

Identifying and prioritizing components and dimensions of green management in the context of Iran's sports with a focus on sustainable development by using (FAHP)

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The International Olympic Committee emphasizes the implementation of the principles of sustainable development in sports realm. The current research was conducted with the aim of identifying and prioritizing the effective components of the green management in the context of Iran's sports fabrics. The objective of this research is developmental and, in terms of methodology, it is descriptive-survey type, in which both quantitative and qualitative methods have been used. Initially, the data was collected and categorized using theoretical bases, literature review, and high-level documents. Through an in-depth study and interviews with 26 experts in the field of sports and the country's environment, the factors affecting the sustainable development of the country's sports were identified. In order to prioritize the criteria, the fuzzy analytics hierarchical process (FAHP) was employed. The results showed that the data distribution was normal. Based on the research findings, 4 criteria and 21 sub-criteria were identified as effective components. The sociocultural criterion with a weight of 0.54884 had the highest degree of importance, followed by the environmental/health criterion with a weight of 0.29265 and approach-management with a weight of 0.10670. Economic criterion also had the lowest priority with a weight of 0.05222. In addition, the pairwise-fuzzy comparison of the sub-criteria indicated that the sub-criterion combating the social exclusion, with a weight of 0.229, held the highest significance, followed by the sub-criterion promoting activities by the youth, and improving their involvement in social life and sports authority institutions with a weight of 0.134. Meanwhile, the economic criterion had less important and it indicated that this parameter did not play a role as a deterrent in moving towards sustainable development. The results were aligned with the 21 Agenda of the Olympic Movement and the Rio Declaration. Finally, the main solution to make sustainable development special is to try to attract people and young people as well as participation in different social groups in sports activities. Also, sports facilities, equipment and facilities are among the other proposed solutions with environmental considerations in mind.

Keywords: Green management; Sustainable sport; Agenda 21; Olympic Movement; Sport Development

1. Introduction

Sustainable development will be possible only if the economic, social and political development is simultaneously combined, especially in order to sustain the interest of the

poorest members of the society (Chernushenko et al., 2001). From Brantland Commission's point of view (1987), sustainable development means meeting the needs of the present generation without compromising the possibilities of future generations (Casper and Pfahl, 2015; Casper et al.,

2014). According to the Rio Convention (1992), it is the responsibility of all people and groups active in different fields related to development and environmental protection to act on the principles of sustainable development theory (Robertson, 2014; McCullough et al., 2016; Collins and Flynn, 2015). The United Nations Environment and Development Conference's Agenda 21, as a theoretical and practical tool, addresses the issue of sustainable development and providing feasible solutions (in the 21st century) for the countries of the world (Bodie, 2011).

This agenda narrates the current urgent issues and its purpose is to prepare the world to face the challenges of the next century (Casper and Pfahl, 2012; Pfahl et al., 2015). The document was ratified with the aim that the heads of different countries use it as a basis for drafting their national agenda (Djballah et al., 2015). The Olympic Movement, whose goal according to the Olympic Charter is to "strive to create a better world with peace and tranquility", has adopted the analysis of the United Nations Conference on Environment and Development and places its actions within the framework of sustainable development (Baade and Matheson, 2016). Due to the universality of sports, the Olympic movement can play an active role in adopting different methods and actions in order to achieve sustainable development. For this reason, the International Olympic Committee has decided that the Olympic Movement should also have its own Agenda 21 (Barker et al., 2014).

The main goal of Agenda 21 of the Olympic Movement is to encourage the members of this movement to play an active role in the formation of sustainable development on the planet. This agenda compiles the basic concepts and general measures that imply achieving this goal, inspired by the 21st agenda of the United Nations Environment and Development Conference, based on the specific characteristics of the Olympic movement and sports (Dolf and Teehan, 2015). This document outlines and guides the activity of the Olympic movement in various fields, leading to its effective role (Mallen et al., 2010). In order to achieve the general goals of Agenda 21, the Olympic movement began to design and compile a practical program. This program

lays the groundwork for better social, economic, environmental and natural resource protection and has the members of this movement play a more important and active role in the field of sustainable development. The main concepts of Rio's (1999) statement are shown in Figure 1. This program revolves around the following three themes:

- Promotion and improvement of economic and social conditions
- Protection and management of resources in order to achieve sustainable development
- Strengthening the role of majority groups

The purpose of this research is to identify and prioritize green management components in the country's sports structure based on the principles of environmental sustainability. Basically, the main question of the research is that what the factors affecting the development of sports in the country, which are based on the principles of sustainable development, are and how they are prioritized.

Many studies have been conducted focusing on sustainability, which include three main and comprehensive aspects: environmental, social, and economic aspects. Other phrases have also been used to describe these aspects and the concept of sustainability. One such phrase is the "triple bottom line" or planet, people, and profit (Kellison and Kim, 2014). In the past, Chernushenko et al. (2001) argued that "a simplistic understanding of key environmental sustainability issues is just the tip of the iceberg." They believed that sports managers who lack awareness of important sustainability issues will not be prepared to manage dynamic environments like the sports industry. These researchers suggested that sports managers can look to other (non-sports) organizations to understand how to approach and address various sustainability issues.

The International Olympic Committee (IOC) led this movement among sports federations and organizations in 1992 to protect the natural environment. As a result, the Olympic Charter was amended in 1996 to emphasize the importance of environmental sustainability, stating that the role of the International Olympic Committee is to "encourage and support responsibility for environmental issues, promote sus-

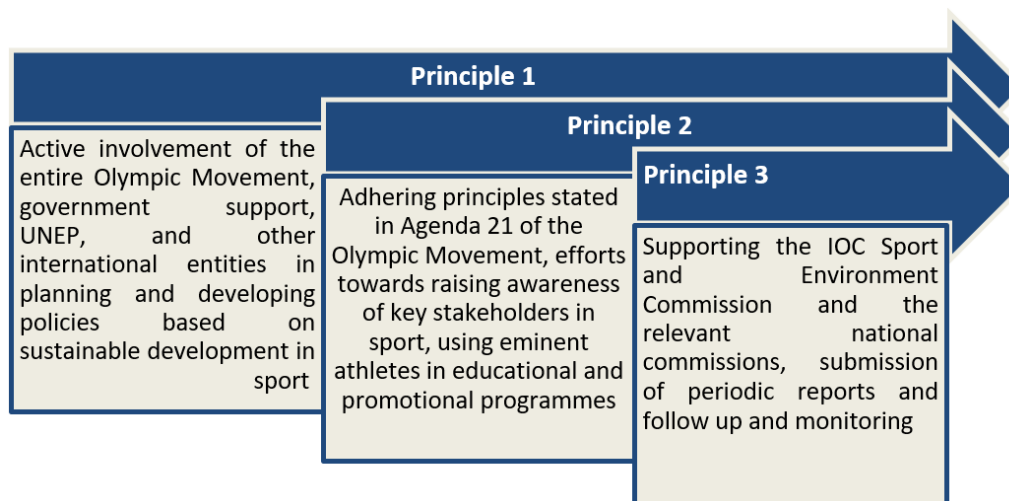


Figure 1. The fundamental principles of the Rio Declaration (1999) Source: (UN, 2016).

tainable development in sports, and organize the Olympic Games based on it" (Olympic Charter, 2020; p. 18).

Sports managers can overcome these challenges by collaborating with sustainability experts. These experts possess practical knowledge or analytical understanding of integrating environmental sustainability with sports (Kellison and McCullough, 2016; McCullough et al., 2016; Pfahl et al., 2015). Consequently, they assist sports managers in developing, integrating, measuring, and refining environmental sustainability activities (Pfahl, 2011). However, current and future experts in the sports industry must understand sustainability, especially environmental sustainability, and its value for both the organization and the natural environment. Like non-sports competitors, sports organizations and leagues operate at various levels of awareness, even definitions of environmental sustainability, and how they assess them within their own organization.

According to the Agenda 21 of the International Olympic Committee, the Sports and Environment Commission of the National Olympic Committee of Iran has proposed a draft agenda in 4 chapters, consisting of four principles with underlying planned action themes:

- Sustainable development, a new perspective on sports policy
- Sports solidarity in the service of sustainable development
- Sports management and organization that respects the environment.
- A sports economy in the service of sustainable development

These four chapters constitute the three pillars of sustainable development (social, environmental, economic) and in total encompass 21 objectives, which are explanatory of guidelines that should be utilized (Bahmanpour and Tofiqh Khatab, 2019). The findings of this study showed that factors such as education, research, management, structure, culturalization, and national strategies influence the development of environmental culture in sports and should be considered as the main priorities for the development of environmental culture in sports. They also categorized their proposed solutions into three managerial, structural, and national solutions. Ten solutions that had the highest priority in this study are as follows:

1. Establishing academic fields or majors in higher education titled Sports and Environment;
2. Promoting research and theses towards sports and the environment;
3. Strengthening national determination for the development of environmental culture through sports;
4. Teaching the principles of collaboration between the Ministry of Sports, the Environmental Protection Organization, and the Ministry of Education;
5. Increasing the level of government facilities to support sports organizations providing services to the environment;
6. Formulating cooperation agreements between the environmental sector, the Ministry of Sports, and other sports organizations;
7. Selecting appropriate slogans and symbols in national sports events based on environmental principles;
8. Expanding the scope of activities and information dis-

semination of the Sports and Environment Commission of the National Olympic Committee;

9. Defining and formulating precise executive mechanisms to preserve the environment in sports projects;
10. Holding conferences and scientific sessions focused on sports and the environment.

(Bahmanpour and Shaji, 2017) discussed various aspects of the relationship between sports and sustainable development in the book "Sustainability through Sports". (Goodarzi, 2018), in his doctoral dissertation, focused on identifying and modeling the effective factors on the development of renewable energy utilization in Iranian sports facilities. According to the results of this research report, in the first step towards developing the utilization of renewable energy in sports facilities, renewable energy should be made available at an affordable price, and then promotion through awareness and culturalization should be addressed in sports facilities. (Soltan Hosseini et al., 2014) examined the environmental effects of sports on the surrounding environment, indicating that sports facilities do not have significantly negative environmental impacts on their surroundings. A study on the issues attached to the environmental effects of sports facilities shows that issues such as noise pollution (increased noise levels) in the area are among the negative effects of sports facilities in the city of Yazd; while it has a positive impact on the development of green space. Also, these facilities have not led to an increase in building waste and debris, and they have not had a negative impact in this area. Boojmehrani et al. (2014) concluded in a study entitled "Strategies for Sustainable Development in Sports" that as many environmental threats, resource destruction, and pollution are the result of human activities, continuous and targeted education of various segments of society can lead to a community with environmental consciousness and a future filled with vitality, health, and independence for the country.

Gary Bettman emphasized the relationship between sports and the environment in the "National Hockey League Sustainability Report (2015)." Wall-Tweedie and Nguyen (2018) examined the environmental sustainability (ES) initiatives in sports organizations in Asia and the Pacific region. In their study, they investigated the initiatives of 114 professional sports teams in 7 countries: Australia, India, New Zealand, Japan, China, Taiwan, and South Korea. They reported that environmental initiatives and the environmental sustainability movement in Asia and the Pacific region are much lower compared to Europe and North America. - McCullough, Pfahl and Nguyen (2016) focused on the evolution of the environmental sustainability green movement in sports in their research. By examining the environmental initiatives of various sports organizations, they categorized these initiatives into three levels. Kellison and Kim (2014) investigated environmental, social, and economic benefits and environmental motivations. They reported that professional sports organizations are increasingly interested in environmental strategies, and sustainable design has become a significant consideration in many sports facilities and establishments owned by these organizations. They found that professional sports organizations also empha-

size environmental awareness among spectators and the attraction of new customers from a marketing and branding perspective.

2. Methodology

This study, in terms of objective, is developmental and descriptive-survey in terms of its implementation, utilizing both quantitative methods (including questionnaire design and employing quantitative statistical techniques) and qualitative methods (including expert interviews and coding). Temporally, it is cross-sectional, and the theoretical approach in this research is inductive. Initially, the research team collected and categorized the data using theoretical foundations, literature review, and available high-level documents. To this end, the determining factors for the sustainable sport development in the country were identified through in-depth study and interviews with subject matter experts in the field of sports and the environment (26 individuals). Subsequently, based on the research objectives and questions, the data were coded using the three-dimensional method (Fornell and Larcker, 1981). To prioritize the criteria, the Fuzzy Analytic Hierarchy Process (FAHP) method was used. This method is used to analyze pairwise comparison matrices using fuzzy logic. In the conventional Analytic Hierarchy Process method, the competence and mental abilities of experts are used for comparisons. However, it should be noted that pairwise comparison using the traditional method may not fully reflect human thinking styles. The use of fuzzy numbers is more compatible with linguistic expressions and sometimes ambiguous human expressions. Therefore, it is better to use fuzzy numbers for decision-making in the real world.

Two Dutch researchers named Van Laarhoven and Pedrycz proposed the first method for FAHP in 1983 (Chard et al., 2013). This method is based on replacing triangular fuzzy numbers in pairwise comparison matrices and based on the minimum value of logarithmic square roots. The complexity of the stages of this method has led to its limited use. Afterwards, multiple methods were proposed for the FAHP. Expert opinions can be obtained in the form of expressions such as: important, very important, and so forth, and then they are converted into triangular fuzzy numbers using the table below. In this study, an improved (extended) algorithm has been used for fuzzification. The improved FAHP is a multi-criteria decision-making method that obtains the weights of criteria by obtaining the geometric mean of pairwise comparison rows and then inverting them. This method, referred to as the Buckley Method, is actually a replacement for the Chang method, as the Chang method had shortcomings such as zero and negative weights (Buckley, 1985).

The steps are as follows:

1- Data Entry:

First, by selecting the desired fuzzy spectrum, the collected data is entered into the pairwise comparison matrix. If there is more than one expert, the fuzzy geometric mean is used to aggregate the subject-matter expert opinions.

2- Fuzzy Expansion of Each Row:

To determine the initial weight of each element, the concept

of fuzzy expansion is used. Chang has proposed fuzzy expansion of the elements of each row, where the sum of fuzzy numbers in each row is calculated. Therefore, in the fuzzy pairwise comparison matrix, the fuzzy geometric mean of the elements of each row is calculated.

$$\prod_{i=1}^n \tilde{F}_i = \left(\prod_{i=1}^n \tilde{l}_i, \prod_{i=1}^n \tilde{m}_i, \prod_{i=1}^n \tilde{u}_i \right) \quad (1)$$

Fuzzy expansion of each row indicates the initial weight of the element included in that row. This weight should be normalized. Chan and Kumar (2007) used the concept of feasibility degree for normalization, but multiple studies have shown that this method does not always yield correct answers and has many drawbacks. Therefore, the following solutions are proposed:

If we denote the geometric mean of each row (fuzzy expansion of each row) as S_i , they calculate the sum of all fuzzy expansions of all rows (initial fuzzy weights) for normalization. The total preferences of all elements, i.e., $\sum(S_i)$, are computed.

For normalization, the fuzzy expansion of each element S_i must be divided by the total sum of preferences $\sum(S_i)$. Since these are fuzzy values, the following formula is used to calculate the weight of each element:

$$\tilde{S}_i = \prod_{j=1}^n \tilde{a}_{ij} \otimes \left[\sum_{i=1}^n \prod_{j=1}^n \tilde{a}_{ij} \right]^{-1} \quad (2)$$

3. Defuzzification

The calculated weight is the final weight of the element under consideration. These weights are fuzzy, and fuzzy defuzzification method is used to calculate the definite weight. Various methods of fuzzification can be used for this purpose. This stage is a crucial step in the process of FAHP. The obtained definite weights can be normalized using linear normalization method (Table 1).

4. The inconsistency ratio in FAHP

The inconsistency ratio indicates whether pairwise comparisons have been consistent or not. This rate should always be less than 0.1 for the pairwise comparison matrix to be consistent (Chan and Kumar, 2007).

3. Results

In the selective coding phase, the process of harmonizing and improving criteria was conducted. Using the components extracted from the literature review and interviews with experts, the criteria influencing the research topic were obtained. To examine the claim made regarding the distribution of criteria data, the Kolmogorov-Smirnov (KS) test was employed. In this test, the null hypothesis (H_0) represents the claim made about the type of data distribution.

Data distribution is normal: H_0

Data distribution is not normal: H_1

The results obtained from the Kolmogorov-Smirnov test of the research criteria in Table 2 indicate that the distribution of all variables (21 cases) in the examined sample follows a normal distribution, as the significance level is more than 5% and the null hypothesis is not rejected. Therefore, the distribution of variables is normal. In Table 2, the criteria

Table 1. Phase spectrum equivalent to 9 degree scale in AHP technique.

Inverted fuzzy equivalent	Fuzzy equivalent	Verbal expression of comparing i with j
(1,1,1)	(1,1,1)	Equal preference
(0.333, 0.5, 1)	(1,2,3)	In between
(0.25, 0.333, 1)	(2,3,4)	Slightly preferred
(0.2, 0.25, 0.333)	(3,4,5)	In between
(0.166, 0.2, 0.25)	(4,5,6)	Very preferred
(0.142, 0.16, 0.2)	(5,6,7)	In between
(0.125, 0.142, 0.166)	(6,7,8)	highly preferred
(0.111, 0.125, 0.142)	(7,8,9)	In between
(0.111, 0.111, 0.111)	(9,9,9)	Totally preferred

Source: (Forzieri et al., 2008)

and sub-criteria extracted from the literature review and exploratory interviews are categorized, and the results of the Kolmogorov-Smirnov test are also provided. The criteria in this section refer to the objectives for sustainable sports development.

In the next step, pairwise comparison and weighting of criteria and sub-criteria were carried out using expert opinions and the Delphi technique. The results of pairwise comparison of the four criteria are presented in Table 3. Additionally, Table 4 illustrates the final weights of the four criteria.

Based on this, the criterion of "Socio-Cultural" with a weight of 0.548 has the highest degree of importance, followed by the criterion of "Environmental-Health" with a weight of 0.292, and "Strategic-Managerial" with a weight of 0.106, respectively. The criterion of "Economic" also has the least priority with a weight of 0.052.

Finally, the fuzzy and final weights of the sub-criteria were calculated, as shown in Figures 2 and 3.

4. Discussion and conclusion

The purpose of this research was to identify and prioritize the components affecting the sustainable development of sports in the country using the FAHP through conducting in-depth studies to gather data and employing the FAHP for weighting and prioritizing criteria and sub-criteria. Based on the research findings, 4 criteria and 21 sub-criteria were identified as effective components. The main criteria consisted of: Strategic/Managerial; Social/Cultural; Environmental/Health; and Economic.

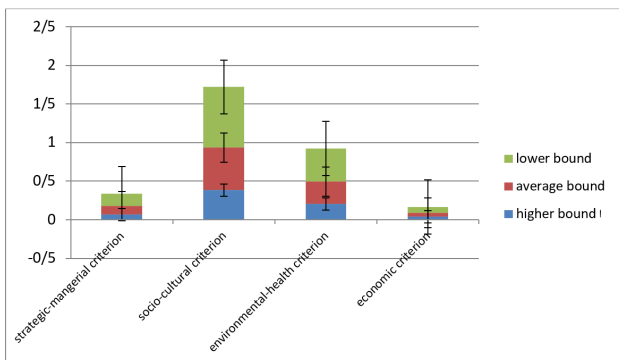


Figure 2. Comparative diagram of fuzzy weights of four criteria.

Pairwise comparison - Fuzzy criteria showed that the "Social/Cultural" criterion with a weight of 0.54884 has the highest level of importance, followed by the "Environmental/Health" criterion with a weight of 0.29265 and the "Strategic/Managerial" criterion with a weight of 0.106. In addition, the "Economic" criterion has the lowest priority with a weight of 0.052. These results are consistent with that of Bahmanpour and Tofigh Khatab (2019) in that the Social/Cultural component in the latter had the highest weight and significance.

The pairwise wise-fuzzy comparison of sub-criteria indicated that the sub-criterion "Combatting Social Exclusion" with a weight of 0.229 had the highest importance, followed by the sub-criterion "Contributing to Youth Activities and Enhancing their Involvement in Community Life and Sports Institutions" with a weight of 0.134. The third most important sub-criterion was "Establishing Sports Facilities, Equipment, and Amenities Observing Environmental Considerations and Developing Sustainable Management Methods" with a weight of 0.131. Due to the lack of previous research and similar studies, it is not possible to compare the results of this section with other comparative studies. However, structurally, the results of this section are completely aligned with the 21 Olympic Agenda, as the three components with the highest weights of importance belong to the "Social/Cultural" and "Environmental/Health" criteria, while the "Economic" criterion among them has less importance, indicating that this parameter cannot act as a significant deterrent of

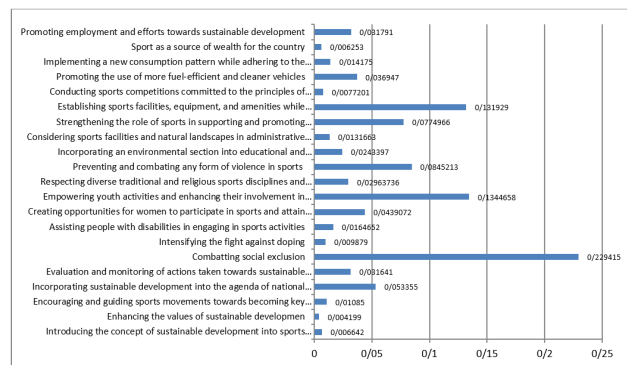


Figure 3. Sub-criteria ranking chart based on the fuzzy final weight resulting from the intervention of the four criteria.

Table 2. Classification of criteria and sub-criteria extracted from the subject literature and exploratory interviews and test results (KS).

Criteria	Sub-criteria (sub-goals)	Coding	Significance	Test results
Strategic- management dimension	inclusion of sustainable development in sports policies	A1	0.065	Normal
	enhancing sustainable development values	A2	0.113	Normal
	promoting and directing sports movements towards their agency in sustainable development	A3	0.425	Normal
	inclusion of sustainable development in the agenda of national and international sports cooperations	A4	0.098	Normal
	monitoring and evaluation of the actions taking towards sustainable development	A5	0.102	Normal
Socio-cultural dimension	combating social exclusion	B1	0.053	Normal
	cracking down on doping	B2	0.107	Normal
	assisting the disabled to take over sport activities	B3	0.107	Normal
	creating opportunities for involving women in sport activities and positions	B4	0.087	Normal
	increasing and improving the youth's involvement in social life and sports entities	B5	0.057	Normal
	respecting diverse traditional and religious sports and enhancing sport as a socially valued element	B6	0.069	Normal
	preventing and combating any kind of violence in sport and	B7	0.071	Normal
Environmental- health dimension	opening a chapter for Environment in the education and internship of employees and athletes	C1	0.108	Normal
	considering to sports camps and landscapes in management	C2	0.098	Normal
	strengthening the role of sport in supporting and improving individual health	C3	0.069	Normal
	establishing sport facilities, equipment, and amenities and developing sustainable management methods	C4	0.214	Normal
	organization of sport events accountable to sustainable development principles	C5	0.49	Normal
	promoting use of more fuel-efficient and cleaner vehicles	C6	0.209	Normal
Economic dimension	implementing new consumption patterns through following sustainable development principles	D1	0.079	Normal
	sport as a source of income for the country	D2	0.054	Normal
	Increasing employment and making efforts towards development.	D3	0.101	Normal

Source: the research findings

Table 3. Pairwise comparison of the four criteria.

	A= Strategic-Managerial			B= Socio-Cultural			C= Environmental-Health			D= Economic		
	L	M	U	L	M	U	L	M	U	L	M	U
	A	1	1	1	0.116	0.2	0.25	0.2	0.25	0.33	2	3
B	4	5	6	1	1	1	2	3	4	6	7	8
C	3	4	5	0.25	0.33	0.5	1	1	1	5	6	7
D	0.25	0.33	0.5	0.125	0.142	0.166	0.142	0.166	0.2	1	1	1
CRm = 0.0208 & CRg = 0.0609 Inconsistency ratio												

Source: the research findings

sustainable development. This factor cannot be overlooked, specifically in developing countries where economic factors, especially job creation in sports, are relatively highly important. The only difference between this research with previous ones applies to the sub-criterion "Provision of Sports as a Source of National Wealth," which ranked higher with a weight of 0.062 in the final ranking, while in the studies by Bahmanpour and Tofigh Khatab (2019), Bahmanpour and Shaji (2017), McCullough et al. (2016), and Kellison and Kim (2014), higher scores were given to economic matters. In this regard, it can be explained that in recent years, sport in Iran has been designated not as an income-generating industry, rather a costly platform. Therefore, this issue may not have influenced the scoring by the experts.

Another somewhat peculiar issue is associated with the sub-criterion "Intensifying the Fight against Doping." This issue holds significant importance for international sports entities, particularly the International Olympic Committee. This matter led to the complete exclusion of Russian sports teams from the Tokyo Olympic Games (2020). However, it is observed that in this study, it does not carry considerable weight, which does not align with foreign research such as (Kellison and Kim, 2014). This can be explained by the fact that systematic doping does not exist in Iran, and most coaches and sports managers do not have a favorable view towards it. Therefore, doping is not considered a significant problem in Iran (at least in most sports disciplines), and for this reason, the experts did not attach significant importance to this sub-criterion.

Finally, the results of this study are in line with the Sustainable Sports Agenda of the country, formulated by the Sports and Environment Commission of the National Olympic

Committee of Iran (Pyramid, 2018). The important point is that in order to move towards the principles of sustainability and achieve sustainable sports in the country, attention to all the above-mentioned criteria and sub-criteria is necessary, and they must be given importance. However, considering the prioritization in this study and taking into account the concept of managerial planning, it is possible to prioritize them in terms of implementation.

In other words, the main solution to plan sustainable principles in the sports economy of the country is to fight against the social exclusion of people. In a way that allows the participation of community members in sports activities. On the other hand, giving young people and entrusting them with the management of sports activities increases their motivation and satisfaction. Also, one cannot ignore the method of creating and developing sports equipment and facilities that are compatible with the environment.

Previous studies that have been conducted in Iran have mentioned the problems and obstacles of realizing sustainable development in the environmental sectors, but it was not mentioned in an integrated and comprehensive way that includes all three principles of environment, economy and society. In this sense, one of the innovative aspects of this research is that the implementation of the principles of sustainable development has not been addressed in a structured way in Iran. It does not seem that the principles of sustainable development in Iranian sports can be achieved if the solutions derived from this research are implemented correctly.

One of the limitations of this research is the impossibility of examining all the provinces and cities of the country. Therefore, the authors suggest conducting similar research in other cities of Iran and comparing the results.

Table 4. The final results of the fuzzy, definite and normal weight of the four criteria.

Criteria	Normal wights	Final weights	Fuzzy weights			Geometric mean of rows		
A	0.106	0.110	0.159	0.107	0.067	0.757	0.622	0.464
B	0.548	0.568	0.784	0.551	0.382	3.722	3.201	2.632
C	0.292	0.303	0.430	0.289	0.202	2.045	1.677	1.391
D	0.052	0.054	0.075	0.051	0.037	0.359	0.298	0.257
Total						6.884	5.799	4.764

Source: the research findings

Authors Contributions

Authors have equal contribution role in preparing the paper.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- Baade R. A., Matheson V. A. (2016) going for the gold: The economics of the Olympics. *Journal of Economic Perspectives* 30:201–218.
- Bahmanpour H., Shaji R. (2017) Sustainability through sport, Shoorafarin Ltd. *t*, 200.
- Bahmanpour H., Tofigh Khatab A. (2019) Evaluation and fitting of the country's sports sustainable development model based on the agenda21 of the Olympic Movement. *Olympic Cultural and Social Studies Quarterly*, 125–143.
- Barker D., Barker-Ruchti N., Wals A., Tinning R. (2014) High performance sport and sustainability: A contradiction in terms?. *Reflective Practice* 15:1–11.
- Bodie M. (2011) NASCAR green: The problem of sustainability in corporations and corporate. 46:491–522.
- Buckley J. J. (1985) Ranking alternatives using fuzzy numbers. *BOOK: Fuzzy Sets Systems* 15:21–31.
- Casper J., Pfahl M. (2012) Environmental behavior frameworks of sport and recreation undergraduate students. *Sport Management Education Journal* 6:8–20.
- (2015) Sport management and the natural environment: Theory and practice. *London: Taylor & Francis*
- Casper J. M., Pfahl M. E., McCullough B. (2014) intercollegiate sport and the environment: Examining fan engagement based on athletics department sustainability efforts. *Journal of Issues in Intercollegiate Athletics* 7:65–91.
- Chan F. D., Kumar N. (2007) Global supplier development considering risk factors using fuzzy extended AHP-based approach. *Omega International Journal of Management Science* 35:417–431.
- Chard C., Mallen C., Bradish C. (2013) marketing and environmental sustainability in the sport sector: Developing a research agenda for action. *ournal of Management and Sustainability* 3:33–44.
- Chernushenko D., Kamp A. Van der, Stubbs D. (2001) Sustainable sport management: Running an environmentally, socially and economically responsible organization. *Ottawa: UNEP*
- Collins A., Flynn A. (2015) the ecological footprint: New developments in policy and practice. *Cheltenham, UK: Edward Elgar Publishing*
- Djaballah M., Hautbois C., Desbordes M. (2015) Non-mega sporting events' social impacts: A sensemaking approach of local governments' perceptions and strategies. *European Sport Management Quarterly* 15:48–76.
- Dolf M., Teehan P. (2015) Reducing the carbon footprint of spectator and team travel at the University of British Columbia's varsity sports events. *Sport Management Review* 18:244–255.
- Fornell C., Larcker D. (1981) Evaluating structural equation models with unobservable variables and measurement error. 18:39–50. 3
- Forzieri G., Gardenti M., Caparrini F., Castelli F. (2008) A methodology for preselection of suitable sites for surface and underground small dams in arid areas: A case study in the region of Kidal, Malia, physics, and chemistry of the Earth. 33:74–85.
- Goodarzi M. (2018) Design and validation of the model of factors affecting the development of the use of renewable energy in sports venues in Iran. *Dissertation of Faculty of Accounting Management, Farabi Campus, University of Tehran. (in Persian)*
- Kellison T. B., Kim Y. K. (2014) Marketing pro-environmental venues in professional sport: Planting seeds of change among existing and prospective consumers.

- Kellison T. B., McCullough B. P. (2016) A forecast for the mainstreaming of environmental sustainability. *Sport and Entertainment Review* 2 (1): 11–18.
- Mallen C., Stevens J., Adams L., McRoberts S. (2010) the assessment of the environmental performance of an international multi-sport event. *European Sport Management Quarterly* 10:97–122.
- McCullough B., Pfahl M., Nguyen S. (2016) the green waves of environmental sustainability in sport. *Sport in Society: Cultures, Commerce, Media, Politics* 19 (7): 1040–1065.
- Pfahl M. (2011) Sport and the natural environment: A strategic guide. *Dubuque, IA: Kendall Hunt Publishing Company*
- Pfahl M., Casper J., Trendafilova S., McCullough B. P., Nguyen S. N. (2015) crossing boundaries: An examination of sustainability department and athletics department collaboration regarding environmental issues. *Communication and Sport* 3 (1): 27–56.
- Pyramid Olympic (2018) Translation of Sports and Environment Commission. *Publications of the National Olympic Committee*, 132.
- Robertson M. (2014) Sustainability principles and practice. *New York, NY: Rutledge*
- Soltan Hosseini M., Alidoost Ghafrokhi E., Farahani A. (2014) Solutions for investigating the environmental and traffic effects of sports venues in Yazd city on its urban environment; Study on sport management. No. 24, 15–30.
- UN (2016) System of Environmental-Economic Accounting (SEEA). *United Nations*, <http://unstats.un.org/unsd/envaccounting/seea.asp>
- Wall-Tweedie J., Nguyen S. N. (2018) Is the Grass Greener on the Other Side? A Review of the Asia-Pacific Sport Industry's Environmental Sustainability Practices. *Journal of Business Ethics* 152 (3): 741–761.