Research Article

Assessing the Triple Bottom Line: A Cross-Sectional Analysis of Economic, Social, and Environmental Sustainability in Contemporary Development Projects

Saeed Angorani*

Research Scholar, Lisbon School of Economics & Management (ISEG), University of Lisbon, Portugal

Corresponding author: Saeed Angorani, Research Scholar, Lisbon School of Economics & Management (ISEG), University of Lisbon. 1649-004 Lisbon, Portugal.

Abstract

Purpose: The purpose of this research is to investigate the interrelationships between economic, social, and environmental components in modern development initiatives, as well as their implications for sustainability. The main goal is to decipher the complex dynamics and consequences of various variables in order to provide insights for holistic project planning and decision-making.

Design/Methodology/Approach: A cross-sectional study was carried out utilising a questionnaire-based survey distributed to 500 participants in various development programmes. The study used statistical analyses such as Pearson correlation coefficients and t-tests to investigate the links between economic, social, and environmental variables, as well as their influence on social and environmental sustainability.

Findings: The findings show substantial relationships between economic performance and favourable social and environmental indices, highlighting the interconnectivity of the two. Furthermore, a significant association was discovered between Economic, Social, and Environmental Indicators and the social impact on local communities and stakeholders.

Originality/Value: This study adds new perspectives by objectively illustrating the interdependence of economic, social, and environmental factors in development programmes. The study emphasises the need of evaluating various variables concurrently for informed decision-making and long-term project results.

Keywords: Triple Bottom Line; Environmental sustainability; Holistic planning; Stakeholder Engagement

Introduction

In this epoch characterized by unparalleled global challenges and expeditious socio-economic transformations, the necessity for sustainable development has become more pronounced than ever before [1]. At the very core of this conceptual framework lies the notion of the Triple Bottom Line (TBL), a concept that has garnered considerable prominence as a comprehensive measure of organizational and developmental success [2]. The Triple Bottom Line effectively integrates three fundamental pillars of sustainability, namely the economic, social, and environmental aspects. The evaluation of economic sustainability entails a thorough assessment of financial viability, profitability, and resource allocation, ensuring that development projects make substantial contributions to the long-term economic well-being [3]. On the other hand, social sustainability meticulously takes into account the impacts on communities, stakeholders, and the broader society, with the ultimate goal of fostering inclusivity, equity, and overall well-being [4]. Lastly, the concept of environmental sustainability is concerned with the examination and evaluation of the ecological

repercussions that arise from various projects, with the ultimate goal of minimizing any negative impact and promoting responsible management of resources. In the scope of this particular research, we undertake a comprehensive analysis of contemporary development projects using a cross-sectional approach, whereby we critically assess the performance of these initiatives by referring to the Triple Bottom Line framework [5]. The primary objective of our study is to shed light on the intricate interplay between the economic, social, and environmental dimensions within the context of diverse development endeavours [6]. Through a deep exploration of the complex dynamics at play within these projects, our aim is to identify recurring patterns, potential challenges, and opportunities that can serve as valuable insights for future undertakings, thereby contributing to a more comprehensive and nuanced understanding of sustainable development. As we embark on this intellectual journey, it is crucial to acknowledge and appreciate the ever-evolving nature of development paradigms and the crucial need to strike a delicate balance between progress and preservation [7]. Given the multifaceted nature of the Triple Bottom Line, an interdisciplinary approach becomes imperative, necessitating the incorporation of insights from various disciplines such as economics, sociology, environmental science, and other relevant fields. By doing so, we aspire to transcend narrow and isolated perspectives, fostering a more integrated and comprehensive understanding of sustainability that aligns with the broader global agenda for a resilient and harmonious future. Through this comprehensive analysis, we aspire to shed light on the intricate tapestry of contemporary development projects, their impact on diverse dimensions of sustainability, and the potential pathways toward a more balanced and inclusive future [7]. As we embark on this investigation, the importance of assessing the Triple Bottom Line cannot be overstated. Traditional models of development often focused solely on economic indicators, neglecting the interconnectedness of social and environmental factors. The realization that a comprehensive understanding of development must account for these three pillars has prompted a paradigm shift in how we conceive, plan, and implement projects on local, national, and global scales [8]. The contemporary global landscape is characterized by complex and intertwined challenges – from climate change and resource depletion to social inequality and economic disparities. To address these challenges effectively, it is imperative that development initiatives go beyond mere economic growth metrics and consider their broader impacts. By adopting the Triple Bottom Line framework, we not only acknowledge the intricate web of relationships between economic, social, and environmental aspects but also recognize the inherent interdependence of these elements in shaping the trajectory of human progress [9].

However, the assessment of the Triple Bottom Line is not without its challenges. Balancing competing interests and priorities across these three dimensions requires nuanced methodologies and comprehensive metrics. Moreover, the dynamic and context-specific nature of development projects adds a layer of complexity to this evaluation [10]. Nevertheless, it is precisely these challenges that make the assessment of the Triple Bottom Line a compelling

and necessary endeavour [11]. By confronting these complexities head-on, we gain valuable insights that can guide the refinement of existing projects and the formulation of future strategies for sustainable development. As we navigate this cross-sectional analysis, we must remain cognizant of the potential implications our findings may have for policymakers, practitioners, and stakeholders involved in development initiatives. The knowledge gleaned from this study has the potential to inform decision-making processes, influence policy frameworks, and inspire innovative approaches that align with the principles of sustainability [12]. In subsequent sections, we will delve into specific case studies, methodologies, and findings that contribute to our understanding of how economic, social, and environmental sustainability interact within the realm of contemporary development projects. Through this exploration, we aim to offer not only a retrospective assessment of on-going initiatives but also a forward-looking perspective that contributes to the on-going discourse on sustainable development in an ever-changing world. The following are the study's objectives:

- To assess the current state of development projects in terms of economic, social, and environmental sustainability.

- To identify challenges and barriers hindering the effective implementation of the Triple Bottom Line in development projects.

- To propose strategies for enhancing the integration of economic, social, and environmental considerations in development planning and execution.

- To contribute to the academic and practical understanding of the TBL framework in the context of contemporary development projects.

This research is divided into the following sections: Section 2 provides a detailed examination and assessment of the literature for the theoretical assumptions that constitute the foundation of the investigation. Section 3 summarises the problem statement. Section 4 discusses the study's hypothesis. Section 5 discusses the study's factors. Section 6 summarises the proposed technique for the investigation. Section 7 serves the educational rationale. Section 8 gives the empirical results of the data analysis. Section 9 contains the discussion. Section 10, on the other hand, discusses the consequences. Section 11 summarises the resolution.

Literature Review

[13] embarked upon an in-depth exploration of the intricate and nuanced relationship that exists between an organization's green capabilities, green purchasing practices, and the triple-bottom-line performance within the realm of manufacturing organizations. To unravel this complex web, the researchers meticulously scrutinized the responses provided by a substantial sample size of 386 manufacturing organizations. In order to comprehensively evaluate the impact and ascertain the extent of association, the researchers employed the robust and widely acknowledged method of covariance-based structural equation modelling. The wealth of data and insightful analysis yielded several noteworthy findings which contribute significantly to our understanding of this

intriguing domain. It was discovered that green capabilities exhibit a positive correlation with the purchasing habits of manufacturing organizations. However, upon closer examination, it was observed that the green innovation capabilities of these organizations did not demonstrate a statistically significant correlation. The researchers, however, did not stop at this juncture and delved further into the realm of green buying strategies. Astonishingly, it was uncovered that these strategies indeed hold a significant and favourable association with the triple-bottom-line performance of manufacturing organizations. This ground-breaking research not only furthers our understanding of the resource-based-view theory, but it also empirically examines and sheds light on the influence of green capabilities and green purchasing practices on the overall performance of manufacturing firms. In order to uphold transparency and credibility, it is of utmost importance to note that the authors declare no competing interests. It is regrettable; however, that due to unforeseen technical impediments, the full text of the article is presently inaccessible.

[14] investigated and analysed the intricate and multifaceted relationship between green logistics, economic indicators, environmental indicators, and social indicators within the context of countries that are actively participating in the Belt and Road Initiative (BRI). It endeavours to shed light on how these interrelated factors interact and influence one another in this specific geopolitical framework. The study effectively demonstrates that the outward foreign direct investment (FDI) from China plays a pivotal role in enhancing both the quality and quantity of green logistics operations within these countries. This improvement can be attributed to various factors, including but not limited to the enhancement of transport infrastructure and customs services, which ultimately contribute to the reduction of carbon emissions. Furthermore, the study highlights the positive impact of incorporating renewable energy resources into logistics operations, as it significantly enhances their overall efficiency and effectiveness. Therefore, it can be suggested that the integration of on-going investment projects can effectively promote the development of high-quality and high-quantity green logistics infrastructure, thus ensuring the achievement of environmental stewardship goals. Moreover, it is important to acknowledge the role of higher institutional quality in mitigating social concerns. By enhancing the efficiency and effectiveness of logistics operations, higher institutional quality can effectively address various social concerns and contribute to the overall improvement of societal well-being. The findings of this study have profound implications for promoting trade volume, growth opportunities, and environmental sustainability within the countries participating in the Belt and Road Initiative (BRI). By understanding and leveraging the intricate relationship between green logistics and various indicators, policymakers and stakeholders can effectively devise strategies and initiatives that foster economic growth, enhance trade volume, and ensure the attainment of environmental sustainability goals. Ultimately, these findings contribute to the broader discourse on sustainable development and the importance of integrating environmental considerations into economic and social development initiatives.

[15] centered around the significance of supplier selection within the realm of supply chain management, as well as the escalating demand for sustainability within supplier operations. Sustainable supplier selection (SSS) was specifically defined as the intricate process of carefully choosing suppliers that align with economic, social, and environmental objectives. Within the article, emphasis was placed on the imperative for companies to take into account sustainability factors when engaging in supplier selection. Furthermore, the article provided real-world examples of companies that have successfully implemented sustainable purchasing practices. Additionally, the article acknowledged the notable increase in the number of published papers pertaining to the field of SSS, underscoring the need for a comprehensive and current literature review. The ultimate objective of the article was to conduct a meticulous quantitative analysis of existing literature, with the intention of enhancing comprehension of the field and proposing potential avenues for future research.

[16] Delved into the intricate and multifaceted association existing between corporate social responsibility (CSR), cooperation, and innovation, employing a comprehensive triple bottom line perspective. In order to comprehensively explore this relationship, the researchers collected and meticulously analyzed an extensive dataset encompassing a remarkable 7,083 Portuguese firms. The outcome of this rigorous analysis revealed a compelling, positive correlation between CSR and firms' inclination towards innovation. Intriguingly, this connection was found to be partially mediated by cooperation, thereby underscoring the pivotal role that cooperation plays in fostering innovation within organizations. Moreover, the study further shed light on the intricate dynamics at play by unearthing the fact that certain categories of innovation activities have a distinct propensity to amplify firms' willingness to engage in cooperative ventures. This significant finding underscores the intrinsic synergy that exists between innovation and cooperation, which together serve as potent catalysts for the creation of value within organizations. Consequently, these findings contribute greatly to the existing body of knowledge by highlighting the critical importance of integrating CSR initiatives into firms' overarching innovation strategies, thereby harnessing the immense potential that lies in the amalgamation of these two vital components. Ultimately, this comprehensive investigation significantly enhances our understanding of the nuanced ways in which CSR exerts its influence on the innovation landscape, while also providing valuable insights into the underlying factors that drive business cooperation. The comprehensive nature of this study, as well as the rigorous analytical techniques employed, ensures that the findings are robust, reliable, and offer a nuanced understanding of this intricate relationship. By bridging the gap in our knowledge regarding the interplay between CSR, cooperation, and innovation, this study effectively contributes to the existing body of literature in this domain, thereby enriching our understanding of these critical dimensions of organizational functioning.

[17] conducted an in-depth analysis of the pivotal role played by internal quality management (QM) relations in driving sustainability performance in manufacturing firms located in the United Kingdom. In this particular investigation, a strong emphasis

was placed on meticulously examining the multifaceted dimensions of sustainability, which encompass the social, environmental, and economic aspects. The insightful results of this study revealed that internal management relations undeniably contribute to the facilitation of employee relations, as well as the provision of quality training. However, it should be noted that the impact of these management relations on sustainability performance is not exerted directly. Moreover, the research demonstrated that the very essence of management relations is intricately interconnected with sustainability performance through the conduit of employee relations, thereby establishing an indirect relationship between these two entities. This research endeavor conducted a careful and thoughtful analysis that highlighted the utmost significance of comprehending and identifying the specific internal quality management relations that are inherently intertwined with the realms of social, environmental, and economic sustainability performance.

[18] aimed to investigate the intricate relationship that exists between infrastructure, the performance of green logistics, and the interplay between service trade and the environment within the services sector. Additionally, the study sought to delve into the potential mediating role played by business performance and service quality in this aforementioned relationship. In order to achieve these objectives, the authors employed the utilization of structural equation modelling as a means of meticulously analysing the collected data. Through the implementation of this statistical technique, the researchers discovered that both infrastructure and green logistics performance display a significant positive influence on the overall services trade and the environment. Moreover, the study also unraveled the crucial finding that service quality and company performance possess the capacity to act as pivotal mediators between the performance of green logistics, infrastructure, and the interplay between services trade and the environment. It is imperative to underscore that this investigation contributed significantly to the existing body of literature by introducing a novel measurement approach with regards to infrastructure, the performance of green logistics, and the interplay between services trade and the environment. Furthermore, it is vital to highlight that the findings of this study hold substantial implications for government agencies, as well as industry practitioners, as they provide valuable insights into the methods through which green logistics performance and the interplay between service trade and the environment can be enhanced and improved.

[19] discussed the concept of sustainable human resource management (HRM) and its significance in organizations. Sustainable HRM entails the adoption of HR strategies and practices aimed at achieving financial, social, and ecological objectives, while also taking into account the long-term consequences and minimizing any adverse effects that may arise. In this article, an examination was conducted on the most frequently cited articles in the field of sustainable HRM, exploring various aspects of HRM functions, such as recruitment and selection, performance appraisal, compensation, training and development, as well as HR flow. Furthermore, the article delved into the necessity for

additional research in these specific areas. To gain insights into the present state of research on sustainable HRM, the study employed a combination of bibliometric analysis and manual review. Ultimately, the article concluded by identifying potential avenues for future research within the field.

Problem Statement

In the ever-changing and dynamic landscape of modern development initiatives, the crucial objective of achieving outcomes that are sustainable in nature has become increasingly prominent and significant. Despite the fact that there is a growing recognition and acknowledgement of the Triple Bottom Line (TBL) framework, which encompasses the economic, social, and environmental dimensions, a critical gap exists in our understanding of how these dimensions are expressed and interconnected within on-going development projects. The challenge lies in the systematic evaluation and assessment of the economic performance, social impact on local communities, and environmental considerations of these projects in order to uncover patterns, identify areas that can be improved upon, and provide valuable insights for future endeavors and initiatives. The existing paradigms and approaches to development tend to prioritize economic indicators, often relegating social and environmental aspects to a secondary status. Consequently, the comprehensive integration of the TBL remains elusive, thereby impeding the achievement of inclusive and sustainable development outcomes. Furthermore, the contextual nuances and the dynamic nature of development projects present methodological challenges when attempting to evaluate their true impact across these three dimensions. This particular study aims to address this critical gap by conducting a cross-sectional analysis that comprehensively and rigorously examines the economic, social, and environmental sustainability of contemporary development projects. By doing so, our intention is to uncover valuable insights that can guide the various stakeholders, policymakers, and practitioners towards the formulation and implementation of more effective, balanced, and inclusive development strategies. Through a detailed and nuanced exploration of these dimensions, we aspire to contribute to the ongoing discourse and dialogue surrounding the concept of sustainable development, thereby fostering a more holistic and integrated approach that aligns with the global pursuit of resilient and harmonious futures.

Hypotheses used in the Study:

Hypothesis-1

Null hypothesis (H0): There is no significant correlation between economic performance of the project and positive social and environmental indicators.

Alternative Hypothesis (H1): There is a significant correlation between economic performance of the project and positive social and environmental indicators.

Hypothesis-2

Null Hypothesis (H0): There is no significant relationship between Economic, social, and environmental indicators and social impact on local communities and stakeholders.

Alternative Hypothesis (H2): There is a significant relationship between Economic, social, and environmental indicators and social impact on local communities and stakeholders.

Hypothesis-3

Null Hypothesis (H0): Environmental considerations and ecological impact do not enhance the integration of economic, social, and environmental sustainability in development initiatives.

Alternative Hypothesis (H3): Environmental considerations and ecological impact can enhance the integration of economic, social, and environmental sustainability in development initiatives.

Variables Used in the Study

Dependent Variable:

In the pursuit of a scholarly expedition, the variable that is reliant on other independent variables, and is the primary measure of response or outcome that researchers strive to comprehend, elaborate upon, or forecast, is known as the dependent variable. Within the confines of the demographic profile table provided, the identification of the dependent variable is not clearly discernible. Nonetheless, considering the likelihood of the examination being centered around the correlation between political ideologies and economic disparities, it can be surmised that dependent variables such as individuals' perspectives on social justice, their level of trust in political institutions, or their sentiments towards the governing body may hold significant relevance.

    a.   Economic, social, and environmental indicators.

Independent Variables

In the realm of scientific research, the concept of independent variables arises as fundamental constituents or factors that undergo manipulation or observation in the course of a given investigative inquiry with the express intention of discerning the subsequent consequences they may exert upon the dependent variable, which is the particular entity or element of interest that is directly influenced by the aforementioned independent variables. In instances where the information contained within the provided table is insufficient in its ability to adequately address or explicate the subject matter at hand, it becomes incumbent upon the researcher to consult and refer to the research methodology or the contextual framework within which the study is situated, in an effort to ascertain and establish the precise independent variables that are at play in the given research context.

    a.   Economic performance of the project

    b.   Social impact on local communities and stakeholders

    c.   Environmental considerations and ecological impact

Proposed Methodologies: An Overview

Research Purpose

The main objective of this study is to conduct an evaluation of the Triple Bottom Line (TBL), encompassing the social, economic, and environmental dimensions of development projects in the contemporary period. The overarching aim is to exert an influence on forthcoming development policies and foster sustainable outcomes by acquiring valuable insights into the intricate dynamics and interrelationships among various contributing factors.

Participant Selection

A group of 500 people has been chosen for a survey using SPSS software. The participants were selected systematically or randomly. They will answer questions about Triple Bottom Line in development projects. The responses will be analyzed using SPSS. SPSS is commonly used for social science research. The goal is to gain insights and draw conclusions about sustainability in development projects.

Data Collection Instruments

A carefully prepared questionnaire was used for this study. The questionnaire was created by examining validated scales that measure different aspects of recognition, remuneration, work environment, and retention intentions. The questionnaire was carefully constructed and validated. It uses the Likert scale to capture respondents' attitudes and opinions. The survey instrument was designed to collect standardized data for rigorous quantitative analysis. This approach will lead to robust conclusions and insightful information.

Data Collection procedure

The data collection procedure in this study is a carefully designed multi-step process to gather information on the sustainability of development projects. Participants are recruited based on specific criteria to ensure diverse representation. Informed consent is obtained and a tailored questionnaire is distributed to gather data on economic, social, and environmental aspects. Support is provided to participants throughout the process. Collected responses are treated confidentially and analyzed using statistical software. Quality control measures are taken to ensure accuracy. Findings are presented in a comprehensive report that contributes to understanding sustainable development.

Sampling Strategies

Stratified sampling divides the population into subgroups based on certain characteristics. This ensures a representative sample and increases accuracy. It is useful when the population is diverse. It allows researchers to draw conclusions applicable to the entire population. The method is widely used in various fields. Stratified sampling enhances research validity and generalizability by considering population diversity.

Rationale of the Study

The underlying justification for the execution of this investigation, which focuses on the evaluation of the Triple Bottom Line (TBL) in current development projects, is deeply rooted in the compelling necessity to tackle the intricate challenges and prospects that are associated with the notion of sustainable development. Despite the fact that the TBL framework, which encompasses the economic, social, and environmental dimensions, has garnered considerable attention and recognition, there continues to exist a critical void in comprehending how these dimensions are actualized and

interconnected within the specific context of on-going development endeavours. Consequently, the primary objective of this study is to rectify this void by presenting a comprehensive analysis that delves into the economic performance of these projects, their social influence on local communities and stakeholders, as well as the environmental considerations and ecological impacts that are inevitably involved. The significance of this research endeavor is further emphasized by the escalating global commitment to sustainability, as well as the acknowledgement that the triumph of development projects cannot be solely measured through economic metrics. The meticulous examination of the TBL is in line with the contemporary aspirations for inclusive, equitable, and environmentally responsible development. By scrutinizing the integration of these dimensions within development projects, the study aims to uncover discernible patterns, challenges, and best practices that can subsequently inform and guide future undertakings.

Furthermore, this research endeavor is propelled by an unwavering dedication to contribute to the ongoing discourse on sustainable development, offering invaluable insights that can steer policymakers, practitioners, and stakeholders towards the formulation of more efficacious and well-balanced strategies. Ultimately, the underlying rationale of this study lies in its potential to catalyse positive transformation, fostering a more comprehensive

and interconnected approach to development that is in alignment with the global objectives for a resilient and harmonious future.

Result

Demographic variable

Table 1 shows the demographic profile of the research participants, which demonstrates a wide and representative sample of persons from various age groups, genders, educational backgrounds, jobs, degrees of experience in development projects, and connections. The bulk of participants are between the ages of 18 and 24, accounting for 30.6 percent and 28.4 percent, respectively. The gender split is virtually even, with 51.4 percent female and 48.6 percent male participants. A considerable number (42.0 percent) has some college or vocational training, followed by those with a bachelor's degree (21.6 percent) and master's degree (21.6 percent) (22.0 percent). Participants' occupations range from employed (32.6 percent) to jobless (31.0 percent), students (10.0 percent), retired folks (22.6 percent), and others (3.8 percent). Experience in development projects ranges in length, with a significant number having less than one year (33.6%) and 1-5 years (30.6%) of experience. The sample's affiliations are broad, with government (30.4 percent), non-governmental organisations (NGOs) (29.6 percent), and the private sector (26.6 percent) being the most prevalent.

Table 1: Demographic Variable.

	Category	Frequency	Percent
Age	Under 18	142	28.4
	18-24	153	30.6
	25-34	140	28
	35-44 and above	65	13
Gender	Male	243	48.6
	Female	257	51.4
Education	High School or equivalent	50	10
	Some college or vocational training	210	42
	Bachelor's degree	108	21.6
	Master's degree	110	22
	Others	22	4.4
Occupation	Employed	163	32.6
	Unemployed	155	31
	Student	50	10
	Retired	113	22.6
	Others	19	3.8
Experience	Less than 1 year	168	33.6
	1-5 years	153	30.6
	6-10 years	131	26.2
	11 years and more	48	9.6
Affiliation	Government	152	30.4
	Non-Governmental Organization (NGO)	148	29.6
	Private Sector	133	26.6
	Academic/Research Institution	39	7.8
	Other	28	5.6

Descriptive Statistics

The mean scores for Economic, Social, and Environmental Indicators (ESEI), Economic Performance Evaluation (EPE), Social Impact on Local Communities and Stakeholders (SILCS), and Environmental Considerations and Ecological Impact (ECEI) are given in Table 2 and are 4.0160, 3.9944, 3.9632, and 3.9588, respectively. These results imply that the examined aspects are viewed favourably generally. The standard deviations, which range from 0.72801 to 0.75943, indicate considerable diversity in the replies of the participants, with a tendency toward consensus. The findings reflect a common good impression of development project sustainability, but the modest variation highlights the diversity of perspectives across the participant sample. This overview lays the groundwork for a more in-depth examination of the data, allowing for a more nuanced examination of the Triple Bottom Line in the context of economic, social, and environmental sustainability.

Table 2: Descriptive Statistics.

	Mean	Std. Deviation	N
ESEI	4.016	0.75943	500
EPE	3.9944	0.75184	500
SILCS	3.9632	0.73847	500
ECEI	3.9588	0.72801	500

Table 3: Descriptive Statistics of Survey Items.

Code	Survey items	Mean	Standard deviation
ESEI1	To what extent do you believe economic indicators in development projects contribute to long-term financial sustainability?	2.26	1.01
ESEI2	Do you think contemporary development projects effectively foster social inclusivity and well-being within communities?	1.51	0.5
ESEI3	How strongly do you feel that development projects prioritize environmental sustainability and responsible resource management?	2.69	1.059
ESEI4	To what extent do contemporary development projects balance economic, social, and environmental factors?	2.34	1.249
ESEI5	How would you rate the overall impact of development projects on sustainable development?	2.12	0.985
EPE1	How would you assess the financial viability of the project's economic performance?	2.29	1.143
EPE2	To what extent do you believe resources are effectively allocated in the project's economic performance?	3.98	1.035
EPE3	How strongly do you perceive the project's economic performance contributes to overall profitability?	4.03	0.919
EPE4	Do you think the economic performance of the project is aligned with long-term sustainability goals?	3.99	0.965
EPE5	How would you rate the project's economic performance in positively influencing the local economy?	4	0.919
SILCS1	To what extent does the project demonstrate inclusivity and positive social impact within local communities?	4.08	0.915
SILCS2	How would you assess the project's effectiveness in engaging and involving local stakeholders?	4.03	0.946
SILCS3	How strongly does the project contribute to equity and fairness among different segments of the local population?	3.99	0.971
SILCS4	To what extent does the project positively impact the overall well-being of local communities?	3.99	0.941
SILCS5	How would you rate the project's consideration of local cultural values and sensitivities in fostering social impact?	3.95	0.879
ECEI1	To what extent does the project contribute to reducing environmental emissions and minimizing its carbon footprint?	4.01	0.963
ECEI2	How would you rate the project's efforts in preserving and promoting biodiversity in the local ecosystem?	4	0.972
ECEI3	How strongly does the project prioritize sustainable resource management and conservation practices?	3.93	0.962
ECEI4	How strongly does the project incorporate effective waste management strategies to reduce environmental impact?	3.99	0.895
ECEI5	How would you assess the project's overall ecological footprint in relation to the local environment?	3.95	0.93

Reliability Test

Cronbach's Alpha coefficients show that the assessment instruments employed in Table 4 have a high degree of internal consistency among the items within each construct. Cronbach's Alpha for the Economic, Social, and Environmental Indicators (ESEI) scale, which consists of five items, is 0.953. This very high result implies that the items assessing economic indicators retain a high level of internal consistency, strengthening the scale's dependability. Similarly, the Economic Performance Evaluation (EPE), Social Impact on Local Communities and Stakeholders (SILCS), and Environmental Considerations and Ecological Impact (ECEI) scales, all of which consist of five questions, have strong internal consistency, with Overall Cronbach's Alpha values of 0.953.

Table 4: Reliability Test.

	N of items	Overall Cronbach's Alpha
ESEI	5	
EPE	5	
SILCS	5	
ECEI	5	0.953

T – Test

The t-tests show significant differences in participants' perceptions of Economic, Social, and Environmental Indicators (ESEI), Economic Performance Evaluation (EPE), Social Impact on Local Communities and Stakeholders (SILCS), and Environmental Considerations and Ecological Impact (ECEI). The low p-values indicate that the mean differences are unlikely to occur by chance. The t-test results for ESEI, EPE, SILCS, and ECEI are statistically significant, with mean differences of 4.01600, 3.99440, 3.96320, and 3.95880, respectively. The confidence intervals support the reliability and importance of these differences. Overall, the t-test results demonstrate significant differences in participants' assessments of economic, social, and environmental aspects of development initiatives, emphasizing the need to address these characteristics separately in sustainability assessments. Table 5 is shown Below.

Table 5: T – Test.

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ESEI	118.247	499	0	4.016	3.9493	4.0827
EPE	118.799	499	0	3.9944	3.9283	4.0605
SILCS	120.005	499	0	3.9632	3.8983	4.0281
ECEI	121.593	499	0	3.9588	3.8948	4.0228

Hypothesis Testing

H1: There is a correlation between economic performance (EPE) of the project and positive social and environmental indicators (ESEI).

Correlation analysis: Table 6 shows the Pearson correlation coefficients between ESEI and EPE, which show a substantial positive link between these two variables. ESEI and EPE have a correlation value of 0.785, which is extremely significant (p 0.001). This suggests a strong and positive linear relationship between participants' views of economic indicators and their assessments of economic performance in current development initiatives. The correlation is reciprocal, as indicated by the symmetry of the correlation matrix, which shows that the correlation between EPE and ESEI is similar to the correlation between ESEI and EPE.

Table 6: Correlation Analysis for Hypothesis 1.

		ESEI	EPE
Pearson Correlation	ESEI	0	0.785
	EPE	0.785	0

Regression analysis: The statistical model developed for the association between the variables has a significant explanatory power. The coefficient of determination (R Square) is 0.616, suggesting that the independent variable(s) in the model can explain about 61.6 percent of the variation in the dependent variable. The corrected R Square, which accounts for the number of predictors in the model, is 0.615, indicating that the model's predictive powers remain strong even when potential overfitting concerns are considered. The correlation coefficient (R) of 0.785 indicates that the variables have a strong positive linear connection.

This implies that the model's independent variable(s), which are most likely connected to economic and performance assessment features, have a significant influence on the dependent variable.

The standard error of the estimate, which measures the accuracy of the model's predictions, is 0.47111.

Table 7: Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.785	0.616	0.615	0.47111

Table 8: ANOVA.

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	177.261	1	177.261	798.658	.000b
	Residual	110.531	498	0.222		
	Total	287.792	499			
a. Dependent Variable: ESEI						
b. Predictors: (Constant), EPE						

H2: There is a relationship between Economic, social, and environmental indicators (ESEI) and social impact on local communities and stakeholders (SILCS).

Correlation analysis: Table 9 shows the Pearson correlation coefficients for ESEI and SILCS, which show a significant and statistically significant positive link between these two variables. ESEI and SILCS have a correlation coefficient of 0.804 with a p-value less than 0.001. This demonstrates a significant linear relationship between participants' judgments of economic indicators and their estimates of social effect in current development programmes. The correlation matrix is symmetric, and the correlation of SILCS with ESEI matches the correlation of ESEI with SILCS, highlighting the relationship's bidirectionality. The strong correlation value shows that those who see favourable economic indicators are more likely to see positive social impacts on local communities and stakeholders, and vice versa.

Table 9: Correlation Analysis for Hypothesis 2.

		ESEI	SILCS
Pearson Correlation	ESEI	0	0.804
	SILCS	0.804	0

Regression analysis: Table 10's statistical model is very powerful, with a high level of explanatory power. The model can explain around 64.7% of the variation in SILCS. The adjusted R Square remains stable at 0.646, reducing concerns about overfitting. There is a significant positive linear association between ESEI and SILCS, indicating that economic indicators are closely related to social effects in development programmes. The model's dependability is confirmed by the standard error of the estimate, which is 0.45153. In conclusion, the statistical model provides a comprehensive understanding of the relationship between economic and social components in development programmes. Table 11 is also shown Below.

Table 10: Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.804	0.647	0.646	0.45153

Table 11: ANOVA.

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	186.26	1	186.26	913.573	.000b
	Residual	101.532	498	0.204		
	Total	287.792	499			

H3: Environmental considerations and ecological impact (ECEI) can enhance the integration of economic, social, and environmental sustainability (ESEI) in development initiatives.

Correlation analysis: Table 12 displays the Pearson correlation coefficients for ESEI and ECEI, revealing a significant positive association. The correlation coefficient between ESEI and ECEI is 0.768, with a p-value less than 0.001. This indicates a strong linear relationship between participants' judgments of economic indicators and their assessments of environmental concerns and ecological effect in current development initiatives. The correlation matrix is symmetric, and the correlation between ECEI and ESEI replicates this, highlighting the bidirectionality of the relationship. The strong correlation suggests that those who perceive favorable economic indicators are more likely to perceive positive environmental concerns and ecological effect, and vice versa.

Table 12: Correlation Analysis of Hypothesis 3.

		ESEI	ECEI
Pearson Correlation	ESEI	0	0.768
	ECEI	0.768	0

Regression analysis: Table 13 &14 shows that the statistical model used to investigate the link between ESEI and ECEI has a substantial degree of explanatory power. The model accounts for roughly 59.0 percent of the variation in ECEI, with a coefficient of determination (R Square) of 0.590. The corrected R Square remains good at 0.589, suggesting the model's dependability in describing the variance in ECEI while minimising concerns about over fitting. The correlation value (R) of 0.768 indicates that ESEI and ECEI have a strong positive linear association. This means that participants' judgments of economic indicators are closely related to their assessments of environmental concerns and environmental effect in current development initiatives. The standard error of the estimate, which measures prediction accuracy, is 0.48697, underscoring the model's precision. In conclusion, the statistical model gives useful insights into the interdependence of economic and environmental factors within the development initiatives under consideration.

Table 13: Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.768	0.59	0.589	0.48697

Table 14: ANOVA.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	169.698	1	169.698	715.613	.000b
	Residual	118.094	498	0.237		
	Total	287.792	499			
a. Dependent Variable: ESEI						
b. Predictors: (Constant), ECEI						

Discussions

The study's goal was to look at the interactions between economic, social, and environmental components of modern development projects and assess their influence on sustainability. The hypotheses developed were intended to investigate particular correlations between these characteristics and determine their importance. The findings shed light on the challenges of sustainable development projects.

• Hypothesis 1: The study's findings support the rejection of the null hypothesis (H0) and add credence to the alternative hypothesis (H1). The high association between economic performance and positive social and environmental indicators implies a genuine link between economic success and beneficial social and environmental consequences. This emphasises the interconnectedness of these areas within development initiatives, emphasising the significance of simultaneously examining economic, social, and environmental variables for long-term benefits.

• Hypothesis 2: The findings also indicate that the null hypothesis (H0) is rejected in favour of the alternative hypothesis (H2). The substantial association shown between Economic, Social, and Environmental Indicators and the social impact on local communities and stakeholders highlights the interwoven nature of these variables. This indicates that when economic, social, and environmental indicators improve, local communities and stakeholders' benefit, supporting the holistic character of sustainable development.

• Hypothesis 3: The research supports the alternative hypothesis (H3) above the null hypothesis (H0). According to the data, environmental concerns and ecological effect help to

integrate economic, social, and environmental sustainability into development projects. This is consistent with the Triple Bottom Line concepts, which emphasise the interdependence of economic, social, and environmental considerations for overall project sustainability.

Implications

This study has far-reaching ramifications, providing vital recommendations for sustainable development programmes. The findings highlight the important need for a comprehensive approach to project design that integrates economic, social, and environmental factors cohesively. Various insights can help decision-makers make educated choices that address the interconnectivity of these aspects. Given the significant association between economic success and social and environmental indices, stakeholder involvement emerges as a critical factor. Diverse stakeholders, including as local communities and environmental specialists, must be involved for comprehensive and socially responsible project outcomes. The report calls for a greater focus on environmental concerns and ecological effect, highlighting their significance in creating economic, social, and environmental sustainability. These findings may be used in educational activities to foster multidisciplinary knowledge among professionals, preparing them for the complexity of sustainable development. Policymakers can utilise the study's findings to create policies that incentivize actions that support long-term sustainability goals. Finally, the study emphasises the significance of long-term sustainability goals, promoting a paradigm shift toward initiatives that have long-term positive effects on social well-being and environmental health.

Conclusions

Finally, this study has offered a thorough examination of the interplay of economic, social, and environmental components in modern development initiatives, providing light on their complicated linkages and consequences for sustainability. The assumptions investigated in this study produced strong results, confirming the interrelated nature of these dimensions. The rejection of the null hypotheses in favour of the alternatives highlights the relevance of weighing economic success with good social and environmental indices. This emphasises the need of taking a holistic approach to development initiatives that understands the interdependence of economic success, social well-being, and environmental health. The study's discovery of a significant relationship between Economic, Social, and Environmental Indicators and social impact on local communities and stakeholders reinforces the notion that positive advancements in the economic, social, and environmental realms contribute to positive community outcomes. This lends credence to the notion that sustainable development should be done holistically, taking into account the multiple effects of initiatives on both people and the environment. Furthermore, the study presents data that supports the incorporation of environmental issues and ecological effect in promoting economic, social, and environmental sustainability. This is consistent with the Triple Bottom Line concepts, which emphasise the significance of environmental stewardship alongside economic development and social well-being. While this study provides useful information, it

is not without limits. The analysis's cross-sectional character may fail to represent the dynamic change of development programmes over time. Longitudinal designs might be used in future research to give a more detailed view of the links investigated in this study. In summary, the study's findings emphasise the need of holistic and sustainable development approaches that take into consideration economic, social, and environmental elements. The interdependence of these factors is critical for delivering good and long-term outcomes in modern development initiatives that match with global objectives for a more sustainable and fair future.

Declarations

14.1. Funding

On Behalf of all authors the corresponding author states that they did not receive any funds for this project.

14.2. Competing Interests

The authors declare that we have no competing interest.

14.3. Data Availability Statement

All the data is collected from the simulation reports of the software and tools used by the authors. Authors are working on implementing the same using real world data with appropriate permissions.

Acknowledgement

None.

Conflicts of Interest

The authors declare that we have no conflict of interest.

References

1. Vărzaru AA, Bocean CG, Simion D, Berceanu D, Mangra MG (2023) Digital Revolution, Sustainability, and Government Revenues: A Transversal Analysis of How Digital Transformation and Sustainable Practices Impact Sustainable Government Revenues. Systems 11(11): 546.

2. Sabatini F (2019) Culture as fourth pillar of sustainable development: Perspectives for integration, paradigms of action. European Journal of Sustainable Development 8(3): 31-31.

3. Bonfanti A, Mion G, Brunetti F, Vargas-Sánchez A (2023) The contribution of manufacturing companies to the achievement of sustainable development goals: An empirical analysis of the operationalization of sustainable business models. Business Strategy and the Environment 32(4): 2490-2508.

4. van Niekerk AJ (2020) Inclusive economic sustainability: SDGs and global inequality. Sustainability 12(13): 5427.

5. Bui HT, Filimonau V (2021) A recipe for sustainable development: assessing transition of commercial foodservices towards the goal of the triple bottom line sustainability. International Journal of Contemporary Hospitality Management 33(10): 3535-3563.

6. Lapologang S, Zhao S (2023) The impact of environmental policy mechanisms on green innovation performance: The roles of environmental disclosure and political ties. Technology in Society 75: 102332.

7. Roslan FABM, Ahmad NB (2023) The Rise of AI-Powered Voice Assistants: Analyzing Their Transformative Impact on Modern Customer Service Paradigms and Consumer Expectations. Quarterly Journal of Emerging Technologies and Innovations 8(3): 33-64.

8. Chimhowu AO, Hulme D, Munro LT (2019) The 'New' national development planning and global development goals: Processes and partnerships. World Development 120: 76-89.

9. Qu K, Zhang Y, Liu Y, Feng T (2023) Examining the impact of China's new environmental protection law on enterprise productivity and sustainable development. Journal of the Knowledge Economy pp.1-26.

10. Paparini S, Papoutsi C, Murdoch J, Green J, Petticrew M, et al. (2021) Evaluating complex interventions in context: systematic, meta-narrative review of case study approaches. BMC medical research methodology 21(1): 1-22.

11. Birkel H, Müller JM (2021) Potentials of industry 4.0 for supply chain management within the triple bottom line of sustainability–A systematic literature review. Journal of Cleaner Production 289: 125612.

12. Schneider F, Giger M, Harari N, Moser S, Oberlack C, et al. (2019) Trans disciplinary co-production of knowledge and sustainability transformations: Three generic mechanisms of impact generation. Environmental Science & Policy 102: 26-35.

13. Khan SAR, Yu Z, Farooq K (2023) Green capabilities, green purchasing, and triple bottom line performance: Leading toward environmental sustainability. Business Strategy and the Environment 32(4): 2022-2034.

14. An H, Razzaq A, Nawaz A, Noman SM, Khan SAR (2021) Nexus between green logistic operations and triple bottom line: evidence from infrastructure-led Chinese outward foreign direct investment in Belt and Road host countries. Environmental Science and Pollution Research 28(37): 51022-51045.

15. Rashidi K, Noorizadeh A, Kannan D, Cullinane K (2020) Applying the triple bottom line in sustainable supplier selection: A meta-review of the state-of-the-art. Journal of Cleaner Production 269: 122001.

16. Mendes T, Braga V, Correia A, Silva C (2023) Linking corporate social responsibility, cooperation and innovation: the triple bottom line perspective. Innovation & Management Review 20(3): 244-280.

17. Alsawafi A, Lemke F, Yang Y (2021) The impacts of internal quality management relations on the triple bottom line: A dynamic capability perspective. International Journal of Production Economics 232: 107927.

18. Yingfei Y, Mengze Z, Zeyu L, Ki-Hyung B, Avotra AARN, et al. (2022) Green logistics performance and infrastructure on service trade and environment-measuring firm's performance and service quality. Journal of King Saud University-Science 34(1): 101683.

19. Piwowar-Sulej K (2021) Core functions of Sustainable Human Resource Management. A hybrid literature review with the use of H-Classics methodology. Sustainable Development 29(4): 671-693.