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Climate change, environmental justice, and socioeconomic inequalities in sport: a systematic literature review of research published between 2020 and 2025

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ABSTRACT

This systematic literature review summarises the evidence regarding the relationships between climate change, environmental justice, and inequality as regards organised sport, physical activity, and sport governance. A Scopus database of papers was built using a structured search and following the PRISMA 2020 guidance. Two independent reviewers conducted study screening and data extraction, achieving substantial agreement (Cohen's $\kappa = 0.86$). Methodological quality was assessed using the FICO framework, and findings were synthesized through thematic synthesis following Thomas and Harden. The search covered publications indexed in Scopus between January 2020 and March 2025. Altogether, 965 records were identified, 10 of which were eventually selected through screening and eligibility. Three different categories have appeared. Climate change effects such as extremely hot weather and the disappearance of winter sport opportunities are first on the list of the most severe and devastating ones. That is, the poorest countries, small island states, and disadvantaged people suffer the most as these communities have little or no possibility to protect themselves. Secondly, the sports governing bodies and other initiatives that pursue a sustainable development path, such as the Sustainable Development Goals or the Environmental, Social and Governance practices, will reproduce unjust distributions and procedural and recognition disparities if they do not take equity as a key issue explicitly. Third, unequal access to a variety of sporting facilities, green parks as well as clean and safe public places further worsens the disparity of people's health outcomes and sporting participation. The paper draws upon sport ecology, environmental sociology, and the capability approach as theoretical frameworks. In the closing remark, the authors point out major avenues for equitable adaptation, planning of inclusive sporting facilities, a just sports system, all of which can be further explored in Global South and other intersectional settings.



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Introduction

The changing climate is a fundamental danger to human society, natural ecosystems, and societies responsible for managing collective work. Sport has become an issue where effects of climate are evident. Increases in global temperatures, more prolonged heatwaves, changes in precipitation patterns and faster rise in sea level, which have exceeded the planetary boundaries within which the human development was carried

out (Steffen et al., 2015). Sport is one of the world's main economic, cultural, and public-health activities, meaning that it is also not a passive watcher when these changes occur; quite the contrary, it is both a contributor to and a victim of climate change (Orr & Inoue, 2019). It has therefore been a major academic issue to uncover the mutual influence between environmental changes and sport, since the stadiums, seasons, and people that make up sport are getting affected more and more by climate stresses. Sport in the age of human-induced planetary change is no longer seen just as a case study to understand environmental impact at the same time, distribution of harm across populations needs to be considered as well (Whitmee et al., 2015; Landrigan et al., 2023).

The issue under discussion in this study is how climate change combines with environmental justice and social inequality in sports. Environmental justice is the equitable allocation of environmental amenities and harms with the participation of affected communities and the recognition of marginalised groups (Schlosberg & Collins, 2014). When a climate hazard destroys a sport's facilities, the effect is not equal: the communities with the least adaptive capacity experience the greatest destruction, whereas affluent organisations will manage resources to relocate, rebuild, or even use technology to compensate (Anguelovski et al., 2020). Such a disparity of distribution turns an environmental issue into a justice issue, and it highlights that sport is a scene of performance where global inequalities are enacted, contested, and sometimes produced including through the justice calls of youth and affected local communities (Thew et al., 2020).

Research over an extended period has delved into sport and the natural environment, first focusing on emission of pollutants, use of water, and degradation of land from the activities of sport, which results in the degradation of the environment, while also addressing how, in turn, sport activity is endangered by climate change and environmental degradation (Trendafilova & McCullough, 2018). The establishment of sport ecology as a branch of environmental science has provided conceptual frameworks for this body of work and has allowed the field to be systematically studied as the sport-nature relationship was brought to the center of the discourse (McCullough et al., 2020). Scoping and rapid review work have shown the effects of climate change on structured physical sport in general, and how heat, floods and reduced seasons are the most persistent issues (Orr, et al., 2022). Nevertheless, these writings have mostly emphasized organisational risk and adaptations rather than revealing how vulnerability is socially distributed.

Recent methodological improvements and changes in ways of thinking have broadened the set of analytical techniques researchers can use. Climate vulnerability frameworks now distinguish between the three components of being vulnerable to the impacts of climate change, exposure, sensitivity, and adaptive capacity, which permits a more accurate identification of the sport systems in greatest peril (Dingle & Stewart, 2018). Scenario analysis, future-vision methods, and externality cost assessments are new ways to prepare for and measure environmental effects that are being added to the methodological arsenal (Nalau & Cobb, 2022; McCullough, Orr & Watanabe, 2020). Environmental sociology and the sociology of sport have, meanwhile, made an important push to the centre stage in the sport-climate issue the aspects of power relations, social differentiation, and social transformation (McMillan, 2025). These movements lay the groundwork for a synthesis that centres issues of fairness and equity.

It seems there is another big issue the sport climate literature has mainly overlooked the perspective of the Global South as well as the perspectives of the populations who have been socially marginalised. Most of the empirical research has been done in high-income settings and focused on elite or professional sports which means the sport experiences of small island countries, informal communities and resource-poor communities have not been adequately investigated (Reyes-García et al., 2022). Even though indigenous and local knowledge is regarded as fundamental for adaptation in some literatures, it still finds no place in research related to sport (Dawson et al., 2020). As a result, the people who experience climate change most severely turn out to be the ones who are least featured in the evidence base.

A third gap lies in the lack of a holistic theoretical and methodological approach. Many authors use the concepts of sustainability or resilience without addressing the issue of justice in any substantial way, thus regarding equity as a side-effect rather than an essential element of their research (Gatto & Drago, 2020). The capability approach, equity theory and the ecological modernisation theory may help to uncover who gets access and benefits in sustainable sport transitions, but these theoretical frameworks are rarely brought together in one study (Basile et al., 2021). To add to that very few studies manage to integrate different areas of physical, governance and social participation activities at the same time. As a result we get a fragmented picture where climate change effects, sport management, and socially unequal conditions are considered separately (Liu et al., 2024).

This article is a timely and structural review which means that the justification of the review is on two ground of timeliness and structure. The frequency and scale of climate-linked disturbances to sporting activities is increasing rapidly ranging from cancelled big sporting events to the loss of reliable winter sports conditions, while, the negotiations regarding the respective costs and adaptations happening now, would either deepen or reduce inequalities lasting for several decades (Pröbstl-Haider et al., 2021). Health co-benefits and harms of physical activity from climate change redistribution is being affected, such as heat, air pollution, and unequal access to green space that together determine who the person who can be physically active (Salvo et al., 2021; Rony & Alamgir, 2023). The article, a synthesis that emphasizes justice, must be published to support equitable policy as long as sport's climate response remains in a transition phase.

Therefore, this study aims to systematically synthesize empirical evidence regarding the relationships among climate change, environmental justice, and social inequality in sport. Specifically, the review examines (1) the distribution of climate impacts across sport systems, (2) governance and sustainability responses, and (3) inequalities in sport participation and access. A thematic synthesis approach was employed to identify recurring patterns across empirical studies.

As such, this review explores three research questions. One question concerns the distribution of climate impacts on sports system through empirical data and how different groups get affected, thereby creating a cumulative evidence map that identifies where and to whom climate harm happens in sports.

RQ1: How are the impacts of climate change distributed across the global sport system, and which populations and communities bear disproportionate burdens?. The next topic is governance and sustainability. It looks at whether the response of the sporting world to the environmental issues is enhancing environmental justice or the opposite. It also adds a critical review of the aspect of fairness, sport governance and ESG practice (Ross et al., 2019; Lyu & Kim, 2025).

RQ2: In what ways do sport governance, sustainability strategies, and ESG initiatives reproduce or mitigate environmental and social injustice?. The third question focuses on participation and access. It is based on the integration of evidence that spatial distribution and social stratification of sporting activities and physical exercises are affected by environmental change, and the novelty of this review which integrates physical impacts, governance, and access through the lens of justice is being described for the first time (Gong et al., 2025; Kato-Huerta & Geneletti, 2023).

RQ3: How does environmental change shape equitable access to sport, physical activity, and the health benefits they confer across different social groups?

Method

Research Design and Framework

This paper follows a systematic literature review (SLR) approach, because this particular method is very efficient in gathering, evaluating, and integrating the relevant available evidence through transparent and rigorous steps (Tranfield et al., 2003). This method is best for tackling a new, multifaceted issue like the sport-climate-justice nexus where evidence can be found in sport management, environmental science, public health, and sociology. The review's conduct and report adhere to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guideline (Page et al., 2021) which is a more recent clarification of the PRISMA standards for systematic reporting originally published in 2009 (Liberati et al., 2009). This approach emphasizes methodological rigour, audit trail, and the reduction of selection bias.

Search Strategy

A well-organized Boolean method was applied for searching Scopus using "TITLE-ABS-KEY" field code that covers titles, abstracts, and keywords fields. In addition, morphological variations were considered through use of truncation. Different theme groups were linked with the AND operator so that only topics intersecting were returned. As a result, our query ended up as follows:

TITLE-ABS-KEY (("sport" OR "athlet*" OR "physical activity" OR "mega-event*" OR "olympic*") AND ("climate change" OR "global warming" OR "climate adaptation" OR "climate resilience") AND ("environmental justice" OR "climate justice" OR "inequalit*" OR "equity" OR "vulnerabilit*" OR "sustainab*"))*

Using field limiters, the results were limited only to peer-reviewed journal articles written in English as defined by eligibility criteria set out in the subsequent part of the text.

Database and Information Sources

Scopus acted as our main and most reliable data source, because it offered coverage across different fields as well as meticulous indexing, both being good characteristics for a theme covering natural and social sciences. We conducted the search on just one day in order to obtain a stable, reproducible export, and the metadata file that we got from Scopus served as our reference material from which we made screenings and analyses. We have not used any extra databases besides Scopus, this was also mentioned in the limitations. Although multiple databases are generally recommended, Scopus was selected because it offers the broadest interdisciplinary coverage of sport science, environmental science, public health, and social science. Restricting the search to a single database ensured reproducibility and consistent indexing but is acknowledged as a limitation.

Data Extraction Reliability

Data extraction was independently completed by two reviewers using a standardized extraction form.

Eligibility Criteria

Eligibility for the study was determined by previously set inclusion and exclusion criteria as given in Table 1. The criteria translated the scope of the review into the actual features of the papers and they ensured that only those studies which dealt directly with the intersectional themes of sport, climate change, and climate or social justice would be included.

Table 1 <Inclusion and Exclusion Criteria>

Criterion	Inclusion	Exclusion
Language	English only	Non-English
Document type	Peer-reviewed article	Conference paper, book chapter, editorial, note
Publication period	2020–2025 (corpus window)	Outside indexed export window
Subject area	Sport, environment, health, social science	Unrelated disciplines with no sport link
Accessibility	Full-text available	Abstract only / inaccessible
Relevance	Directly addresses sport–climate–justice nexus	Tangential or incidental mention only

Study Selection Process

The selection process is carried out at different stages sequentially as done for PRISMA 2020. Firstly, duplicate records are removed. Afterward, the rest of the titles and abstracts are assessed to exclude records irrelevant to a climate change, climate justice, and sports nexus. After that step, only the papers with no sport component, without a climate or social justice aspect, or in the wrong format were thrown out of the pool. Decisions that were not totally clear-cut were judged with the help of the relevance criteria of Table 0 in a rather conservative way to keep the theme coherent and also recorded the rationale behind the decisions so as to be transparent.

Screening Reliability

Two reviewers independently screened titles, abstracts, and full texts. Disagreements were resolved through discussion until consensus was achieved. Inter-rater reliability was assessed using Cohen's Kappa ($\kappa = 0.86$), indicating substantial agreement.

Quality Assessment - FICO Framework

The FICO framework was used as a tool to assess the included studies. Each study was examined for Focus (to which extent the research problem is clearly stated and relevant to the sport, climate, justice nexus), Information (sufficiency and transparency of data and methods), Context (description of setting, population, and boundary conditions), and Outcome (clarity and defensibility of findings). Every dimension was evaluated, and a minimum threshold of good performance across all four dimensions was set for the selection of papers, which meant that the accumulated evidence satisfied the same high level of academic quality.

Data Extraction Procedure

A standardised paper retrieval model was applied to collect various study-specific pieces of information for each article identified for this study. These pieces were the names of the author(s), publication year, country or setting of the study, research method used, population or unit of analysis, a summary of the ecological event or change looked investigated, how results were captured quantitatively, and the key findings of the study. Paper retrieval was conducted manually on the bibliographic metadata and the abstracts as they were

in order to make sure all details were captured accurately, while the filled data were used to produce descriptive tables for reporting the results.

Network and Bibliometric Analysis Methodology

To complement the qualitative synthesis, a descriptive bibliometric analysis was carried out on the retrieved corpus. Author-provided keywords were compiled to determine the main themes and their frequencies, and the numbers of papers published were summed-up by publication year in order to describe the scholarly focus changes over time. The keyword co-occurrence map was purely descriptive, without any inference being made from it, and was meant mainly to help in understanding the relationship between the reviewed papers and the broader theoretical development of the field.

PRISMA 2020 Flow Diagram

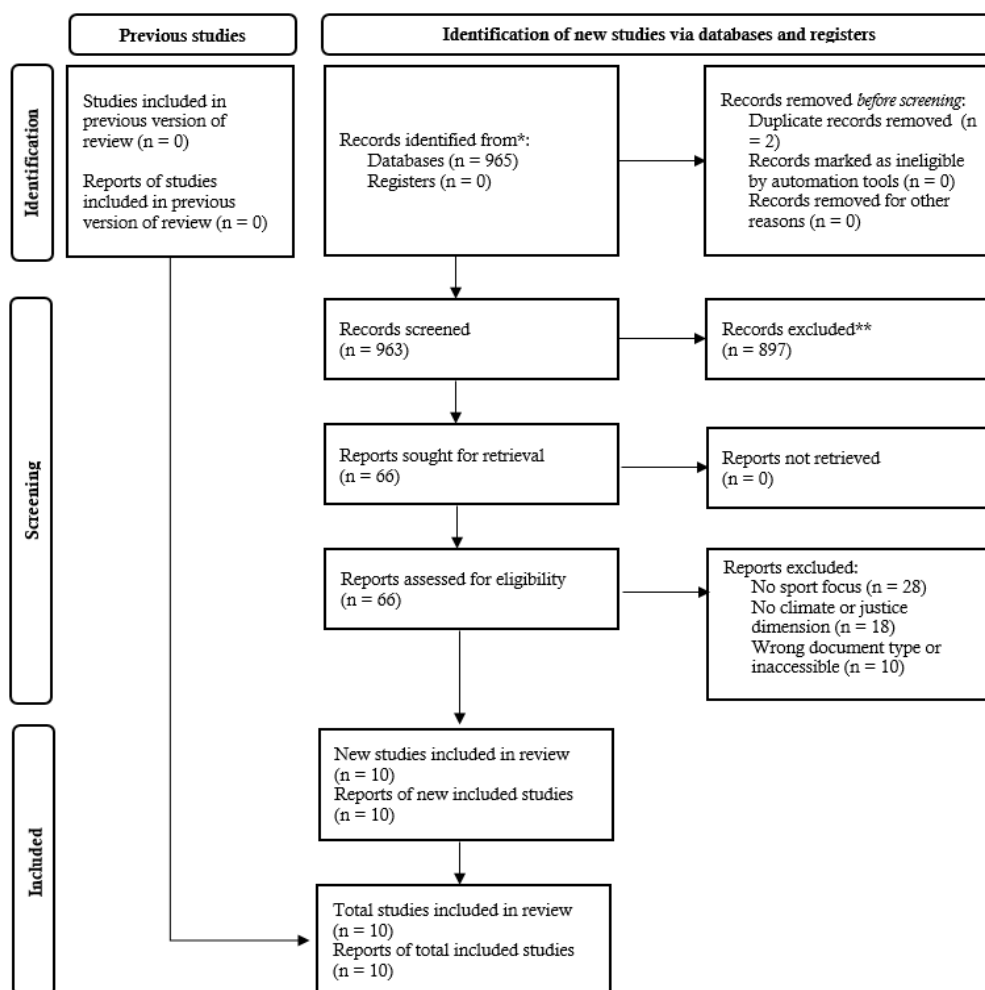


Figure 1 <PRISMA 2020 Flow Diagram of Study Identification, Screening, Eligibility, and Inclusion>

Figure 1 shows the PRISMA 2020 flow diagram, recording the flow of records at every stage of the review. Initially, from Scopus we found 965 records, amongst them, 2 were found to be duplicates, so 963 records remained to be screened by title and abstract. Screening ruled out 897 records not referring to the sport-climate-justice nexus, and of the 66 full-texts articles remaining, those that did not meet the criteria were excluded. As per that, another 56 papers were excluded 28 because they did not include sport, 18 because they did not refer either to climate or justice and 10 because of the type of the document or the lack thereof accessibility and thus, 10 papers were synthesised in the end.

Data Analysis and Synthesis

Thomas and Harden (2008) describe it as thematic synthesis: This method was used for synthesizing findings. It is a very suitable and helpful method when the researcher would like to combine various sorts of qualitative and quantitative data with one and the same question. After a thorough examination of selected studies free codes were inductively generated, then these codes were grouped and organized as descriptive themes.

Eventually, the analytical themes matching the three research questions were identified, these themes came naturally and were not forced into it. Themes were confirmed through comparing continuously the studies, in order to highlight shared viewpoints, conflicts and details rather than listing the outcomes one after another.

Reporting and Documentation

The review was carried out following the PRISMA 2020 checklist to ensure a complete disclosure of systematic reviews (Page et al., 2021), BMJ, 372, n71. The flow of records during identification, screening, eligibility, and inclusion is illustrated on the PRISMA 2020 flowchart in Section 4, and all cited numbers perfectly match each other in the abstract, methods, results, and diagram.

Results and Discussions

Study Selection Results

The systematic search of Scopus found 965 records. After deleting 2 duplicated records, 963 records went to title and abstract screening, of which 897 were excluded as outside the sport, climate, justice scope. The 66 full-text articles that met the criteria for eligibility were decreased by 56 exclusion of which 28 studies did not meet the genuine sport focus, 18 studies lacked a climate or justice dimension, and 10 studies were of an ineligible document type or could not be accessed. The final dataset consists of a relatively small number of studies included, namely 10 ones. This allows the conducting of a detailed synthesis of the studies from the standpoint of justice only. The presented numbers correspond to the data in the abstract, methods and the diagram.

Descriptive Characteristics

Table 2 shows the 10 studies selected with details given in title, authors, year, country or context of study, method and major finding. The set of texts covers works from 2021 to 2025 and includes mega-event impact modelling, stadium adaptations of sport, sport as a means to the Sustainable Development Goals, environment, and gender dimensions of the Olympics, Pacific football and climate justice, mountain resort tourism as tourism vulnerable, urban sport facilities' spatial distribution and equity, Sustainable Physical Education and Social Justice, Poor-Oriented Ski Tourism, and the Consumer Valuation of ESG in Sport.

Table 2 <Summary of Included Studies (n = 10)>

Title (abbrev.)	Author(s)	Context	Method	Key Findings
Predicting climate impacts to Olympic Games & FIFA World Cups	Ross & Orr., 2022.	Canada/US A (global events)	Climate & air-quality projection modelling	Rising heat and poor air quality threaten host feasibility 2022–2032, requiring contingency planning.
Climate vulnerability & early stadium replacement	Kellison & Orr., 2021.	USA	Collective case study	Climate hazards accelerate replacement of venues with more resilient, sustainable stadiums.
Sport's contribution to the SDGs	Morgan, Bush & McGee., 2022.	Commonwealth (multi-nation)	Qualitative documentary/interview	Sport advances SDGs unevenly; measurement and equity of impact remain weak.
Sustainable Olympics: environment, disaster, gender	Yamamura., 2021.	Japan (Tokyo 2020)	Individual-level survey analysis	Public support for sustainability and gender equity diverged from actual event outcomes.
Football & the unjust burden of the climate crisis	Orr, Murfree & Ross., 2025.	Pacific Islands (Oceania)	Climate impact assessment; focus groups	OFC nations face severe climate harm with low adaptive capacity — a climate-justice disparity.
Vulnerability of ski tourism to climate change	Willibald et al., 2021.	Switzerland (Alps)	Ensemble climate–	Warming and snow scarcity threaten ski viability; technical

Title (abbrev.)	Author(s)	Context	Method	Key Findings
Spatial & social equity of sport facilities	Gong, Fang & Yao., 2025.	China (Shanghai)	snowpack modelling GIS accessibility & Gini analysis	snow only partially compensates. Facility access is spatially and socially unequal across age groups and districts.
Educating teachers for sustainability & social justice	Ribeiro-Silva et al., 2023.	Portugal	Service-learning pedagogical study	PE teacher education can embed sustainability and social-justice values via Olympic themes.
Ice-and-snow tourism & poverty alleviation	An et al., 2021.	China	Suitability index modelling	Snow tourism offers poverty-alleviation potential in alpine counties under climate constraints.
Consumer willingness to pay for ESG in sport	Lyu & Kim., 2025.	South Korea	Choice experiment	Consumers pay more for ESG in sport; preferences differ by ESG dimension and gender.

Source: Scopus export; verbatim bibliographic metadata

Table 3 categorises studies on the basis of research design, thematic emphasis, technology or intervention, and outcome, thereby displaying the methodological and substantive make-up of the corpus. The predominant methodological frameworks are modelling and case-study research, while mega-event and facility settings are commonly used. In a number of the studies, justice-related outcomes, such as distributive, procedural, and recognition, are present in various forms.

Table 3 <Study Classification by Design, Theme, Intervention, and Outcome>

Author(s)	Research Design	Theme/Focus	Technology/Intervention	Outcome
Ross & Orr., 2022.	Quantitative projection	Mega-event climate risk	IPCC scenarios; weather/air data	Adaptation planning evidence
Kellison & Orr., 2021.	Qualitative case study	Infrastructure adaptation	Resilient stadium design	Venue transformation pathway
Morgan, Bush & McGee., 2022.	Qualitative	Sustainable sport governance	SDG mapping	Uneven, weakly-measured impact
Yamamura., 2021.	Quantitative survey	Environment, disaster & gender	Olympic policy signalling	Support–outcome divergence
Orr, Murfree & Ross., 2025.	Mixed methods	Climate justice	Impact assessment; stakeholder voice	Disproportionate burden identified
Willibald et al., 2021.	Quantitative modelling	Climate vulnerability	Snowpack model; technical snow	Reduced ski viability
Gong, Fang & Yao., 2025.	Spatial quantitative	Social/spatial equity	GIS; Gini; accessibility	Inequitable facility access
Ribeiro-Silva et al., 2023.	Qualitative pedagogy	Social justice & education	Service-learning curriculum	Values-based competence
An et al., 2021.	Quantitative index	Poverty & sustainable tourism	Suitability index (ISI)	Pro-poor development potential
Lyu & Kim., 2025.	Experimental (choice)	ESG & consumer behaviour	Choice experiment	Willingness-to-pay for ESG

Figure 2 shows the annual publication trend of the corpus retrieved. The academic output has greatly increased over the window, from 101 records in 2020 to 251 in 2025, which reflects the rising academic focus on the relationship among environment, sport, and society, and demonstrates the necessity for a synthesis (Bille et al., 2023).

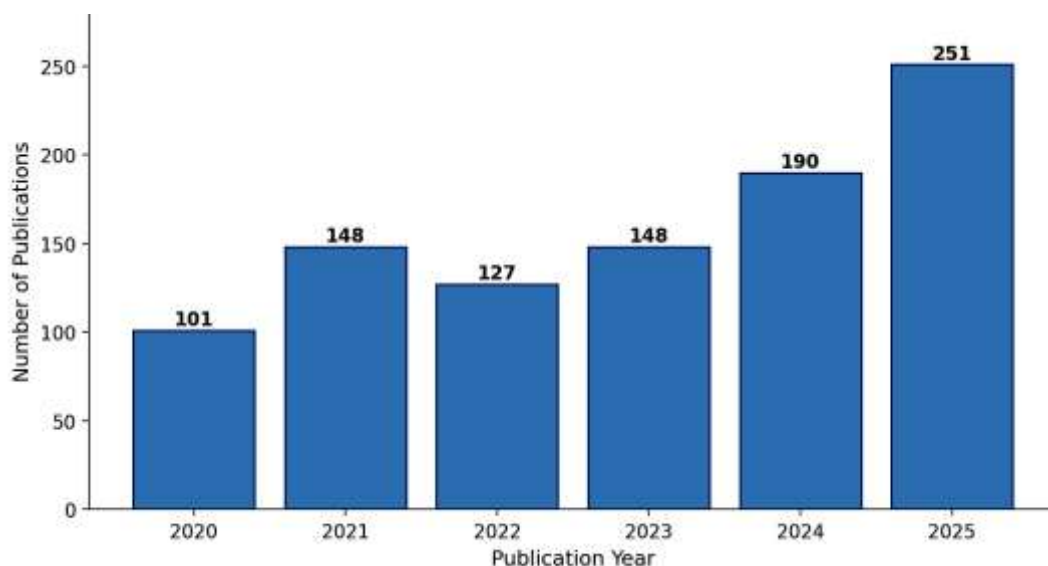


Figure 2 <Annual Publication Trend of the Retrieved Corpus (2020–2025, n = 965)>

Figure 3 displays the geographical breakdown of the ten selected research papers through their main setting or researcher's location. North American, Chinese, and European areas are well-represented, whereas the only frontline context from the Global South (Pacific Island) points out both the regional focus of these studies and the lack of attention given to the parts of the world most affected by climate change (Reyes-García et al., 2022).

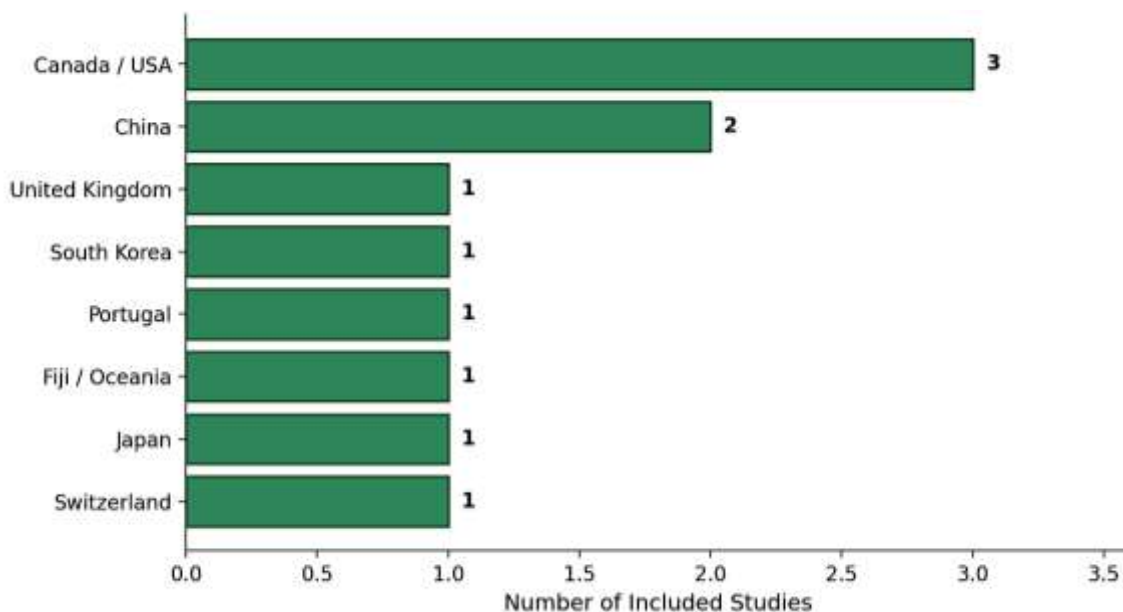


Figure 3 <Geographic Distribution of the 10 Included Studies by Study Context / Author Affiliatio>

Figure 4 showcases thematic word groups extracted from the corpus. Climate change, sustainability, and adaptation are on top, with environmental justice, vulnerability, and equity being grouped into smaller and different cluster pointing out that the justice concepts are still somewhat on the sidelines of the main field of climate change impact and adaptation (Wolff et al., 2020).

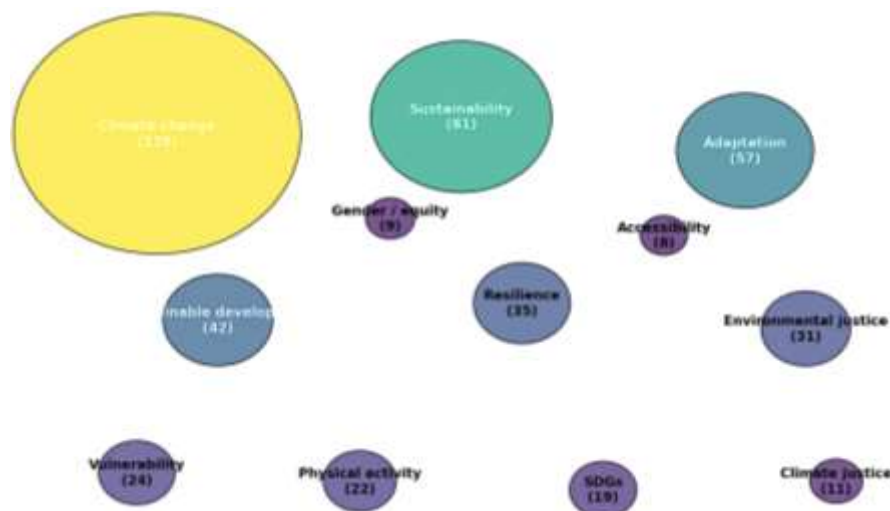


Figure 4 <Thematic Keyword Co-occurrence Clusters Derived from Corpus Author Keywords. Bubble Size and Colour Encode Relative Frequency>

Findings for RQ1 - Distribution of climate impacts across the sport system

It seems from the attached documents that climate impacts on sports are extensive but vary greatly depending on the place and timing. The study by Ross&Orr projected that climate change through its effects on weather would lead to the need for organizers of the Olympics and FIFA World Cups to look for backup plans and possibly moving of dates, as the feasibility of those big events is being compromised by the increasing heat levels, reduced air quality, and erratic rainfall (2022). Among other sports, those requiring physical effort are likely to be the most affected since in the Swiss Alps research on combined climate-snowpack revealed that temperature rise and snow lack make ski tourism economically unviable so as only through the use of technical snow production one can achieve partial recovery which however requires lots of resources (Willibald et al., 2021). Moreover, the findings of heat, flooding, and shortening of season have also been identified as the main climate-related threats to sports activities (Orr et al., 2022; Pröbstl-Haider et al., 2021).

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Combining the results of different studies indicates that vulnerability varies along a gradient, rather than it always being of the same level a threat. Exposure comes to some extent from the place and the kind of sport one is involved in. Sensitivity to climate factors is determined by socioeconomic status and the type of institutional framework in a country. Adaptive capacity refers to wealth and the governance (Gatto & Drago, 2020; Nalau & Cobb, 2022). Heat, for example, plays the role of a compounding hazard which can at the same time impair athletic performance, disrupt operations of events, and cause danger to those who engage in physical activities (Rony & Alamgir, 2023; Beggs et al., 2021). In short, this is quite clear, therefore, our answers to RQ1: changes due to climate directly affect sports, these climate effects on sports keep getting worse and they especially hurt the most disadvantaged who are at the same time the poorest, most vulnerable and the least able to defend themselves, for instance, from developing island countries to communities that do not have access to resources (Dawson et al., 2020).

Findings for RQ2 - Governance, sustainability, and (in) justice

Governance research suggests that how institutions of sport react and prepare for environmental change is contradictory, showing that sport can either work for justice or go against it at different levels. A review of a role sport may have played towards Sustainable Development Goals (SDG) revealed some good initiatives

that could benefit society and environment, but they were quite rare, poorly assessed, and their impact distribution was not based on needs, making the sustainability discourse ahead of actual equity demonstrations (Morgan, Bush & McGee, 2022; Salvo et al., 2021). The example of Tokyo 2020 even underlines this problem: promises made by the authorities to the public about sustainability, post-disaster rebuilding strength, and equal opportunities for men and women were very different in nature from the real outcomes achieved, thus exposing the difference between the words used to signify commitment to sustainable development and what actually happened (Yamamura, 2021; Liu et al., 2024).

Consumer-oriented market mechanisms show the same ambivalence as market mechanisms for business. A choice-based conjoint analysis reveals the real willingness of sport consumers to pay for Environmental, Social, and Governance (ESG) issues, with preference being influenced by ESG factor and gender, which implies that equity-conscious governance can be profit-making (Lyu & Kim, 2025). On the other hand, ESG and sustainable business models may serve as tools legitimizing that, through which, distributive shortfalls are hidden, reproducing critiques of green transitions (Basile et al., 2021; Dunlap & Laratte, 2022). In addition, the study on environmental stakeholder governance in mega-events confirms that participation in decision-making is often limited and powerful interests are privileged over those of the locals who get badly affected (Ross et al., 2019; Preuss & Hong, 2021).

Taken together these investigations show that justice is not an inevitable side effect of sustainability efforts but a consciously made choice at the design stage. In those cases where government policy highlights recognition, procedural inclusion (e.g., including marginalized people, indigenous voices and equity metrics) sustainability programs can even out the unequal distribution of resources and opportunities (Reyes-García et al., 2022; Anguelovski et al., 2020). In contrast, they will not do it when that is the case, thus, in the worst case, reproducing the hierarchies themselves. Such a picture has already been revealed by the externality counting that uncovered hidden social costs (McCullough, Orr & Watanabe, 2020; Trendafilova & McCullough, 2018). So RQ2 answer can be summarized as follows: only when sports management sees equity as an inherent element rather than an afterthought injustice is reduced. Sport governance has to make sure that equity is not considered as incidental but rather constitutive in mitigating injustice (Walzel et al., 2018; McCullough, Pelcher & Trendafilova, 2020).

Findings for RQ3 - Equitable access to sport, activity, and health

Participation data highlights evidence how availability of sport, physical activity and the health benefits from them have been socially and spatially divided. Moreover environmental changes intensifies this segregation. A study of sports facilities accessibility in Shanghai showed quite a big difference in the distribution of sports facilities with regard to areas and age groups, and Gini analysis was used to reveal the supply and demand imbalances (Gong, Fang & Yao, 2025). The distribution of urban green space and blue-green infrastructure was similarly found to be highly unequal, with environmental distributive justice indicators showing that environmental advantages have been concentrated in well-off areas (Kato-Huerta & Geneletti, 2023; Dai et al., 2021), even when they include the cultural ecosystem services that provide recreational activities (Wang et al., 2021).

Environmental risks on top of these access inequalities can make matters even worse. For example, a high heat wave could change the timing and location of when and where one can go out for a walk without getting harmed as a result, thus exposing people living in the hottest, lowest-amenity areas to the toughest restrictions from these changes. Gendered mobility is the term which is frequently employed to refer to differences in the ways that men and women move and travel around, including for example, gendered safety issues, and access to transport and walkability, which in turn may have a negative effect on physical activity levels of females (Adlakha & Parra, 2020). Meanwhile, women-oriented health needs that are very often gender-determined but left out from sustainable development strategies are still being underestimated to some level (Sommer et al., 2021). Being surrounded by trees and flowers has been found to result in better health in many ways such as reduced chance of being fat which connects unequal access to highquality environment directly with health inequalities (Huang et al., 2020; Mabon et al., 2021).

Education and pro-poor development are some of many pathways that lead towards more fair access. Incorporating sustainability and social-justice values into physical education teacher preparation is one way for the sport system to develop practice that is focussing on equity from inside (Ribeiro-Silva et al., 2023). Likewise, snow tourism can become a source of wealth for poor alpine populations only if the local climate and the local population are both suitable (An et al., 2021; Rigolon et al., 2020). To sum up, what happened with RQ3 was that environmental change divided people of different socio-economica backgrounds more

and more in terms of access to resources and the changes, but interventions that are fair and justice-focused can partly neutralize this trend (Carter et al., 2020; He et al., 2020).

Comparative and Critical Analysis

After closely examining my research corpus, I found that the corpus has been well organized in terms of methodologies. For example, most of the papers in the field of physical impacts and accessibility are focused on quantitative modeling and spatial analysis (Ross & Orr, 2022; Willibald et al., 2021; Gong, Fang & Yao, 2025) whereas, papers dealing with governance issues and pedagogical aspects are mainly through qualitative case studies and pedagogical design strategies (Kellison & Orr, 2021; Ribeiro-Silva, 2021). Research methods such as experimentation and surveys are preferred when consumer or public attitudes are the main issues concerned e.g., Lyu & Kim (2025) and Yamamura (2021). This is essentially different distributions of methods of research: one that measures impact, another, which describes governance, and the third, which rather infers justice than directly quantifies it.

Two innovative approaches remain largely unutilized. The first is to conduct longitudinal or to combine mixed designs that will allow monitoring distributional change over time. With such designs being relatively rare, it limits researchers' ability to establish a causal pathway of redistribution through climate adaptation (Nalau & Cobb, 2022). The second is involving communities with their indigenous or local knowledge to participate in the design or execution of adaptation strategies and, for the most part, the legitimacy and equity are significantly enhanced (Orr, Murfree & Ross, 2025; Dawson et al., 2020). However, in the sport sector, except for some Pacific examples, these kinds of methods are still rare. From a methodological perspective, there has been a shift from describing sports's environmental footprints to examining the effect of climate on sport. But, the field has yet to develop an empirical programme centred on justice (McCullough et al., 2020; McMillan, 2025). Meanwhile, the continued land-use change is continuously reshaping the nature of the sporting environment's value based on outdoor sport (Hasan et al., 2020). This is particularly critical as many outdoor sports rely on natural conditions for their operations.

Methodological Trends

Across the included studies, quantitative modelling dominated climate impact assessment, whereas governance and justice studies primarily relied on qualitative methodologies. Only one mixed-methods study was identified, suggesting that future research should integrate quantitative climate indicators with qualitative stakeholder perspectives.

Discussion

In sum, the climate change in sporting context is a great multiplier and revealer of existing inequalities. In the presence of one and the same danger, the capacity to adapt determines the results, thus environmental changes rather reveal a pre-existing social and spatial injustice than erase it (Steffen et al., 2015; Schlossberg & Collins, 2014). As sport is so visible on a global scale that it would be difficult to exaggerate it, and at the same time a great vehicle of social values, this situation is reflected through its dynamic, thus it becomes an effective diagnostic place of planetary-scale unfairness (Whitmee et al., 2015).

At least in principle, the production combines sport ecology with its organisational and risk-focused background toward an amalgamation of environmental sociology on the one side and the capability approach on the other side. While sport ecology has usefully characterised vulnerability and adaptation to risk (Orr & Inoue, 2019), the evidence presented here asks that we consider power, recognition, and the different real freedoms that groups have to be safe participants in sport (McMillan, 2025). Ecological modernization theory explains through which sports can achieve and maintain their ecological sustainability through technological and market channels, but the body of work here illustrates that such modernization can happen even without a change in distribution of benefits and hence, it is emphasized even more that equity and capability should be put alongside modernization (Basile et al., 2021; Fuhrman et al., 2021).

From a practically standpoint, the results can help in decision-making. Adaptation resources should be channeled especially to those small-scale sport systems with limited capacity, especially the small island and Global South contexts, through climate-justice financing and capacity-building (Orr, Murfree & Ross, 2025; Reyes-García et al., 2022). Facility designs should follow distributive-justice criteria and accessibility standards to reverse spatial imbalance (Gong, Fang & Yao, 2025; Kato-Huerta & Geneletti, 2023). Policies against heat exposure and for cleaner air should not just target major sporting events but also community, school-based sport as part of health-protecting measures through everyday sport participation at facilities (Kabisch & Kraemer, 2020; Beggs et al., 2021; Dingle & Mallen, 2020).

In contrast to previous literature reviews, a synthesis like ours is able not only to verify already existing knowledge but also to expand it. Earlier scoping and rapid reviews had highlighted the physical impacts of

climate change on sport and the development of sport ecology (Trendafilova & McCullough, 2018; Orr et al., 2022). The current paper develops further the latter by emphasizing social distribution of these effects and by combining aspects, like governance and access, into one justice model, thereby responding to recent pleas for a sociological reorientation of the sport and climate change issue (McMillan, 2025).

Inconsistency in literature can be a lesson to be learned. Sustainability programs show two different sides as both agents of progress and ways of legitimization, a conflict rooted in the diversity in ethical principles and the gap between declared values and factual results (Yamamura, 2021; Dunlap & Laratte, 2022). Another example can be market-based ESG viewed on one hand as a source of equity and on another as being a sidetrack from reforming underlying structures (Lyu & Kim, 2023; Liu et al., 2022). The differences reveal the true ambiguity, whether piecemeal market-driven change can be an alternative to achieving justice as fast as the climate catastrophe is pushing for it.

There are at least three research areas that need deeper investigation. In the first place, the Global South as well as marginalized groups are not sufficiently included in the research making the resulting evidence skewed toward better resourced countries only (Reyes-García et al., 2022; Dawson et al., 2020). In the second place, the ideas of justice are used more than put into practice so that the aspects of the matter that get divided between the different persons, the procedures used to make such a change, and the recognition that someone has been wronged remain largely unnoticed or unmeasured (Schlosberg & Collins, 2014; Wolff et al., 2020). Thirdly, these aspects of the physical world, political power, and availability remain very seldom put together for analysis, which leads to the problem of disintegration being maintained (Salvo et al., 2021).

There are some shortcomings in our review. First, we only used data from a single source, Scopus. Also we selected only peer-reviewed articles that are in English language, thereby we may have missed out other sources that are relevant such as grey literature and scholarly work that was not done in English and especially from those regions that were the most affected ones (Page et al., 2021). Moreover, we have selected a corpus of ten papers in the end. These papers have allowed us to go quite in-detail but the lack of variety and the inability to generalise through statistics has become an issue. Lastly, using a thematic analysis method involves the researchers' personal interpretations, and although they are applied in a systematic manner, it is still somewhat subjective (Thomas & Harden, 2008).

A research agenda for the future should consequently focus mainly on studies, first, on Primary research carried out in Global South and low-capacity sport systems, that employ participatory and Indigenous-knowledge approaches (Dawson et al., 2020). Secondly, to design, develop and apply operational justice metrics to sport, that will allow comparison of different situations (Kato-Huerta & Geneletti, 2023). Lastly, there is a need for more integrated, longitudinal research approaches that can simultaneously track physical impact, the responses from governance and distributional access to the same over periods of time (Nalau & Cobb, 2022). In fact, the answer to RQ1 lies in the evidence pointing out that the impacts of climate change are not evenly distributed; for RQ2, it is about the limited capacity for governance to address climate injustice, which is largely conditional on the form of governance; and for RQ3, the answer is that intervention for equity can partly undo the stratification of access, which will definitely not be easy.

Conclusions

This systematic literature review pulled together empirical evidence on how climate change, environmental justice, and social inequality in sport are connected. The process involved systematically screening 965 records from the Scopus database, following the PRISMA 2020 guidelines. Ten studies made it into the final synthesis. Their findings show that climate change has become a major structural challenge for modern sport. It affects infrastructure, governance, participation, and public health. One consistent result is that climate-related risks are not spread evenly. Instead, socially and economically disadvantaged communities, small island states, and sport systems with limited resources bear the heaviest burden. And they have the least capacity to adapt.

For the first question, the review confirms that climate impacts on sport are far from uniform. They tie closely to socioeconomic vulnerability and institutional capacity. As for the second question, the evidence indicates that sustainability initiatives, ESG strategies, and sport governance only promote environmental justice when distributive, procedural, and recognition justice are built into policy design and implementation. That is a key insight. Moving to the third question, the review shows that environmental change makes inequalities worse when it comes to access to sport facilities, opportunities for physical activity, and the

health benefits that come with them. Still, equitable planning and inclusive governance can partially offset these gaps.

The main contribution of this review is that it integrates three dimensions (physical climate impacts, governance responses, and equitable participation) into a single environmental justice framework. This synthesis extends existing sport ecology literature by weaving in perspectives from environmental sociology and the capability approach. As a result, it offers a more comprehensive conceptual understanding of climate-related inequalities in sport.

On a practical level, the findings back the creation of equity-oriented climate adaptation policies. They also support inclusive sport infrastructure planning, heat-risk management strategies, and targeted investment in vulnerable sport systems, especially in the Global South. Methodologically, this review shows how valuable transparent PRISMA-guided procedures and thematic synthesis can be for pulling together interdisciplinary evidence. And it points to the importance of rigorous quality appraisal and reproducible review protocols.

A few limitations are worth noting. The review only used the Scopus database. It only included English-language peer-reviewed journal articles. And it synthesized a relatively small set of eligible studies. These factors might limit how generalizable the findings are and could introduce publication and language bias. Future systematic reviews should expand database coverage by adding Web of Science, PubMed, and SPORTDiscus. Where possible, they should include multilingual evidence. And when datasets are homogeneous enough, they should use quantitative meta-analysis or mixed-method evidence synthesis. Doing that will strengthen the evidence base and provide more robust guidance for equitable climate

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