

Project Management Practices in Construction Projects and Their Roles in Achieving Sustainability—A Comprehensive Review [†]

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Abstract: Effective project management practices are crucial in the construction sector, providing a structured approach to planning, executing, and controlling projects. They set clear objectives, define scopes, allocate resources efficiently, and manage risks effectively. However, challenges can arise throughout all project phases. This study focuses on literature from reputable journals over the last decade, and, considering the post-COVID scenario for inadequate scope definition, poor communication, resource mismanagement, and regulatory barriers were identified as major barriers to project success. To achieve sustainable construction projects, specific targets like energy efficiency, waste reduction, water conservation, and social responsibility must be set. Integrating project management with sustainability involves incorporating green building design, sustainable materials, waste management, water conservation, biodiversity promotion, smart technologies, and performance measurement systems. By adopting sustainable approaches and effective project management practices, construction projects can achieve successful outcomes while ensuring environmental responsibility, social equity, and economic viability. Future research should explore identified barriers, their local implications, and project management practices for successful project outcomes.

Keywords: construction projects; project management; sustainability targets; project phases



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1. Introduction

Effective communication is crucial for project success, managing triple constraints, and sustainable practices. This involves environmental responsibility, social equity, and economic viability [1]. Project management methods control construction costs through precise estimation and cost control. Engaging stakeholders with effective communication ensure project success and quality assurance [2]. Proactive planning, stakeholder engagement, risk management, and continuous monitoring mitigate cost overruns, improving project progress for timely completion with minimized costs.

Energy efficiency, Leadership in Energy and Environmental Design (LEED) certifications [3], greenhouse gas (GHG) emissions reduction targets [4], and waste management are vital for sustainability [1]. Water conservation aims for efficient water management [1]. Challenges in achieving sustainability objectives include inadequate leadership support, limited resources, poor planning, and competing goals, as well as insufficient collaboration, communication, monitoring, and evaluation, and inconsistent regulations and policies creating barriers and uncertainties in reaching goals.

To achieve effective project planning and execution, define clear objectives, scope, deliverables, and success criteria. A detailed project plan and efficient communication with stakeholders prevent misunderstandings [1]. Implement risk management to maintain timelines and budgets [2]. Optimize resource management and adhere to quality standards [2]. Employ a structured change management process to handle changes. Monitor

progress using KPIs while embracing innovative technologies, best practices, and green building principles for enhanced outcomes [2].

In view of deficient integration, adopting sustainable approaches, and implementing effective project management practices, construction projects can achieve successful outcomes while ensuring environmental responsibility, social equity, and economic viability.

2. Project Management Practices in Construction Sector

2.1. Role of Project Management in Construction Sector

Project management practices are crucial for successful construction projects, encompassing aspects like time, budget, quality, and resources. They prevent cost overrun issues through goal setting, feasibility studies, and realistic schedules [5]. Risk assessment and cost-control measures ensure staying within the budget [2]. In conclusion, project management is pivotal, providing a structured approach for planning, controlling, and executing, leading to successful project delivery.

2.2. Issues Related to Project Management during Various Project Phases

Project management involves distinct project lifecycle phases and challenges, as shown in Figure 1. Unclear initiation objectives and scope lead to stakeholder misalignment [2]. Inadequate feasibility assessment causes unrealistic goals and resource shortages [2]. Planning scope creep increases costs and delays [1]. Underestimating project duration and resource needs results in conflicts [1]. Proactive planning, communication, stakeholder engagement, risk management, and continuous monitoring are crucial for project success.

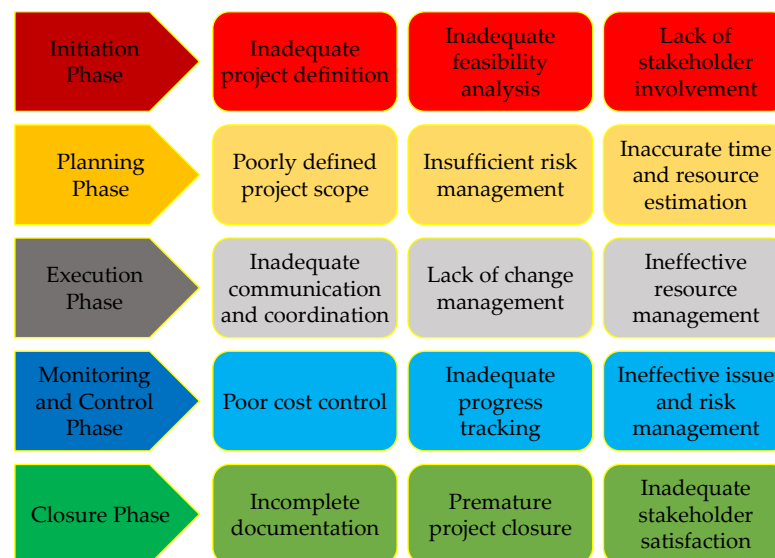


Figure 1. Issues related to project management during various project phases.

3. Sustainability in Construction Projects

3.1. Targets for Achieving Sustainability in Construction Projects

Achieving sustainability in construction requires specific targets for environmental, social, and economic responsibility. Table 1 lists common targets: energy efficiency to reduce consumption [6], (GHG) emissions reduction [4], waste management to minimize generation [1], water conservation [7], and sustainable materials use [8]. Realistic goals aligned with regulations, project type, and stakeholders' priorities contribute to a responsible built environment.

Table 1. Targets for achieving sustainability in construction projects.

Sustainability Factors	Targets	Ref.
Energy Efficiency	Establish energy performance targets in design to reduce energy consumption.	[6]
GHG Reduction	Set targets for carbon reduction by reducing GHG emissions.	[4]
Waste Management	Set waste minimization and recycling targets for construction wastes	[1]
Water Conservation	Set water consumption targets and implement technologies for management systems.	[7]
Sustainable Materials	Set targets for incorporating recycled and renewable materials in construction.	[8]

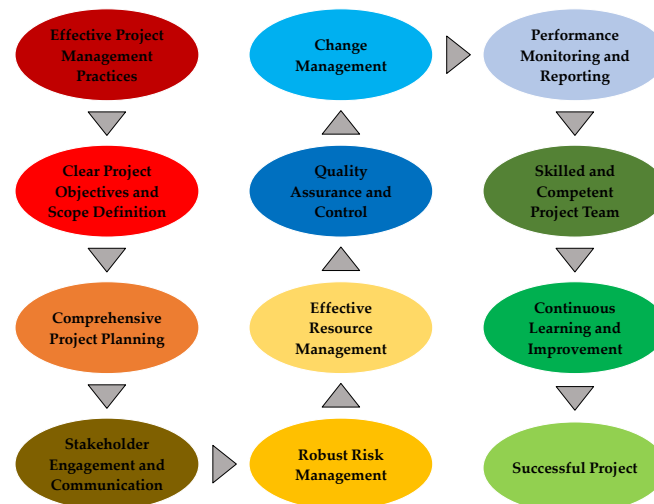
3.2. Issues Leading to Failure of Sustainability Goals

Challenges in building projects for sustainability include limited knowledge, poor planning, resource constraints, and competing goals. Leadership support, budget constraints, and rapid construction also pose difficulties. Inadequate monitoring hampers progress tracking [2]. Limited awareness, sustainable technology availability, and resistance to change hinder adoption [2]. Holistic sustainability demands strong leadership, stakeholder engagement, planning, communication, and resource allocation.

4. Integration of Project Management Practices with Sustainability

4.1. Effective Project Management Practices for a Successful Project

Effective project management practices are vital for successful construction projects, as shown in Figure 2. Key practices include well-defined objectives, scope, and deliverables, as well as effective communication with stakeholders [2]. Quality standards and a structured change management process are essential for meeting project standards. Systematic monitoring and reporting using KPIs is necessary [2]. A capable and motivated project team fosters a positive team culture. Embracing innovative technologies and industry best practices enhances project success and stakeholder satisfaction [9].

**Figure 2.** Effective project management practices to avoid cost overrun in construction projects.

4.2. Sustainable Approaches for a Successful Project

Table 2 shows achieving construction project sustainability through green building principles, using energy-efficient designs, sustainable materials, and renewable energy systems. Obtain certifications from recognized green building rating systems like LEED or other international standards [3]. Utilize water-efficient fixtures, rainwater harvesting, and greywater reuse [7]. Implement smart technologies like Building Management Systems (BMS) and IoT devices for energy efficiency and occupant comfort [9]. Set sustainability KPIs for energy, water, waste, and carbon emissions, regularly assessing and reporting progress for continuous improvement and transparency.

Table 2. Sustainable approaches for successful construction project.

Sustainable Approach	Practices to Be Adopted	Ref.
Water Conservation	Implement water-efficient fixtures and rainwater harvesting technologies	[7]
Green Design and Certification	Green building principles in design and certifications of rating systems	[3]
Biodiversity and Green Spaces	Sustainability by green spaces, urban forests, and biodiversity	[10]
Smart Technologies and BMS	Utilize BMS systems to optimize building efficiency and comfort	[9]
Performance check and Monitoring	Systems track water use and energy use to ensure sustainability	[2]

5. Conclusions

Project management ensures construction project success, aiding resource allocation, risk management, and communication. Integrating sustainability, green design, and smart technologies fosters environmental responsibility, social equity, and economic viability.

1. Project management and sustainability practices enhance success, cost control, stakeholder satisfaction, and built environment.
2. Sustainable construction projects aim for energy efficiency, waste reduction, water conservation, and social responsibility.
3. The blend of project management and sustainability fosters success, cost control, stakeholder satisfaction, and a sustainably built environment.

6. Recommendations

The research explores existing knowledge regarding practical aspects in construction projects, including training, deployment, standardization, and implications. Utilize key tools like scheduling, risk strategizing, quantitative analysis, and earned value management. Future research should focus on critical variables, variations, and reasons, guiding sustainable construction projects through project management skillset implications.

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