

# Management of Sustainability in Construction Works

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**Abstract:** *The current paper investigates the contribution of better understanding of the building evaluation and its role for achieving sustainable development using existing researches. The research will be a relationship between existing researches, their results, methods and their questions. The construction industry plays an essential role in improving the quality of the built environment, but it also has some influences on the wider environment in a number of ways. The main section of the study begins by giving out the questionnaire to the subjects that are chosen on random selection from the construction firms in Kerala. The frequency and percentage analysis were carried out by SPSS version 20. The research results are expected to make clear that whether the awareness of sustainable development is present among construction industries, the level of the implementation of sustainable development factors in construction is satisfactory or not and professionals believe that the government has a major role to develop sustainable building in Kerala. Furthermore, the paper has put forward some recommendations for better improvements in construction with reference to MATURITY MODEL.*

## 1. Introduction

Sustainability is a state that requires the humans to carry out their activities in a way that protects the functions of the earth's ecosystem as a whole. The issue of sustainable development is broad and of global concern, and, as such, involves all relevant communities and interested parties. Both the current and future needs of the global community define the extent to which economic, environmental and social aspects should be considered in the sustainable development process. These general principles form the basis for a suite of standards intended to address specific issues and aspects of sustainability relevant to construction works

## 1.1 Objective of the Study

The Objective of this study is;

- Improvement of the construction sector and the built environment.
- Reduction of adverse impacts while improving value, where impacts as well as value may be judged against any combination from the three primary aspects of sustainability.
- Stimulation of proactive approach.
- Reconciliation of contradictory interests or requirements arising from short term and long term planning or decision making.

## 1.2 Scope of the Study

- The study intends to be the basis for the future development of an advanced building sustainability rating tool suitable for our traditions, climate, national and international standards.
- Maturity models are a practical way to 'translate' complex concepts into organizational capabilities and to raise awareness for potential development. They provide guidance for action plans and allow organizations to monitor their progress.

## 2. Principles

- Continual improvement
- Equity
- Global thinking and local action
- Holistic approach

## 3. Literature Review

A literature review is a detailed report of information obtained from the literature that is

related to our topic of study. The review describes, summarize, evaluate and clarify this literature. It gives a base for the research and helps in determining the nature of the study. This section represents the review of literature collected from various journals and articles that are most relevant to the study.

**Malik Khalfan [1]:** The aim of the paper is to examine the perceptions towards environmental, social and economic benefits of sustainable construction amongst contractors. For this purpose questionnaire survey was employed in two stages with construction contractors. Client demand, associated costs of sustainable construction materials and practices and perceptions of employees and workers were perceived as weaknesses towards implementation of sustainable construction practices. The questionnaire in the first stage focused on the environmental aspects while in the second stage the focus was on the social and economic aspects of sustainable construction.

**Jamilus Md Hussin [2]:** Construction industry is one of the most significant industries that contribute toward socio-economic growth especially to developing countries. The nature of the industry are fragmented, unique and complex which always face chronic problems like time overrun (70% of projects), cost overrun (average 14% of contract cost), and waste generation (approximately 10% of material cost). It is also regarded as one of the largest polluters to our environment. These challenges accent the need for practitioners to rethink and improve the construction process and technology. This shows that the construction industry has a major potential in the advancement of sustainable development by addressing issues related to the economic, social, and environment. By adopting sustainable construction, it can reduce the overall energy use and maximize potential for renewable energy supply, minimize waste, conserve water resources, enhance water quality, incorporate water sensitive design and minimize vulnerability to flooding, minimize polluting emissions to water, air and soil and minimize noise and light pollution.

**Karma Wangchuk [3]:** There are many choices in regard to selection of materials in any type of constructions. Due to growing interest in sustainable construction, engineers and architects are motivated to choose the materials which are more sustainable. Green concrete capable for sustainable construction is characterized by application of industrial wastes to reduce consumption of natural resources and energy and pollution of the environment. Replacement of materials over nominal concrete is what makes green concrete more environmental friendly concrete.

Marble sludge powder, quarry rocks, crushed concrete and fly ashes are some of the materials used for making green concrete, a sustainable construction.

**B. M. Kataria1 [4]:** This paper brings together research on available alternatives and implementations required for Sustainable development. More than ever, Construction industry of India is concerned with improving the social, economic and environmental indicators of sustainability. An active effort is extremely essential by construction industry of India along with participation of all the institutions, professional bodies, academicians, industry as well as government for sustainable development and hence leave resources for the future generation to satisfy their needs. This paper provides possible aspect where and how sustainability can be adopted and implemented and/or incorporated for sustainable development.

**Javier Irizarry [5]:** The aim of this paper is to develop a prototype of a Sustainable-Construction Planning System (SCPS) in order to mitigate the negative impacts of the construction industry on the environment. To achieve this aim, frequency and severity of known environmental impacts of construction process of residential buildings were investigated through interviews with a safety expert panel in Malaysia. Then, risk level associated with each environmental impact was calculated based on the relevant risk matrix. The SCPS extracts current construction activities from any computer-based schedule and identifies sustainable strategies, and environmental impacts related to each activity as a report. The SCPS was presented to an expert panel who was asked to assess the reliability and usability of the SCPS. It can be concluded that the SCPS is efficient and helpful in mitigating construction related impacts on the environment. The practical implication of this study is to promote sustainable construction by promoting the project participants' knowledge and awareness of significant environmental impacts related to construction operations. This study could be a platform for developing automated sustainable planning systems that can be used broadly in construction projects.

#### 4. Methodology

This project have adopted some reliable and innovative methods which include, selection of study area, systematic collection of data's in the form of literature papers and journals analysis and understanding of data, identification of the topic, project planning which involves adopting innovative ideas for the progress of project success, conducting a detailed study on the needful tools. In this project,

for example the data analysis by SPSS (Statistical package for social sciences) software was well studied and the critical factors that are identified by ranking in SPSS software would be studied. Survey through questionnaires is found effective because relative ease of obtaining standard data is appropriate for achieving the objectives of this study. The ranking was determined by using the mean and standard deviation values computed from the respondent's data. The questionnaire survey was done to determine the importance of critical success factors for sustainability which was perceived by contractors, supervisors, site engineers working within construction industry.

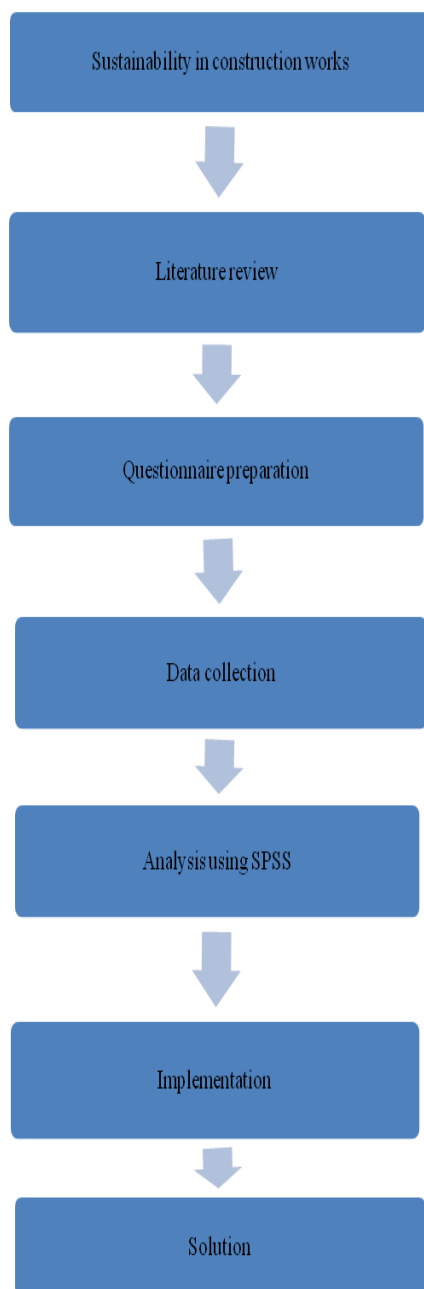


Figure 1: Research Methodology

#### 4.1 Preparing Questionnaire

A questionnaire is an analyzing instrument consisting of a set of questions for the purpose of collecting information from the respondents. They are designed for statistical analysis of the responses. Questionnaires must be prepared such that the respondents must be capable to read the questions and answer to them.

The design of questionnaire is one of the essential parts in this study to know about the awareness of people in the construction field in sustainable development. In this thesis, the questionnaire survey consists of two parts. The first part consist of general details like the type of company, experience, value of the project etc and the second part consist of factors affecting the implementation of sustainability in construction industry.

The questionnaire for this project survey is formulated by referring the relevant literature in the area of sustainable development in construction. The survey is done by direct interview with the key personnel of contractor and engineers. It is done through asking open ended questions. The results from this stage are used mainly to get some ideas related to the identified problems. Questionnaire survey definitely has been used for evaluation of various results obtained. The data which is collected is analyzed with an objective of checking data and reducing the defects and delays by implementing MATURITY MODEL.

Analysis was employed using four point Likert scale and the weight is given as below:

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Agree
- 4 – Strongly Agree

#### 4.2 Analysis Using Software

Statistical Package for Social sciences is software used for executing analysis in social sciences. It is also used by market, education and health researchers and also various organizations. The 'Data View' shows a spreadsheet using rows and columns. The following table shows the mean, Standard deviation and rank of the major seven lean wastes. These values are obtained as a result of the responses obtained from the Respondents of 30 Construction companies and the obtained data are analyses and ranked using the software.

## 5. Results and Discussion

This section represents the data analysis and discussions based on the questionnaire survey. The collected data are analyzed by using the SPSS software. The objective of conducting the analysis for this section is to establish the factors for the causes identified from the literature review and the ranking them according to their influence in construction project.

### 5.1. Bar Chart obtained from SPSS

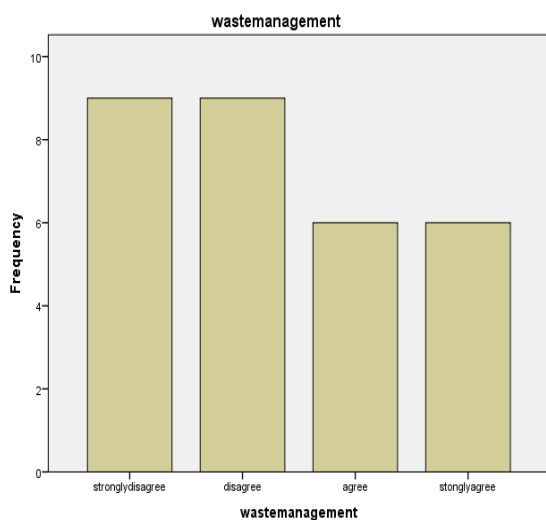


Figure 2: Analysis of Waste management

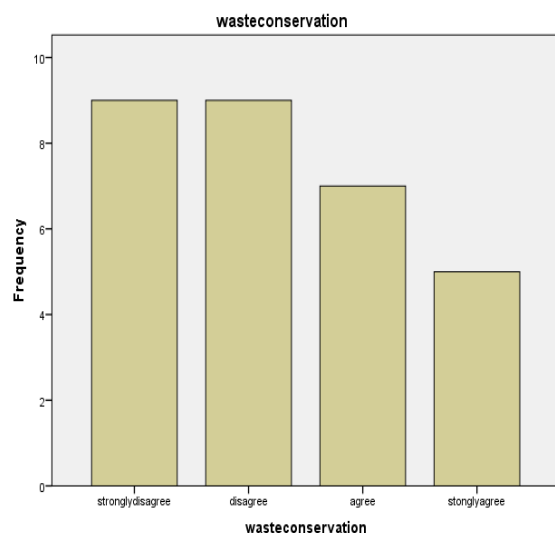


Figure 3: Analysis of Water conservation

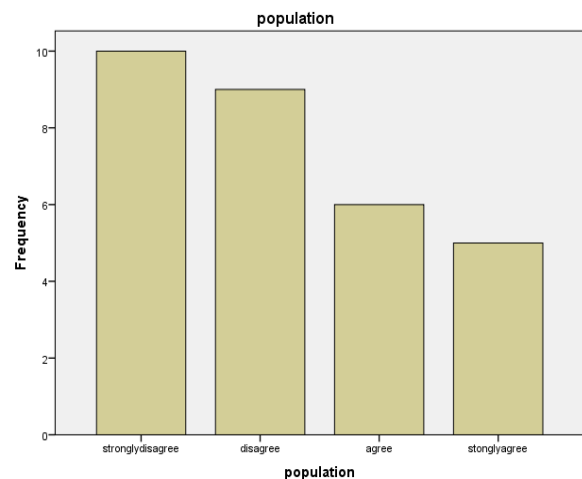


Figure 4: Analysis of Population

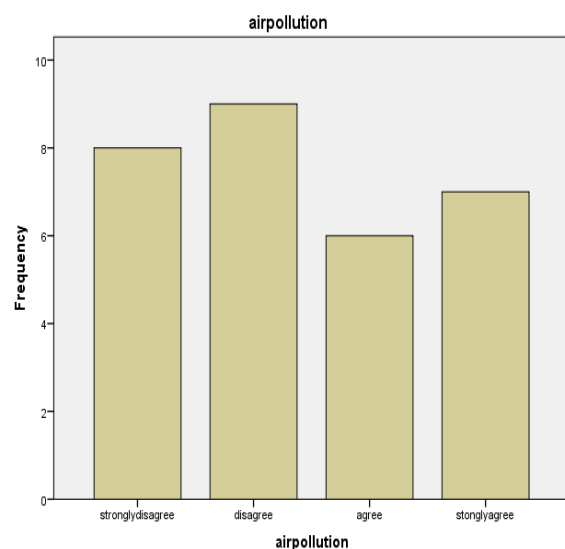


Figure 5: Analysis of Air pollution

## 6. Maturity Model

Maturity models are a practical way to ‘translate’ complex concepts into organizational capabilities and to raise awareness for potential development. They provide guidance for action plans and allow organizations to monitor their progress. Most maturity models are derived from the Software Engineering Institute’s Capability Maturity Model (Carnegie Mellon Software Engineering Institute, 2002) and thereby based on the maturity of processes. For example, project management maturity is in this context a measure for the organization’s ability to perform project management and related processes in a controlled and optimized way. For the goals our sustainability a maturity

model is developed that addresses the consideration of sustainability aspects more specifically. The model is based on two dimensions. The first dimension is that of the aspects, or criteria, of sustainability, the second that of the level or depth of considering sustainability.

### 6.1 Criteria of sustainability

Sustainability in the context of sustainable development is defined by the World Commission on Environment and Development (1987) as "forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs". This broad definition emphasizes the aspect of future orientation as a basic element of sustainability. This care for the future implies a wise use of natural resources and other aspects regarding the environmental footprint. However, sustainability requires not just an environmental "green" perspective, but also a social one. Elkington (1997), recognizes this in his 'triple bottom line' or 'Triple-P (People, Planet, Profit)' concept: Sustainability is about the balance or harmony between economic sustainability, social sustainability and environmental sustainability (Elkington, 1997).

Elaborating on the three perspectives of the Triple-P concept, several organizations developed frameworks of indicators that would allow organizations to evaluate the sustainability aspects of different policies and projects, as well as to monitor progress. In fact, the literature on these models is a veritable jungle of different approaches and numerous case studies. A widely used framework in (external) sustainability reporting is the Sustainability Reporting Guidelines by the Global Reporting Initiative (GRI). The GRI is a non-profit organization that pioneered the Sustainability Reporting Guidelines (SRG). Companies can use the SRG to indicate to shareholders and consumers their economic, social and environmental performance. GRI's objective is to facilitate sustainability reporting for companies and thereby stimulate them to operate more sustainably. The SRG framework consists of an extensive set of indicators, from which companies can select a set that is relevant to their operations or industry.

### 6.2 Level of consideration

The second dimension of the maturity model is that of level, or depth, of consideration of sustainability. This dimension is based on the observation that sustainability can be considered on different levels.

A first logical level is the level of resources (beginning). For example, using resources that

provide the same functionality, but are less harmful for the environment, like using hybrid cars instead of normal fuelled cars. These actions can reduce the less sustainable effects of operating the organization, but do not take away the cause of non-sustainability. A second level of consideration is therefore the business process (improving) in which the resources are used. A more sustainable business process takes away the cause of non-sustainable effects instead of just limiting or compensating them. For example, optimizing a service management process in such a way that less travel is required. A third level of consideration is looking at the way the products or services are delivered: the business model (succeeding). For example changing from a strictly off-line business model to a combined on-line and off-line business model, may have favorable effects on sustainability because of the fact that on-line shoppers travel less than off-line shoppers. A fourth and final level of consideration takes into account not only the business process or model to deliver products and services, but also the products and services themselves (leading). How can products and services be innovated to contribute to a more sustainable society? For example a product that teaches children to respect nature.

## 7. Conclusion

The aim of the study is to investigate the major factors effecting sustainability in whole construction industry. The works like literature review, problem identification, and questionnaire preparation has been carried out till now. The works like data collection, data analysis, solution, recommendation and discussion have to be carried out in the next phase of the project. The most affected factors of sustainability have to be identified by the ranking using Statistical Package for Social Sciences analysis. The recommended actions will be considered into account and the improvement activities are executed. MATURITY MODEL is used as a tool for analyzing results obtained. Sustainability assessment of construction projects is essential to the fact that it does not create any harmful effects on the living ecosystem while optimizing the cost of construction. This is to ensure the availability of resources for the future generations. Following are the important construction activities which have large impacts on sustainability in construction and civil engineering.

India is a rapidly growing economy and hence the pressure on the use of natural resources is very heavy. There is an awakening about the words durability and then sustainability. An active effort is extremely essential by construction industry of India

along with participation of all the institutions, professional bodies, academicians, industry as well as government for sustainable development and hence leaves resources for the future generation to satisfy their needs.

## 8. Acknowledgement

On the very beginning of this paper, I would like to prolong my sincere & heartfelt responsibility towards all the personalities who have helped me in the completion of this undertaking. Without their active guidance, help, cooperation & encouragement, I would not have completed this paper.

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