

# IDENTIFICATION OF CRUCIAL FACTOR AFFECTING TO SUSTAINABLE CONSTRUCTION PROJECTS

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**Abstract:** This research paper focuses on the analysis of governing factor for sustainable construction in various construction project. Urbanization and globalization has led to a rapid development in the construction industry. Because of depleting resources and environmental concerns, researchers and practitioners have begun to explore sustainable construction strategies. Therefore, this paper aims to determine selection criteria based on the fundamental concept of sustainability and provides an assessment framework. A questionnaire survey was conducted among various stakeholders to elicit information pertaining to the sustainable construction. Among all, 10 main criteria are finalized which further explores to 41 sub-criteria. The findings of this study will guide the decision makers to appraise the sustainable practices for sustainable construction.

**Keyword:** Sustainable, Selection Factor, Construction Projects.

## INTRODUCTION:

Sustainability is becoming increasingly important in the delivery of projects as stakeholders require ethicality, eco-friendliness, and economic efficiency during a project's life cycle. Sustainability is commonly understood through its three components, often referred to as the triple bottom line (economic, environmental and social sustainability). In project business, the sustainability of the deliverable and the sustainability of the delivery process are both very important as they can have remarkable social and environmental impacts. Sustainable project management is particularly relevant for infrastructure projects that cause enduring changes in the community and involve multiple stakeholders with varying expectations. Project control is used to make sure that the goals of the project are met. The focus is on how the project organization implements sustainability during project execution, and how project control is used for sustainable project management, both in terms of control mechanisms and the alliance contract of the project partners.

Sustainability can be managed in various ways throughout the delivery of the project. The early phases of the project are critical for defining the total value generated by the project and putting innovations in place. Companies make significant sustainability-related decisions even with incomplete information on decision parameters. During the execution of the project, such value-innovating activities may continue, information is updated, and decisions are implemented in the material choices, process steps, and resource consumption that are manifested in the project deliverables.

## LITERATURE REVIEW:

Aman Randhawa and Ashwani Kumar (2017) Exploring sustainability of smart development initiatives in India

Saeed Banihashemi, M. Reza Hosseini, Hamed Golizadeh and Shankar Sankaran (2017) Critical Success Factors (CSFs) for integration of Sustainability into Construction Project Management practices in Developing Countries

Jesse Kivila, Miia Martinsuo, Lauri Vuorinen (2017) Sustainable project management through project control in Infrastructure Projects

Mauro L. Martens, Marly M. Carvalho (2016) Key factors of sustainability in project management context: A survey exploring the project managers' perspective

Nannan Wang, Shengnan Yao, Chin-Chia WU, Dongdong Jiang (2015) Critical Factors for

Sustainable Project Management in Public Projects

Mustafa Y, Imaza, Adem Bak (2015) Sustainability in Construction Sector

Paulinus Woka Ihuah, Iyenemi Ibimina Kakulu, David Eaton (2014) A review of Critical Project Management Success Factors (CPMSF) for sustainable social housing in Nigeria

## RESEARCH METHODOLOGY

- A. Problem Identification:** Competition has increased, the markets have globalized, and technological advantages have been made. So to overcome all this factors identification is necessary. This study aims to identify sustainable construction work successfully. The importance and urgency of understanding the factor which is most important for the sustainable construction. This research explains which factor is most affects the sustainable construction.
- B. Data Collection:** The data collection stage is one of the crucial stage of the research process which provides an input to the data analysis stage. For this research the data will be collected as two forms first is primary data collection and other is secondary data. Primary data includes information collected from sources such as personal interviews, questionnaires surveys which is concerned with a specific intention and on a specific subject and observation and discussion by the researcher him or herself and can be self-assessed further. It is a direct approach. Secondary data includes information already available somewhere, whether it be in journals or on the internet, publications or records. Secondary data allows for comparison.
- C. Criteria for Identification:** On the basis of the critical literature review from Literature published in various national, international and other online and local journals; national, international and other conferences; various reports; master and Ph.D. dissertations; books; various standards published by various authorities; etc. the various factors affecting the selection process of sustainable construction. Total 41 factors were found.
- D. Questionnaire Survey Approach:** The questionnaire designed on the bases of the literature review was distributed among various stakeholders like Contractors, Site Engineer, Developer, Project Manager.
- E. Data Collection:** The survey work was carried out within the scope of the study and among the selected respondents of the sample. The questionnaires was distributed among respondents in Navsari City and data was collected through these filled questionnaires.
- F. Questionnaire distribution and collection:** Total 180 questionnaires were distributed to different respondents in Navsari District. Total 128 respondents provided their response for this research work. A list of the stakeholders who showed their response has been presented. The responses were obtained after personal requests and visits to their respective offices. 128 responses collected i.e. 71% response rate which is considered very good for this kind of survey. Though the total number of questionnaires sent and the responses received were limited, the survey covered most of the known experts and consultants of the construction projects in Surat District. The reliability of the survey results is expected to be high because all the respondents are top-level experienced stakeholders. Table 1 shows distribution of responses.

**Table -1: Distribution of Responses**

Sr. No.	Respondent	Questionnaires Distributed	Responses Returned	Percentage of Responses(%)
1	Contractor	100	74	74
2	Architect/Engineer	50	38	76
3	Developer /Owner	20	12	60
4	Project Manager	10	4	40
<b>Total</b>		180	128	71

The ranking method used for the research is Relative Important Index method.

**Introduction of Relative Important index:** The Relative Importance Index (RII) was used to rank (R) the different causes. These rankings make it possible to cross-compare the relative importance of the factors as perceived by the four groups of respondents (i.e. Site Engineer, Developer and Contractors, Project Manager). Each individual cause's RII perceived by all respondents were used to assess the general and overall rankings in order to give an overall picture of the causes of construction delays in Indian construction industry. The formula to calculate RII is given below:

$$RII = \frac{\sum w}{A+N}$$

Where, W = Weighting given to each factor by the respondents, A = Highest weight, N = Total Number of respondents.

**Table 1.2 Architect/Engineer Ranking By RII Method**

Code No.	Perspective	Factors Affecting	SUM	RII
F5	Related to Clients Criteria	Cost Parameter	179	0.94
B1	Environmental	Being saving in using unrenewable resources	178	0.93
B3	Environmental	Minimizing harm to the environment and living things	175	0.92
H3	Process control	Balancing time, cost and quality	174	0.91
F1	Related to Clients Criteria	Identifying proper material selection	172	0.90
C1	Economic	Inadequate working capital	168	0.88
B2	Environmental	Sustainable usage of renewable resources	166	0.87
C3	Economic	Unexpected prices raises for materials	166	0.87
F3	Related to Clients Criteria	Fulfilment of Client expectation	164	0.86
A4	Social	Health and safety	160	0.84

**Table 1.3 Contractors Ranking by RII Method**

Code No.	Perspective	Factors Affecting	SUM	RII
F5	Related to Clients Criteria	Cost Parameter	349	0.94
B1	Environmental	Being saving in using unrenewable resources	346	0.93
B3	Environmental	Minimizing harm to the environment and living things	343	0.92
F1	Related to Clients Criteria	Identifying proper material selection	340	0.91
H3	Process control	Balancing time, cost and quality	337	0.91
C1	Economic	Inadequate working capital	332	0.89
C3	Economic	Unexpected prices raises for materials	328	0.88
B2	Environmental	Sustainable usage of renewable resources	322	0.87
C2	Economic	Unexpected prices raises for labour	318	0.85
A4	Social	Health and safety	314	0.84

**Table 1.4 Developers Ranking by RII Method**

ode No.	Perspective	Factors Affecting	SUM	RII
F5	Related to Clients Criteria	Cost Parameter	57	0.95
B1	Environmental	Being saving in using unrenewable resources	56	0.93
B3	Environmental	Minimizing harm to the environment and living things	55	0.91
F1	Related to Clients Criteria	Identifying proper material selection	55	0.91
H3	Process control	Balancing time, cost and quality	54	0.90

C1	Economic	Inadequate working capital	53	0.88
C3	Economic	Unexpected prices raises for materials	53	0.88
C2	Economic	Unexpected prices raises for labour	52	0.86
B2	Environmental	Sustainable usage of renewable resources	51	0.85
A4	Social	Health and safety	50	0.83

**Table 1.5 Project Manager Ranking by RII Method**

Code No.	Perspective	Factors Affecting	SUM	RII
F5	Related to Clients Criteria	Cost Parameter	19	0.95
B1	Environmental	Being saving in using unrenrenewable resources	18	0.90
F1	Related to Clients Criteria	Identifying proper material selection	18	0.90
B2	Environmental	Sustainable usage of renewable resources	17	0.85
B3	Environmental	Minimizing harm to the environment and living things	17	0.85
C1	Economic	Inadequate working capital	17	0.85
C3	Economic	Unexpected prices raises for materials	17	0.85
E2	Execution	Information/Communication	17	0.85
H3	Process control	Balancing time, cost and quality	17	0.85
A4	Social	Health and safety	16	0.80

**Table 1.6: Top 10 Factors Overall Ranking by RII Method**

CODE NO.	Perspective	Factors Affecting	Sum	RII
F5	Related to Clients Criteria	Cost Parameter	604	0.94
B1	Environmental	Being saving in using unrenrenewable resources	598	0.93
B3	Environmental	Minimizing harm to the environment and living things	590	0.92
F1	Related to Clients Criteria	Identifying proper material selection	585	0.91
H3	Process control	Balancing time, cost and quality	582	0.90
C1	Economic	Inadequate working capital	570	0.89
C3	Economic	Unexpected prices raises for materials	564	0.88
B2	Environmental	Sustainable usage of renewable resources	556	0.86
C2	Economic	Unexpected prices raises for labour	543	0.84
A4	Social	Health and safety	540	0.84

**Table 1.7 Comparison of All Respondents (RII Method)**

RANK	CONTRACTOR	ENGINEER	DEVELOPER	PROJECT MANAGER
1	Cost Parameter	Cost Parameter	Cost Parameter	Cost Parameter
2	Being saving in using unrenrenewable resources			
3	Minimizing harm to the environment and living	Minimizing harm to the environment and living	Minimizing harm to the environment and living	Identifying proper material selection
4	Identifying proper material selection	Balancing time, cost and quality	Identifying proper material selection	Sustainable usage of renewable resources
5	Balancing time, cost and quality	Identifying proper material selection	Balancing time, cost and quality	Minimizing harm to the environment and living things
6	Inadequate working capital	Inadequate working capital	Inadequate working capital	Inadequate working capital

7	Unexpected prices raises for materials	Sustainable usage of renewable resources	Unexpected prices raises for materials	Unexpected prices raises for materials
8	Inadequate usage of renewable resources	Unexpected prices raises for materials	Unexpected prices raises for labour	Information/Communication
9	Unexpected prices raises for labour	Fulfilment of Client expectation	Sustainable usage of renewable resources	Balancing time, cost and quality
10	Health and safety	Health and safety	Health and safety	Health and safety

## CONCLUSION

Overall combined ranking considering the perception of all the stakeholders is done. Based on the analysis, 10 risk factors have been identified which most affect sustainable construction projects. In the decreasing order ranking of the factors are Cost Parameter, Being saving in using unrenusable resources, Being saving in using unrenusable resources, Identifying proper material selection, Balancing time, cost and quality, Inadequate working capital, Unexpected prices raises for materials, Sustainable usage of renewable resources, Unexpected prices raises for labour, Health and safety. Rank of each factors and their importance is identified by the Relative Important Index(RII) method.

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