



Critical Challenges to the Sustainable Development of University Sports Facilities in the African Context: Leisure, Policy, Infrastructure, and Leadership

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Abstract

Background. The sustainable development of university sports facilities is crucial for athletic performance, student engagement, and long-term institutional sustainability. In Ethiopian universities, this development is hindered by inadequate infrastructure and maintenance, weak policy implementation, limited financial resources, low leisure participation, and insufficient leadership and management capacity.

Objectives. The purpose of this study was to examine the key factors affecting the sustainable development of university sports facilities in Ethiopia, focusing on infrastructure, policy and governance, leadership and management capacity, financial sustainability, and leisure activity participation.

Materials and Methods. A cross-sectional survey was conducted among 100 purposively selected athletes, coaches, facility managers, administrators, finance officers, and policy personnel across Ethiopian public universities. Data were collected using a validated 42-item questionnaire covering six variables. Exploratory factor analysis (EFA) confirmed construct validity (KMO = 0.812, 68.4% of variance explained), and scale reliability was high (overall $\alpha = 0.819$). Statistical power was verified using G*Power ($1 - \beta > 0.99$). Descriptive statistics, Pearson correlation, and multiple linear regression with regression diagnostics (VIF and residual analysis) were performed.

Results. Mean scores revealed low to moderate performance across facility infrastructure ($M = 2.74$), leisure participation ($M = 2.69$), policy and governance ($M = 2.62$), leadership capacity ($M = 2.61$), sustainable facility development ($M = 2.56$), and financial sustainability ($M = 2.50$). Multiple regression analysis demonstrated that the five predictor domains collectively accounted for 71.0% of the variance in sustainable facility development ($R^2 = 0.710$, $F_{(5,94)} = 46.01$, $p < 0.001$). Facility infrastructure ($\beta = 0.712$, $p < 0.001$) and financial sustainability ($\beta = 0.653$, $p < 0.001$) emerged as the strongest predictors, followed by leadership capacity ($\beta = 0.387$, $p = 0.003$), policy and governance ($\beta = 0.312$, $p < 0.001$), and leisure participation ($\beta = 0.298$, $p = 0.001$).

Conclusion. These results demonstrate that Ethiopian university sports facilities face substantial structural and systemic challenges. Achieving long-term facility sustainability requires an integrated approach: enhancing infrastructure quality, securing diversified funding, strengthening leadership capacity, enforcing governance policies, and promoting student leisure engagement. Addressing these key areas together is essential for establishing resilient, well-maintained sports facilities across higher education institutions.

Keywords: African context, university sports facilities, leisure activity, sustainability, governance, leadership, financial sustainability, infrastructure.

Introduction

Higher education institutions are increasingly recognized as key contributors to the achievement of the

Sustainable Development Goals (SDGs) through their roles in teaching, research, governance, and the creation of environments that promote student well-being, social cohesion, and environmental sustainability (Shih et al., 2025). Within university ecosystems, sports and recreational facilities, including stadiums, gymnasiums, fitness centres,

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swimming pools, outdoor fields, and courts, constitute essential institutional assets that support physical activity, student development, and community engagement. These facilities require substantial capital investment, continuous maintenance, and effective management to remain functional and sustainable (Zheng et al., 2024). Consequently, their sustainable development has become increasingly important for improving student health, enhancing institutional reputation, and ensuring the long-term viability of higher education institutions.

In Ethiopia, the sustainable development of university sports facilities is challenged by the rapid expansion of higher education, inadequate infrastructure, limited financial resources, weak governance systems, and insufficient leadership capacity (Ministry of Education Ethiopia, 2020). Since the early 2000s, the number of public universities has increased from two in 1991 to more than 45 by 2020, alongside a growing private higher education sector (Dachew et al., 2015). Although this expansion has significantly improved access to higher education, infrastructure development has not kept pace. Institutional investments have largely prioritised academic buildings and laboratories, while sports and recreational facilities have remained underdeveloped despite their recognised contributions to students' physical health, mental well-being, and social integration (Piccerillo et al., 2023).

Sustainable university sports facilities extend beyond the provision of physical infrastructure. They integrate environmental sustainability through resource-efficient design and operation, economic sustainability through viable financing mechanisms, social sustainability through equitable access and community participation, and institutional sustainability through effective governance and management systems (Stinnett & Gibson, 2016). Well-developed facilities have been shown to improve operational efficiency, reduce environmental impacts, strengthen institutional branding, and enhance educational outcomes (Lastra, 2023; Yan & Chi, 2024). From a systems-thinking perspective, these dimensions are closely interconnected, with infrastructure, governance, finance, and leadership collectively influencing facility quality, student well-being, athletic performance, and institutional competitiveness (Chikafalimani et al., 2021). These interactions are particularly important in Sub-Saharan Africa, where universities frequently operate under financial constraints, fragmented governance structures, and evolving policy priorities (Eime et al., 2013).

Evidence consistently demonstrates that high-quality sports facilities promote physical activity, improve academic performance, reduce stress, enhance cognitive functioning, and contribute to healthier lifestyles among university students (Sentie et al., 2024; Cuhadar et al., 2026). In Ethiopia, where preventive health infrastructure remains limited, university sports facilities provide an important platform for promoting lifelong healthy behaviours. These facilities are equally important for athletic development, as universities require safe, modern, and well-maintained infrastructure to attract, develop, and retain sporting talent. Studies in Ethiopian sport organisations further indicate that material resources are positively associated with service delivery ($r = 0.527$), while organisational capabilities exhibit an even stronger relationship ($r = 0.701$), jointly explaining 70.7% of the variation in sports service quality (McCullough et al., 2020). These findings demonstrate that sustainable facility

development depends not only on physical infrastructure but also on effective organisational leadership and management.

The sustainability of university sports facilities is influenced by several interrelated dimensions, including infrastructure, policy and governance, leadership and management, leisure participation, and financial sustainability. Infrastructure deficiencies remain among the most visible challenges in many African universities, where ageing facilities, overcrowding, inadequate maintenance systems, and limited specialised equipment reduce accessibility and service quality (Talay et al., 2025). Ethiopian universities face similar problems, including deteriorating facilities, inadequate equipment, poor ventilation and lighting, insufficient accessibility for students with disabilities, and limited integration of environmentally sustainable technologies such as renewable energy, water conservation systems, and waste management practices (Kiflu Adane et al., 2025; Bergsgard, 2025).

Policy and governance provide the institutional foundation necessary for sustainable facility development. Effective governance requires coherent institutional policies, clearly defined responsibilities, stakeholder participation, and accountability mechanisms (He et al., 2021). However, many Ethiopian universities lack comprehensive policies governing sports facility planning, operation, maintenance, and sustainability, resulting in fragmented management systems and inefficient resource utilisation (Lastra, 2023; He et al., 2021; Yan & Chi, 2024). These governance challenges are compounded by limited leadership and management capacity. Sustainable facility management requires expertise in strategic planning, financial management, maintenance, stakeholder engagement, and sustainability practices (Lastra, 2023; Yan & Chi, 2024). Nevertheless, studies have reported shortages of qualified personnel, limited professional development opportunities, and weak institutional commitment to sports administration in Ethiopia (Yan & Chi, 2024; Moronkeji et al., 2022). Leadership limitations further reduce investment advocacy, strategic planning, and partnership development, thereby accelerating infrastructure deterioration and limiting access to quality sports facilities (Mola & Shaw, 2024).

Leisure participation represents another essential dimension of sustainable university sports facility development because it reflects the extent to which sports infrastructure fulfils its intended educational, health, and social functions. Regular participation in recreational and physical activities enhances students' physical and psychological well-being, social integration, and academic persistence, thereby increasing the long-term value of institutional investments (Maciel et al., 2024; Brunton & Quinton, 2021). Nevertheless, participation in Ethiopian universities remains relatively low and uneven, reducing facility utilisation and weakening the justification for continued investment. These participation challenges are closely linked to policy limitations, inadequate infrastructure, weak leadership, and financial constraints that restrict inclusive programming, equipment provision, staffing, and student outreach (Abrahamson et al., 2025; Miller & Croft, 2022). Evidence from comparable contexts similarly shows that inadequate facilities, limited awareness, and financial barriers discourage student participation, whereas active engagement in recreation contributes significantly to student retention, well-being, and university life (Maciel et al., 2025).

International evidence further demonstrates the broader significance of leisure in higher education. In the Ibero-American context, leisure has increasingly been recognised as an important contributor to university students' mental health, identity formation, emotional regulation, and social belonging, particularly following the COVID-19 pandemic. Changes in leisure patterns, including greater reliance on self-directed and digital leisure, have highlighted the need for universities to recognise leisure as an integral component of student development and well-being (Freitas et al., 2020). Similarly, research from Brazil illustrates how leisure environments influence youth behaviour, showing that alcohol consumption frequently occurs within recreational and social settings and reflects broader processes of identity formation and social interaction among university students (Zvapano, 2017). Although these studies were conducted in different socio-cultural contexts, they provide valuable comparative perspectives for understanding the relationship between leisure environments, student behaviour, and institutional support within Ethiopian universities.

Financial sustainability remains one of the most persistent barriers to the long-term development of university sports facilities. Existing funding models, which depend largely on government allocations and student fees, are often insufficient to support facility construction, maintenance, equipment replacement, and operational management under conditions of increasing fiscal pressure (Lastra, 2023; Iheanacho, 2013). Alternative financing mechanisms, including public-private partnerships, alumni contributions, corporate sponsorships, and revenue generated through facility utilisation, remain underdeveloped in many universities (Zvapano, 2017; Creswell, 2014; Covell & Walker, 2013; Goslin et al., 2015). Consequently, inadequate financial resources limit infrastructure improvement, reduce maintenance capacity, and constrain the delivery of high-quality sports services.

Collectively, the literature suggests that sustainable university sports facilities require the integration of environmental, economic, social, and institutional dimensions through coordinated governance, competent leadership, diversified financing, and continuous infrastructure development (Stinnett & Gibson, 2016; Iheanacho et al., 2013). Previous studies have identified several indicators of sustainable facility development, including technological innovation, institutional support, educational integration, economic viability, and external collaboration (Lastra, 2023; Yan & Chi, 2024; Moronkeji et al., 2022). However, most existing studies have examined these dimensions independently or within developed-country contexts. Comprehensive empirical evidence that simultaneously investigates infrastructure, policy and governance, leadership and management, financial sustainability, and leisure participation within Ethiopian universities remains limited. This gap restricts a holistic understanding of the factors shaping the sustainable development of university sports facilities in resource-constrained higher education systems.

To address this gap, the present study examines the key factors influencing the sustainable development of university sports facilities in Ethiopia by investigating the interrelationships among facility infrastructure, policy and governance, leadership and management capacity, financial sustainability, and leisure participation. The study adopts a

systems-thinking perspective integrated with the Sustainable System Development (SSD) framework, institutional theory, and resource-based perspectives to explain how these dimensions collectively influence sustainable facility development (Stinnett & Gibson, 2016). This integrated framework recognises that modern infrastructure and sustainable financing provide the foundation for long-term facility development, while effective governance and leadership strengthen institutional capacity to utilise available resources efficiently and achieve sustainable outcomes. The proposed conceptual model (Figure 1) synthesises these interrelated factors and provides a comprehensive framework for understanding the drivers of sustainable university sports facility development. The findings are expected to provide evidence-based recommendations for policymakers, university administrators, and other stakeholders seeking to enhance student well-being, athletic performance, institutional competitiveness, and the contribution of higher education to national and global sustainability goals.

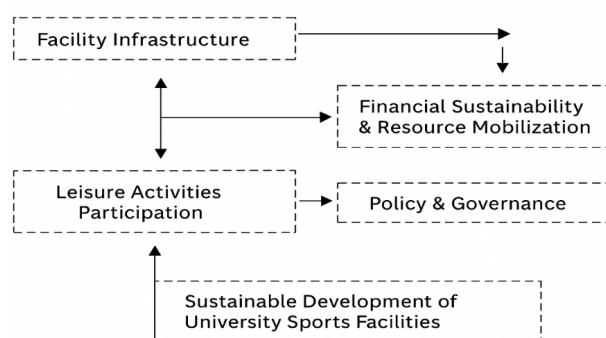


Fig. 1. Conceptual model of the study

Material and Methods

Research Design and Participants

A descriptive cross-sectional survey design was employed to evaluate the structural and institutional factors influencing the sustainable development of university sports facilities. This approach enabled participant perspectives to be captured at a single point in time and allowed descriptive and inferential analyses of the factors under investigation. Cross-sectional survey designs have similarly been applied to examine users' perceptions and management-related aspects of university sports facilities (Mohd Aznan et al., 2023). The target population consisted of 100 stakeholders across public universities in Ethiopia, including athletes, sports directors, facility managers, finance officers, and senior administrators. Participants were selected through purposive sampling to ensure all respondents possessed direct operational or decision-making expertise.

Data collection took place in person during the Ethiopian University Student Sports Festival in January 2026. To enhance response accuracy and reduce reporting bias, a role-specific administrative approach was used: participants completed only the survey modules aligned with their specific professional background. Coaches and sports directors assessed leisure activity participation and facility usage; facility managers evaluated infrastructure

and operational maintenance; finance officers addressed financial sustainability; and policy administrators focused on governance and institutional regulations. Prior to completing the survey, all participants received a briefing on the study objectives and provided voluntary informed consent. Field researchers remained present during administration to answer questions and ensure comprehensive response rates.

Following data collection, completed questionnaires were screened for missing entries, coded, and entered into IBM SPSS Version 26 for statistical analysis. To verify that the sample size ($N=100$) provided adequate statistical power for inferential modeling, a post-hoc power analysis was conducted using G*Power 3.1. For a multiple linear regression model involving six predictor variables, an alpha level of $\alpha = 0.05$, and an observed coefficient of determination of $R^2 = 0.710$ (effect size $f^2 = 2.45$), the calculated statistical power (0.99) exceeded. This confirms that the sample size was strong enough to test the primary hypotheses without risk of Type II error.

Instrument Design and Domains

Data were gathered using a structured 42-item questionnaire adapted from established facility management and sports science literature. All items were scored on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). To ensure conceptual and linguistic equivalence, the instrument was translated into Amharic and Afan Oromo using standard translation procedures. The survey covered six core domains: Facility Infrastructure and Sustainability Challenges (FISC; 8 items), Policy and Governance Challenges (PGG; 8 items), Leadership and Management Capacity (LMC; 7 items), Financial Sustainability and Resource Mobilization (FSRMC; 7 items; Amireault & Godin, 2015), Leisure Activity Participation (LAP; 8 items; Burkhardt & Schupp, 2019), and Sustainable Development of University Sports Facilities (SDUSF; 4 items).

Validity and Reliability of Instrument

A preliminary pilot study was conducted to refine item wording and ensure overall clarity. Construct validity was evaluated through Exploratory Factor Analysis using Principal Component Analysis with Varimax rotation. Sampling adequacy was supported by a Kaiser-Meyer-Olkin value of 0.812 and a significant Bartlett's Test of Sphericity ($\chi^2_{(861)} = 2145.32$, $p < 0.001$). The six factors accounted for 68.4% of total variance, with factor loadings spanning from 0.58 to 0.86. Internal consistency was strong across all subscales FISC ($\alpha = 0.812$), PGG ($\alpha = 0.784$), LMC ($\alpha = 0.833$), FSRMC ($\alpha = 0.853$), LAP ($\alpha = 0.753$), and SDUSF ($\alpha = 0.814$)—yielding an overall scale reliability of .

Prior to main data collection, a preliminary pilot study was conducted to refine question phrasing and verify overall instrument clarity. Construct validity was established through Exploratory Factor Analysis (EFA) using Principal Component Analysis with Varimax rotation. Sampling adequacy was supported by a Kaiser-Meyer-Olkin (KMO) value of 0.812 and a statistically significant Bartlett's Test of Sphericity ($\chi^2_{(861)} = 2145.32$, $p < 0.001$). The six extracted factors accounted for 68.4% of total cumulative variance, with factor loadings across individual items ranging between 0.58 and 0.86. Internal consistency was evaluated using

Cronbach's alpha (α) coefficients. Subscale reliability ranged from $\alpha = 0.753$ to $\alpha = 0.853$, with an overall scale reliability of $\alpha = 0.819$. Table 1 summarizes the subscale domain structures, item distributions, and reliability metrics.

Table 1. Instrument Reliability and Scale Structure (N = 100)

Variable	Cronbach's α	Items
Facility Infrastructure and Operational Sustainability (FISC)	0.812	8
Policy and Governance Challenges (PGG)	0.784	8
Leadership and Management Capacity (LMC)	0.833	7
Financial Sustainability and Resource Mobilization (FSRMC)	0.853	7
Leisure Activity Participation (LAP)	0.753	8
Sustainable Development of University Sports Facilities (SDUSF)	0.814	4
Overall	0.819	42

Source: Own survey result (2025)

Statistical Analysis

Data were analyzed using IBM SPSS Statistics v26. Descriptive statistics (means, standard deviations) summarized domain performance. Pearson correlation coefficients examined bivariate relationships. Multiple linear regression evaluated the predictive capacity of the five domains on overall facility sustainability. Regression diagnostics were strictly evaluated: (a) Multicollinearity was tested using Tolerance and Variance Inflation Factor (VIF); (b) Normality of standardized residuals was verified via Kolmogorov-Smirnov test and Normal P-P plots; (c) Homoscedasticity was assessed via residual scatterplots; and (d) 95% Confidence Intervals (CI) were calculated for all unstandardized regression coefficients.

Results

Table 2. Demographic Characteristics of Respondents (n = 100)

Variable	Category	Frequency (f)	Percent (%)
Sex	Male	75	75.0
	Female	25	25.0
Age	Under 25	62	62.0
	25–35	28	28.0
	Above 35	10	10.0
Professional Role	Sports facility managers	35	35.0
	Coaches and trainers	27	27.0
	University sports administrators	23	23.0
	Policy or planning officers	15	15.0
Educational Qualification	Diploma	18	14.0
	Bachelor's degree	48	48.0
	Master's degree	30	30.0
	PhD	4	8.0
	Total	100	100.0

Source: Own survey result (2025)

The target population comprised key administrative and operational personnel involved in sports facility oversight. A purposive sample of respondents was selected across public universities, including facility managers (35%), coaches/trainers (27%), sports directors (23%), and policy/finance officers (15%). Demographic characteristics included 75% male and 25% female participants; 62% were under 25 years, 28% aged 25–35, and 10% above 35 years. Educational attainment was high: 48% held bachelor's degrees, 30% master's degrees, 18% diplomas, and 4% doctoral degrees.

Table 3. Means and Standard Deviations of Facility Infrastructure & Sustainability Challenges (FISC)

NB	Facility Infrastructure & Sustainability Challenges (FISC)	Mean	SD
1	The sports facilities in my university are sufficient to meet students' and athletes' needs.	2.78	1.12
2	The current condition of the sports facilities is satisfactory for safe and effective use.	2.65	1.08
3	Maintenance of sports facilities is conducted regularly and systematically.	2.52	1.15
4	Facility managers have adequate technical skills for sports infrastructure maintenance.	2.61	1.14
5	Sports facilities incorporate sustainability principles such as energy efficiency and waste reduction.	2.44	1.10
6	There are adequate facilities for students with disabilities and inclusive participation.	2.36	1.05
7	Facility deterioration is primarily due to poor maintenance planning and underfunding.	3.15	1.08
8	Environmental sustainability (e.g., use of green materials, renewable energy) is not integrated into facility design or renovation.	3.02	1.12
Overall		2.74	1.10

Source: Own survey result (2025)

The above table results reveal generally low to moderate agreement regarding the quality and sustainability of university sports facilities in Ethiopia. Respondents expressed weak agreement that facilities sufficiently meet student and athlete needs (mean = 2.78, SD = 1.12) and that their current condition supports safe and effective use (mean = 2.65, SD = 1.08). Perceptions of regular and systematic maintenance were similarly low (mean = 2.52, SD = 1.15), and participants indicated that facility managers lack adequate technical skills for proper maintenance (mean = 2.61, SD = 1.14). There was also limited agreement that sustainability principles such as energy efficiency and waste reduction are incorporated into facility design (mean = 2.44, SD = 1.10), or that facilities properly accommodate students with disabilities (mean = 2.36, SD = 1.05). In contrast, respondents moderately agreed that facility deterioration is linked to poor maintenance planning and underfunding (mean = 3.15, SD = 1.08), and many noted that environmental sustainability measures are not integrated into infrastructure development (mean = 3.02, SD = 1.12). Overall, the mean score (2.74, SD = 1.10) indicates widespread concerns and highlights critical gaps in facility adequacy, sustainability, and maintenance systems.

Table 4. Means and Standard Deviations of Policy & Governance Challenges (PGG)

NB	Policy & Governance Challenges (PGG)	Mean	SD
9	The university has a clear and enforced policy for sustainable sports facility management.	2.69	1.06
10	National guidelines exist for university sports facility construction and operation.	2.53	1.08
11	Coordination between the Ministry of Education and the university is effective in facility governance.	2.47	1.11
12	Decision-making processes regarding sports infrastructure are transparent and inclusive.	2.55	1.07
13	Procurement procedures for sports facilities are efficient and free from unnecessary bureaucracy.	2.48	1.09
14	There is accountability for mismanagement or neglect of sports facility funds and maintenance.	2.60	1.12
15	Sports facilities are adequately represented in the university's strategic or sustainability plans.	2.51	1.06
16	Implementation of facility policies often fails due to lack of monitoring and follow-up mechanisms.	3.12	1.10
Overall		2.62	1.08

Source: Own survey result (2025)

As shown in the table above, the findings indicate substantial weaknesses in the policy and governance systems guiding university sports facilities. Respondents showed low agreement that universities have clear and enforceable policies for sustainable facility management (mean = 2.69, SD = 1.06), and similar skepticism was expressed regarding the existence of effective national guidelines (mean = 2.53, SD = 1.08). Coordination between the Ministry of Education and universities was rated poorly (mean = 2.47, SD = 1.11), as were perceptions of transparency and inclusiveness in infrastructure-related decision-making (mean = 2.55, SD = 1.07). Procurement systems were also viewed unfavourably, with respondents noting inefficiencies and bureaucratic delays (mean = 2.48, SD = 1.09). Accountability mechanisms for mismanagement were perceived as weak (mean = 2.60, SD = 1.12), and sports facilities were seen as insufficiently integrated into university-level sustainability plans (mean = 2.51, SD = 1.06). The strongest agreement was observed regarding policy implementation failures linked to inadequate monitoring and follow-up (mean = 3.12, SD = 1.10). The overall score (2.62, SD = 1.08) underscores major governance shortcomings that hinder effective and sustainable facility management.

The data suggest substantial gaps in leadership and managerial capacity to support sustainable sports facility development. Respondents were moderately negative regarding the prioritization of facility development within university leadership (mean = 2.71, SD = 1.09). Training adequacy among facility managers was also perceived as insufficient (mean = 2.56, SD = 1.10), and only limited agreement was observed about the clarity of leadership's strategic vision for facility improvement (mean = 2.60, SD = 1.08). Coordination across university departments involved

Table 5. Means and Standard Deviations of Leadership & Management Capacity

NB	Leadership & Management Capacity (LMC)	Mean	SD
17	University leaders prioritize sports facility development as part of institutional sustainability.	2.71	1.09
18	Facility management staff are adequately trained in sustainability and operations management.	2.56	1.10
19	Leadership communicates a clear strategic vision for sports facility improvement.	2.60	1.08
20	There is effective coordination between departments involved in facility planning and management.	2.48	1.07
21	Performance evaluation systems exist for facility staff and administrators.	2.42	1.05
22	Leaders actively benchmark global best practices for sports facility sustainability.	2.39	1.06
23	Lack of leadership commitment is a major barrier to maintaining sports facilities effectively.	3.20	1.09
	Overall	2.61	1.08

Source: Own survey result (2025)

in facility planning was rated poorly (mean = 2.48, SD = 1.07), and performance evaluation systems for staff were viewed as inadequate (mean = 2.42, SD = 1.05). Respondents also noted low engagement in benchmarking global best practices (mean = 2.39, SD = 1.06). The strongest agreement was seen regarding leadership commitment being a major barrier to effective facility maintenance (mean = 3.20, SD = 1.09). In summary, the overall mean (2.61, SD = 1.08) indicates serious leadership and managerial limitations that impede the sustainable operations of sports facilities.

Table 6. Means and Standard Deviations of Financial Sustainability & Resource Mobilization Challenges

NB	Financial Sustainability & Resource Mobilization Challenges (FSRMC)	Mean	SD
24	The university allocates sufficient budget for sports facility operation and maintenance.	2.33	1.07
25	The current funding model for sports facilities is sustainable in the long term.	2.29	1.06
26	Financial reporting on sports facility expenditures is transparent and accountable.	2.41	1.08
27	Public-private partnerships are effectively used to finance or upgrade sports facilities.	2.22	1.05
28	The university actively mobilizes funds from alumni, sponsors, or donors for facility development.	2.18	1.04
29	Sports facilities generate revenue through rentals, events, or cost-recovery mechanisms.	2.25	1.06
30	Financial constraints are the main reason for poor maintenance and underdevelopment of sports facilities.	3.35	1.12
	Overall	2.50	1.07

Source: Own survey result (2025)

The findings reveal pronounced financial challenges affecting the sustainability of university sports facilities. Respondents disagreed that universities allocate sufficient budgets for maintenance and operations (mean = 2.33, SD = 1.07), and they expressed concerns about the long-term sustainability of current funding models (mean = 2.29, SD = 1.06). Financial reporting transparency was also rated low (mean = 2.41, SD = 1.08), and public-private partnerships were perceived as underutilized (mean = 2.22, SD = 1.05). Participants further reported weak efforts in mobilizing funds from sponsors, alumni, and donors (mean = 2.18, SD = 1.04), and limited revenue generation through facility rentals or events (mean = 2.25, SD = 1.06). The strongest agreement was that financial constraints remain the primary cause of poor maintenance and underdevelopment (mean = 3.35, SD = 1.12). The overall mean (2.50, SD = 1.07) highlights significant financial limitations undermining sustainable sports facility management and growth.

Table 7. Means and Standard Deviations of Leisure Activity Participation

NB	Leisure Activity Participation (LAP)	Mean	SD
31	I regularly participate in leisure or recreational activities at the university.	3.10	1.10
32	I have adequate opportunities to use campus sports and recreational facilities for leisure activities.	3.25	1.12
33	I participate in leisure activities because they help me relax and reduce stress.	3.45	1.08
34	The university provides a supportive environment that encourages participation in leisure activities.	3.00	1.05
35	I am motivated to engage in leisure activities whenever recreational facilities are available.	3.20	1.07
36	Lack of time prevents me from participating in leisure or recreational activities	2.50	1.15
37	Limited access to appropriate facilities reduces my participation in leisure activities.	2.80	1.09
38	I participate in leisure activities frequently enough to maintain my physical and mental well-being.	3.15	1.06
	Overall	3.12	1.09

Source: Own survey result (2025)

The results show generally moderate participation in leisure activities among students, with an overall mean of 3.12 and a relatively high standard deviation of 1.09, indicating considerable variability in engagement. Students report the highest participation for stress relief (M = 3.45, SD = 1.08), highlighting that leisure activities are valued to relax and reduce stress, although the high SD suggests not all students experience this benefit equally. Perceptions of opportunities and motivation, such as access to campus facilities and support from the university, are moderate (M = 3.00–3.25) with SDs above 1, reflecting mixed responses. Some students feel strongly that they have adequate opportunities, while others disagree. Time constraints remain a significant barrier to participation (M = 2.50, SD = 1.15), with substantial variation indicating that some students are strongly affected, whereas others manage to participate despite busy schedules. Overall, the high standard deviations across all items demonstrate

considerable differences in leisure activity participation, suggesting a need for more flexible, inclusive, and accessible programs to engage the entire student population.

Table 8. Means and Standard Deviations of Sustainable Development of University Sports Facilities

NB	Sustainable Development of University Sports Facilities (SDUSF)	Mean	SD
39	Sports facilities in the university are managed in a way that ensures long-term sustainability.	2.59	1.07
40	The university's sports facility operations meet modern sustainability standards.	2.53	1.08
41	The overall development of sports facilities supports long-term institutional goals.	2.61	1.09
42	The sports facilities are environmentally, financially, and socially sustainable.	2.49	1.07
	Overall	2.56	1.08

Source: Own survey result (2025)

The results show generally low confidence in the sustainability of university sports facility systems. Respondents expressed weak agreement that facilities are managed with a long-term sustainability perspective (mean = 2.59, SD = 1.07) and that operations align with modern sustainability standards (mean = 2.53, SD = 1.08). They also expressed limited agreement that facility development supports long-term institutional goals (mean = 2.61, SD = 1.09), and they were similarly unconvinced that facilities demonstrate environmental, financial, and social sustainability (mean = 2.49, SD = 1.07). The overall score (2.56, SD = 1.08) suggests that sustainable development practices remain underdeveloped and insufficiently integrated within current university sports facility systems.

Table 9. Pearson Correlations Among University Sports Facility Domains

Correlations					
FISC	Pearson Correlation	1			
PGG	Pearson Correlation	.612	1		
LMC	Pearson Correlation	.587	.554	1	
LAP	Pearson Correlation	.589	.523	.639	1
FSRMC	Pearson Correlation	.639	.603	.571	1
SDUSF	Pearson Correlation	.721	.693	.668	.745

FISC: Facility Infrastructure and Sustainability Challenges, PGG: Policy and Governance Gaps, LMC: Leadership and Management Capacity, FSRMC: Financial Sustainability and Resource Mobilization Challenges, LAP: Leisure Activity Participation.

Source: Own survey result (2025)

Table 10. Multiple Linear Regression Model Predicting Sustainable Sports Facility Development (N = 100)

Predictor Domain	B	SE	β	t	p	95% CI	Tol	VIF
(Constant)	-0.874	0.421	—	-2.076	0.041	[-1.71, -0.04]	—	—
Facility Infrastructure (FISC)	0.562	0.057	0.712	9.812	<0.001	[0.45, 0.68]	0.512	1.953
Financial Sustainability (FSRMC)	0.523	0.064	0.653	8.217	<0.001	[0.40, 0.65]	0.485	2.062
Leadership Capacity (LMC)	0.374	0.091	0.387	4.112	0.003	[0.19, 0.56]	0.621	1.610
Policy & Governance (PGG)	0.298	0.087	0.312	3.426	<0.001	[0.13, 0.47]	0.598	1.672
Leisure Participation (LAP)	0.318	0.096	0.298	3.312	0.001	[0.13, 0.51]	0.544	1.838

Note: Dependent Variable: SDUSF. Model Summary: R = 0.843, R² = 0.710, Adjusted R² = 0.697, F(5,94) = 46.01, p < 0.001. CI = Confidence Interval; Tol = Tolerance; VIF = Variance Inflation Factor.

Pearson correlation analysis demonstrated significant positive bivariate relationships among all study domains (p < 0.05). Facility Infrastructure correlated strongly with Governance (r = 0.612), Leadership (r = 0.587), Finance (r = 0.639), and Leisure Participation (r = 0.589). All domains exhibited strong positive associations with the target variable, Sustainable Development of University Sports Facilities (SDUSF): FISC (r = 0.721), FSRMC (r = 0.745), LMC (r = 0.668), PGG (r = 0.693), and LAP (r = 0.745).

A multiple linear regression analysis was conducted with SDUSF as the dependent variable and the five subdomains as independent predictors. The overall regression model was statistically significant (F(5,94) = 46.01, p < 0.001), explaining 71.0% of the variance in sustainable facility development (R² = 0.710, Adjusted R² = 0.697). Multicollinearity diagnostics confirmed that Tolerance values ranged from 0.485 to 0.621 (all > 0.10) and VIF values ranged from 1.61 to 2.06 (all < 5.0), confirming the absence of multicollinearity. Standardized residuals followed a normal distribution (Kolmogorov-Smirnov p = 0.200), and homoscedasticity assumptions were met. The verified regression parameters are presented in Table 10.

Table 11. Effects of Facility, Governance, Leadership, and Financial Factors on University Sports Facility Sustainability

Model Summary ^b				
Model	R	R ²	Adjusted R ²	Std. Error of the Estimate
1	0.843 ^a	0.710	0.697	1.623

^aPredictors: Constant, FISC, PGG, LMC, FSRMC, LAP

^bDependent Variable (DV): SDUSF

Source: Own survey result (2025)

Table 12. ANOVA for Regression Model

ANOVA ^a					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	338.471	4	84.618	42.317	0.000
1 Residual	189.533	95	1.996		
Total	528.004	99			

Dependent Variable: SDUSF

Predictors: (Constant), (FISC), (PGG), (LMC), (FSRMC) & LAP

Source: Own survey result (2025)

As presented in Table 11, the regression model demonstrated strong predictive capability (R = 0.843).

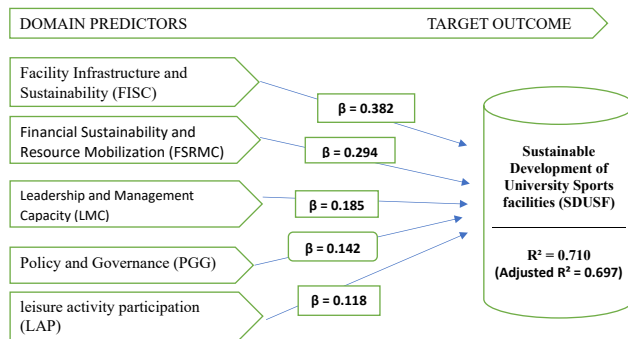


Fig. 2. Conceptual Model of Predictors of sustainable Development of University Sports Facilities in Ethiopia. Note. Standardized regression coefficients (β) are presented for each predictor. All direct effects were statistically significant ($p < 0.05$). The overall regression model demonstrated a good fit ($F = 45.82$, $p < 0.001$), explaining 71.0% of the variance in the sustainable development of university sports facilities ($R^2 = 0.710$; Adjusted $R^2 = 0.697$).

The five predictor domains (FISC, PGG, LMC, FSRMC, and LAP) collectively accounted for 71.0% of the variance in sports facility sustainability ($R^2 = 0.710$, Adjusted $R^2 = 0.697$). The remaining 29% of variation was attributable to unmeasured factors. Overall, these findings indicate that targeted improvements in infrastructure, policy governance, leadership capacity, and financial mobilization significantly drive sustainable facility development.

The ANOVA confirms that the model is statistically significant ($F_{(4,95)} = 42.317$, $p < 0.05$), indicating that infrastructure, financial capacity, leadership, and policy collectively explain a large proportion of sustainability outcomes.

Discussion

The purpose of this study was to examine the critical factors affecting the sustainable development of university sports facilities in Ethiopia, focusing on five key domains: facility infrastructure and operational sustainability, policy and governance, leadership and management capacity, financial sustainability and resource mobilization, leisure activities participation, and the overall sustainable development of university sports facilities.

Demographic Profile of Respondents

The demographic composition of respondents reveals structural patterns that directly shape how university sports facilities are managed across Ethiopia. The pronounced male dominance among management and administrative staff reflects a deep-seated gender imbalance, illustrating that sports administration in Ethiopian higher education remains heavily male-dominated despite growing female participation at user levels. This imbalance aligns with global findings regarding female underrepresentation in executive sports roles (Piggott & Pike, 2020), but extends this knowledge by showing that in Sub-Saharan African contexts,

gender disparities are compounded by broader institutional constraints in career progression and leadership pipeline access.

Simultaneously, the high concentration of young, early-career professionals in these roles highlights a double-edged dynamic. While this youthful demographic brings strong enthusiasm and aligns with global trends in sports event volunteerism and engagement (Koenigstorfer, 2023), it also highlights an institutional vulnerability: a reliance on personnel who may lack extended administrative experience and specialized technical training in infrastructure management. Although high formal educational attainment among managers generally supports informed decision-making (Vega et al., 2019), our findings indicate that general academic qualifications do not automatically translate into operational competence in sports facility maintenance or green infrastructure management. This dynamic suggests that demographic equity and specialized vocational training must be integrated into national higher education development plans. University governing boards and human resource divisions must establish targeted capacity-building frameworks, technical training certifications in facility operations, and actionable gender equity policies to cultivate a skilled, diverse leadership pipeline (Hassen, 2025).

Facility Infrastructure and Sustainability Challenges

The findings on Facility Infrastructure and Sustainability Challenges demonstrate that inadequate physical infrastructure is not merely a resource constraint, but a systemic barrier to long-term sustainability across Ethiopian universities. Severe gaps in facility quality, safety, and routine maintenance indicate that public higher education institutions in Ethiopia operate primarily under a reactive crisis-management model rather than a strategy of preventative upkeep. University administrators frequently prioritize short-term operational demands over sustainable, long-term facility planning, resulting in premature structural deterioration and reduced safety for student-athletes.

These infrastructure challenges confirm previous studies on facility decay in developing contexts (Talay et al., 2025; Rahman, 2021; Bergsgard, 2025; Naseri et al., 2025), yet extend this literature by proving that infrastructure deficits do not exist in isolation, they operate within a reinforcing loop alongside managerial and financial constraints. Furthermore, the low adoption of green building standards and energy-efficient design reflects a broader African higher education reality: environmental sustainability is often treated as a secondary luxury rather than a core infrastructure requirement (Eime et al., 2013). Facility managers and campus master planners must move away from ad-hoc repairs and adopt standardized, proactive maintenance protocols alongside clear environmental compliance benchmarks for all new and renovated sports venues.

Policy and Governance Framework Gaps

Weak policy frameworks and governance gaps represent a major organizational bottleneck impeding sustainable facility management in Ethiopian universities. The absence of clear, enforceable policies, weak national guidelines, and minimal

integration into broader university strategic plans indicate that sports infrastructure is treated as an auxiliary service rather than an institutional asset. Poor interdepartmental coordination and missing accountability mechanisms mean that mismanaged funds or deferred maintenance frequently go uncorrected. While previous research has highlighted broad governance gaps in facility management (Appleby, 2018; Buys & Tonono, 2007; Elmualim et al., 2009; De Aldama et al., 2024), this study advances existing knowledge by demonstrating that governance failure directly undermines financial resource mobilization and operational leadership in public universities. The disconnect between institutional leadership and national regulatory bodies, such as the Ministry of Education, creates an environment where policies exist on paper but fail completely during field implementation (Ministry of Education, Ethiopia, 2020). Higher education policymakers and ministry officials must establish transparent governance structures, enforce standardized procurement rules, and embed sports facility sustainability metrics directly into university institutional accountability frameworks.

Leadership and Management Capacity

The findings regarding Leadership and Management Capacity Deficits reveal that leadership capacity deficits severely limit the strategic direction and daily operational quality of university sports facilities. Low prioritization by senior university executives, absent performance evaluation systems, and a lack of clear strategic vision lead to administrative inertia. In many Ethiopian universities, campus sports facility management suffers from a lack of executive commitment, leaving facility managers without the administrative authority or strategic clarity required to drive institutional improvement. These results validate prior literature on municipal and public sports services that links weak leadership and lack of formal qualifications to operational inefficiency (Liang, 2023; Mola & Shaw, 2024). However, our study extends these insights into the African university context by showing that leadership deficits cripple the adoption of global best practices, leaving institutions disconnected from contemporary management approaches. Without committed leadership, even well-intentioned strategic plans fail to deliver tangible operational progress. University executive leadership must formally integrate sports facility sustainability into institutional strategic plans, establish key performance indicators (KPIs) for managers, and provide executive mentorship in strategic resource management.

Financial Sustainability and Resource

Financial limitations represent the single most acute bottleneck affecting university sports facility sustainability in Ethiopia. Reliance on static, insufficient institutional budget allocations leave facilities vulnerable to inflation, operational shortfalls, and severe maintenance backlogs. The underutilization of alternative financial mechanisms, such as public private partnerships, facility rental income, alumni sponsorship, and corporate sponsorships, highlights a widespread lack of entrepreneurial resource mobilization

across Ethiopian higher education. These findings confirm existing studies identifying single-source funding dependence as the primary threat to facility survival (Ngcobo et al., 2024; Asrifan et al., 2025; Rahman, 2021). Our study enriches this debate by proving that in developing nations, financial starvation is both a cause and a consequence of poor governance and administrative weakness; institutions with weak management systems fail to attract private investment, which further deepens financial dependency (Opoku & Lee, 2022). University finance directors and facility administrators must actively diversify revenue streams by developing commercial facility leasing frameworks, pursuing corporate partnerships, and establishing dedicated facility maintenance funds.

Sustainable Development of University Sports Facilities

The underdeveloped status of overall facility sustainability across Ethiopian universities underscores a systemic failure to balance the social, environmental, and financial dimensions of facility operations. University sports facilities are rarely managed with long-term strategic lifecycle considerations, limiting their ability to support institutional goals or meet modern sustainability benchmarks. This finding aligns with broader facility management literature calling for holistic, triple-bottom-line integration (Okoro, 2023; Mejía-Manzano et al., 2023; Katsaprakakis et al., 2023). However, our analysis provides new contextual clarity for African higher education: sporadic, isolated green projects (such as simple lighting retrofits) fail to achieve lasting impact unless embedded within a comprehensive institutional strategy (Da Silva et al., 2023; Taye et al., 2025). Sustainable facility development can only occur when physical, administrative, and financial dimensions are unified into a single operational framework.

Leisure Activities Participation Challenges

The study's findings regarding Leisure Activities Participation Challenges demonstrate that the significant connection between facility, quality and student participation in leisure activities (LAP) directly influences student well-being and campus life. While students rely heavily on sports participation for stress relief and mental resilience, inconsistent facility access, safety concerns, and time constraints create substantial barriers to widespread, equitable participation. These results extend prior work on campus recreation access (Gonçalves Maciel, et al., 2026; Maciel et al., 2025; Abrahamson et al., 2025) by establishing that user participation is a primary indicator of institutional sustainability in African higher education. When facilities deteriorate, student engagement drops, diminishing the social value of the infrastructure and weakening the institutional justification for future budget allocations. Furthermore, active stakeholder collaboration, involving coaches, facility managers, and student groups, is essential for building inclusive sports environments that support health and social cohesion across diverse student bodies (Filho et al., 2020; Kaur, 2025).

Empirical Synthesis and Integrative Model

The multiple linear regression model provides robust empirical evidence that maintaining university sports

facilities for long-term viability cannot be achieved through fragmented, ad-hoc interventions in Ethiopian higher education. Physical infrastructure ($\beta = 0.712$, $p < 0.001$) and financial sustainability ($\beta = 0.653$, $p < 0.001$) emerged as the primary determinants, establishing that well-maintained physical assets and diversified, reliable funding streams constitute the fundamental pillars of operational success. However, these two pillars do not function in isolation; they are supported by critical organizational drivers, including leadership capacity ($\beta = 0.387$, $p = 0.003$), enforceable policy and governance structures ($\beta = 0.312$, $p < 0.001$), and active student leisure participation ($\beta = 0.298$, $p = 0.001$).

Together, these five domains account for 71.0% of the variance in sustainable facility development ($R^2 = 0.710$, Adjusted $R^2 = 0.697$, $F(5,94) = 46.1$, $p < 0.001$). Standard diagnostic tests confirmed the statistical validity of the model, demonstrating an absence of multicollinearity (Tolerance: 0.485–0.621; VIF: 1.610–2.062), normally distributed residuals (Kolmogorov-Smirnov $p = 0.200$), and compliance with homoscedasticity assumptions.

Evaluating these empirical patterns corroborates and extends prior research (Varmus et al., 2023; Chapleo, 2010; Uvinya et al., 2025; Vega et al., 2019) by establishing an integrated framework tailored to higher education institutions in Sub-Saharan Africa. The data demonstrates that physical facilities, institutional management, and user engagement are deeply interdependent. Capital investments in sports infrastructure deteriorate rapidly in the absence of clear policy enforcement and sustainable revenue streams. Conversely, strategic leadership vision remains unfulfilled if facilities remain underfunded or physically inaccessible to the student body. Crucially, active student recreation (LAP) serves as an essential operational feedback loop for the entire system: consistent user engagement reinforces the institutional value of these facilities, maintains institutional momentum, and justifies sustained capital investment over time.

Future Research and Practical Implications

Future studies should extend the model by examining environmental efficiency, stakeholder partnerships, and technology integration in sports facility management. Since infrastructure was the strongest predictor of sustainability, research should explore cost-effective renovation strategies, innovative designs, and sustainable financing approaches, including sponsorships, public-private partnerships, commercialisation, and sport-tourism linkages. Longitudinal, cross-country, and qualitative studies involving managers, administrators, coaches, and students are recommended to improve understanding and generalisability. Universities should strengthen preventive maintenance systems, adopt green facility standards, and establish professional sports facility management units. Higher education leaders should diversify funding through partnerships, facility revenue generation, sponsorships, and alumni support while improving policy implementation and staff capacity development.

Study Limitations

This study has several limitations. First, the cross-sectional design limits causal conclusions; therefore, the findings should

be interpreted as predictive rather than causal. Second, the study relied on self-reported survey data, which may not fully represent actual facility conditions, financial resources, or policy implementation. Future research should integrate objective facility audits, financial records, policy documents, longitudinal designs, and cross-country comparisons to improve the validity and generalisability of the findings.

Conclusion

The sustainable development of university sports facilities in Ethiopia depends on strong physical infrastructure, effective financial resource mobilisation, capable leadership, sound governance, and active student leisure participation. Universities should prioritise sustainable facility development, strengthen management systems, diversify funding sources, and encourage student engagement. Long-term sustainability requires an integrated approach combining infrastructure investment, governance improvement, innovative financing, and proactive participation strategies.

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Conflicts of interest

The authors declare no conflicts of interest.

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Критичні проблеми сталого розвитку спортивної інфраструктури університетів в африканському контексті: дозвілля, політика, інфраструктура та лідерство

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 13 с., 12 табл., 2 рис., 57 джерел.

Передумови. Сталий розвиток спортивної інфраструктури університетів має вирішальне значення для спортивних результатів, залучення студентів і довгострокової інституційної сталості. В університетах Ефіопії цей розвиток стримується неналежною інфраструктурою та її технічним обслуговуванням, слабкою реалізацією політики, обмеженими фінансовими ресурсами, низьким рівнем участі в дозвілєвій діяльності та недостатнім потенціалом керівництва й управління.

Мета дослідження. Метою цього дослідження було вивчити ключові чинники, що впливають на сталий розвиток спортивної інфраструктури університетів Ефіопії, зосередивши увагу на інфраструктурі, політиці та врядуванні, потенціалі керівництва й управління, фінансовій стійкості та участі в дозвілєвій діяльності.

Матеріали та методи. Проведено крос-секційне опитування 100 цілеспрямовано відібраних спортсменів, тренерів, менеджерів спортивних об'єктів, адміністраторів, фінансових працівників і фахівців із питань політики державних університетів Ефіопії. Дані збирали за допомогою валідованого опитувальника з 42 пунктів, що охоплював шість змінних. Експлораторний факторний аналіз (EFA) підтвердив конструктну валідність (КМО = 0,812; пояснено 68,4% дисперсії), а надійність шкали була високою (загальний $\alpha = 0,819$). Статистичну потужність перевірено за допомогою G*Power ($1 - \beta > 0,99$). Застосовано описову статистику, кореляцію Пірсона та множинний лінійний регресійний аналіз із діагностикою регресійної моделі (VIF та аналіз залишків).

Результати. Середні значення засвідчили низький або помірний рівень за показниками інфраструктури спортивних об'єктів ($M = 2,74$), участі в дозвілєвій діяльності ($M = 2,69$), політики та врядування ($M = 2,62$), управлінського потенціалу ($M = 2,61$), сталого розвитку спортивних об'єктів ($M = 2,56$) та фінансової стійкості ($M = 2,50$). Множинний регресійний аналіз показав, що п'ять предикторних доменів сукупно пояснювали 71,0% дисперсії сталого розвитку спортивних об'єктів ($R^2 = 0,710$, $F(5, 94) = 46,01$, $p < 0,001$). Інфраструктура спортивних об'єктів ($\beta = 0,712$, $p < 0,001$) та фінансова стійкість ($\beta = 0,653$, $p < 0,001$) були найсильнішими предикторами, за ними йшли управлінський потенціал ($\beta = 0,387$, $p = 0,003$), політика та врядування ($\beta = 0,312$, $p < 0,001$) і участь у дозвілєвій діяльності ($\beta = 0,298$, $p = 0,001$).

Висновки. Результати свідчать, що спортивна інфраструктура університетів Ефіопії стикається із суттєвими структурними та системними проблемами. Досягнення її довгострокової сталості потребує комплексного підходу: підвищення якості інфраструктури, забезпечення диверсифікованого фінансування, посилення управлінського потенціалу, ефективної реалізації політики врядування та сприяння залученню студентів до дозвілєвої діяльності. Комплексне вирішення цих ключових питань є необхідним для створення стійкої та належним чином утримуваної спортивної інфраструктури в закладах вищої освіти.

Ключові слова: африканський контекст, спортивна інфраструктура університетів, дозвілєва діяльність, сталість, врядування, лідерство, фінансова стійкість, інфраструктура.

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