

Article

Project Finance Structuring, Public Sector Participation, and Institutional Capacity on Sustainability of Special Economic Zone Projects in Kenya

Asha Abdi ^{1,*}, Reuben Wambua Kikwatha ²  and Johnbosco M. Kisimbii ³¹ Department of Project Planning & Management, University of Nairobi, Nairobi 00100, Kenya² Department of Management Sciences and Project Planning, University of Nairobi, Nairobi 00100, Kenya; kikwathar@uonbi.ac.ke³ Department of Finance and Accounting, University of Nairobi, Nairobi 00100, Kenya; jkisimbii@uonbi.ac.ke

* Correspondence: aishaabdi13@gmail.com; Tel.: +254-736067118

Abstract

Special Economic Zones (SEZs) have increasingly been adopted worldwide as policy instruments for industrialization, export promotion, and employment creation. However, despite their rapid expansion, the long-term sustainability of SEZ projects remains uneven, particularly in emerging economies such as Kenya, where several zones continue to operate below expected performance levels. Existing studies largely emphasize financial viability while paying limited attention to how governance and institutional factors jointly influence multidimensional sustainability outcomes. This study therefore examines the combined influence of project finance structuring, public sector participation, and institutional capacity on the sustainability of SEZ projects in Kenya. In this study, sustainability is conceptualized through the triple bottom line dimensions of economic, social, and environmental sustainability. The study adopted a cross-sectional research design and collected primary data from stakeholders across SEZ projects using structured questionnaires administered to project managers, government officials, and community representatives. Reliability and validity of measurement instruments were confirmed through Cronbach's alpha and factor analysis, while diagnostic tests verified compliance with regression assumptions. Data were analyzed using descriptive statistics, Pearson correlation, and multiple linear regression techniques. Descriptive findings indicate moderate overall project sustainability, with economic sustainability recording relatively stronger outcomes compared to social and environmental sustainability, suggesting uneven progress across sustainability dimensions. Regression results show that public sector participation emerged as the strongest predictor of SEZ projects' sustainability, followed by institutional capacity, while project finance structuring demonstrated only a moderate relationship and became statistically insignificant when public sector participation and institutional factors were jointly considered. Collectively, the integrated model explained approximately 76.5% of the variation in SEZ projects' sustainability. The study concludes that sustainable SEZ projects in Kenya depends less on project finance structuring alone and more on strong institutional systems and proactive public sector participation capable of balancing economic growth with social and environmental objectives. The findings contribute to policy and practice by emphasizing a shift from finance-centric SEZ projects development toward integrated governance frameworks that promote inclusive and environmentally responsible industrialization.



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1. Introduction

Special Economic Zones (SEZs) have become an important policy instrument for promoting industrialization, export diversification, foreign direct investment attraction, and employment creation across both developed and developing economies. Globally, more than 7000 SEZs operate across over 140 countries, demonstrating their growing importance in global value chain integration and infrastructure-led economic transformation [1,2]. By concentrating infrastructure investment, regulatory facilitation, and fiscal incentives within designated geographic areas, SEZs are intended to reduce investment risks, stimulate industrial activity, and accelerate economic growth. However, increasing global experience indicates that economic expansion alone does not automatically translate into sustainable development outcomes, raising concerns regarding the long-term economic, social, and environmental sustainability of SEZ projects [3].

This study was anchored on the triple bottom line (TBL) theory which views projects as value creators across economic, social, and environmental dimensions [4]. The theory offers a lens for linking project finance structuring to economic outcomes, public sector participation to social engagement, and institutional capacity to environmental sustainability, thereby framing the pursuit of sustainable SEZ projects [5]. In addition, agency theory was applied to explain the principal-agent relationship between stakeholders such as sponsors, government, and project implementers, and how they align interests, manage risks, and resolve conflicts. The social-ecological systems theory emphasized the interdependence between society and the environment, guiding sustainable resource use in project implementation. Finally, institutional theory highlighted the influence of institutional norms and pressures in shaping organizational behavior and decisions that affect project sustainability.

In the context of project management, sustainability has been conceptualized in various ways. Ref. [6] suggested that integrating sustainability within SEZ projects is essential for meeting current financing needs while also ensuring long-term life-cycle stability and delivering social, economic, and environmental benefits. In alignment with approach by [7] the current study measures sustainability across these three dimensions, economic, social, and environmental, providing a comprehensive framework for evaluating the long-term viability of SEZ projects.

From a sustainability perspective, SEZ outcomes remain mixed and contested. While countries such as China and Vietnam have successfully leveraged SEZs to stimulate industrial upgrading, export growth, and employment expansion, empirical evidence also documents social and environmental trade-offs, including land displacement, unequal benefit distribution, labor challenges, and ecological degradation [3,8]. For instance, coastal SEZ developments have been linked to mangrove forest loss and ecosystem disruption, illustrating tensions between rapid industrialization and environmental protection objectives [8]. These contrasting outcomes have generated ongoing debate on whether SEZs function as engines of sustainable development or remain enclaves primarily delivering short-term economic gains.

Across Africa, SEZs are increasingly promoted as mechanisms for inclusive industrialization, regional integration, and structural economic transformation. Despite strong policy commitment, many African SEZs have performed below expectations due to infrastructure financing constraints, weak public sector coordination, and fragile institutional arrangements [9,10]. Experiences from several African countries demonstrate that regulatory inconsistencies, delayed infrastructure delivery, and governance fragmentation undermine investor confidence, job creation, and long-term project sustainability [11,12].

Recent evidence from East Africa further highlights the uneven sustainability performance of SEZ initiatives across the region. In Ethiopia, industrial parks such as Hawassa Industrial Park have achieved rapid export growth and employment generation; however,

studies note challenges related to environmental compliance, labor welfare concerns, and heavy reliance on government subsidies, raising questions about long-term financial and social sustainability [13,14]. Similarly, Rwanda's Kigali Special Economic Zone has demonstrated relatively strong institutional coordination and investor facilitation systems, yet sustainability assessments reveal persistent constraints associated with high infrastructure costs and limited local supply chain integration [15,16].

In Tanzania, the Benjamin William Mkapa SEZ and Export Processing Zones have experienced slower industrial uptake due to policy uncertainty, land acquisition challenges, and insufficient infrastructure financing, which have affected investor retention and project scalability [17,18]. Uganda's Namanve Industrial Park and other industrial zones similarly illustrate the importance of institutional effectiveness; while investment inflows have increased, studies show that weak coordination among regulatory agencies and inadequate skill development programs continue to limit social sustainability outcomes and local economic spillovers [19,20].

These regional experiences demonstrate that the sustainability of SEZs in East Africa depends not only on financial investment but also on strong governance structures, effective public sector participation, and institutional capacity. Kenya reflects a comparable trajectory. Following the enactment of the Special Economic Zones Act of 2015, projects such as Dongo Kundu Special Economic Zone, Naivasha Industrial Park, and Tatu City Special Economic Zone were established to support the country's Vision 2030 development agenda. Nevertheless, recent national assessments indicate that several SEZ projects continue to operate below capacity due to inadequate financial structuring, fragmented governance arrangements, infrastructure gaps, and weak inter-agency coordination mechanisms [21,22].

Existing literature has examined several determinants influencing SEZ performance and sustainability. Studies focusing on project finance structuring (PFS) emphasize its role in capital mobilization, risk allocation, and long-term financial resilience of infrastructure-intensive projects [23,24]. Other research highlights the importance of public sector participation (PSP) through infrastructure provision, regulatory facilitation, and investment incentives as critical drivers of SEZ success [25,26]. A related stream of studies identifies institutional capacity (IC) as central to ensuring compliance, investor confidence, and environmental and social accountability [27,28]. While these studies provide valuable insights, they predominantly examine these determinants independently, often emphasizing single-factor explanations of SEZ performance.

A major limitation of prior research is that SEZ projects operate as complex systems in which financing mechanisms, government participation, and institutional capability function simultaneously rather than separately. Financially well-structured projects may underperform where institutional enforcement is weak, while strong government participation may fail to generate sustainable outcomes in the absence of sound financial architecture. Consequently, analyzing individual determinants in isolation risks overlooking the interactive mechanisms through which these factors jointly influence sustainability outcomes. Global reviews increasingly highlight insufficient empirical evidence explaining how financial, governance, and institutional variables collectively shape economic, social, and environmental sustainability trajectories in SEZ development [3,27].

Furthermore, past studies have largely emphasized short-term economic indicators such as investment inflows, export performance, and employment generation, with limited integration of multidimensional sustainability measures. Within the Kenyan context, existing research has primarily addressed policy frameworks, investment incentives, or infrastructure development challenges, leaving a gap in empirical understanding of how project finance structuring, public sector participation, and institutional capacity jointly influence sustainable SEZ performance. This gap is particularly important given Kenya's

commitment to sustainable industrialization aligned with national development priorities and the Sustainable Development Goals relating to decent work, resilient infrastructure, and responsible industrial growth [29].

Against this background, this study examines the joint influence of project finance structuring, public sector participation, and institutional capacity on the sustainability of SEZ projects in Kenya. Investigating these determinants simultaneously enables assessment of whether governance and institutional conditions strengthen, moderate, or outweigh financial structuring effects in shaping sustainability outcomes.

This study makes three key contributions. First, it advances SEZ scholarship by adopting a multidimensional sustainability perspective encompassing economic viability, social inclusiveness, and environmental performance. Second, it empirically evaluates the combined effects of financial, governmental, and institutional determinants rather than treating them as isolated predictors. Third, it provides context-specific empirical evidence from Kenya, contributing to the limited body of literature on SEZ sustainability within African economies and offering policy-relevant insights for improving long-term effectiveness of SEZ investments.

The findings demonstrate that public sector participation represents the most influential driver of SEZ sustainability in Kenya, followed by institutional capacity, while project finance structuring plays a supportive but comparatively weaker role once governance conditions are considered. These results suggest that sustainable SEZ development is primarily a governance and institutional coordination challenge rather than a purely financial structuring issue.

Conceptual Framework

The hypothesis formulated from the relationships depicted in Figure 1 by the conceptual framework is:

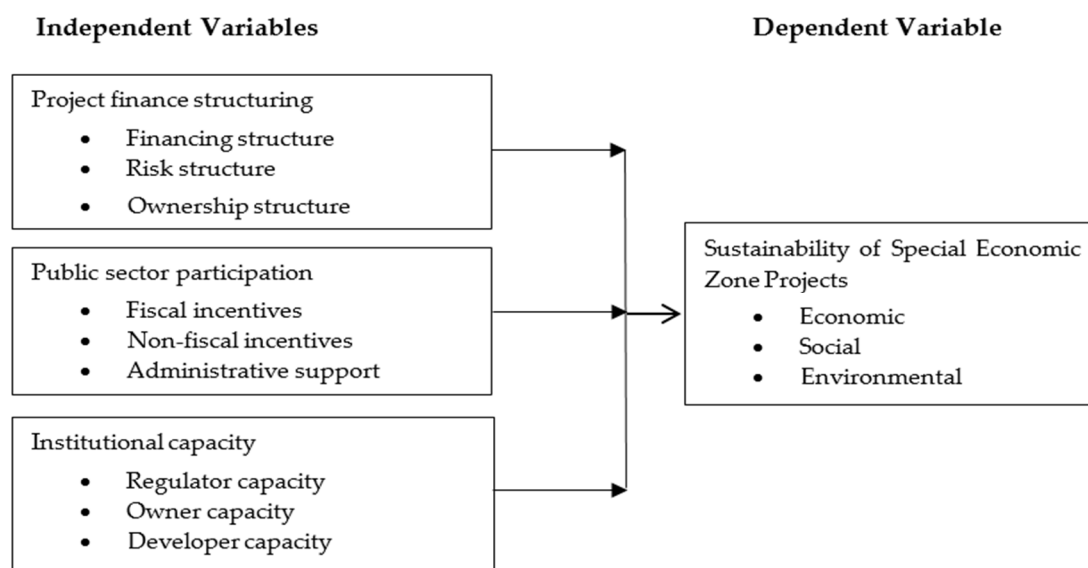


Figure 1. Conceptual Framework.

H1. *Project finance structuring, public sector participation and institutional capacity have no significant joint influence on sustainability of Special Economic Zone projects in Kenya.*

2. Materials and Methods

This study was guided by the positivist research paradigm, which assumes that social phenomena can be objectively measured and analyzed using quantitative techniques to

generate generalizable findings. The paradigm is consistent with contemporary research in project finance, governance, and sustainability assessment, where relationships among measurable constructs are examined using statistical modeling approaches [30,31].

2.1. Variable and Data Source

The study investigated the sustainability of Special Economic Zone (SEZ) projects as the dependent variable, conceptualized through three complementary dimensions: economic viability, social inclusiveness, and environmental sustainability. The independent variables included project finance structuring, public sector participation, and institutional capacity, which were derived from prior empirical and theoretical studies on infrastructure governance and sustainable development [23,25,27]. SEZ project sustainability was measured using a composite index constructed from economic, social, and environmental sustainability indicators based on the triple bottom line framework (Elkington, 1998) [32]. Multiple indicators for each sustainability dimension were measured using a five-point Likert scale. Composite scores for each sustainability dimension were computed using the mean score of validated indicators. Thereafter, the overall SEZ sustainability composite index was obtained by averaging standardized scores of the economic, social, and environmental sustainability sub-indices, with equal weighting assigned to each dimension. This approach ensured aggregation of multidimensional sustainability outcomes into a single measurable variable suitable for regression analysis.

In Kenya, twelve SEZs have been established under the Special Economic Zones Authority (SEZA). As of August 2024, sixty-one projects were operational within these zones, and these projects constituted the unit of analysis for the study. The unit of observation comprised key stakeholders directly involved in SEZ implementation and oversight, including sixty-one project managers, two SEZA officials, eight county government officials, twelve community leaders, two officials from the Ministry of Industrialization, and two environmental experts from the National Environment Management Authority (NEMA).

Given the relatively small and well-defined population, the study adopted a census approach to ensure comprehensive coverage and minimize sampling error. Community leaders were selected using simple random sampling, with one representative drawn from each SEZ to ensure local stakeholder representation. Purposive sampling was applied in selecting government officials and technical experts due to their specialized knowledge and involvement in SEZ planning, regulation, and environmental compliance.

Primary data were collected using a structured questionnaire aligned with the study objectives and hypotheses. The instrument consisted mainly of closed-ended items measured using a five-point Likert scale ranging from strongly disagree to strongly agree which is widely recommended for perception-based empirical studies [33].

The questionnaire was structured into five sections. The first section captures demographic and background information about the respondents. The remaining four sections are aligned with the study's conceptual framework and focus on project finance structuring, public sector participation, institutional capacity, and sustainability of Special Economic Zone (SEZ) projects. The items in each of these sections were measured using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree, thereby ensuring contextual relevance and enabling quantitative analysis of each construct under investigation.

2.2. Research Method

2.2.1. Research Design

The study employed a cross-sectional research design, which enabled the collection of standardized data from multiple SEZ stakeholders at a single point in time [33,34]. The design was appropriate for examining relationships among project finance structuring, public

sector participation, institutional capacity, and sustainability outcomes across different SEZ projects operating under similar policy conditions.

Although SEZ sustainability is inherently a long-term phenomenon that evolves over time, a cross-sectional approach was considered suitable for several reasons. First, SEZ projects in Kenya are currently at varying implementation stages, making it possible to capture comparative sustainability conditions across projects within the same temporal policy environment. Second, the study sought to establish structural relationships among public sector participation, project finance, and institutional capacity determinants rather than measure longitudinal performance trajectories. Third, practical constraints related to data availability, project maturity levels, and institutional access limited the feasibility of longitudinal tracking.

Nevertheless, the cross-sectional design presents limitations in capturing dynamic temporal changes such as policy adjustments, environmental impacts emerging over extended periods, and evolving socio-economic outcomes. Consequently, the findings should be interpreted as reflecting associations observed at a specific time rather than causal developments over time. Future research may adopt longitudinal or panel study designs to track SEZ sustainability performance across multiple years and better assess long-term institutional and financial effects.

2.2.2. Data Analysis Techniques

Data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics, including means and standard deviations, summarized response patterns across study variables. Pearson's correlation analysis examined the direction and strength of relationships among variables, with statistical significance determined at $p < 0.05$. Multiple linear regression analysis was subsequently employed to estimate the predictive influence of the independent variables on SEZ sustainability [35]. Statistical Package for Social Science (v25) was used as the data analysis tool [36].

2.2.3. Model Specification

The joint influence of project finance structuring, public sector participation, and institutional capacity on sustainability of SEZ projects was estimated using the following multiple linear regression model:

$$Y_i = \beta_0 + \beta_1 PFS_i + \beta_2 PSP_i + \beta_3 IC_i + \varepsilon_i$$

where

Y_i represents sustainability of SEZ project i ;

β_0 denotes the regression intercept;

β_1 , β_2 , and β_3 represent coefficients associated with project finance structuring (PFS), public sector participation (PSP), and institutional capacity (IC), respectively;

ε_i represents the stochastic error term.

2.2.4. Handling of Missing Data

The structured questionnaire was initially checked for completeness upon collection. For any incomplete responses, we assessed the extent and pattern of missing data. Cases with more than 10% missing responses were excluded from the analysis. For the remaining items with missing values (less than 5% of the dataset), we applied item-wise mean imputation for continuous-scale items and mode imputation for categorical items. This approach was considered appropriate as the missing data were minimal and assumed to be missing completely at random, ensuring that the final dataset was suitable for descriptive, and regression analyses without introducing significant bias.

2.2.5. Statistical Diagnostics

Prior to regression analysis, statistical assumptions were assessed [37]. Multicollinearity was evaluated using the Variance Inflation Factor (VIF), with values below 5 indicating no serious collinearity [38]. Heteroscedasticity was examined with the Breusch-Pagan test, and robust standard errors were applied when necessary. Principal Component Analysis (PCA) was used to reduce dimensionality and create composite indices for Project Finance Structuring, Public Sector Participation, and Institutional Capacity, as it efficiently summarizes correlated survey items into uncorrelated components while retaining maximum variance [39]. Scale reliability was confirmed with Cronbach's alpha (>0.70) and construct validity through expert review and convergent validity [38].

2.2.6. Response Rate

Primary data was gathered through 87 valid scripts from the fieldwork. Sixty-one (61) were for SEZ project managers, two (2) for officials from the Special Economic Zone Authority (SEZA), eight (8) for county government officials, twelve (12) for community leaders, two (2) for officials from the Ministry of Industrialization, and environmental experts from the National Environment Management Authority (NEMA), respectively. For the project managers, 58 out of 61 responded, representing a 95.1% response rate. The SEZA officials, Ministry of Industrialization officials, and NEMA experts had a 100% response rate. Conversely, the response rate among county government officials was 75%, with 6 out of 8 participating, while among community leaders, all 12 responded, yielding a rate of 100%. Overall, achieving a response rate of 94.3%, equivalent to 82 out of the 87 targeted respondents.

3. Results

3.1. Validity and Reliability Test Results

Validity and Reliability

Instrument validity was assessed through several procedures prior to main data collection. Content validity was established through expert review involving academic supervisors, peers, and subject specialists whose recommendations guided refinement of questionnaire items [33]. Construct validity was evaluated using exploratory factor analysis. Sampling adequacy was confirmed through Kaiser–Meyer–Olkin (KMO) statistics and Bartlett's Test of Sphericity [2,40].

For project finance structuring, the KMO value was 0.698 and Bartlett's Test was significant ($\chi^2 = 5468.875$, $df = 496$, $p = 0.000$), confirming factorability. Public sector participation recorded a KMO value of 0.739 with significant Bartlett's Test results ($\chi^2 = 5253.404$, $df = 561$, $p = 0.000$). Institutional capacity achieved a KMO value of 0.806 ($\chi^2 = 4455.330$, $df = 595$, $p = 0.000$), while sustainability of SEZs recorded a KMO value of 0.716 ($\chi^2 = 3947.803$, $df = 703$, $p = 0.000$). Rotated component matrices produced satisfactory composite loading scores exceeding acceptable thresholds, confirming construct adequacy.

Reliability was assessed using Cronbach's alpha coefficients to test internal consistency of measurement scales. Project finance structuring recorded an alpha coefficient of 0.987 across 31 items; public sector participation recorded 0.986 across 34 items; institutional capacity recorded 0.982 across 35 items; and sustainability of SEZs recorded 0.977 across 38 items. All values exceeded the recommended threshold of 0.70, indicating excellent reliability and consistency of measurement items.

3.2. Demographic Information of Respondents

The results presented in Table 1 summarize the demographic characteristics of the surveyed Special Economic Zone (SEZ) projects in Kenya. Most respondents had between 6

and 10 years of SEZ industry experience (70.7%), while 22.4% reported 1–5 years and 6.9% had more than 10 years of experience, indicating that the majority possessed moderate industry exposure suitable for providing informed responses. With respect to project financing sources, concessional loans constituted the largest share (24.1%), followed by government grants (19.0%), private sector equity (17.2%), development partner grants (15.5%), commercial loans (13.8%), and government equity (10.3%), suggesting reliance on a combination of public, private, and development financing mechanisms. In terms of ownership classification, foreign-owned SEZs accounted for the largest proportion of projects (39.7%), followed by private SEZs (27.6%), hybrid SEZ arrangements (18.9%), and public SEZs (13.8%), indicating the presence of diverse ownership structures involving both domestic and international investors alongside government participation.

Table 1. Respondent's and SEZ Projects Characteristics.

Variable	Category	N	Percentage (%)
Experience in SEZ Projects	1–5 years	13	22.4
	6–10 years	41	70.7
	>10 years	4	6.9
SEZ Projects Financing Sources	Commercial loans	8	13.8
	Concessional loans	14	24.1
	Development partner grants	9	15.5
	Government equity	6	10.3
	Government grants	11	19.0
	Private sector equity	10	17.2
SEZ Projects Ownership	Foreign Owned SEZ	23	39.7
	Hybrid SEZ	11	18.9
	Private SEZ	16	27.6
	Public SEZ	8	13.8

3.3. Descriptive Analysis of Study Variables

3.3.1. Project Finance Structuring Descriptive Statistics

This section presents the descriptive statistics for project finance structuring indicators, which was the study predictor variable, based on the responses collected using a five-point Likert scale, where 1 represents “Strongly Disagree” and 5 represents “Strongly Agree”.

The results shown in Table 2 revealed that financing structure indicators recorded moderate agreement, with government equity, private equity, commercial bank loans, and concessional loans scoring between mean = 3.45 and mean = 3.52, showing that respondents moderately agreed that financing options for SEZ projects are accessible and supportive.

Ownership structure showed strong agreement as well, with private ownership enhancing sustainability [mean = 3.60, SD = 1.313], increased public ownership supporting sustainability [mean = 3.59, SD = 1.448], and clear ownership structures facilitating conflict resolution and capital decisions (mean values ranging from 3.51 to 3.55). Overall, project finance structuring across financial, risk, and ownership structures was moderately rated, suggesting that these components play a meaningful role in supporting the sustainability of SEZ projects.

Risk structure was rated highest, with risk-sharing mechanisms recording the strongest score [mean = 3.68, SD = 1.332], followed by the use of risk management tools [mean = 3.63, SD = 1.374], clear risk response strategies [mean = 3.60, SD = 1.387], and continuous risk assessment [mean = 3.45, SD = 1.344]. This indicates that risk mitigation practices were viewed as important components of project finance structuring.

Table 2. Project finance structuring.

PFS Dimensions	Statements	Mean	Std. Deviation
Financing structure	Government equity financing is readily available, accessible, and faster to secure.	3.52	1.335
	Private equity financing is readily available, accessible, and faster to secure.	3.45	1.389
	Commercial bank loans are readily available, accessible, and faster to secure.	3.52	1.372
	Concessional loans are readily available and accessible for SEZ projects.	3.49	1.336
Ownership structure	The project maintains a clear project financing structure outlining each project participant's shareholding.	3.54	1.390
	Public ownership improves sustainability of SEZ projects.	3.49	1.381
	Private ownership leads to improved project sustainability.	3.60	1.313
	Increase in public ownership in SEZ leads to project sustainability.	3.59	1.448
	The project's ownership structure facilitates efficient capital raising and investment decisions.	3.51	1.317
	The ownership structure provides clear mechanisms for resolving conflicts between shareholders.	3.55	1.316
Risk structure	The identified risks were properly allocated among the different parties engaged.	3.40	1.404
	The project conducted continuous project risk assessment at every stage of the project's lifecycle.	3.45	1.344
	The project used risk management tools to accurately mitigate the risk exposure of the project.	3.63	1.374
	The project had a clear risk response strategy to address potential threats and uncertainties.	3.60	1.387
	Risk-sharing mechanisms such as insurance, guarantees, or contractual clauses were put in place to cushion against losses.	3.68	1.332

3.3.2. Public Sector Participation Descriptive Statistics

This section presents the descriptive statistics for public sector participation indicators, which was the study moderating variable, based on the responses collected using a five-point Likert scale, where 1 represents “Strongly Disagree” and 5 represents “Strongly Agree”.

The results presented in Table 3 indicated that fiscal incentives were rated highly, with wage subsidies recording the strongest rating [mean = 4.10, SD = 1.140], followed by investment tax credits and green investment support, both at mean = 4.05. Preferential withholding tax rates [mean = 4.01, SD = 1.138] and accelerated depreciation allowances [mean = 3.96, SD = 1.201] also showed strong agreement. Overall, fiscal incentives were viewed as important drivers of SEZ attractiveness.

Non-fiscal incentives also received high ratings, particularly the availability of reliable infrastructure [mean = 4.01, SD = 1.094] and expatriate support services [mean = 4.00, SD = 1.100]. Job training programs were moderately rated (means between 3.94 and 3.99), indicating general agreement that these interventions strengthen the SEZ labor market and operational environment.

Administrative support was moderately rated, with most items ranging between mean = 3.61 and mean = 3.91. Efficient one-stop-shop services [mean = 3.91, SD = 1.188], dispute resolution mechanisms [mean = 3.85, SD = 1.188], and support for accessing

international markets [mean = 3.85, SD = 1.198] were viewed positively, though overall administrative support scored slightly lower than fiscal and non-fiscal incentives.

Table 3. Public sector participation.

Statements	Mean	Std. Deviation
The SEZ projects enjoy preferential withholding tax rates.	4.01	1.138
The SEZ projects have been provided with tax holidays.	3.89	1.227
The SEZ projects enjoy investment tax credits when they set up shop in SEZ.	3.78	1.267
The projects under SEZ are provided with accelerated depreciation allowances.	3.96	1.201
The SEZ projects have benefited from tax support on greenfield investments.	4.00	1.133
The tax rates offered in the SEZ are competitive compared with other investment locations.	3.99	1.128
The duration of tax holidays provided is sufficient to attract and retain investors.	3.96	1.170
The investment tax credit system effectively encourages capital investment in the SEZ.	4.05	1.132
The green investment support through fiscal incentives promotes sustainable development in SEZ.	4.05	1.110
The SEZ projects are awarded wage subsidies by the government.	4.10	1.140
The SEZs benefit from job training, which enriches the labor market.	3.99	1.181
The government supports SEZ projects with expatriation support.	3.80	1.281
Infrastructure development in SEZ includes reliable power, water, and transportation networks.	4.01	1.094
The job training programs effectively address the skill gaps in the local workforce.	3.94	1.180
The expatriate support services facilitate smooth relocation of international personnel.	4.00	1.100
The government's infrastructure investment has enhanced SEZ connectivity to major markets.	3.76	1.243
The government maintains efficient one-stop-shop services.	3.91	1.188
The government ensures coordination among different agencies.	3.80	1.261
The public sector maintains effective dispute resolution mechanisms.	3.85	1.188
The public sector provides adequate business development support.	3.61	1.284
The government provides support for accessing international markets.	3.85	1.198

3.3.3. Institutional Capacity Descriptive Statistics

This section presents the descriptive statistics for institutional capacity indicators, which was the study intervening variable, based on the responses collected using a five-point Likert scale, where 1 represents “Strongly Disagree” and 5 represents “Strongly Agree”.

The results presented in Table 4 revealed that regulator capacity was rated positively, with the provision of external infrastructure scoring highest [mean = 4.07, SD = 1.075], indicating strong agreement that regulatory support enhances SEZ development. The regulator's ability to efficiently review SEZ projects [mean = 3.93, SD = 1.215] and enforce compliance with SEZ laws [mean = 3.85, SD = 1.278] also showed moderate-to-high agreement, suggesting a generally effective regulatory environment.

Owner capacity received the strongest ratings among the three indicators. The responsibility for financing land acquisition scored highest overall [mean = 4.20, SD = 1.082], followed by effective resettlement and livelihood restoration for displaced persons [mean = 4.17, SD = 1.174]. Transparent selection of developers through objective scoring and tendering [mean = 4.09, SD = 1.135] and effective land management systems [mean = 3.94, SD = 1.280] further indicate strong owner capacity in supporting the implementation of SEZs.

Developer capacity showed moderate agreement, with administrative service provision scoring between mean = 3.80 and mean = 3.91. Pre-construction activities such as

grading and leveling were also moderately rated [mean = 3.80, SD = 1.290], suggesting that developers perform essential preparation tasks adequately. Overall, institutional capacity was rated favorably across regulator, owner, and developer dimensions, with owner capacity emerging strongest in terms of supporting the success of SEZ projects.

Table 4. Institutional capacity.

Statements	Mean	Std. Deviation
The SEZ regulator efficiently reviews proposed SEZ construction projects and confirms their viability in light of the developed SEZ plan.	3.93	1.215
Independent institutions are tasked with conducting feasibility studies on the proposed SEZs by taking into account project commercial viability.	3.89	1.267
Effectively, the regulator coerces all parties into abiding by SEZ laws, rules, and regulations.	3.85	1.278
In order to promote SEZ projects, the regulator has supplied external infrastructure, such as access roads and power generation.	4.07	1.075
The SEZ owner is responsible for financing land acquisition for an SEZ project.	4.20	1.082
The SEZ project owners have effectively resettled displaced people and offered livelihood opportunities to those displaced.	4.17	1.174
The owner employed an objective scoring system to choose a developer and operator for the SEZ and held a legal tender to choose the developer.	4.09	1.135
The SEZ owner has implemented effective land management systems and procedures.	3.94	1.280
The owner has established clear criteria for evaluating and selecting project partners.	3.83	1.275
Grading and leveling have been carried out on the SEZ land in addition to any other pre-construction tasks to guarantee sustainability.	3.80	1.290
The SEZ has the capacity to offer administrative services to investors, including collecting rental and utility payments on behalf of a developer.	3.91	1.288

3.3.4. Sustainability of Special Economic Zone Project Descriptive Statistics

This subsection presents the descriptive statistics for the sustainability of Special Economic Zone (SEZ) projects, based on respondent ratings on a five-point Likert scale where 1 corresponds to “Strongly Disagree” and 5 to “Strongly Agree”.

The descriptive results presented in Table 5 indicate that economic sustainability indicators were rated moderately high, with increased exports, GDP contribution, employment creation, and foreign direct investment scoring between mean = 3.38 and mean = 3.57. These findings suggest that SEZ projects are widely perceived as effective instruments for stimulating regional economic growth and investment attraction, consistent with studies showing that SEZs primarily emerge as economic development tools aimed at export promotion and industrial expansion [9,10].

Environmental sustainability recorded the highest overall ratings among the three sustainability dimensions. Indicators such as promotion of green communities (mean = 3.79), adoption of efficient environmental technologies (mean = 3.70), and integration of renewable energy infrastructure (mean = 3.66) received strong agreement. The relatively higher ecological scores may be attributed to the growing global emphasis on environmentally compliant industrial zones and green infrastructure standards required by international investors and development partners [11]. Modern SEZ developments increasingly integrate energy efficiency, resource conservation, and low-carbon technologies during the design stage, making environmental sustainability more visible and measurable compared to social outcomes [12].

Table 5. Sustainability of SEZ projects.

Sustainability Dimension	Statements	Mean	Std. Deviation
Economic sustainability	The SEZ project has significantly increased job opportunities in the region.	3.46	1.390
	The SEZ project contributes significantly to the region's GDP.	3.57	1.432
	The SEZ projects have led to an increase in exports.	3.38	1.471
	The foreign direct investment has increased.	3.54	1.372
Environmental sustainability	The SEZ has adopted green technologies to ensure sustainability.	3.65	1.299
	The energy is conserved and well managed in the zone, i.e., turning off the lights during the daytime.	3.48	1.459
	The zone uses efficient technologies to reduce environmental impacts.	3.70	1.321
	The SEZ's designs prioritize daylight utilization, reducing dependency on artificial lighting.	3.62	1.471
	Renewable energy installations (e.g., solar panels) are visibly integrated into the SEZ's infrastructure	3.66	1.239
	The SEZ projects has encouraged green communities.	3.79	1.293
	The water sources used to supply water to the Free Zone are sustainable and cannot be depleted.	3.52	1.317
	The SEZ uses efficient fixtures when distributing and using water to reduce carbon footprint.	3.33	1.441
	The SEZ has contributed significantly to the development of local infrastructure (e.g., roads, schools, healthcare facilities).	3.54	1.326
	The SEZ strictly prohibits child labor and regularly monitors compliance with these regulations.	3.49	1.408
Social sustainability	The SEZ partners with local organizations to promote education and child welfare as alternatives to child labor.	3.50	1.345
	Workers in the SEZ have access to fair wages, benefits, and opportunities for skill development.	3.24	1.462
	The SEZ regularly audits businesses to ensure compliance with labor standards and ethical practices.	3.46	1.381

In contrast, social sustainability recorded comparatively lower ratings, particularly regarding fair wages and worker development opportunities (mean = 3.24). While respondents acknowledged improvements in employment and infrastructure development, perceptions relating to labor welfare, inclusive growth, and social equity remained moderate. This pattern aligns with prior research indicating that SEZs often prioritize economic competitiveness and investment attraction during early development phases, while social welfare improvements tend to evolve gradually as institutional and regulatory systems mature [9]. The lower social sustainability scores therefore suggest that although SEZs generate employment opportunities, challenges remain in translating economic gains into equitable labor conditions and long-term community benefits.

3.4. Correlation Analysis Results

Correlation analysis was conducted to establish the strength and direction of the linear relationships among project finance structuring, public sector participation, institutional capacity, and the sustainability of Special Economic Zone (SEZ) projects.

The results presented in Table 6 revealed that project finance structuring had a positive and moderate relationship with the sustainability of Special Economic Zone projects ($r = 0.532$, $p < 0.05$). Public sector participation showed a positive and very strong re-

relationship with SEZ sustainability ($r = 0.867$, $p < 0.05$), and institutional capacity also demonstrated a positive and strong relationship with sustainability ($r = 0.742$, $p < 0.05$). Overall, the findings indicate that all three variables, project finance structuring, public sector participation, and institutional capacity, have linear, positive, and statistically significant relationships with the sustainability of Special Economic Zone projects.

Table 6. Correlation results.

		Project Finance Structuring	Public Sector Participation	Institutional Capacity	Sustainability of Special Economic Zone Projects
Project Finance Structuring	Pearson Correlation	1			
Public Sector Participation	Pearson Correlation Sig. (1-tailed)	0.598 ** 0.000	1		
Institutional Capacity	Pearson Correlation Sig. (1-tailed)	0.564 ** 0.000	0.773 ** 0.000	1	
Sustainability of Special Economic Zone Projects	Pearson Correlation Sig. (1-tailed)	0.532 ** 0.000	0.867 ** 0.000	0.742 ** 0.000	1

** Correlation is significant at the 0.05 level (1-tailed).

3.5. Hypothesis Testing

This section presents the hypothesis testing results concerning the joint influence of project finance structuring, public sector participation, and institutional capacity on the sustainability of Special Economic Zone (SEZ) projects in Kenya. The null hypothesis (H1) posits that project finance structuring, public sector participation, and institutional capacity have no significant joint influence on the sustainability of Special Economic Zone projects in Kenya. To evaluate this claim, a multiple regression model was applied to test the collective explanatory power of the independent variables on the dependent variable.

The results in Table 7 showed that project finance structuring, public sector participation, and institutional capacity had a high explanatory power on the sustainability of Special Economic Zone projects. The coefficient of determination was $R^2 = 0.765$, and adjusted $R^2 = 0.756$. This means that the joint effect of the three variables explained 75.6% of the variation in SEZ sustainability, while the remaining 24.4% was accounted for by other factors not included in the model.

The ANOVA results confirmed that the overall model was statistically significant ($F = 84.485$, $p = 0.000 < 0.05$). Therefore, the null hypothesis was rejected, indicating that project finance structuring, public sector participation, and institutional capacity jointly have a significant effect on the sustainability of Special Economic Zone projects.

Regarding individual significance, the constant term was not significant ($p = 0.854$). Project finance structuring also had no significant effect ($p = 0.912$), as its p -value exceeded the 0.05 significance level. However, public sector participation ($p = 0.000$) and institutional capacity ($p = 0.045$) were significant predictors of sustainability, since their p -values were below the 0.05 threshold.

The resulting prediction model was as follows:

$$\text{Sustainability of SEZs} = 0.044 - 0.007\text{PFS} + 0.733\text{PSP} + 0.184\text{IC}$$

This implies that a one-unit increase in public sector participation would, on average, increase SEZ sustainability by 0.733 units, while a one-unit increase in institutional

capacity would increase sustainability by 0.184 units. Project finance structuring showed no meaningful contribution to the model.

Table 7. Multiple regression analysis results.

(a) Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
F Change	df1	df2							
1	0.874 ^a	0.765	0.756	0.46236	0.765	84.485	3	78	0.000
(b) Goodness-of-Fit ANOVA									
Model	Sum of Squares		df		Mean Square		F		Sig.
2	Regression		54.183		3		18.061		0.000 ^a
	Residual		16.675		78		0.214		
	Total		70.858		81				
(c) Beta Coefficients									
Model		Unstandardized Coefficients			Standardized Coefficients		t	Sig.	
		B	Std. Error		Beta				
3	(Constant)		0.044	0.240				0.184	0.854
	Project Finance Structuring		−0.007	0.060		−0.008		−0.111	0.912
	Public Sector Participation		0.733	0.091		0.733		8.046	0.000
	Institutional Capacity		0.184	0.090		0.180		2.036	0.045

^a Predictors: (constant) institutional capacity, project finance structuring, and public sector participation; dependent variable: sustainability of Special Economic Zone projects.

Based on the unstandardized coefficients, public sector participation had the greatest influence on sustainability ($\beta = 0.733$), followed by institutional capacity ($\beta = 0.184$). Therefore, enhancing public sector participation would yield the greatest improvement in the sustainability of Special Economic Zone projects.

4. Discussion

The Pearson correlation results revealed that all three independent variables had positive and significant relationships with SEZ sustainability at $p < 0.05$. Project finance structuring showed a moderate positive correlation ($r = 0.532$), suggesting that structured financing arrangements such as risk allocation mechanisms, blended finance, and long-term funding frameworks support sustainable SEZ implementation. Institutional capacity demonstrated a strong positive relationship ($r = 0.742$), emphasizing the importance of regulatory effectiveness, governance quality, and developer competence. Public sector participation exhibited the strongest correlation ($r = 0.867$), highlighting the central role of government incentives, policy coordination, and administrative facilitation in achieving sustainable SEZ outcomes. Similar findings have been reported in global SEZ studies emphasizing that successful SEZs depend heavily on proactive government involvement [11,12].

Multiple regression analysis further quantified the joint contribution of the predictors. The model demonstrated strong explanatory power ($R = 0.874$; $R^2 = 0.765$; Adjusted $R^2 = 0.756$), indicating that 76.5% of variation in SEZ sustainability was explained collectively by project finance structuring, public sector participation, and institutional capacity.

Although project finance structuring exhibited a significant bivariate correlation with sustainability, it became statistically insignificant in the joint regression model ($\beta = -0.007$, $p = 0.912$). This outcome suggests the presence of mediating or moderating effects within the model. One plausible explanation is that financing mechanisms influence sustainability indirectly through institutional capacity and public sector participation. Effective financial structuring may only translate into sustainability outcomes when supported by strong governance frameworks, regulatory enforcement, and coordinated public policies [41]. Without institutional oversight, financial arrangements alone may not guarantee environmental or social sustainability outcomes.

Additionally, contextual factors specific to SEZ development may explain the non-significant coefficient. In many developing economies, governments play a dominant role in land provision, infrastructure development, and investor facilitation. Consequently, public sector participation and institutional capacity may absorb much of the explanatory power that might otherwise be attributed to financing structures. Similar observations have been reported in comparative SEZ evaluations emphasizing institutional effectiveness often outweighs financing arrangements in determining SEZ performance [9].

Similarly, within the African context, studies in Ethiopia and Rwanda highlight that public sector facilitation, policy coordination, and regulatory oversight often outweigh standalone financial structuring in influencing SEZ outcomes [9,41]. These comparative perspectives suggest that the observed Kenyan pattern is consistent with broader global trends, where sustainability is achieved not merely through financing but through the effective interplay of governance and institutional mechanisms.

The findings therefore imply that project finance structuring functions primarily as an enabling mechanism rather than a direct driver of SEZ projects' sustainability. Project finance structuring creates investment feasibility, ownership structuring, and risk structuring, but sustainability outcomes depend more strongly on public sector participation quality, regulatory enforcement, and government coordination. This explains why project finance structuring shows moderate correlation independently but loses significance when institutional and public sector variables are simultaneously considered. Overall, the study demonstrates that strengthening public sector participation and institutional capacity represents the most effective pathway toward enhancing SEZ sustainability, while improvements in financial structuring should be integrated with broader governance and policy frameworks to achieve meaningful long-term impacts.

4.1. Policy Implications

Based on the findings, several policy and practical recommendations emerge. First, national and county governments should strengthen inter-agency coordination mechanisms among investment authorities, infrastructure agencies, environmental regulators, and labor institutions. Improved coordination would enhance the effectiveness of public sector participation, which emerged as the strongest predictor of sustainability.

Second, policy makers should expand social sustainability interventions within SEZs. These may include wage support programs, skill development initiatives, and incentives tied to labor welfare compliance. Introducing targeted wage subsidies or training grants for firms operating within SEZs can improve employment quality and address the comparatively lower social sustainability performance identified in the study.

Third, institutional capacity should be reinforced through continuous regulatory reforms, professionalization of SEZ management authorities, and adoption of digital governance systems to improve monitoring, compliance enforcement, and transparency. Strengthening institutional oversight can ensure that environmental and social sustainability standards are maintained alongside economic growth objectives.

Fourth, although project finance structuring was not a direct predictor of sustainability, policymakers should integrate financing models with governance and institutional reforms. Blended finance approaches, public–private partnerships, and sustainability-linked financing instruments may become more effective when aligned with strong institutional frameworks and public policy support.

4.2. Theoretical Implications

The study contributes to sustainability and development theory by demonstrating that institutional and public sector participation factors exert stronger influence on SEZ sustainability than purely financing, risk, and ownership mechanisms. The findings reinforce institutional theory by highlighting the role of governance quality and regulatory effectiveness in shaping sustainable development outcomes. Additionally, the results extend public participation perspectives by confirming that government coordination acts as a catalyst linking investment, environmental performance, and social outcomes within SEZ ecosystems.

4.3. Practical Implications

For practitioners, including SEZ developers, investors, and policy implementers, the findings underscore the importance of collaborative governance models. Sustainable SEZ development requires coordinated engagement between government agencies, private developers, and local communities rather than reliance on financial structuring alone. Developers should therefore prioritize compliance systems, stakeholder engagement, and sustainable infrastructure planning during SEZ design and implementation.

5. Conclusions

This study examined the determinants of sustainability of Special Economic Zone (SEZ) projects in Kenya by analyzing the influence of public sector participation, institutional capacity, and project finance structuring. The findings demonstrate that public sector participation is the most significant determinant of SEZ sustainability. The multiple regression results ($\beta = 0.733$, $p = 0.000$) and strong correlation ($r = 0.867$) indicate that government involvement through fiscal incentives, infrastructure provision, policy coordination, and administrative facilitation plays a central role in enhancing economic, ecological, and social sustainability outcomes of SEZ projects.

Institutional capacity was also found to significantly influence SEZ sustainability ($\beta = 0.184$, $p = 0.045$; $r = 0.742$). The findings suggest that effective regulatory systems, competent zone management authorities, transparent governance structures, and capable developers are essential for ensuring efficient project implementation and long-term sustainability performance. Strong institutions enable enforcement of environmental standards, labor regulations, and investment policies, thereby supporting balanced sustainability outcomes.

Project finance structuring, although positively correlated with sustainability ($r = 0.532$), was not statistically significant in the joint regression model ($\beta = -0.008$, $p = 0.912$). This implies that financing arrangements alone do not directly drive sustainability outcomes when institutional and public sector factors are taken into account. Rather, financial structuring appears to function as an enabling mechanism whose effectiveness depends on supportive governance environments and coordinated public sector involvement.

The descriptive analysis further revealed that environmental sustainability recorded the highest ratings, suggesting that SEZ projects have made notable progress in adopting green technologies, efficient resource utilization, and environmentally responsive infrastructure. Economic sustainability indicators were moderately strong, reflecting improvements in exports, foreign direct investment, and regional economic performance. However, social

sustainability indicators recorded comparatively lower scores, particularly regarding fair wages, labor welfare, and workforce development opportunities, indicating areas requiring targeted policy attention.

6. Limitations of the Study

Despite its contributions, the study has several limitations. First, the research relied primarily on cross-sectional data, which limits the ability to observe sustainability outcomes over time. Longitudinal studies could provide deeper insight into how SEZ sustainability evolves across different project life-cycle stages. Second, the study focused on selected determinants of sustainability; other potential factors such as technological innovation, investor behavior, global market dynamics, and community participation were not included in the model. Third, the use of perception-based survey responses may introduce respondent bias, as sustainability outcomes were assessed based on stakeholder perceptions rather than exclusively objective performance indicators.

7. Future Research Directions

Future studies should adopt longitudinal research designs to examine how sustainability outcomes change as SEZ projects mature. Comparative studies across multiple countries or regions would also help determine whether the dominance of public sector participation observed in Kenya holds in different institutional contexts. Further research may also explore mediating or moderating variables, such as governance quality, stakeholder engagement, or innovation capability, to better explain the indirect role of project finance structuring identified in this study. Additionally, integrating quantitative performance indicators such as emissions reduction data, employment quality metrics, and investment productivity measures would strengthen empirical assessment of SEZ sustainability.

Overall, the study concludes that sustainable SEZ development in Kenya depends less on financial structuring alone and more on strong public sector leadership, institutional effectiveness, and deliberate policy interventions that balance economic growth with environmental stewardship and social inclusion.

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