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Integrating sustainability in project management in Egypt: Barriers, challenges and strategies

Hanan H. A. Mohamed *

The School of Environment, Resources and Sustainability (SERS), University of Waterloo, Waterloo, Canada.

Abstract

This research explores the integration of sustainability into project management in Egypt, addressing sector-specific challenges, barriers, and opportunities. Using a mixed-methods approach, it combines surveys and interviews across sectors such as construction, IT, healthcare, and manufacturing. Key barriers identified include resource constraints, regulatory gaps, and cultural resistance, which impede the adoption of sustainable practices. Sector-specific challenges, such as the high cost of sustainable materials and knowledge gaps, underscore the need for tailored solutions. The research emphasizes aligning sustainability with organizational goals through frameworks like the Triple Bottom Line (TBL) and Sustainable Development Goals (SDGs). Recommendations include regulatory reforms, financial incentives, stakeholder engagement, and capacity-building initiatives such as training programs and certifications.

This research provides actionable strategies tailored to Egypt's socio-economic context, contributing to global sustainability discourse and supporting Egypt's Vision 2030. It highlights the importance of collaboration, innovative funding, and governance for advancing sustainable project management.

Keywords: Sustainability Integration; SDGs; Sustainability Practices; Sustainable Project Management; Local Sustainability Practices; Barriers to Sustainability Adoption

1. Introduction

1.1. Egypt's Vision 2030

Egypt's Vision 2030, launched in 2016, aligns with the United Nations Sustainable Development Goals (SDGs), offering a strategic framework for economic, social, and environmental growth. [1]. However, significant challenges hinder its realization. Ranked 105th on the Human Development Index, Egypt faces bureaucratic inefficiencies and socio-economic barriers that slow progress. [2]. With an SDG Index score of 65.6 (83rd globally), the country grapples with slow advancements in critical areas, such as renewable energy, which remains at just 3.3% of the energy mix (SDG13), minimal CO2 reductions (2.4 tons per capita), and limited protection of terrestrial sites (38.8%, SDG15).

Economic reforms, while ambitious, are constrained by persistent inflation (24.8% in 2022) and a high debt-to-GDP ratio of 96%, which strains growth potential. [3]. Programs like the Technology Innovation and Entrepreneurship Center and "Hayah Karima" initiatives show promise but are hampered by resource limitations and implementation gaps. [4]. Social inequalities, such as low female labor participation (23.1%) and limited financial service access (27.4%), further highlight the complexities of achieving sustainable development (SDG10, SDG8).

* Corresponding author: Hanan HA Mohamed

Environmental sustainability efforts, such as the Benban Solar Park and water management initiatives, demonstrate progress but fall short of addressing widespread challenges like desertification and water scarcity. [5]. Public awareness campaigns, including "Go Green," have had limited reach, emphasizing the need for greater systemic reform and alignment with global sustainability standards [6]. Vision 2030 represents an ambitious roadmap, but substantial obstacles remain in turning its goals into reality.

1.2. Key Metrics and Targets for Egypt's Vision 2030

Egypt employs measurable indicators across economic, social, and environmental domains to track Vision 2030's progress and refine strategies, yet the effectiveness of these measures remains questionable. While these metrics are intended to assess policy success and foster stakeholder trust through transparency, challenges in implementation and limited progress in achieving key targets undermine their credibility and impact [1].

Table 1 Key Metrics and Targets for Vision 2030

Dimension	Metric	Target
Economic	GDP Growth Rate	Annual growth rate of 10%
	Unemployment Rate	Below 7%
	Foreign Direct Investment (FDI)	Increase in FDI
	Industrial Productivity	Enhanced productivity
	Exports	Increase in value-added products
Social	Poverty Reduction	Reduction in national poverty rate
	Healthcare Accessibility	More hospital beds per capita
	Educational Attainment	Higher literacy rates
Environmental	Greenhouse Gas Emissions	10% reduction by 2030
	Renewable Energy Contribution	42% by 2035
	Air Quality Improvement	Reduced PM2.5 and CO2 levels
	Water Conservation	Improved water efficiency

These indicators serve as benchmarks for future policy development, ensuring Egypt stays on track to achieve Vision 2030's ambitious goals.

1.3. The Growing Need for Sustainable Project Management

Integrating sustainability into project management is pivotal for achieving Egypt's Vision 2030 goals. Sustainable project management considers environmental, social, and economic impacts throughout a project's lifecycle, ensuring responsible and inclusive development [7]. This approach improves efficiency, reduces costs, and fosters stronger stakeholder relationships, enhancing the appeal of Egypt's development projects to investors while delivering societal benefits. Beyond being a strategic advantage, sustainable project management is essential for aligning Egypt's growth with global environmental and social objectives, ensuring inclusive and responsible planning [8]. Similarly, adopting sustainable practices guarantees that development projects contribute positively to the environment, society, and economy [9], reinforcing Egypt's commitment to sustainable progress and enhancing its global standing.

1.4. Research Problem and Objectives

Integrating sustainability into project management involves embedding environmental, social, and economic considerations into all project phases. While practices like lifecycle costing, resource efficiency, and community engagement are essential for advancing Vision 2030's goals, significant challenges persist. High costs of sustainable materials, technological limitations, regulatory gaps, and cultural resistance hinder progress [10]. Overcoming these barriers requires policy reforms, enhanced stakeholder collaboration, and investments in education and technology.

1.4.1. Key Objectives

- Investigating current sustainability frameworks and barriers to adoption.

- Evaluating sector-specific challenges and opportunities.
- Proposing strategies, including policy reforms, to promote sustainable project management.
- Providing recommendations to address Egypt's unique challenges while aligning with global sustainability goals.

2. Literature Review

2.1. Conceptual Framework

The growing importance of sustainability in project management underscores the need to address interconnected global environmental, social, and economic challenges [11]. Frameworks such as the Triple Bottom Line (TBL) and the Sustainable Development Goals (SDGs) provide structured methodologies for integrating sustainability into project lifecycles. These frameworks emphasize balancing immediate project objectives with long-term sustainability impacts, ensuring that project outcomes align with broader developmental goals [12].

The TBL framework, introduced by Elkington, broadens traditional project success metrics by incorporating environmental responsibility, social equity, and economic viability [13]. Environmental responsibility focuses on reducing resource consumption, minimizing waste, and adopting eco-friendly practices. For example, Egypt's sustainable agricultural initiatives and circular economy models in construction and manufacturing illustrate efforts to improve resource efficiency and reduce greenhouse gas emissions [14]. Social equity prioritizes stakeholder engagement, fair labor practices, and community development, with initiatives such as affordable housing projects and public-private partnerships addressing Egypt's housing challenges and fostering inclusive growth [15]. Economic viability emphasizes lifecycle costing and risk management, which are critical for ensuring project stability and resilience in the face of financial uncertainties [16]

The SDGs provide a complementary framework for addressing sustainability challenges, offering globally recognized targets to align projects with priorities such as climate action (SDG 13) and decent work (SDG 8). Research demonstrates that aligning projects with the SDGs enhances credibility and stakeholder support, fostering a deeper commitment to sustainability [17].

2.2. Challenges in Sustainability Integration

Despite the availability of established frameworks, integrating sustainability into project management remains a complex undertaking. Resource constraints, high initial costs, and resistance to change are among the most significant barriers. These challenges are particularly pronounced in resource-limited environments like Egypt, where financial limitations and a lack of standardized metrics often constrain the adoption of sustainable practices [18]. Additionally, the absence of universal guidelines complicates efforts to ensure consistency and accountability across projects [19].

Balancing the economic, social, and environmental dimensions of sustainability often involves trade-offs. Environmentally sustainable methods may incur higher upfront costs, creating tension between financial goals and environmental objectives [20]. Stakeholder expectations further complicate sustainability efforts, as financial stakeholders often prioritize profitability while others advocate for stricter environmental standards [21]. Organizational barriers, including limited training and knowledge gaps among project managers, exacerbate these challenges, highlighting the need for capacity building and leadership development [22].

2.3. Frameworks for Sustainability

Robust frameworks such as PRiSM (Projects Integrating Sustainable Methods), the P5 Standard, and Sustainable Project Management (SPM) offer comprehensive approaches to integrating sustainability. PRiSM emphasizes resource efficiency, social responsibility, and continuous monitoring. However, its complexity and cost often limit its accessibility for smaller organizations and the P5 Standard broadens sustainability considerations to include societal impact and aligns projects with the SDGs, addressing critical global challenges like poverty and climate change [23]. SPM complements these frameworks by emphasizing transparency and proactive stakeholder engagement, bridging the gap between traditional project success metrics and sustainable growth objectives [24].

These frameworks collectively provide project managers with the tools to incorporate sustainability into project planning and execution effectively, ensuring long-term value and alignment with global sustainability goals.

2.4. Global vs. Local Context

Globally, sustainable project management is increasingly recognized as a vital tool for addressing climate change, resource scarcity, and social inequality [25]. Emerging trends include integrating SDG targets into project frameworks, leveraging technology for resource efficiency, and conducting lifecycle assessments to evaluate long-term impacts [26] . However, local contexts such as Egypt's Vision 2030 initiative present unique challenges [27]. Economic instability, regulatory gaps, and cultural resistance hinder the effective adoption of sustainability frameworks [28]. Sector-specific issues further highlight the complexity of local implementation. In the construction sector, high costs and the absence of standardized guidelines hinder the adoption of sustainable practices, while outdated infrastructure in the energy sector limits progress toward renewable energy goals [29].

Resource-dependent industries like healthcare and tourism face additional barriers, including limited resources, misaligned regulations, and inconsistent enforcement. These challenges threaten the achievement of sustainable development goals, underscoring the need for targeted regulations and sector-specific sustainability strategies [30]. By bridging global principles with localized needs, sustainable project management can ensure that sustainability practices are both globally aligned and regionally effective, fostering meaningful progress toward sustainable development [31].

3. Research Methodology

3.1. Research Design

The conceptual framework played a pivotal role in shaping the research design and guiding the development of objectives, survey instruments, and interview protocols. By emphasizing environmental responsibility, social equity, and economic viability, it offered a comprehensive lens to examine sustainability practices. Integrating the principles of the Triple Bottom Line (TBL) and the Sustainable Development Goals (SDGs) ensured a balanced approach that connected global sustainability principles with Egypt's unique socio-economic context. This alignment enabled an in-depth exploration of sector-specific challenges and opportunities, ultimately contributing to actionable insights for advancing sustainable project management.

A mixed-methods approach was employed to analyze sustainability integration in Egypt's project management landscape. This method combined quantitative data, capturing measurable aspects such as adoption rates and challenges, with qualitative insights that revealed the cultural and contextual nuances unique to Egypt. The use of both methods enhanced validity through triangulation, providing a well-rounded understanding of sustainability issues [32].

Structured surveys were utilized to identify trends and challenges, offering generalizable findings and pinpointing areas for improvement [33]. Complementing this, semi-structured interviews provided a deeper exploration of participant experiences, uncovering cultural and regulatory influences that shape context-specific strategies.

Triangulation of the quantitative and qualitative data further reinforced the findings. Quantitative analyses identified patterns, while qualitative insights explained their underlying causes, reducing biases and ensuring a holistic perspective [32]. This integrated approach contextualized findings within Egypt's economic and regulatory landscape, combining macro-level trends with in-depth qualitative insights. Its flexibility allowed for iterative exploration, ensuring actionable, context-sensitive recommendations for sustainable project management in Egypt [34].

3.2. Data Collection and Analysis

Quantitative data was collected through structured surveys featuring closed-ended and Likert-scale questions designed to measure adoption levels, identify barriers, and gauge attitudes toward sustainability in project management across Egypt. Purposive sampling ensured the inclusion of participants with sustainability expertise, such as project managers from diverse sectors, aligning the data with the study's objectives. Microsoft Power BI was used to analyze and visualize survey results, reveal trends, evaluate the prevalence of sustainable practices, and pinpoint areas needing improvement, which provided actionable insights for policy and practice [33].

To complement these findings, qualitative data was gathered through semi-structured interviews, offering depth and context. These interviews maintained consistency while allowing flexibility to explore participants' experiences, motivations for adopting sustainable practices, and perceived barriers, including regulatory and cultural challenges [35]. Thematic analysis was employed to identify recurring themes, which were integrated with survey findings using Microsoft Power BI for comparative analysis [36]. This approach provided a detailed understanding of the cultural and contextual dynamics shaping sustainability practices in Egypt, enriching the study with a nuanced perspective on the trends identified in the survey data [37].

4. Results and Discussion

4.1. Quantitative Analysis and Results

Survey data were collected from 39 professionals across Egyptian sectors to assess sustainability integration in project management using descriptive statistics, Principal Component Analysis (PCA), and Logistic Regression. The survey was deployed electronically to 50 participants, ensuring a diverse representation of sectors and roles, and 39 responses were analyzed. No personal or identification data were collected, and informed consent was embedded within the survey. Participants included project managers (38.5%), executives (25.6%), and professionals from construction (33.3%), IT (17.9%), and healthcare (15.4%) sectors, providing varied perspectives (Table 1). Semi-structured interviews were conducted virtually, ensuring accessibility and flexibility while maintaining consistency and ethical compliance.

Table 2 Respondent Demographics – Roles

Role	Percentage (%)
Project Managers	38.5
Executives	25.6
Other Professionals	35.9

Table 3 Respondent Demographics – Sector

Sector	Percentage (%)
Construction	33.3
IT	17.9
Healthcare	15.4
Other Sectors	33.4

4.1.1. Key Findings

Key findings revealed varying levels of familiarity, perceived importance, and integration of sustainability practices. While 56.4% of respondents reported high familiarity, knowledge gaps were evident, with 35.8% indicating moderate familiarity. Similarly, 53.8% rated sustainability as very important, yet most organizations demonstrated only moderate or low integration levels (Table 4).

Table 4 Key Findings

Metric	Mean (SD)	High (%)	Moderate (%)
Familiarity	3.62 (1.02)	56.4	35.8
Perceived Importance	4.05 (1.23)	53.8	33.3
Integration Level	2.67 (0.93)	20.5	35.9
Formal Policies	-	46.2 (Yes)	33.3 (No)

4.1.2. Challenges

The survey identified critical barriers, with 79.5% of respondents citing resource constraints as a major challenge. A lack of expertise (71.8%) and difficulties in measuring sustainability outcomes (51.3%) were also significant barriers (Table 5).

Table 5 Primary Challenges

Challenge	Percentage (%)
Resource Constraints	79.5
Lack of Expertise	71.8
Measurement Difficulties	51.3

4.1.3. Opportunities

Respondents identified several opportunities for improvement, including government incentives (84.6%), enhanced training programs (74.4%), and clear internal sustainability policies (66.7%) to address barriers (Table 6).

Table 6 Opportunities for Improvement

Opportunity	Percentage (%)
Government Incentives	84.6
Training Programs	74.4
Policy Development	66.7

4.1.4. Sector-Specific Insights

Sector-specific challenges varied significantly. Construction professionals reported regulatory hurdles and resource constraints, IT respondents noted rapid technological changes, and manufacturing faced financial and compliance limitations (Table 7).

Table 7 Sector-Specific Challenges

Sector	Key Challenges
Construction	Regulatory hurdles, resource constraints.
IT	Rapid technological advancements and limited adoption capacity.
Manufacturing	Financial limitations, compliance with regulations.

4.1.5. Advanced Statistical Analysis

PCA identified three critical dimensions influencing sustainability, as stated in Table 6

Table 8 Principal Component Analysis (PCA) Results

Variance Explained (%)	Key Dimensions
17.4	Positive attitudes toward sustainability.
15.0	Resource constraints (financial, human).
11.9	Knowledge gaps and training needs.

4.1.6. Respondent Clusters

Cluster analysis revealed four distinct respondent groups, each with unique perspectives on sustainability barriers and strategies (Table 9).

Table 9 Respondent Clusters

Cluster	Percentage (%)	Key Characteristics
Balanced Integrators	32.3	Moderate challenges prefer incremental solutions.
Resource-Driven Advocates	25.6	Emphasize budgets and stakeholder support.
Strategic Aligners	20.5	Struggle with aligning sustainability and organizational goals.
Knowledge Builders	21.6	Focus on training and measurement tools.

4.1.7. Strategy Effectiveness and Support Needs

Key strategies included organizational alignment (Mean = 4.08), training programs (Mean = 3.77), and stakeholder engagement. Government incentives (84.6%), increased budgets (66.7%), and expert training (55%) were identified as critical needs.

4.2. Qualitative Analysis and Results

Thematic and sentiment analysis identified key themes such as awareness, resource limitations, strategic integration, stakeholder engagement, and measurement needs, highlighting critical insights and examples of successful initiatives.

4.2.1. Key Themes

Awareness and Training

A significant knowledge gap persists due to limited training opportunities. Advanced, context-specific programs are needed to equip project managers with the skills required for effective sustainability integration.

Resource Limitations

High costs for sustainable materials and technologies, especially in construction and manufacturing, were cited as major barriers. Developing local alternatives and systemic financial support, such as subsidies, are essential to address these constraints.

Strategic Integration

Sustainability efforts often lack alignment with organizational goals, leading to fragmented initiatives. Embedding sustainability within core strategies, using frameworks like TBL, SDGs or other frameworks, is vital for meaningful impact.

Stakeholder Engagement

Stakeholder support, particularly from governments, clients, and communities, is crucial but often inconsistent. Enhanced collaboration is needed to overcome policy and engagement gaps.

Measurement and Reporting

The absence of standardized metrics hinders the evaluation of sustainability impacts and weakens accountability. Reliable tools are critical for tracking progress, justifying investments, and securing funding.

Table 10 Key Themes Related To Integrating Sustainability Into Project Management

Key Theme	Sub-Theme	Insights
Strategic Alignment of Sustainability Goals	Embedding Sustainability in Project Objectives	Project managers are increasingly expected to align sustainability objectives with overall project goals, ensuring that environmental, social, and economic considerations are integral to project outcomes. This involves incorporating sustainability from the planning phase through to execution and evaluation.
	Balancing Cost, Time, and Sustainability	A recurring sub-theme is the need to balance traditional project constraints (scope, time, cost) with sustainability goals. Project managers face challenges in delivering

		sustainable outcomes without compromising timelines or budgets, especially in industries where green materials and practices are costlier.
Stakeholder Engagement and Communication	Engaging Stakeholders for Buy-In	Successful sustainability integration requires strong support from stakeholders, including clients, communities, and project teams. Project managers often need to advocate for sustainability, communicating its long-term benefits and ensuring stakeholder alignment with sustainable project goals.
	Transparent Communication and Reporting	Effective communication around sustainability metrics, goals, and impacts is essential. Project managers are increasingly responsible for providing transparent updates and reports on sustainability performance to stakeholders, fostering accountability and trust.
Sustainability-Driven Risk Management	Identifying and Mitigating Environmental and Social Risks	Project managers now incorporate environmental and social risks into their risk assessments. This involves proactively identifying risks related to climate impact, resource scarcity, community disruption, and environmental compliance.
	Long-Term Risk Planning	Sustainability adds a dimension of long-term risk management, where project managers consider the enduring impacts of project outcomes on the environment and society. This shift from short-term to long-term risk considerations requires updated frameworks and skills.
Resource Optimization and Waste Reduction	Efficient Resource Management	Sustainable project management emphasizes optimizing resources to reduce waste, manage costs, and lower environmental impact. Project managers are responsible for selecting materials, technology, and processes that minimize resource usage, reduce waste, and improve energy efficiency.
	Waste Management and Recycling	Integrating waste reduction and recycling practices within project processes is crucial for sustainability. Project managers often need to design processes that incorporate recycling materials, responsible disposal, and reduction of single-use resources.
Knowledge and Skill Development in Sustainability	Training and Upskilling Project Teams	Implementing sustainability practices requires project teams to be well-versed in sustainable techniques, such as green procurement, energy efficiency, and sustainable resource management. Project managers often facilitate training and knowledge-sharing to build sustainability competencies within their teams.
	Project Manager Competency in Sustainability	There is an emerging need for project managers to be educated in sustainability principles, frameworks, and best practices. Certifications in sustainable project management or courses in environmental stewardship can enhance a project manager's ability to drive sustainable outcomes.
Measurement, Monitoring, and Reporting of Sustainability Metrics	Setting and Tracking Sustainability KPIs	To evaluate project success in terms of sustainability, project managers set clear sustainability KPIs (e.g., carbon footprint reduction, waste reduction, energy efficiency). Tracking these KPIs enables project managers to monitor sustainability performance throughout the project lifecycle.
	Enhanced Reporting and Accountability	Reporting frameworks specific to sustainability are increasingly adopted, requiring project managers to provide stakeholders with detailed reports on environmental impact, resource use, and social contributions. This enhanced accountability reinforces the organization's commitment to sustainability.
Regulatory Compliance and Adherence to Standards	Meeting Local and International Sustainability Standards	Compliance with local environmental regulations and international sustainability standards, such as ISO 14001 (environmental management) or LEED certification (for construction), is vital. Project managers must ensure that projects align with these standards, requiring familiarity with regulatory requirements.
	Navigating Changing Policies and Incentives	As governments introduce new regulations and incentives related to sustainability, project managers need to stay informed and adapt to changes. Compliance with new environmental laws or taking advantage of incentives for sustainable practices often falls within a project manager's responsibilities.

Financial Planning and Budgeting for Sustainability	Cost-Benefit Analysis of Sustainable Practices	Project managers frequently perform cost-benefit analyses to justify sustainable practices. They evaluate upfront costs against long-term benefits, such as energy savings, regulatory incentives, and improved brand reputation.
	Securing Funding for Sustainable Projects	Integrating sustainability often involves additional costs for materials, technology, or training. Project managers work with financial stakeholders to secure budget allocations or explore funding sources, such as grants and green bonds, to support these initiatives.
Cultural and Organizational Support for Sustainability	Fostering a Sustainability-Oriented Culture	Project managers play a role in building an organizational culture that values sustainability by encouraging teams to adopt eco-friendly practices and promoting the importance of sustainability in everyday project activities.
	Leadership and Advocacy for Sustainability	Project managers are increasingly acting as sustainability champions within their organizations, advocating for sustainable practices and motivating their teams to consider the environmental and social impacts of their actions.
Adapting Project Methodologies for Sustainability	Integrating Sustainability into Project Methodologies	Agile, Lean, and other project methodologies are being adapted to incorporate sustainability principles. For example, Agile sprints can be used to iterate sustainable solutions quickly, while Lean methods help reduce resource waste. Project managers modify these methodologies to align with sustainable goals.
	Continuous Improvement for Sustainable Practices	Project managers monitor and refine sustainability practices as part of project evaluations, incorporating lessons learned into future projects. This iterative approach helps to build sustainable practices into the project management framework, ensuring continuous improvement.

4.3. Sentiment Analysis

Sentiment analysis reveals participants' emotions and attitudes toward sustainability challenges and opportunities, shedding light on areas of progress and frustration.

4.3.1. Positive Sentiments

Optimism was prevalent regarding government initiatives, stakeholder engagement, and emerging training programs. Respondents expressed hope for sectors like education and healthcare, where sustainability practices are gradually being integrated through curriculum changes and policy reforms. This optimism reflects the belief that incremental progress, collaboration, and innovation can drive transformative change, inspiring broader adoption across industries.

4.3.2. Negative Sentiments

Frustration centered on regulatory barriers, resource limitations, and organizational resistance to change, particularly in construction and manufacturing. These challenges were seen as significant roadblocks but also opportunities for innovation and adaptation. Respondents emphasized the need for leadership, education, and clear regulations to overcome these barriers and align organizational goals with sustainability principles.

4.3.3. Sector-Specific Insights

Education

Sustainability is gradually being integrated into curricula, aligning with Egypt's Vision 2030. Specialized programs are equipping future leaders with the skills to address sustainability challenges, demonstrating education's critical role in fostering a culture of responsibility and innovation.

Healthcare

While sustainability in healthcare faces funding and workload challenges, waste management and recycling initiatives are gaining traction. These small steps highlight the sector's potential for broader sustainability efforts, aligning environmental goals with its mission of promoting well-being.

Finance

The high cost of sustainable investments and the lack of standardized ESG reporting hinder progress in the financial sector. Regulatory incentives and clear standards are essential to drive sustainable finance, positioning it as a critical enabler of sustainable development.

Construction

The construction sector struggles with high costs for sustainable materials and a shortage of skilled labor. Emerging initiatives like LEED certification show progress, but greater support in training, funding, and regulatory incentives is needed to scale sustainable practices across the industry.

Manufacturing

Reliance on imported materials creates cost and supply chain challenges. Local sourcing, regulatory reforms, and financial investments are essential to foster sustainable manufacturing, reduce dependency, and enhance economic resilience.

4.4. Unique Contextual Challenges

The analysis revealed several challenges unique to Egypt, shaped by its economic, regulatory, and cultural landscape, hindering the integration of sustainability into project management.

4.4.1. Resource Constraints

High costs for sustainable materials, reliance on imports, and limited funding present significant barriers, particularly in construction and manufacturing. Economic pressures such as inflation, currency fluctuations, and ineffective policies exacerbate the issue—centralized government control and corruption further limit private sector involvement, stifling sustainable initiatives and investment opportunities.

4.4.2. Skilled Labor Shortage

The lack of specialized sustainability training programs in Egypt results in a limited talent pool. International certifications, such as LEED or ISO, remain inaccessible due to high costs, while economic pressures drive a brain drain of qualified professionals. Underinvestment in vocational training and low demand for sustainability roles further hinder skill development, especially in construction and manufacturing.

4.4.3. Cultural Resistance

Short-term financial priorities often outweigh long-term sustainability goals in both businesses and society. SMEs view sustainability as an expense rather than an investment, and hierarchical management structures resist innovation. Additionally, the societal mindset that sustainability is a responsibility of the government or large corporations leads to disengagement from smaller enterprises. Raising awareness, offering incentives, and fostering cultural shifts are essential to overcoming these barriers.

4.4.4. Regulatory Barriers

Inconsistent policies and weak enforcement create significant obstacles to the adoption of sustainability. Overlapping regulations confuse, while poor enforcement diminishes the impact of initiatives like Egypt Vision 2030. Streamlined, transparent policies with incentives such as tax breaks or subsidies, alongside clear enforcement mechanisms, are critical to encouraging sustainable practices.

4.4.5. Infrastructure Limitations

Infrastructure gaps, such as limited access to renewable energy, insufficient waste management, and outdated construction practices, restrict sustainability efforts. Small businesses and rural areas face challenges in adopting renewable energy, while inefficient transportation systems and inadequate recycling facilities hinder carbon reduction and circular economy practices. Modernizing infrastructure is vital for sustainable development.

4.5. Synthesis of Findings and Discussion

The study highlights the multifaceted challenges and opportunities for sustainability integration in Egypt's project management landscape. Addressing resource, cultural, and regulatory barriers through targeted strategies, capacity building, and standardized metrics will enable organizations to advance sustainable practices and contribute meaningfully to Egypt's Vision 2030 goals.

Findings reveal partial adoption of sustainability practices while identifying critical areas for improvement to enhance integration in project management. They emphasize key barriers and opportunities for advancing sustainability, offering actionable insights to guide strategic improvements. Despite growing awareness, comprehensive integration across environmental, social, and governance (ESG) dimensions remains a challenge. The diversity of sector-specific barriers highlights the need for tailored strategies, as a one-size-fits-all approach would not effectively address the unique challenges faced by different groups.

Sustainability integration in Egypt faces systemic barriers, including knowledge gaps, resource limitations, weak strategic alignment, insufficient stakeholder engagement, and inadequate measurement tools. Addressing these requires tailored strategies, capacity-building, and collaborative support to advance sustainable project management practices.

Sentiment analysis and sector-specific insights highlight both opportunities and challenges in advancing sustainability in Egypt. Optimism drives progress, while frustrations underscore areas requiring targeted interventions, such as training, regulatory reforms, and resource allocation. Tailored strategies are essential to address the unique needs of each sector, ensuring sustainability becomes a cornerstone of Egypt's development.

The integration of quantitative and qualitative data highlighted key barriers to sustainability in Egypt, emphasizing conflicting priorities and resource limitations as the most significant challenges. Quantitative findings revealed that short-term goals often override sustainability efforts, while resource constraints, such as high costs and limited funding, are particularly impactful in sectors like construction and manufacturing. Qualitative insights added depth by uncovering additional issues, including cultural resistance and sector-specific regulatory challenges. For example, cultural resistance was prominent in profit-driven sectors, where sustainability is perceived as an unnecessary expense. At the same time, regulatory inconsistencies and weak enforcement complicate the adoption of sustainable practices across industries.

Each sector faces unique sustainability challenges, requiring tailored solutions. In the construction sector, high material costs and insufficient stakeholder engagement necessitate investments in affordable, sustainable resources and improved collaboration. The IT sector faces significant knowledge gaps, underscoring the need for targeted training programs and certifications. Healthcare struggles with regulatory inconsistencies and infrastructure limitations, which demand streamlined policies and investments in sustainable waste management. Meanwhile, manufacturing is hindered by resource scarcity and cultural resistance, highlighting the importance of promoting sustainable procurement practices and local sourcing.

Aligning sustainability goals with organizational objectives emerged as a critical strategy for integrating sustainability into project management. By incorporating Environmental, Social, and Governance (ESG) metrics alongside traditional performance indicators, organizations can shift perspectives to view sustainability as a driver of long-term success rather than a financial burden. Addressing resource constraints through strategies like green bonds, public-private partnerships, and investments in affordable materials is essential for overcoming financial barriers. Overcoming cultural resistance requires awareness campaigns and inclusive stakeholder engagement, demonstrating the long-term benefits of sustainability, such as improved brand reputation and regulatory compliance. Bridging knowledge gaps, particularly in IT, education, and healthcare, can be achieved through partnerships with international organizations and local universities to provide targeted training and certifications.

Regulatory reforms are also critical to advancing sustainability. Simplifying compliance processes, introducing enforceable standards, and ensuring consistent enforcement will create an environment conducive to sustainability. Collaboration between policymakers and industry leaders can align regulatory frameworks with sector-specific needs, ensuring accountability and facilitating widespread adoption of sustainable practices.

Standardized metrics are vital for tracking sustainability progress. Recommended metrics include environmental indicators like carbon emissions and energy efficiency, social metrics such as community engagement and employment diversity, economic measures like lifecycle cost analysis and green investment returns, and governance metrics

covering ESG compliance and transparency. Regular tracking and reporting of these metrics enable organizations to measure outcomes effectively, foster accountability, and support continuous improvement.

In practice, organizations should develop sector-specific strategies to address unique barriers while integrating sustainability metrics throughout project lifecycles. Investing in capacity building, such as sustainability training and certifications like LEED and ISO 14001, is crucial for equipping project managers with the necessary skills. Inclusive stakeholder engagement, involving community leaders, government representatives, and business partners, can build support for sustainability initiatives. Advocating for regulatory reform to establish clear and enforceable standards will also facilitate broader adoption of sustainable practices across sectors.

5. Recommendations

To facilitate the integration of sustainability into project management practices in Egypt, the following recommendations are proposed based on the findings of this study:

Table 11 Recommendations for Advancing Sustainability in Project Management in Egypt – Implementation Mechanisms and Expected Benefits

Recommendation	Implementation Mechanisms	Expected Benefit
Regulatory Reforms and Policy Alignment	- Streamline sustainability-related regulations and establish a unified enforcement framework.	Improved compliance and reduced confusion across industries.
	- Introduce sector-specific tax incentives (e.g., for renewable energy, eco-friendly materials, and green certifications).	Increased adoption of sustainable practices in construction, manufacturing, and energy sectors.
	- Establish sustainability monitoring committees to oversee compliance at a regional level.	Enhanced accountability and effective policy implementation.
Resource Allocation and Financial Strategies	- Launch a "Green Egypt Fund" to provide financial support for sustainability-focused projects.	Reduced financial barriers to sustainable project management.
	- Promote affordable local alternatives to imported materials through R&D incentives and subsidies for local manufacturers.	Lower project costs and increased reliance on domestic production.
	- Develop public-private partnerships for renewable energy projects (e.g., wind and solar in the New Administrative Capital).	Accelerated infrastructure development and progress toward renewable energy goals.
Capacity Building and Education	- Partner with universities to include sustainability modules in engineering and management programs.	Increased workforce expertise in sustainability and project management.
	- Offer subsidized or free certifications (e.g., LEED, ISO 14001) for project managers in priority sectors.	Enhanced skillsets and increased adoption of international standards.
	- Conduct regional workshops and awareness programs targeting SMEs to highlight sustainability benefits and practices.	Reduced cultural resistance and greater participation by small and medium-sized enterprises.
Stakeholder Engagement and Collaboration	- Establish a National Sustainability Forum to connect government, private sector, and community leaders.	Stronger multi-stakeholder collaboration and alignment on sustainability goals.
	- Involve local communities in project planning, particularly for housing and infrastructure initiatives.	Improved social equity and increased project acceptance.

	- Create sector-specific advisory councils (e.g., for construction, healthcare) to align goals and share best practices.	Better sector-specific strategies and knowledge sharing.
Integration of Sustainability Metrics	- Implement standardized metrics (e.g., water efficiency, carbon emissions, lifecycle cost analysis) in all government tenders.	Clear benchmarks for sustainability progress and improved accountability.
	- Annual sustainability reporting is required for all publicly funded projects.	Increased transparency and ability to measure progress.
	- Use digital dashboards to track sustainability metrics and share progress publicly.	Public trust and data-driven decision-making.
Sector-Specific Strategies	- Construction: Subsidize eco-friendly construction materials and mandate LEED certification for new government projects.	Reduced environmental impact and improved energy efficiency in the construction sector.
	- IT: Provide grants for research into sustainable IT practices, such as energy-efficient data centers.	Innovation in IT sustainability and reduced sector emissions.
	- Healthcare: Upgrade waste management systems in hospitals and clinics through public-private collaboration.	Reduced medical waste and enhanced environmental compliance.
	- Manufacturing: Offer tax incentives for companies adopting local raw materials and sustainable production methods.	Improved economic resilience and reduced dependency on imports.
Public Awareness and Cultural Shift	- Launch a nationwide campaign, "Sustainability for All," featuring community clean-ups, tree-planting drives, and workshops.	Increased public participation and awareness of sustainability benefits.
	- Highlight successful local projects (e.g., Benban Solar Park) in media and public education initiatives.	Greater public trust in sustainability initiatives and increased community engagement.
	- Promote eco-friendly practices through school programs and interactive workshops.	Cultivation of a sustainability mindset in future generations.
Advancing Innovation and Technology	- Invest in research hubs for sustainability innovations, particularly in renewable energy and water management.	Accelerated progress toward environmental sustainability and innovation leadership.
	- Use AI and data analytics to optimize resource allocation in public projects (e.g., energy and water efficiency).	Improved resource efficiency and reduced project costs.
	- Support start-ups focusing on clean technologies with grants and incubation programs.	Growth of green entrepreneurship and local innovation capacity.

6. Study Limitations and Future Research Directions

This study has limitations typical of research with substantial qualitative components. The sample size, while representative, may not capture the full diversity of perspectives across industries, and the sectoral focus leaves room for further exploration in areas like tourism, agriculture, and finance. Self-reported data, inherent in qualitative studies, carries potential bias but offers rich, context-specific insights. Additionally, the study reflects the state of sustainability integration during the research period, with future technological, policy or economic changes possibly affecting its relevance. Cultural influences on participant openness are expected in such research and highlight the importance of socio-cultural sensitivity.

Future research should address these limitations by expanding sectoral coverage and conducting longitudinal studies to track sustainability progress over time. Comparative analyses with other MENA countries can provide benchmarks, while studies on SMEs and emerging technologies, such as AI and blockchain, could uncover tailored strategies for sustainability integration. Examining policy implementation and public perceptions will further bridge gaps between frameworks and action, ensuring broader adoption. By building on this foundation, future research can deepen understanding and advance sustainable project management practices in Egypt and similar contexts.

7. Conclusion

This research highlights the significant barriers and sector-specific challenges in integrating sustainability into project management in Egypt, including regulatory gaps, resource constraints, and cultural resistance. While practical strategies such as capacity building, financial incentives, and local sourcing are proposed, their implementation will require substantial effort and systemic change. The findings provide a framework for gradual progress, emphasizing the need for tailored solutions to address Egypt's unique context. While the impact of these efforts may take time to materialize, this research contributes valuable insights that can guide more deliberate and sustainable practices, offering a step forward in addressing the complex issues of environmental and social responsibility.

Compliance with ethical standards

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1]   Ministry of Planning and Economic Development., "Egypt Vision 2030," n.d. [Online]. Available: https://mped.gov.eg/DynamicPage?id=115&lang=en&Egypt.

[2]   United Nations Development Programme, "Rich countries attain record human development, but half of the poorest have gone backwards, finds UN Development Programme," 2024. [Online]. Available: https://www.undp.org/egypt/press-releases/rich-countries-attain-record-human-development-half-poorest-have-gone-backwards-finds-un-development-programme.

[3]   Organisation for Economic Co-operation and Development, "Egypt Country Programme," 2023. [Online]. Available: https://www.oecd.org/en/about/programmes/egypt-country-programme.html.

[4]   Egypt Today, "Highlights: Why Haya Karima is the 'largest development initiative' in Egypt's history," 2022. [Online]. Available: https://www.egypttoday.com/Article/16/119414/Highlights-Why-Haya-Karima-is-the-largest-development-initiative-in.

[5]   E. Adel, "Impact of Benban Solar PV Park on renewable energy and grid parity in Egypt," 2020. [Online]. Available: https://aps.aucegypt.edu/en/articles/446/impact-of-benban-solar-pv-park-on-renewable-energy-and-grid-parity-in-egypt.

[6]   State Information Service, "Go Green Initiative," 2022. [Online]. Available: https://www.sis.gov.eg/Story/173015/Go-Green-Initiative/?lang=en-us.

[7]   I. R. Hegazy and A. A. Tohlob, "Strategic environmental assessment and SDG integration: Enhancing sustainable development in Egypt," Journal of Umm Al-Qura University for Engineering and Architecture, vol. 15, pp. 340-354, 2024.

[8]   N. l-Bassiouny, D. El-Bassiouny, S. K. Kolkailah, N. Zahran and S. Moharram, "Corporate Social Responsibility in Egypt," in Current Global Practices of Corporate Social Responsibility, Springer, Cham., 2021.

[9]   O. H. Orieno, N. L. Ndubuisi, N. L. Eyo-Udo, V. I. Ilojianya and P. W. Biu, "Sustainability in project management: A comprehensive review," World Journal of Advanced Research and Reviews, vol. 21, no. 1, pp. 656-677, 2024.

[10]   C. Okogwu, M. O. Agho, M. A. Adeyinka, B. A. Odulaja, N. L. Eyo-Udo, C. Daraojimba and A. A. Banso, "EXPLORING THE INTEGRATION OF SUSTAINABLE MATERIALS IN SUPPLY CHAIN MANAGEMENT FOR ENVIRONMENTAL IMPACT," vol. 4, no. 3, 2023.

[11]   A. Baro Garcia, "Enabling sustainable development through project management: Identifying obstacles, opportunities, and best practices.," Jyväskylä University of Applied Sciences, 2023.

[12]   P. Mansell , S. P. Philbin and E. Konstantinou, "Redefining the Use of Sustainable Development Goals at the Organisation and Project Levels—A Survey of Engineers," Administrative Sciences, vol. 10, no. 3, p. 55, 2020.

[13]   J. Elkington, "The triple bottom line," in Environmental management: Readings and cases, 1997, pp. 49-66.

[14]   H. Elbasiouny, B. A. Elbanna, E. Al-Najoli, A. Alsherief, S. Negm, E. Abou El-Nour, A. Nofal and S. Sharabash, "Agricultural Waste Management for Climate Change Mitigation: Some Implications to Egypt," in Waste Management in MENA Regions, Springer Water, p. 149–169.

[15]   D. Haryani and Z. Anjani, "The Importance of Environmental, Social, and Governance (ESG) Principles in Public Works and Housing Infrastructure," Journal of Infrastructure Policy and Management (JIPM), vol. 6, no. 1, p. 15–31, 2023.

[16]   D. Settembre-Blundo, R. González-Sánchez, S. Medina-Salgado and F. E. García-Muiña, "Flexibility and Resilience in Corporate Decision Making: A New Sustainability-Based Risk Management System in Uncertain Times," Global Journal of Flexible Systems Management, vol. 22, p. 107–132, 2021.

[17]   E. A. Moallemi, S. Malekpour, M. Hadjikakou, R. Raven, K. Szetey, D. Ningrum, A. Dhiaulhaq and B. A. Bryan, "Achieving the Sustainable Development Goals Requires Transdisciplinary Innovation at the Local Scale," One Earth, vol. 3, no. 3, pp. 300-313, 2020.

[18]   J. Dye, M. McKinnon and C. V. der Byl, "Green Gaps: Firm ESG Disclosure and Financial Institutions' Reporting Requirements," Journal of Sustainability Research, 2020.

[19]   A. J. K. Newman and P. Styring, "The pursuit of methodological harmonization within the holistic sustainability assessment of CCU projects: A history and critical review," Frontiers in Sustainability, vol. 3, 2022.

[20]   T. Dzhengiz and K. Hockerts, "Dogmatic, instrumental and paradoxical frames: A pragmatic research framework for studying organizational sustainability," International Journal of Management Reviews, vol. 24, no. 4, pp. 501-534, 2022.

[21]   R. Hahn, Sustainability management: Global perspectives on concepts, instruments, and stakeholders, Fellbach, Germany: Rüdiger Hahn, 2022.

[22]   A. Fathalizadeh, M. R. Hosseini, A. Gilbert Silvius, A. Rahimian, I. Martek and D. J. Edwards, "Barriers impeding sustainable project management: A Social Network Analysis of the Iranian construction sector," Journal of Cleaner Production, vol. 318, 2021.

[23]   Green Project Management, "The P5 Standard," Green Project Management, 2023.

[24]   M. B. Shaukat, K. F. Latif, A. Sajjad and G. Eweje, "Revisiting the relationship between sustainable project management and project success: The moderating role of stakeholder engagement and team building," Sustainable Development, vol. 30, no. 1, pp. 58-75, 2021.

[25]   R. Picciotto, "Towards a 'New Project Management' movement? An international development perspective," International Journal of Project Management, vol. 38, no. 8, pp. 474-485, 2020.

[26]   R. Aryasomayajula, "Sustainability in Project Management: Balancing Environmental and Social Factors (a Paradigm Shift Towards a Greener Future)," SSRN, 2023.

[27]   H. S. Moghaieb, "Estimating local administrators' participation in planning: case of "Egypt vision 2030"," Review of Economics and Political Science, vol. 4, no. 3, pp. 197-223, 2020.

[28]   D. El-Bassiouny and P. Letmathe , "Political instability and corporate social responsibility: the case of Egypt," Social Responsibility Journal, vol. 16, no. 5, pp. 745-767, 2020.

[29]   M. K. Saraji and D. Streimikiene, "Challenges to the low carbon energy transition: A systematic literature review and research agenda," Energy Strategy Reviews, vol. 49, 2023.

[30]   H. Abdelaty, D. Weiss and D. Mangelkramer, "Climate Policy in Developing Countries: Analysis of Climate Mitigation and Adaptation Measures in Egypt," Sustainability, vol. 15, no. 11, p. 9121, 2023.

[31] F. Marín-González, S. R. Moganadas, A. J. Paredes-Chacín, S. F. Yeo and S. Subramaniam, "Sustainable Local Development: Consolidated Framework for Cross-Sectoral Cooperation via a Systematic Approach," Sustainability, vol. 14, no. 11, p. 6601, 2022.

[32] A. Bans-Akutey and B. M. Tiimub, "Triangulation in Research," Academia Letters, p. Article 3392, 2021.

[33] T. Clark, L. Foster, A. Bryman and L. Sloan, Bryman's Social Research Methods, Oxford University Press, 2021.

[34] E. Denny and A. Weckesser , "How to do qualitative research?," BJOG, vol. 129, no. 7, p. 1166–1167, 2022.

[35] R. Ruslin, S. Mashuri, M. Abdul Rasak, F. Alhabsyi and H. Syam, "Semi-structured Interview: A Methodological Reflection on the Development of a Qualitative Research Instrument in Educational Studies," Journal of Research & Method in Education, vol. 12, no. 1, pp. 22-29, 2022.

[36] C. R. Lochmiller, "Conducting Thematic Analysis with Qualitative Data," The Qualitative Report, vol. 26, no. 6, pp. 2029-2044, 2021.

[37] B. Thomas, "The role of purposive sampling technique as a tool for informal choices in social sciences in research methods," Just Agriculture Multidisciplinary E-Newsletter, vol. 2, no. Article ID 047, 2022.

[38] J. Arnold, Learning Microsoft Power BI, O'Reilly Media, Inc., 2022.