions to outline marketing strategies that use athletes as environmental role models (Hanna et al., 2018).

Finally, future research using the SSCEM may introduce post-event measurement, with the application of a post-questionnaire, as suggested by Trail (2016), despite the

valuable contribution of knowledge provided by the verification of intentions as predictors of factual behaviour.

### **General Conclusion**

This dissertation addresses an urgent topic and of current importance on a planetary scale for society. Environmental sustainability has been a topic of increasing interest for scientific research, namely, in its relationship with sport, in which the study of sport events has been highlighted. In this context, the present investigation emphasizes the importance of studying spectators of sporting events, and the factors that impact their eco-sustainable intentions, when stimulated by environmental campaigns carried out during the events. The findings from the application and testing of the SSCEM allowed to conclude about its adoption as a useful model to investigate the environmental campaigns of sporting events, especially with regard to surfing. The predictors of the spectators' eco-sustainable intentions were important to sustain the approach to the various segments of this important niche of sport consumption, contributing to the strategy, planning and promoting the success of the results of future environmental campaigns at surfing events.

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# **Appendix 1: Authors'**

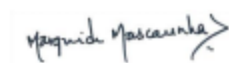
## **Authorization**



### Compilation authorization

We, the co-authors of the article "How has science highlighted sports tourism in recent investigation on sports' environmental sustainability? A systematic review", published in 2021 to the *Journal of Sport & Tourism*, hereby authorize its inclusion in the thesis "The commitment of sport tourism to environmental sustainability: An application to the consumption of international surfing events.", submitted by the PhD candidate Rute Isabel Grilo Filipe Martins.

Lisboa, April 9<sup>th</sup>, 2021



(M. Margarida V. M. Mascarenhas)



Assinado por: Elsa Cristina Sacramento Pereira  
Identificação: 8180951813  
Data: 2021-04-12 às 06:00:17

(Elsa C. S. Pereira)

(António F. B. Rosado)

Assinado por: António Fernando Boletto Rosado  
Num. de identificação: 805506877  
Data: 2021,04,14 19:54:05+01'00'

(Rute Isabel Grilo Filipe Martins)



Assinado por: Rute Isabel Grilo Filipe Martins  
Identificação: 8111700176  
Data: 2021-04-15 às 12:16:54

### Compilation authorization

We, the co-authors of the article “Environmental campaigns in sport tourism events: Testing the Sport Sustainability Campaign Evaluation Model in Surfing”, submitted in 2021 to the *European Sport Management Quarterly*, hereby authorize its inclusion in the thesis “The commitment of sport tourism to environmental sustainability: An application to the consumption of international surfing events.”, submitted by the PhD candidate Rute Isabel Grilo Filipe Martins.

Lisboa, April 9<sup>th</sup>, 2021



Assinado por: Rute Isabel  
Grilo Filipe Martins  
Identificação: 811780576  
Data: 2021-04-15 às 12:24:12

(Rute Isabel Grilo Filipe Martins)

(Elsa C. S. Pereira)



Assinado por: Elsa Cristina  
Sacramento Pereira  
Identificação: 803895815  
Data: 2021-04-12 às 14:59:06

(António F. B. Rosado)

Assinado por: **António Fernando Bojeto Rosado**  
Num. de Identificação: 805506877  
Data: 2021.04.14 19:43:27+01'00'

(João P. Marôco)

Assinado por: **João Paulo Maroco Domingos**  
Num. de Identificação: 8108481265  
Data: 2021.04.15 10:02:02+01'00'



(Brian P. McCullough)

**Brian  
McCullough** Digitally signed by  
Brian McCullough  
Date: 2021.04.16  
09:13:05 -05'00'

(M. Margarida V. M. Mascarenhas)

### Compilation authorization

We, the co-authors of the article “Understanding spectators’ sustainable transportation intentions in international sport tourism events”, submitted in 2021 to the *Journal of Sustainable Tourism*, hereby authorize its inclusion in the thesis “The commitment of sport tourism to environmental sustainability: An application to the consumption of international surfing events.”, submitted by the PhD candidate Rute Isabel Grilo Filipe Martins.

Lisboa, April 9<sup>th</sup>, 2021.



Assinado por: Rute Isabel  
Grilo Filipe Martins  
Identificação: 8111700576  
Data: 2021-04-15 às 12:19:33

(Rute Isabel Grilo Filipe Martins)

(Elsa C. S. Pereira)



Assinado por: Elsa Cristina  
Sacramento Pereira  
Identificação: 828991811  
Data: 2021-04-12 às 15:02:41

(António F. B. Rosado)

Assinado por: **António Fernando Boaleto Rosado**  
Num. de Identificação: 805506877  
Data: 2021.04.14 19:52:02+01'00'

(João P. Marôco)

Assinado por: **João Paulo Maroco Domingos**  
Num. de Identificação: 808481265  
Data: 2021.04.15 10:05:02+01'00'

(Brian P. McCullough)



Digitaly signed by Brian  
McCullough  
Data: 2021.04.14 09:12:07 -01'00'

Margarida Mascarenha





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## **Appendix 2: Studies' data collection authorization**



Rute Martins – FMH, ULisboa (doutoranda); CIEO, UAlg.

(Contactos: Telemóvel: 963417286; rute.grifa@gmail.com)

Elsa Pereira – ESEC (Professora Adjunta), CIEO, UAlg.

Margarida Mascarenhas – FMH (Professora Auxiliar), ULisboa; CIEO, UAlg.

**Assunto:** Investigação no âmbito da sustentabilidade ambiental dos eventos internacionais de surf - Solicitação de autorização.

Exmo. Senhor Project and Events Manager da Ocean Events  
(organização responsável pelos eventos da WSL (World Surf League) em Portugal

Dr. Frederico Teixeira,

Uma equipa de investigadoras pertencentes ao Research Centre for Spatial and Organizational Dynamics (CIEO), da Universidade do Algarve, bem como à Faculdade de Motricidade Humana da Universidade de Lisboa, encontra-se a realizar um estudo que incide sobre os eventos de surf / bodyboard de nível internacional e a sua relação com a sustentabilidade ambiental.

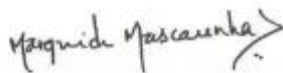
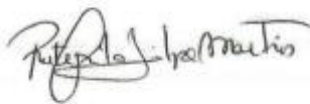
Solicitamos assim, autorização e colaboração no desenvolvimento da referida investigação no que respeita aos seguintes eventos internacionais de surf: EDP Billabong Pro Ericeira 2019, MEO Rip Curl Pro Peniche 2019 e Nazaré Challenge 2019-20. Nomeadamente, será necessário ter acesso antecipado à programação dos eventos, para se poder traçar o plano de pesquisa; acesso a documentos de

planeamento, promoção e avaliação da sustentabilidade ambiental; acesso a todo o espaço de funcionamento do evento no decorrer do mesmo; e ainda, autorização à realização de questionários/entrevistas nos referidos eventos. Salientamos que toda a informação recolhida terá uma utilização estritamente académica e que será garantido o anonimato e confidencialidade que a organização entenda que devam ser mantidos.

Do interesse nacional neste tipo de eventos, incluídos na estratégia "Turismo 2027 – Liderar o turismo do futuro" do Turismo de Portugal, e da aposta da WSL na sustentabilidade, o presente estudo representa não só uma mais valia para a contribuição de conhecimento científico nesta temática, como também um benefício para a organização, uma vez que a equipa de investigação se compromete, desde já, a elaborar um relatório de conclusões e recomendações após o final da investigação.

Agradecendo desde já a melhor atenção dispensada a esta solicitação, ficamos a aguardar resposta.

Com os melhores cumprimentos,



---

## **Appendix 3: Events' form**



<b>EDP Billabong Pro Ericeira - 24 a 29 de setembro 2019</b>				
	Nome	Contacto	Tipo de patrocínio / parceria	Tipo de produto fornecido
Manager	Frederico Teixeira	<a href="mailto:fteixeira@oceanevents.pt">fteixeira@oceanevents.pt</a> <a href="mailto:geral@oceanevents.pt">geral@oceanevents.pt</a>	----	----
Patrocinadores/ Parcerias	Câmara Municipal de Mafra (coorganizador); EDP; Billabong; Turismo Portugal; Turismo Oeste; Meo; Moche; Megahits; RTP; Sport Tv; Record; Público; Jogos Santa Casa; Autoestradas Atlântico; Via Verde; Hertz	----	----	----
Concessões / Fornecedores	Setup Eventos; NiU Sistemas; Masstige Catering; Media Luso; Antea Segurança Privada; Be there Be everywhere (Shuttles); Oneway (som)	----	----	----
Divulgação do evento (meios utilizados / a utilizar)	Campanha Online, Televisão e Rádio; Campanha Outdoor			
	Nº estimado de:			
Atletas	112			
Staff	150			
Visitantes	Aproximadamente 30 mil			



Gestão Ambiental		S (Sim) / N (Não)
Evento	Existe alguma certificação ambiental para o evento Se sim, qual?	N
Água	Promoção e operacionalização do reenchimento de garrafas de água para os espectadores	S
	Promoção e operacionalização do reenchimento de garrafas de água para os atletas / staff?	S
	Outras. Quais?	----
Materiais e Catering	Utilização de alimentos locais e sazonais.	S
	Utilização de materiais ecológicos para as embalagens, pratos, copos.	S
	Promoção da reutilização / reciclagem / devolução de materiais utilizados no espaço do evento (tendas, sinalização, etc.)	S
	Outras. Quais?	----
Resíduos	Disponibilização de W.C. a utilizar	S
	Disposição de contentores para os resíduos	S
	Disposição de contentores para os itens recicláveis	S
	Realização de atividades de reciclagem	S

	Realização de limpezas de praia	S
	Outras. Quais?	----
Energia	Utilização de energias renováveis	N
	Elaboração da pegada de carbono	N
	Outras. Quais?	----
Proteção da biodiversidade	Designação de áreas específicas para estacionamento de veículos	S
	Designação de áreas específicas para o espectador	S
	Medidas de proteção da fauna e da flora local	S
	Outras. Quais?	----
Poluição estética e sonora	Medidas contra a poluição sonora	N
	Outras. Quais?	---
Comunicação da informação	Disponibilização de orientações / regulamentos de sustentabilidade ambiental antes do evento	S
	Disponibilização de sinaléticas de boas práticas ambientais no espaço do evento	S
	Possibilidade reportar comportamentos ambientalmente inapropriados	S
	Outras. Quais?	----

Marketing	Comunicação das iniciativas ambientais	S
	Outras. Quais?	----
Transporte	Promoção do uso dos transportes públicos ou car-pooling para os espectadores.	S
	Promoção do uso de alternativas de transporte ambientalmente sustentáveis para os atletas e staff.	S
	Outras. Quais?	----
Outras	Transmissão do evento por televisão ou internet	S

<b>MEO Rip Curl Pro Peniche - 16 a 28 de outubro 2019</b>				
	Nome	Contacto	Tipo de patrocínio / parceria	Tipo de produto fornecido
Manager	Frederico Teixeira	<a href="mailto:fteixeira@oceanevents.pt">fteixeira@oceanevents.pt</a> <a href="mailto:geral@oceanevents.pt">geral@oceanevents.pt</a>	----	----
Patrocinadores/ Parcerias	Câmara Municipal de Peniche (coorganizador); Rip Curl; Meo; Moche; Turismo Portugal; Turismo Oeste; Corona; Red Bull; Jeep; Megahits; RTP; Sport Tv; Record; Público; Jogos Santa Casa; Autoestradas Atlântico; Via Verde; Hertz	----	----	----
Concessões / Fornecedores	Setup Eventos; NiU Sistemas; Masstige Catering; Media Luso; Antea Segurança Privada; Be there Be everywhere (Shuttles); Oneway (som)	----	----	----
Divulgação do evento (meios utilizados / a utilizar)	Campanha Online, Televisão e Rádio; Campanha Outdoor			
	Nº estimado de:			
Atletas	54			
Staff	300			
Visitantes	Aproximadamente 140 mil			

Gestão Ambiental		S (Sim) / N (Não)
Evento	Existe alguma certificação ambiental para o evento Se sim, qual?	N
Água	Promoção e operacionalização do reenchimento de garrafas de água para os espectadores	S
	Promoção e operacionalização do reenchimento de garrafas de água para os atletas / staff?	S
	Outras. Quais?	----
Materiais e Catering	Utilização de alimentos locais e sazonais.	S
	Utilização de materiais ecológicos para as embalagens, pratos, copos.	S
	Promoção da reutilização / reciclagem / devolução de materiais utilizados no espaço do evento (tendas, sinalização, etc.)	S
	Outras. Quais?	----
Resíduos	Disponibilização de W.C. a utilizar	S
	Disposição de contentores para os resíduos	S
	Disposição de contentores para os itens recicláveis	S
	Realização de atividades de reciclagem	S
	Realização de limpezas de praia	S
	Outras. Quais?	----

Energia	Utilização de energias renováveis	N
	Elaboração da pegada de carbono	S
	Outras. Quais?	----
Proteção da biodiversidade	Designação de áreas específicas para estacionamento de veículos	S
	Designação de áreas específicas para o espectador	S
	Medidas de proteção da fauna e da flora local	S
	Outras. Quais?	----
Poluição estética e sonora	Medidas contra a poluição sonora	N
	Outras. Quais?	----
Comunicação da informação	Disponibilização de orientações / regulamentos de sustentabilidade ambiental antes do evento	S
	Disponibilização de sinaléticas de boas práticas ambientais no espaço do evento	S
	Possibilidade reportar comportamentos ambientalmente inapropriados	S
	Outras. Quais?	----
Marketing	Comunicação das iniciativas ambientais	S
	Outras. Quais?	----

Transporte	Promoção do uso dos transportes públicos ou car-pooling para os espectadores.	S
	Promoção do uso de alternativas de transporte ambientalmente sustentáveis para os atletas e staff.	S
	Outras. Quais?	----
Outras	Transmissão do evento por televisão ou internet	S

---

## **Appendix 4: Questionnaire**





**Caro espectador:** Pedimos a sua participação num estudo sobre a sustentabilidade ambiental dos eventos de surf. A sua cooperação é extremamente importante, pelo que solicitamos que responda a este questionário de resposta rápida. A informação nele contida será apenas divulgada de forma agregada, após tratamento estatístico, sendo garantida absoluta confidencialidade. Obrigado pela sua colaboração.

Por favor, classifique cada necessidade/valor de acordo com a importância que este assume como princípio orientador na sua vida, na escala apresentada abaixo. Responda a cada item da forma mais fiável possível, assinalando com uma cruz (X) o número correspondente à sua opção. Obrigado.

	(-1) Oposto aos meus valores	(0) Nada importante	1	2	(3) Importante	4	5	(6) Muito importante	(7) Suprema importância
Sabedoria – Ter conhecimento acumulado ao longo da vida adquirido através da experiência.									
Paz interior – Estar em paz consigo mesmo e com a vida.									
Estética – Apreciar as coisas bonitas da vida.									
Ambientalismo – Proteger o meio ambiente.									
Justiça Social – Tratar com justiça e dignidade todas as pessoas na sociedade.									
Tolerância – Aceitar opiniões diferentes de outras pessoas e tratá-las de forma justa.									

Por favor, avalie a forma como concorda com as seguintes afirmações, usando a escala que varia de "Discordo totalmente" a "Concordo totalmente":

	(1) Discordo Fortemente	(2) Discordo	(3) Discordo parcialmente	(4) Não concordo nem discordo	(5) De certo modo concordo	(6) Concordo	(7) Concordo plenamente
Não compreendo o porquê da preocupação deste evento com a redução do uso de plástico descartável.							
No próximo evento de surf, tenciono recorrer ao shuttle bus (autocarro circulante) .							
Durante este evento, estou a planear encher a minha garrafa de água nas estações de abastecimento disponíveis.							
Não compreendo o porquê da preocupação deste evento com o abastecimento das garrafas de água.							
Durante este evento, tenciono encher a minha garrafa de água.							
Durante este evento, estou a planear reciclar todo o meu lixo plástico.							
Considero que sou mais um(a) fã de determinados surfistas do que do surf em geral.							
Gosto que este evento esteja a inspirar as pessoas a serem mais amigas do ambiente.							
Sou um(a) grande fã de determinados surfistas.							

	(1) Discordo Fortemente	(2) Discordo	(3) Discordo parcialmente	(4) Não concordo nem discordo	(5) De certo modo concordo	(6) Concordo	(7) Concordo plenamente
Neste evento, não sei onde encher a minha garrafa de água.							
Enquanto estou a assistir a eventos de surf, não tenho tempo para agir de forma amiga do ambiente.							
O meu companheiro(a) não está interessado(a) em agir de forma sustentável.							
Quando estou a assistir a eventos de surf, é simplesmente mais fácil deitar a minha garrafa de água para o chão do que procurar um ponto de reciclagem para plástico.							
Sinto que faço parte da comunidade de Ericeira.							
Penso que não vale a pena a encher a minha garrafa de água.							
Não compreendo o porquê da preocupação deste evento com a reciclagem do lixo.							
De todos os desportos, prefiro o surf.							
Neste evento, eu não sei onde descartar adequadamente o meu lixo.							
Gosto que este evento esteja a tentar promover as práticas ambientalmente sustentáveis das pessoas.							
Considero-me um(a) fã dos eventos da WSL, e não apenas de um determinado surfista.							
Quando estou a assistir a eventos de surf, é simplesmente mais fácil comprar uma garrafa de água do que procurar uma estação de abastecimento de água.							
Gosto que este evento esteja a encorajar as pessoas a agir de forma mais sustentável.							
Agir de forma amiga do ambiente não vai contribuir o suficiente para fazer a diferença.							
Não existem estações de abastecimento de água de fácil acesso próximos deste evento.							
No próximo evento de surf, tenciono utilizar modos de transporte sustentável.							
Apoio a comunidade de Ericeira no seu todo.							
Este evento é o melhor evento de surf em Portugal.							
Não existe um fácil acesso para obter um cantil de água neste evento.							
Sou fã dos eventos da WSL independentemente de quem esteja a competir.							
Sinto-me ligado(a) a muitos aspetos da comunidade de Ericeira.							
Enquanto estou a assistir a eventos de surf, não tenho tempo para procurar uma estação de reabastecimento de água.							
Durante este evento, vou certificar-me de reciclar todo o meu lixo.							
Acima de tudo, considero-me um(a) fã de surf.							
Enquanto estou a assistir a eventos de surf, não tenho tempo para procurar pontos de reciclagem.							
Os meus amigos não estão interessados em agir de forma sustentável.							
Penso que não vale a pena fazer reciclagem.							
Durante este evento, vou certificar-me de encher a minha garrafa de água nas estações de abastecimento disponíveis.							

	(1) Discordo Fortemente	(2) Discordo	(3) Discordo parcialmente	(4) Não concordo nem discordo	(5) De certo modo concordo	(6) Concordo	(7) Concordo plenamente
No próximo evento de surf, tenciono utilizar o transporte público ou carpooling (boleia organizada).							
Sou um(a) grande fã dos eventos da WSL.							
A minha família não está interessada em agir de forma sustentável.							
Sou fã dos surfistas presentes nos eventos da WSL (Liga Mundial de Surf).							
Ser fã deste evento de surf é muito importante para mim.							
Neste evento, eu não sei onde descartar adequadamente o meu lixo plástico.							
Não existem pontos de reciclagem de fácil acesso próximos deste evento.							
Sou um(a) grande fã deste evento de surf.							
Durante este evento, tenciono reciclar todo o meu lixo.							
O surf é o meu desporto favorito.							
Quando estou a assistir a eventos de surf, é simplesmente mais fácil deitar as minhas embalagens para o chão do que procurar um ponto de reciclagem.							

**Por favor, dê uma resposta numérica às seguintes questões:**

Quantas vezes já foi a um evento de surf onde usou um shuttle bus? \_\_\_\_\_

Quantas vezes já se deslocou a um evento de surf utilizando o transporte público ou carpooling? \_\_\_\_\_

Aproximadamente, qual a percentagem do lixo reciclável que deposita nos contentores de reciclagem? \_\_\_\_\_

Aproximadamente, qual a percentagem de vezes que reutiliza a sua garrafa de água em vez de comprar uma nova? \_\_\_\_\_

**Responda marcando a opção correta (x)**

- Com o seu grau de escolaridade?

Ensino básico\_\_\_; Secundário\_\_\_; licenciatura\_\_\_; mestrado\_\_\_; doutoramento\_\_\_; Outro\_\_\_.

- Sexo? Feminino\_\_\_; Masculino\_\_\_.
- Idade? \_\_\_ anos.
- Quantas vezes já assistiu a um evento de surf? \_\_\_\_\_
- Pratica desporto? Não\_\_\_; Sim\_\_\_, qual? \_\_\_\_\_.

**Nós gostaríamos de ter a sua opinião sobre a sua experiência neste evento.**

Se quiser participar no pós-questionário por favor indique o **seu email** que apenas servirá para uso exclusivo desta investigação

\_\_\_\_\_

**Dear spectator:** We are asking you to participate in a study on the environmental sustainability of surfing events. Your cooperation is extremely important, so we would like you to respond this quick response questionnaire. The information contained therein will only be disclosed in aggregate form after statistical treatment. Absolute confidentiality is guaranteed. Thanks for your collaboration.

Please rate each need/value in terms of its importance to you AS A GUIDING PRINCIPLE IN YOUR LIFE on the scale provided below. Please answer each item as accurately as you can, making a mark (X) in the chosen number.

	(-1) Opposed to my Values	(0) Not Important	(1)	(2)	(3) Important	(4)	(5)	(6) Very Important	(7) Of Supreme Importance
Environmentalism - Protecting the environment.									
Social justice – Fair and dignified treatment of all people within society.									
Tolerance - Accepting differing views of other people and treating them fairly.									
Wisdom – Accumulated knowledge of life gained through experience.									
Inner peace – At peace with one’s self and life.									
Aesthetics - Being appreciative of beautiful things in life.									

Please rate the manner in which you agree with the following statements, using the scale ranging from “Strongly Disagree” to “Strongly Agree”:

	(1) Strongly Disagree	(2) Disagree	(3) Somewhat Disagree	(4) Neither Agree nor Disagree	(5) Somewhat Agree	(6) Agree	(7) Strongly Agree
I don’t understand why this event is worried about reducing the use of single-serve plastic.							
I intend to use shuttle bus in the next surfing event.							
During this event, I am planning to refill my water bottle at the provided refill stations.							
I don’t understand why this event is worried about water bottle refilling.							
During this event, I intend to refill my water bottle.							
During this event, I am planning to recycle all of my plastic waste.							
I consider myself a fan of certain surfers more than of the surfing in general.							
I like that this event is inspiring people to be more environmentally friendly.							
I am a big fan of specific surfers.							
I don’t know where to refill my water bottle during this event.							

I don't have time to act in an environmentally friendly way, when I'm watching surfing events.							
My significant other is not interested in acting sustainably							
When watching surfing events, it is just easier to throw my water bottle on the ground than to look for a recycling plastic receptacle.							
I feel that I am a part of the Ericeira community.							
I don't think refilling my water bottle is worthwhile.							
I don't understand why this event is worried about waste recycling.							
Of all sports, I prefer surfing.							
I don't know where to appropriately dispose all of my waste during this event.							
I like that this event is trying to promote people's environmentally sustainable practices.							
I consider myself a fan of WSL events, and not just one specific surfer.							
When watching surfing events, it is just easier to buy a water plastic bottle than to look for a refill water station.							
I like that this event is encouraging people to act more sustainably.							
Acting in an environmentally friendly way won't improve the environment enough to make a difference.							
There are no easily accessible refill water stations at this event.							
I intend to use sustainable transportation modes to the next surfing event.							
I support the Ericeira community as a whole.							
Local governments have a responsibility to integrate environmentally sustainable practices into their operations.							
This event is the best surfing event in Portugal.							
There is no easily accessible way to get a water canteen at this event.							
I am a fan of WSL events regardless of who is surfing.							
I feel connected to numerous aspects of the Ericeira community.							
I don't have time to find a refill water station when I'm watching surfing events.							
During this event, I will make sure to recycle all of my waste.							
First and foremost, I consider myself a surfing fan.							
I don't have time to find a waste recycling receptacle when I'm watching surfing events.							
My friends are not interested in acting sustainably.							
I don't think recycling is worthwhile.							
During this event, I will make sure to refill my water bottle at the provided refill stations.							
I intend to use public transportation or carpooling to the next surfing event.							
I am a big fan of WSL events.							
My family is not interested in acting sustainably.							
Being a fan of this surfing event is very important to me.							
I am a fan of the surfers on the World Surf League (WSL) events.							
I don't know where to appropriately dispose of my plastic waste during this event.							
There are no easily accessible recycling waste receptacles at this event.							
I am a big fan of this surfing event.							
During this event, I intend to recycle all of my waste.							
Surfing is my favourite sport.							
When watching surfing events, it is just easier to throw my wrappers on the ground than to look for a recycling waste receptacle.							

Please provide a numerical response to each of the following questions.

How many times have you used a shuttle bus at surfing events? \_\_\_\_\_

How many times have you gone to a surfing event by public transport or carpooling? \_\_\_\_\_

Approximately what percentage of times do you recycle material that is recyclable? \_\_\_\_\_

Approximately what percentage of times do you reuse your water bottle instead of buying one? \_\_\_\_\_

Mark (x) the correct answer:

- What is your highest level of education?

Some high school\_\_\_\_; High school graduate\_\_\_\_; Some college\_\_\_\_; Graduate degree\_\_\_\_; College graduate\_\_\_\_; Other\_\_\_\_.

- Gender? Female\_\_\_\_; Male\_\_\_\_.
- Age? \_\_\_\_ years.
- How many times have you attended a surfing event before? \_\_\_\_\_
- Do you practice any sport? No\_\_\_\_; Yes\_\_\_\_ What sport? \_\_\_\_\_.

**We would like to have your opinion on your experience in this event.**

If you want to participate please fill in **your e-mail** for sending a post survey for the exclusive use for this investigation\_\_\_\_\_ Thank you!

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## **Appendix 5: Chapter 3**





## How has science highlighted sports tourism in recent investigation on sports' environmental sustainability? A systematic review

Margarida Mascarenhas, Elsa Pereira, António Rosado & Rute Martins

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## How has science highlighted sports tourism in recent investigation on sports' environmental sustainability? A systematic review<sup>1</sup>

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### ABSTRACT

The present investigation aimed to understand how scientific research has recently studied the environmental sustainability in the sports tourism market. Thus, a systematic literature review was developed for the time 2013–2019 using Scopus, Sage, Science Direct and Web of Knowledge as database resources. The main results were: (a) the sports event context was the most scrutinized with major concentration on mega events; (b) the environmental pillar of sports tourism was predominantly investigated through the sports practitioners and sparsely by the spectators' role; (c) sports practice was the most influencing factor for sports practitioners' greener behaviour, mainly in nature-based activities; and (d) external pressures and perceptions on the environmental organizational efforts were strongly related to the adoption of ecological management by sports events. This study provided practical implications for sports tourism managers such as the need of collaboration within the sports tourism sector to develop environmental strategies and initiatives, tailoring the sports services according to the expertise of sports practitioners in natural areas and promoting environmental education across all sports actors involved in the demand and supply of the sports tourism market.

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actors; sports' organizations;  
sports tourism; tourism

## 1. Introduction

The concept of sustainable development disclosed by the Brundtland report (WCED, 1987) embeds the environmental pillar focused on the Sustainable Development Goals (SDG) defined in the United Nations (UN) Agenda 2030 (UN, 2015). Environmental sustainability presupposes a state of 'balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by

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our actions diminishing biological diversity' (Morelli, 2011, p. 6). The need to promote environmental sustainability strategies is justified by the weak ecological status of the planet reflected in several international reports (e.g. IPCC, 2018).

In pursuing the SDG, the IIN (2015) recognize the importance of tourism and sport, defending their interconnection: (a) tourism's role in the path of sports sustainability, especially within the Olympic Games, is recognized by the International Olympic Committee (IOC, 2012); (b) sports tourism is highlighted by the World Tourism Organization (WTO, 2019) for its potential to promote environmental sustainability, both by raising awareness and encouraging the adoption of pro-environmental measures, being one of the fastest growing tourism segments (Alexandris & Kaplanidou, 2014).

Also noteworthy is the recent creation of the Sports for Climate Action Framework (UNFCCC, 2019) which aims to incorporate actions to combat climate change. In the field of tourism, an event entitled Transforming Tourism for Climate Action (UNEP, 2019) was held with the same objective. Sustainable tourism is also envisaged in the One Planet Sustainable Tourism Program (UN, 2019) as a strategy to drive sustainable consumption and production, in association with the themes of lifestyles and education.

Sports tourism is a social, economic and cultural phenomenon that emerges from the interaction of activities, people and places (Weed & Bull, 2004). As highlighted by Hinch and Ito (2018), sports tourism 'is broadly conceived and includes recreational as well as high performance sports and active engagement as well as spectator activities' (p. 96). In addition, the recent work developed by Getz and Page (2016) also enshrines sporting events as one of the four major classes of the typology of planned events in the tourist context.

Scientific research has given increasing attention to the relationship of environmental sustainability and sport (Mallen, 2018), especially focusing on sports tourism, although more on the destinations' environmental impacts than on those generated by sporting events (Moyle, Hinch, & Higham, 2018). However, literature reviews on the intersection of sport, tourism and environmental sustainability have followed a fragmented approach, whether analysing the relationship between sports organizations and environmental sustainability from a narrow perspective of the sports sector (Mallen, 2018; Trendafilova & McCullough, 2018), or by researching the relationship between leisure activities and sustainability, leaving a gap in terms of the sports component (Ardoin, Wheaton, Bowers, Hunt, & Durham, 2015; Vaugeois, Parker, & Yang, 2017).

In this sequence, this study aimed to carry out a systematic review of the literature on the relationship between sports tourism and environmental sustainability, filling an important scientific gap, by expanding the tourist-sports focus to the contexts of recreation and leisure and the respective actors. The prioritization of environmental topics in future tourism research (Buckley, Gretzel, Scott, Weaver, & Becken, 2015), the rapid growth of the sports tourism segment (Alexandris & Kaplanidou, 2014) and the need to increase environmental sustainability in sports tourism (WTO, 2019) justify the systematization of current scientific knowledge to assist future research. This review may also favour sports tourism management, highlighting environmental sustainability strategies that strengthen: (a) the ecological behaviour of sport practitioners and spectators (Lin & Lee, 2020; Trail & McCullough, 2020); and (b) the mitigation of the environmental impact of sports tourism in destinations, caused both by the practice of nature-based sports (Wolf, Croft, & Green, 2019) and by hosting sporting events (Babi, Inglés, & Soler, 2019).

Specifically, this review intended to summarize existing literature exploring the relationship between sports tourism and environmental sustainability considering the research questions: (i) Which sports tourism contexts and sports actors have been studied? (ii) When and where has research on the topic been conducted and published? (iii) What theoretical frameworks are related to the theme? (iv) How has research been conducted in the field regarding its focus and methodological approach? (v) What results have been found? and (vi) What are the management and theoretical implications for sports tourism?

## 2. Materials and methods

A systematic literature review is a reproducible methodology 'to identify, select, and appraise studies of a previously agreed level of quality (...) relevant to a particular question' (Booth, Sutton, & Papaioannou, 2016, p. 11). Such methodology permits to approach a large scientific research area and it should be objective, integrating the produced scientific research (Booth et al., 2016). Moreover, the quantitative systematic literature review (Pickering, Grignon, Steven, Guitart, & Byrne, 2015), also adopted by other reviews developed in the context of sports tourism, namely, on sporting events (Thomson et al., 2019) and on nature-based sports recreation (Pickering, Rossi, Hernando, & Barros, 2018; Wolf, Ainsworth, & Crowley, 2017), is an appropriate method for this investigation as a complement to qualitative content analysis (Hsieh & Shannon, 2005).

### 2.1. Search strategy and quality assessment

The review process was carried out sequentially, adapting the recommendations of Pickering et al. (2015). Thus: (a) the theme was circumscribed, namely the relationship between sports tourism and environmental sustainability; (b) the research questions were outlined; (c) the databases – Scopus, Web of Knowledge, ScienceDirect and Sage – were selected for their wide range of scientific areas and peer-reviewed journals, also allowing the data collection sources triangulation and increasing the reliability of the investigation (Salkind, 2010); and (d) the first author conducted an exploratory study in the designated databases, in order to identify the search terms and the review timeline. From this process the search string was structured as following:

((environmental\*responsible OR pro-environmental OR environmentally-friendly OR environmental-behavi\* OR environmental-action\* OR sustainab\* OR low-carbon OR green-consumption OR conscious-consumer OR eco-friendly) AND (sport\* OR recreation\* OR physical-activit\* OR active-leisure)).

Inclusion and exclusion criteria (Table 1) were employed to ensure that the boundaries of the review were clearly defined and the search strategy would identify all relevant literature for answering the research questions (Creswell, 2003). It should also be noted that online databases searching included: (a) all the academic areas, which ensured a greater breadth of the research area and avoided the skewed selection error (Booth et al., 2016); and (b) studies published since 2013, according to the results of Tölkes (2018) that point to a sustained growth of publications from that year, reducing 'the studies down to a more manageable number' (Weed, 2005, p. 80).

**Table 1.** Inclusion and Exclusion criteria.

	Criteria
Inclusion	Peer-reviewed articles; Articles published between 2013 and 2019; Articles containing specific references to sports tourism, with the word tourism or its derivatives in the journal's title, article's title/abstract/keywords. Articles containing specific references to environmental pillar of sustainability or environmental behaviour.
Exclusion	Articles which don't provide the identification data (e.g. authors' name, year of publication); All book reviews and conference proceedings; Articles which relate sports tourism to sustainability without the environmental pillar; Articles addressing sport without any reference to tourism or sports event; Articles investigating recreation without any reference to a sports activity; Articles examining sport through wildlife recreation exclusively, namely, recreational fishing and hunting; Articles exploring physical activity, recreation or sport through a sustainable mobility or walkability perspective; Articles which are not written in English.

This process involved the review of data and the research process by the research team, who provided support, challenged the researchers' assumptions, including questioning the resulting interpretations (Creswell & Miller, 2000). It took place between the lead researcher (first author) and the second, third and fourth authors, who provided support on the process of conducting systematic reviews. Peer debrief took place throughout this study, by way of regular formal meetings and informal discussions.

## 2.2. Data extraction and analysis

The selected protocol to operationalize data collection was PRISMA (Moher, Liberati, Tetzlaff, & Altman, 2009). The data were exported using Endnote x7 software and treated with NVivo software – version 11. The flow chart of Figure 1 shows the development of this process.

This review also relied on content analysis (Hsieh & Shannon, 2005), such as that developed by Cheng, Edwards, Darcy, and Redfern (2018) on adventure tourism. Since the conceptual framework for the theme under study is limited, the use of the content analysis into its conventional form allowed the use of the inductive method as a preferred way to design emerging categories of data (Hsieh & Shannon, 2005). Thus, the inductive method was used to define: (i) research focus categories based on the studies' aim – abstract and/or introduction section; (ii) main conclusions subcategories, based on the studies' key-findings – results and/or discussion sections, and (iii) practical implications subcategories, based on the studies' discussion and/or conclusion sections.

## 3. Results

### 3.1. Sports tourism contexts, actors and bibliometric analysis

The results of the 157 articles that met the selection criteria revealed four contexts of study (Table 2): (a) 'sports events', including studies on mega-events, such as the Olympic Games and the world football championships; (b) 'inland natural areas' (INAs), encompassing research that focuses on natural parks and protected areas, snow tourism and golf tourism; (c) 'costal and maritime areas' (C&Ms), covering dive and surf tourism; and (d) 'general contexts', containing articles that explore sports tourism in a

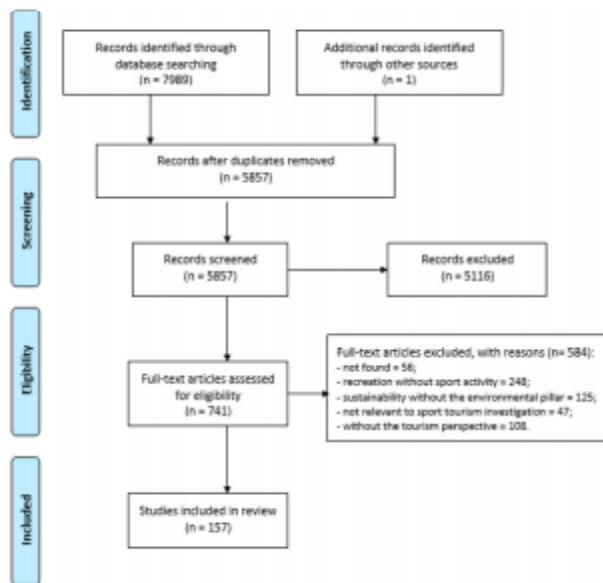


Figure 1. PRISMA flow diagram based on Moher et al. (2009).

multiplicity of or without contextual specification. The most studied actors were sports practitioners (43.3%), followed by sports event organizations and sports tourism operators. The remaining actors – spectators, local residents, natural areas organizations and media – were investigated by less than 10% of the studies.

Table 2. Number of publications by sports tourism contexts and their actors.

		Publications	
		(n)	%
Sports tourism contexts	Sports Events	63	40.1
	Inland Natural Areas	54	34.4
	Coastal & Maritime Areas	29	18.5
	General Contexts	11	7.0
Sports actors	Sports practitioners	68	43.3
	Sports events organizations (committees, host cities organizations, sponsors, clubs, federations, leagues, colleges e public entities)	35	22.3
	Sports tourism operators	20	12.7
	Spectators	14	8.9
	Local residents	12	7.6
	Natural areas organizations	11	7.0
	Media	2	1.3
	Not applicable	16	10.2
Total of the publications <sup>a</sup>		157	100

<sup>a</sup>Some publications account for more than one sports actor.



**Table 3.** Number of publications by journals and by research areas.

Journals	Publications (n)	%
Sustainability	15	9.6
Journal of Sustainable Tourism	13	8.3
Journal of Outdoor Recreation and Tourism	10	6.4
Journal of Sport & Tourism	10	6.4
Tourism Management	8	5.1
Environmental Management	4	2.5
Scandinavian Journal of Hospitality and Tourism	4	2.5
Total of publications in journals with more than 3 publications	64	40.8
Total of publications in journals with 3 or less publications	93	59.2
Total of publications	157	100
Total of publications in journals within the sport and tourism research area	74	47.1
Total of publications in journals within the sustainability and environmental research area	50	31.8
Total of publications in journals within others research area	33	21.1
Total of publications	157	100

Considering the geography of the production of publications, the United States of America (USA) was the country that most studied the topic (20%); however, from a continental accounting perspective, Europe was the largest contributor, with 42% of the total selected studies.

The production of studies on sports events was led by Asia (13.4%), while the rest of the contexts (INAs, M & Cs and general) received the most attention from affiliated authors in Europe (18.5%, 7.6% and 3.8%, respectively).

Between 2013 and 2018, the average number of publications (pubs) was 19 pubs/year; however, in 2019, 42 pubs were obtained, representing a growth of 121% compared to the previous average, which covered all contexts under study with the exception of C&Ms whose peak occurred in 2016.

The selected articles (157) were published in 95 scientific journals (Table 3), highlighting the research in the field of sports tourism, as well as the top position of a sustainability literature journal.

### 3.2. Theoretical framework

The results showed that 31.2% of the studies presented a theoretical basis (Table 4), highlighting Theory of Planned Behaviour as the most used. This theory, as well as Value-Belief-Norm Theory, was used to infer about the psychological factors that influence the spectators' and sports practitioners' environmental behaviour. The other most used theories were Recreation Specialization Theory, served to investigate the relationship between sports practitioners and the natural space, underlining a positive association between greater sporting experience and pro-environmental attitude/behaviour, and Place-attachment Theory focuses on the positive influence that emotional connexion to space can have on an individual's environmental behaviour.

### 3.3. Research focus and methodological approach

The objectives pursued by the selected studies were grouped into four categories: (a) 'Environmental sustainability (ES) shaping factors', comprising articles on factors capable of influencing the adoption of environmental sustainability in sports tourism

**Table 4.** Number of publications by theoretical frameworks.

Theory	Publications (n)	%
Planned Behaviour	6	3.8
Recreation Specialization	5	3.1
Place-attachment	5	3.1
Value-Belief-Norm	4	2.5
Social Exchange	3	1.9
Sport Fan Sustainability Behaviour Model	2	1.8
Outcomes-Focused Management	2	1.8
Principal-agent Model	2	1.8
Tourism Area Life Cycle	2	1.8
Event Portfolio	2	1.8
Total of theories applied once	35	22.3
Total of theories applied	45	28.7
Total publications applying theories	49	31.2
Total of publications without theories	108	68.8
Total of the publications <sup>a</sup>	157	100

<sup>a</sup>Multiple answers included – some publications used more than one theory.

(59,2%); (b) 'ES strategies, practices and tools', encompassing studies on strategies, practices and tools for the management and promotion of environmental sustainability in sports tourism (36,3%); (c) 'Environmental impacts evaluation', including articles on the identification and assessment of environmental impacts in sports tourism (19,7%); and (d) 'Conceptualizations', containing articles on theoretical models and concepts exploring the relationship between sports tourism and environmental sustainability (12,7%).

The majority of the selected investigations (82,2%) is empirical, while 17,8% of all studies represent non-empirical research (Table 5).

A larger stain of the empirical literature involved a quantitative research design (36,3%), while 24,2% applied qualitative research methods and 21,7% used a mixed-methods approach. Among the non-empirical research, theoretical papers prevail (8,9%) over conceptual (5,1%), and literature reviews (3,8%).

There is a predominance of survey-based studies, whose respondents were mostly sports practitioners. There is also a prevalent use of interviews and direct/participatory observation as data collection methods. Geographical maps were used to determine the impacts generated by recreation and predominantly contextualized in INAs; media reports were used by studies on sports events to analyse environmental communication.

The use of experimental designs is sparse and mainly applied by studies in the C&Ms context. Among the total of the studies, 40,1% combined more than one data collection method, mainly due to research developed in the context of INAs.

### 3.4. Selected studies' main conclusions

#### 3.4.1. Environmental sustainability shaping factors

The results showed six factors with more influence on the environmental sustainability of sports tourism actors (Table 6): sports practice, perceptions, external pressures, environmental attitudes, environmental objectives, environmental knowledge and environmental preferences. The remaining eighteen ES shaping factors were examined by less than 10% of the studies, distributed by psychological, contextual, organizational and demographic factors.



**Table 5.** Research designs and data collection methods.

Research design	Data collection methods	Publications (n)	%	
Empirical	Quantitative	129	82.2	
		57	36.3	
		49	31.2	
		9	5.7	
		2	1.3	
		2	1.3	
		1	0.6	
		1	0.6	
		1	0.6	
	Qualitative	38	24.2	
		27	17.2	
		17	10.8	
		7	4.5	
		7	4.5	
		6	3.8	
		4	2.5	
	Mixed	1	0.6	
		34	21.7	
		27	17.2	
20		12.7		
10		6.4		
10		6.4		
7		4.5		
Non-empirical	Conceptual	1	0.6	
		1	0.6	
		1	0.6	
	Theoretical	28	17.8	
		8	5.1	
	Review	14	8.9	
		6	3.8	
	Total of publications with more than one data collection method		63	40.1
	Total of publications with experimental design		4	2.5
	Total of publications		157	100

The results exposed sports practice – including sports experience and the use of sports accessories/equipment – as the factor with the greatest power to influence the sustainability of sports practitioners. One of its benefits arises from the increased environmental awareness provided by nature-based activities. Another important factor for valuing the conservation of the natural space is the sports experience, particularly verified in the context of C&Ms: divers with more sporting experience have shown a greater predisposition to pay for coral conservation (e.g. Emang, Lundhede, & Thorsen, 2019); conversely, a more destructive behaviour of the marine biota was more noticeable among less experienced divers. The use of sports accessories and equipment by divers/snorkelers (i.e. cameras/musk sticks) proved to be harmful for the conservation of marine biota, even among the most experienced divers (Giglio, Luiz, & Schiavetti, 2015).

In sports events' context, when the spectators positively perceived the environmental efforts developed by the events' organization, they exhibited more environmentally friendly behaviours (e.g. Han, Nelson, & Kim, 2015); the contrary was found when they understood that such initiatives were only a means to increase the profit of organizations. On the other hand, local residents' positive perception regarding the events' environmental impacts at the destination encouraged support for the respective hostage (e.g. Boonsiritomachai & Phonthanakitithaworn, 2019). In INAs and C&Ms contexts, sports practitioners revealed less environmentally friendly attitudes and behaviours when

**Table 6.** Environmental sustainability shaping factors by sports tourism contexts ( $n = 93$ ).

Environmental sustainability shaping factors	Publications (n)				Association (positive/negative)	Total	%
	Inland Natural Areas	Sports Events	Coastal & Maritime Areas	General Contexts			
Sports practice	8		13	3	(14/10)	24	25.8
Perceptions	6	12	5		(10/13)	23	24.7
External pressures	5	12			(8/9)	17	18.3
Environmental attitudes	8	5	2	1	(10/6)	16	17.2
Environmental objectives	8	3	3		(8/6)	14	15.1
Environmental knowledge	5	2	3		(7/3)	10	10.8
Environmental preferences	5	1	4		(6/3)	10	10.8
Expectations	5	2	1		(6/2)	8	8.6
Place-attachment	3	2	2		(7/0)	7	7.5
Collaboration	1	4	2		(5/2)	7	7.5
Organizational benefits	4		2		(6/0)	6	6.5
Time & financial features	1	4			(0/5)	5	5.4
Values		4		1	(4/1)	5	5.4
Education level		1	2		(2/1)	3	3.2
Income	2	1			(2/1)	3	3.2
Environmental motivations	2		1		(1/2)	3	3.2
Organizations' dimension	2		1		(1/2)	3	3.2
Past environmental behaviours		2			(2/0)	2	2.2
Behaviour context		3			(0/3)	2	2.2
Environmental regulations		2			(0/2)	2	2.2
Age	1	1			(2/0)	2	2.2
Gender		1			(1/0)	1	1.1
Psychological ownership	1				(1/0)	1	1.1
Political affiliation		1			(1/0)	1	1.1
<b>Total of publications<sup>a</sup></b>						<b>93</b>	<b>100</b>

<sup>a</sup>Multiple answers included – some publications have more than one shaping factors.

inconsistencies between the destination's environmental message and the respective sports offer were perceived (e.g. Hsiao, 2018). At INAs, local residents negatively perceived the environmental impacts of some tourist options taken by destinations, such as snow-making practices at ski resorts (Hopkins, 2014). In contrast, at C&Ms, the local community positively perceived the importance of environmental benefits of surf tourism (Towner & Davies, 2019).

External pressures, mostly revealed in the sports events' context and exerted by public sector organizations, imposed the adoption of environmentally sustainable management practices at mega events; however, antagonistic interests to environmental management also constrained the respective operationalization (e.g. Gaffney, 2013). In INAs context, external pressures from stakeholders limited the adoption of good environmental practices by natural management organizations and sports tourism operators; similar effects occurred due to the pressure of sports demand: for example, Purdie, Hutton, Stewart, and Espiner (2020) verified the inconsistency between the promotion of environmental education in a natural park and the use of aerial means to facilitate the sports practitioners' accessibility to remote locations.

The sports practitioners' ecological attitudes positively influenced the intention/adoption of pro-environmental behaviours. Although more prominent in the INAs, this result crossed all sports tourism contexts: for example, golfers' environmental attitudes were preponderant in their intentions to use environmentally friendly golf courses (Lopez-Bonilla, Reyes-Rodriguez, & Lopez-Bonilla, 2018). However, an attitude-behaviour gap

was also verified, since the environmental attitudes associated with nature-based sports practitioners were insufficient for adopting more ecological behaviours, such as the choice of ecological transport (Wicker, 2018).

The existence of environmental objectives by organizations motivated the adoption of good environmental practices, in the contexts of INAs, sports events and C&Ms. This finding was corroborated by results showing greater constraints in the implementation of environmental management initiatives, both by the sports tourism operators of the INAs, whose strategic objectives were only centred on the economic pillar of sustainability (e.g. Hopkins, 2014), as well as by natural management organizations (Dupke, Dormann, & Heurich, 2019) with conflicting strategic and environmental objectives.

In INAs and M&Cs contexts, the sports practitioners' environmental knowledge about the natural space was positively related to the adoption of good environmental practices; in sports events context, knowledge transfer among sports event organizations fostered environmental sustainability (Samuel & Stubbs, 2013).

Finally, the sports practitioners' environmental preferences contributed to sustainability, due to the attributed valorisation to sports practice in natural spaces favouring biodiversity (e.g. Emang et al., 2019).

### 3.4.2. Environmental sustainability strategies, practices and tools

The results (Table 7) revealed a prevalence of research around tools (47.4%), followed by strategies (29.8%) and lastly, environmental sustainability practices (26.3%) in sports tourism organizations.

The results revealed a prevalence of strategies addressing the mitigation of carbon emissions and the efficient management of natural resources, such as options for the event's location (e.g. Pereira, Camara, Ribeiro, & Filimonau, 2017) and diving tourism management strategy (Augustine, Dearden, & Rollins, 2016). Less expressively, the results revealed environmental communication strategies: at INAs, social marketing was used to promote behavioural changes among sports practitioners and at sports events, for the dissemination of environmental sustainability media content.

In the context of sports events, most practices in environmental management aimed at the elaboration of an adequate planning and consequent execution of the mega events' infrastructure, and also, environmental education initiatives. In the events in natural space, the results revealed the implementation of practices regarding the limitation of the number of participants, redirection of traffic and zoning of the event (Malchrowicz-

**Table 7.** Environmental sustainability strategies, practices and tools (n = 57).

Research focus	Outcomes	Publications (n)	%
Strategies	Natural resources management	17	29.8
	Carbon emissions mitigation	8	14.0
	Environmental communication	7	12.3
		2	3.5
Practices		15	26.3
	Sports events' sustainable planning and infrastructures management	9	15.8
	Environmental campaigns	6	10.5
	Organizational environmental practices	2	3.5
Tools		27	47.4
	Total of publications*	57	100

\*Some publications account for multiple options.

Moško, Botíková, & Poczta, 2019). At INAs, practices included environmental education campaigns, ecoroutes and signage. Finally, few studies contextualized in C&Ms examined environmental sustainability practices in intraorganizational management, showing the promotion of energy efficiency, consumption of environmentally friendly products and implementation of recycling/reuse programs (Carneiro, Breda, & Cordeiro, 2016) of sports tourism operators.

In INAs and C&Ms contexts, most of the tools to assist the implementation and assessment of environmental sustainability was based on the analysis and mapping of the natural space, using new technologies, such as web share services (Campelo & Mendes, 2016). Regarding sports events, the tools were mostly directed to mega events.

### 3.4.3. Environmental impacts evaluation

Mainly, the assessment of environmental impacts (Table 8) focused on the pressure of recreational sport on the soil (32.3%) and marine biota (25.8%).

Regarding the INAs, the results showed that the use of trails causes most impacts at the level of soil erosion and fragmentation, pollution, and fauna disturbance (Dixon & Hawes, 2015); soil erosion was also a consequence of trails usage in hosting nature sports events. In C&Ms context, divers' physical contact has caused most of the environmental impacts on marine biota.

The environmental impacts of transport and waste were mostly assessed in the sports events' context, comprising the quantification of carbon emissions generated by the travel of spectators and sports teams (e.g. Dolf & Teehan, 2015) and by the generation of waste (e.g. Costello, McGarvey, & Birisci, 2017). The carbon emissions' assessment, by quantifying the contributing areas to such emissions, was also carried out, through the carbon footprint (Andersson, Armbrecht, & Lundberg, 2016) and the life cycle assessment (Edwards, Knight, Handler, Abraham, & Blowers, 2016), revealing the importance of impacts associated with accommodation and transport. Concerning the INAs, transport's carbon emissions were also assessed, both as regarding snow tourism consumers' traveling (Wicker, 2018) and the operations and ecomobility of snow resorts (Rutty, Matthews, Scott, & Matto, 2014).

### 3.4.4. Conceptualizations

The majority (60%) of studies dedicated to conceptualizing the environmental sustainability of sports tourism focused on the sports events' context, regarding to environmental legacies and impacts (Gold & Gold, 2013), for example.

In the general contexts, which obtained 35% of the results, the studies focused on human-nature interaction, introducing several thematic areas and concepts within the

**Table 8.** Environmental impacts evaluation outcomes (n = 31).

Outcomes	Publications (n)	%
Soil	10	32.3
Marine biota	8	25.8
Transport	8	25.8
Waste	3	9.7
Mix (transport, accommodation, waste, etc.)	2	6.5
Total of publications	31	100

scope of environmental behaviour/awareness of sports tourism, such as the recreation ecology, in the review of the environmental impacts of sports tourism (e.g. Monz, Pickering, & Hadwen, 2013).

### 3.5. Selected studies' implications

In terms of recommendations, most studies addressed the implications for management compared to those of a theoretical nature (Table 9).

#### 3.5.1. Management implications

Among the implications for sports tourism management evidenced by the results, the operationalization of environmental sustainability prevailed in all contexts. Thus, for sports events, the operationalization of supportive guidelines, measures, regulations and permanent commitments was recommended to: promote the integration of environmental sustainability in strategic and operational management. The sporting events themselves must also be held as vehicles for encouraging environmental sustainability (e.g. Harris, 2013), integrating sustainable management in the use of temporary/existing infrastructure and rehabilitating trails consigned to sporting events in natural space. Finally, the greenest transport options should be operationalized, namely, carpooling, public transport, parking policies (e.g. Triantafyllidis, Ries, & Kaplanidou, 2018), reduction of long distance travel (e.g. Dolf & Teehan, 2015) and choice of host cities according to the associated carbon emissions (Pereira et al., 2017).

In the INAs, the operationalization of environmental sustainability was oriented to the regulation of access to natural areas, through zoning (e.g. Dixon & Hawes, 2015), limiting

**Table 9.** Implications of the included studies ( $n = 137$ ).

Implications	Publications	
	(n)	%
Management Implications	128	93.4
Operationalization	68	49.6
Environmental monitoring	34	24.8
Tailoring for sport actor	33	24.1
Collaboration	31	22.6
Communication	31	22.6
Environmental education	31	22.6
Planning	27	19.7
Theoretical Implications	27	19.7
Sports Event context	9	6.6
(Sustainable Development Goals framework; legacy; post political thinking; events portfolio; environmental evaluation approach; sport sustainability evaluation campaign model; green mind theory; social exchange theory; life cycle assessment)		
General Contexts	8	5.8
(Recreation ecology; sustainable tourism; environmental connectedness; means-ends change theory; participatory ecological approach; outdoor adventure)		
C&Ms	6	4.4
(Triple bottom line; ecosystem services; theory of planned behaviour; co-branding; socio-ecological system framework)		
INAs	4	2.9
(Model for the environmental behaviour of sport practitioners; integrative perspective for golfer's experience; theory of the reasoned action and planned behaviour; brief ecological paradigm and revised tourist ecological orientation scales)		
Total of the publications <sup>a</sup>	137	100

<sup>a</sup>Some publications account for more than one implication.

the number of visitors, through the use of carrying/bed capacity (e.g. Uusitalo & Sarala, 2016) and entrance fees (e.g. Dumitras et al., 2017). The results also showed that policies should be established to encourage the economic valorisation of the environmental heritage (Wicker, 2018), as well as the management of natural spaces for sports practice; for example, the offer must focus on the specific attributes of the natural space, throughout the year, combating seasonality and the consequent environmental pressure caused by the peaks of sports tourism (Santarem, Silva, & Santos, 2015).

In C&Ms, the implementation of measures to mitigate the environmental impact was also recommended, highlighting: the use of artificial coral reefs (Belhassen, Rousseau, Tynyakov, & Shashar, 2017); the implementation of specific programs and training to promote low impact behaviour in dive tourism and zoning of marine/coastal areas (Hammerston, 2017). In general contexts, the results recommended the operationalization of the inclusion of the environmental dimension in the development of business models for sports tourism (Perić, Vitezić, & Mekinc, 2016) and measures to regulate accessibility to natural spaces (e.g. Monz et al., 2013). In addition, there were recommendations to leverage sustainability through nature-based activities (e.g. Varley & Semple, 2015).

As for the remaining implications, the results also distinguished the need for: (a) more environmental monitoring of sports tourism in the natural environment (e.g. Dixon & Hawes, 2015); (b) sports actors' segmentation according to their motivations (Ho, Liao, Huang, & Chen, 2015); (c) collaboration between all stakeholders and with scientific institutions (Dupke et al., 2019); (d) strengthening the communication of environmental efforts/initiatives (e.g. Han et al., 2015); (e) intensification of environmental education actions (e.g. Kil, Holland, & Stein, 2014); and (f) planning for the sustainability of sports tourism (Augustine et al., 2016).

### 3.5.2. Theoretical implications

The context of sport events was the most contemplated with theoretical implications (Table 9), which provided new approaches to the study of sport events organizations, sport practitioners, local residents and spectators such as the adoption of the SDG theoretical framework (Crabb, 2018) and events portfolio (Ziakas, 2019), the environmental valuation approach (Saayman, 2016), social exchange theory (e.g. Boonsiritomachai & Phonthanukitithaworn, 2019) and life cycle assessment (Dolf & Teehan, 2015), respectively.

The research in the remaining sport tourism contexts provided an addition to the theoretical approaches on outdoor and nature-based sport activities, mainly focused on the environmental impact of recreation in the natural space, i.e. recreation ecology (Monz et al., 2013), as well as on the factors that foster greater environmental awareness and action, i.e. environmental connectedness (Beery & Wolf-Watz, 2014). In turn, the theoretical implications advanced by studies contextualized in C&Ms favoured the management of sport tourism by addressing, for examples, the triple bottom line (Cameiro et al., 2016) and ecosystem services (Drius et al., 2019).

## 4. Discussion

Similar to previous studies on sport and the environment (Mallen, 2018; Vaugeois et al., 2017), this review has shown that science has given increasing attention to the



relationship between sports tourism and environmental sustainability. The clear predominance of Europe and the USA in conducting the investigation had already been verified in the review on natural and protected areas (Pickering et al., 2018). Among the contexts of sports tourism, sports events and INAs stood out in the investigation of environmental issues, consolidating the literature highlighting the importance of sports events in the context of tourism (Weed, 2014) and corroborating the results of review studies on the sport's environmental impacts in the natural environment (Morz et al., 2013; Sumanapala & Wolf, 2019). Compared to the study by Pickering et al. (2018), this review was able to highlight the context of marine areas, through the analysis of the dimension of sports tourism related to C&Ms.

Predominantly, the assessment of environmental impacts focused on the quantification of topics associated with the natural resources of INAs and the carbon emissions generated by the transport of sports events. Regarding impacts on soil, fauna and marine biota, the results were aligned with the findings of Pickering et al. (2018).

This review also demonstrated the importance that investigation has given to the analysis of environmental sustainability shaping factors.

In this sequence, in the sports events' context, the results showed the positive and negative importance of external pressures in the pursuit of environmental sustainability by sports event organizations, certifying what had already been identified in the sports literature (Trendafilova, Babiak, & Heinze, 2013); in addition, the positive perception of the environmental efforts undertaken by organizations and the environmental benefits provided by sports tourism reinforce the spectators' environmental behaviour (Casper, McCullough, & Pfahl, 2020) and the support of local residents (Towner & Davies, 2019), respectively. This finding complements the positive role of perceptions about sponsors in the image, consumption and implementation of sustainable consumption practices, as evidenced by Melovic, Rogic, Smolovic, Dudic, and Gregus (2019). However, the negative perception regarding the environmental impacts generated by sports tourism may condition the local residents' support (Boonsiritomachai & Phonthanukitithaworn, 2019), justifying the study of these sports actors in the light of the Social Exchange Theory. The supremacy of these factors underlies the recommendations to: (a) increase environmental communication, covering both sides of the sports tourism market (i.e. supply: organizations; and demand: spectators/local residents); (b) operationalize mitigating measures for environmental impacts, ranging from sports infrastructures to the host city itself; and (c) deepen the investigation of the subject under study (Weed, 2014).

In INAs' context, environmental attitudes have often been associated with increased environmental behaviour, corroborating the literature on sustainable tourists (Wong, Wan, Huang, & Qi, 2020). Nevertheless, the attitude-behaviour gap verified in tourism warns of the complexity of analysing this relationship. Thus, as advocated by Wicker (2018), studying the environmental behaviours which are intended to influence has to contemplate the intensity of the effort that has to be undertaken by the spectator/sports practitioner; for example, there may be a greater predisposition to recycle than to use sustainable transport, not because of the underlying environmental attitude, but simply, because it implies less effort. Still in INAs' context, the existence of environmental objectives in sports organizations has propelled environmental sustainability. Yet, the dichotomy of the objectives pursued by natural management organizations – i.e. to conserve the natural space and simultaneously use nature to foster active sport and leisure

(Borgstrom, Lindborg, & Elmqvist, 2013; Dupke et al., 2019) – generates a conflict in the adoption of a concerted strategy capable of promoting, at the same time, sports tourism and nature conservation (Malchrowicz-Moško et al., 2019). This is a difficult conflict to reconcile, because although sport does not enjoy immunity in terms of generating environmental impacts (Sumanapala & Wolf, 2019), it was considered one of the main drivers to increase the environmental sustainability (Mullins, 2014; Varley & Semple, 2015), consolidating the results of van Riper et al. (2020). It is also important to highlight the preponderance of environmental education in the role of sport managers (Graham, Trendafilova, & Ziakas, 2018; Mercado & Grady, 2017; Rodrigues & Payne, 2017), since their ecological sensitivity seems to be decisive in the adoption of management practices more oriented towards environmental preservation (Salome, van Bottenburg, & van den Heuvel, 2013); for this reason, future studies should deepen this line of investigation.

In C&Ms' context, the sports experience and the use of sports accessories were highlighted as factors that influence environmental sustainability. Some studies (Augustine et al., 2016; Tverijonaite, Olafsdóttir, & Thorsteinsson, 2018) showed recent changes in the profile of natural areas' tourists, particularly with regard to low sports specialization, foreseeing the massification of tourism in natural spaces and the consequent obstacle to environmental sustainability. Concomitantly, a strong recommendation to promote environmental sustainability in natural areas was to limit accessibility to natural spaces for the purpose of sporting practice, corroborating the tourism literature (Whitelaw, King, & Tolkach, 2014). In this sequence, the sustainable marketing approach can bring benefits, focusing on the product development approach, according to which the tourism offer must present sustainable tourism products, based on attributes that, in addition to the environmental ones, are also capable of stimulating sports demand (Font & McCabe, 2017); for example, the offer can promote the quality of artificial reef dives for less experienced practitioners, mitigating the environmental impact on marine biota.

Across all studied contexts, this review highlighted the strong consistency of education in promoting sport tourists' pro-environmental behaviours. Thus, sports events were emphasized as a vehicle for environmental education (Harris, 2013), so the perspective of strategic leverage of environmental sustainability must be considered, case by case, to ensure the effectiveness of its implementation (O'Brien & Chalip, 2008; Pereira, Mascarenhas, Flores, Chalip, & Pires, 2019). In line with the findings of Ardoin et al. (2015), sports practice in natural spaces also endorses ecological behaviours, so its effective operationalization in nature-based activities and ecotourism was highly recommended.

Additionally, the benefits of environmental communication through social marketing (Borden & Mahamane, 2020) with nature-based sports practitioners were also verified, reinforcing the findings of Martin, Weiler, Reis, Dimmock, and Scherrer (2017) and emphasizing the need to segment these sports actors, in favour of the effectiveness of such communication (Font & McCabe, 2017).

This review also underlined the need for political actions to guide the effective shift of environmental behaviour, confirming what was proclaimed by Hofman, Hughes, and Walters (2020) in relation to sustainable C&Ms tourism.

In turn, collaboration between stakeholders was another important factor in implementing sustainability by sports tourism organizations, also evidenced in the literature



of sports organizations (Trendafilova & McCullough, 2018; Weed, 2014). The extension of collaboration to scientific organizations, facilitating the production/transfer of knowledge on environmental issues to natural areas organizations (Dupke et al., 2019; Wolf et al., 2019) was another recommendation of this review. In this sequence, this review supports the vision of Wäsche and Woll (2013), advising the development of networking in sports tourism, which must manage the acquisition of benefits and the mitigation of negative social, economic and environmental impacts, and attend to the key factors such as mutual trust, planning, innovation, effective communication and a coordinating actor.

In view of the research gaps found in this review, future research should focus on: (i) the least studied sports actors; (ii) the environmental impacts of nature-based sports events; (iii) the carbon emissions generated by sports tourism; and (iv) sports organizations' environmental management practices.

Thus, the results pointed to a predominance of the study of sports practitioners, followed by sports event organizations and a research gap regarding other essential elements of sports tourism's demand (e.g. athletes, spectators and local residents) and supply (sports tourism operators and natural areas management). Considering the scarcity of studies focused on spectators and local residents, cross-contextual spillover should be further investigated, given the importance of results for sustainable sports tourism, not only as a tourism product, but as a fostering sustainability product across leisure and daily life (Xu, Huang, & Whitmarsh, 2020). Although playing an important role in the dissemination of information, education and pressure that can be exerted on sports actors in favour of environmental sustainability (Preuss, 2013), the media has also been poorly investigated.

The high capacity of events to attract people to destinations, and the consequent ecological damage, generates a paradox that needs further attention by the investigation. Recognizing the importance of sports events and INAs in the study of environmental sustainability, this review also advises to fill the scientific gap found at the level of specific scrutiny of the environmental impacts related to sporting events in natural spaces.

Considering today's great concern about climate change (WTO, 2019) and the sparse research on the topic, with little dedication to the complete study of carbon emissions, this review warns of such a research gap. Alongside, this review stresses that future studies should deepen its knowledge, looking for relational links between the actors involved in the carbon emission of this tourist cluster, reinforcing the recommendations of Orr and Inoue (2019) and Sharpley (2020). Also, underlines the strong recommendation of research on sports events to develop strategies capable of mitigating transport's carbon emissions (e.g. reducing air transport and long-distance travel), reinforcing what was proclaimed in other studies on tourism (Lohmann & Scott, 2018; Scott, Peeters, & Gössling, 2010).

Although important to implement environmental sustainability (Vaugeois et al., 2017), the study of strategies and tools was broader than the investigation of the sports tourism organizations' environmental practices and their impacts; therefore, future research should focus on this crucial area of environmental management. Also, the prevalence of the use of quantitative research methodologies found in this review, recommends that future research uses qualitative and mixed-methods to increase the understanding of the processes associated with the development of strategies and practices for managing environmental sustainability.

Additionally, considering the relevance of SGDs in sports tourism (WTO, 2019), this review revealed a gap in their focus, only used to analyse the environmental projects of a mega event (Crabb, 2018). Also, given the potential of sports events to promote environmental education and behaviour, this review only found a model capable of ascertaining the environmental intentions of the sports tourists targeted by the respective campaigns (Trail & McCullough, 2020). This review also underlined the lack of theoretical implications for the study of environmental sustainability in the sports management of INAs, whose substantial focus was the behaviour of outdoor sports practitioners.

Finally, the authors of this review are aware that the studies that specified sports modalities, not mentioning the general words that identify the sports context contained in the search query, were not included in this review, although they may be relevant. This is a limitation of the present investigation.

## 5. Conclusion

The current consumption patterns, and the consequent environmental degradation and rarefaction of natural resources, underpin one of the greatest challenges facing Humanity. It is therefore necessary to abandon the logic of negligent behaviour towards the imperative of preserving the ecological heritage, both in the production and consumption of sports tourism, in favour of sustainable tourism architecture (WTO, 2019).

This systematic review of the literature allowed to synthesize the scientific knowledge recently produced on the relationship between sports tourism and environmental sustainability. The growing interest in the topic is evident and researching has been led by Europe and the USA.

The present review highlighted the importance of the sports events and inland natural areas contexts in the relationship between sports tourism and environmental sustainability, and also filled a gap in the literature regarding the context of coastal and marine areas. In addition, it showed a predominance of studies on sports practitioners and sports event organizations and a research gap regarding spectators, local residents, sports tourism operators, natural areas management organizations and media.

The theories of Planned Behaviour and Recreation Specialization were evidenced in the theoretical framework, to infer about the factors that influence the environmental behaviour of sports practitioners and spectators.

Among the sports actors' environmental sustainability shaping factors across the sports tourism contexts, the sports practice, perceptions and demand and supply pressures, stood out for their importance in the adoption of environmental sustainability. Thus, topics such as environmental communication and education should receive more attention, as well as the operationalization of environmental sustainability through the promotion of nature-based sports tourism activities.

The differentiation of sports tourism contexts also exposed interesting results, highlighting the following associations: external pressures at sports events; environmental attitudes of sports practitioners in inland natural areas; and sports practice in natural areas, especially in coastal and marine areas. However, the results related to environmental attitudes emphasized inconsistencies in relation to their ability to predict environmental behaviour, so the attitude-behaviour gap deserves further scientific reflection.

The results on the assessment of the environmental impacts also showed contextual differences, suggesting the deepening of the study of transport as a transversal topic to the various contexts of sports tourism.

The analysis of strategies, practices and tools contributed to highlight the need for more research in relation to what is effectively being practiced by the management of sports tourism organizations. In fact, a greater number of studies have presented tools helping the adoption, implementation or monitoring of environmental sustainability, among which the use of new technologies has stood out.

This review reflected on a set of implications for environmental management, namely: the promotion of environmental education across all sports actors, both on the demand and supply sides of sports tourism; at sports events, managers of sports organizations must collaborate with each other in the development of environmental initiatives; as the spectators' environmental behaviours were positively associated with their perception of the environmental efforts developed by the organization of sporting events, the respective leveraging processes should be oriented towards the increase of these behaviours. Also, sports events must adopt supportive guidelines, regulations and permanent commitments, and that both the infrastructure and the trails used by sporting events in nature are managed in order to guarantee their sustainability. In addition, the environmental impacts related to sporting events in natural space have been poorly examined, requiring further investigation. The external pressures exerted by the political sector in mega-events led to the adoption of environmentally sustainable management practices, highlighting the role of governance in increasing sustainability in the management of sports tourism. The relevance of the results regarding the sporting experience in natural areas, justifies that, in certain ecosystems, the sporting practice is limited to experienced practitioners and that alternatives are created for the less inexperienced.

In conclusion, this review allowed the reflection of a broader spectrum of factors, topics and concepts capable of influencing the environmental behaviour of the players in the sports tourism market, which will facilitate the efficiency of new studies assisting sports tourism in the path of sustainability.

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