Proceedings of 2nd International Conference on Climate Change and Emerging Trends in Civil Engineering CCETC-2025

Integrating Sustainability into Construction Contracts: Evaluating Standard Forms for Effective Implementation in Pakistan

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Abstract

The construction industry plays a pivotal role for economic growth, social progress, creating job market, providing vital infrastructure, and driving innovation. However, the conventional construction practices harm the environment by utilizing large quantities of natural resources, producing limitless waste, and emitting greenhouse gases by the use of materials like concrete, steel, plastic, glass and wood etc. Additionally, improper waste disposal practices and land disruption cause pollution and loss of biodiversity. These practices are unsustainable and need deviation towards greener and more energy-efficient methods of construction to reduce the environmental impact. These methods come under the umbrella of sustainability which is the ability to meet the needs of present without compromising the ability of future generations to meet their own needs. The public awareness regarding the concept of sustainability is quite good among the literate public but many face challenges in adopting sustainable practices due to lack of accessible resources, cost-effective solutions, clear guidelines, and tools. One of the most effective ways to ensure sustainability especially in construction projects is by incorporating sustainability clauses during contract formation. This would make sustainability not just a voluntary act but a contractual obligation. Globally, various standard forms of contract documents are being followed and a comparative analysis is needed to determine which document is the most effective in promoting sustainability. In Pakistan, we need to assess whether the current standard contract document that we follow is sufficient or we need to adopt a better model that ensures sustainability effectively.

Keywords: Sustainability, Awareness, Contracts, Comparative Analysis.

1. Introduction

The construction industry is one of the biggest industries around the globe and it has a huge impact on the lives of humans, their behaviors, the economy and the environment. In Pakistan, it is considered as one of the most significant industry and has overtaken agriculture as Pakistan's second-largest sector. The share of the construction industry is 13.4 percent in industry value-added which is mainly driven by construction-related expenditures by industries. Due to an increase in government spending construction industry reordered modest growth of 3.1 percent (Pakistan Economic Survey, 2021-22).

With the increase in global population the need for construction is also increasing and new ways and techniques in the industry are also being adopted, but with these advancements a negative impact is also created around the world in the form of environment, natural resources,

 https://doi.org/10.64615/fjes.1.Special Issue.2025.51

pollution etc. For instance, construction industry causes 23% of the air pollution, 40% of drinking water pollution and 50% of landfill wastes; moreover the construction industry utilizes 40% of the world's raw stones, gravel and sand. [1]

In order to reduce these negative impacts of construction, sustainable approach is needed to be implemented in the construction industry, there are many researches about the inclusion of sustainability in construction but the implementation of sustainable aspects in the industry has been a major problem.

The word "sustainability" gained widespread usage after 1987, when the Brundtland Report from the United Nations' World Commission on Environment and Development defined Sustainable development as the development that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs". [2]

Sustainability is often broken down into three main pillars: economic, social, and environmental [3]. Economic sustainability focuses on creating and maintaining a strong economy that benefits all members of society, economic sustainability includes the use of full-cost accounting methods and real-cost pricing to set prices and tariffs for goods and services and achieve more efficient use of resource [4]. Social sustainability focuses on creating and maintaining a just and equitable society. Environmental sustainability focuses on protecting and preserving natural resources and ecosystems for future generations. Together, these three pillars form a comprehensive approach to creating a sustainable future.

The concept of sustainability has been increasingly applied in construction. Construction involves all stages of the life cycle of building, including the design of a building or structure, construction planning and management, construction works, maintenance and rehabilitation of buildings or infrastructure objects [5]. Sustainability in construction refers to the application of sustainable principles and practices in design, construction, and operation of buildings and infrastructure. One key aspect of sustainable construction is the use of sustainable materials and methods. This includes the use of laterite soil, brick wastes, rice husk ash, burnt refuse ash, fly ash, pulverized burned clay, periwinkle shell aggregate, mud blocks or bricks, laterite blocks, bamboo for roofing and ceiling, palm front roofing, and mud plaster [6].

Sustainable principles can be implemented in the construction industry when there is a client's demand and stakeholder's involvement for the sustainable construction. One of the ways of implementation is the inclusion of sustainable principles in the construction contracts because the standard construction contracts are not sufficient to cater to all the challenged of the sustainable development and construction, it is necessary to make changes in order to have a well drafted standard green construction contract [7].

This study aims to assess public awareness regarding sustainability concepts and their application among construction professionals in Pakistan. It explores how standard construction contract documents can be leveraged to promote sustainability in construction projects. Through a comparative analysis of various international standard contract documents, the study seeks to identify the most effective contract form for ensuring sustainability. Finally, it will evaluate whether the current standard contract document used in Pakistan is adequate for promoting sustainability or if a transition to a more suitable alternative is necessary.

2. Methodology

In order to achieve our objectives of assessing the awareness among the public regarding sustainability concepts and their application through the use of the most effective standard form of contract document, the following approach will be adopted:

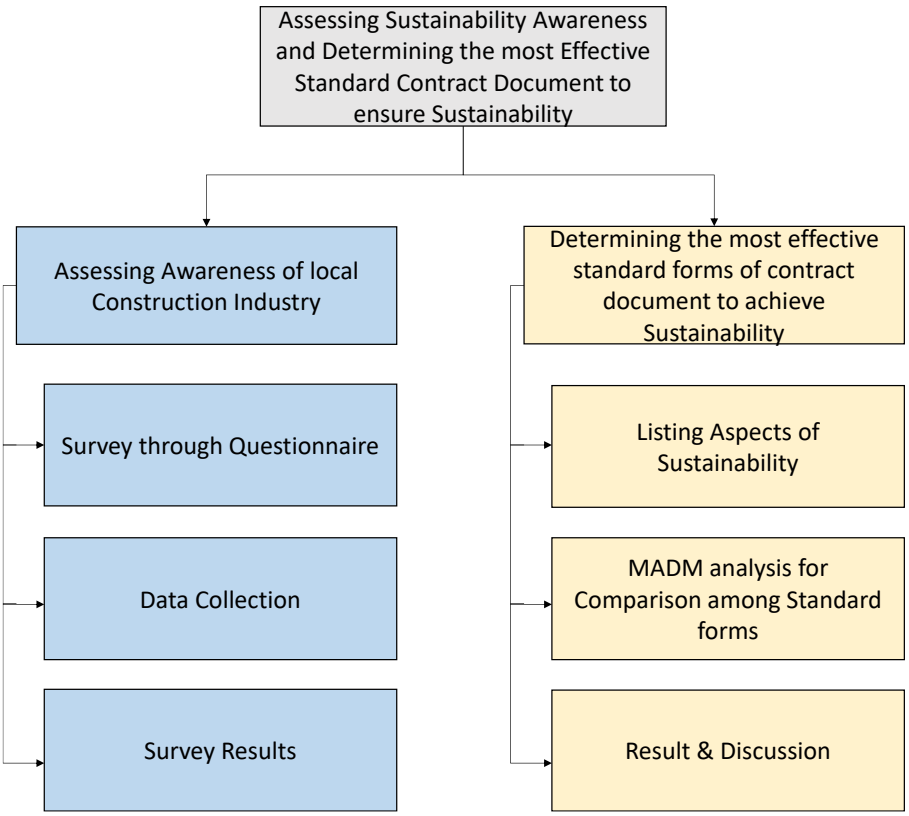

Figure 1. Methodology

3. Assessing the Awareness of Sustainability Concepts in local Construction Industry:

The construction industry of Pakistan is a crucial element of economic growth that contributes around 2.5% to the country's GDP and provides employment to over 8 million people, which accounts for about 6.5% of the total labor force. But despite the importance of the construction industry in driving economic growth, it faces challenges such as outdated techniques, low productivity, and a lack of sustainable construction practices. The sector consumes large amounts of energy and materials, contributing to environmental degradation and as Pakistan is urbanizing, adopting sustainable construction practices are very essential for balancing growth with environmental responsibility.

In order to achieve this goal of adopting the sustainable construction practices, the first step is awareness and knowledge among the professionals and stakeholders associated with construction industry. There have been considerable efforts by the professional bodies, government, and social-welfare organizations to promote the use of sustainable construction practices in Pakistan. Before identifying strategies to integrate sustainability concepts effectively, it is vital to assess public understanding of these principles. The most efficient way to gather this data is through surveys and questionnaires.

3.1. Data Collection:

In order to obtain the data regarding sustainability awareness among the professionals of construction industry, a Google form was created and shared with various construction companies' employees including contracting firms, consultancies and the representatives from client's side. This google form consists of various questions firstly regarding the basic personal information of the person filling the form like qualification, designation, work experience and professional role and then about their understanding of the concepts of sustainability in construction, its importance and challenges they are facing in achieving sustainable practices.

3.2. Survey Results:

The answers to the questions asked through the survey form that provide reasonable insights regarding the understanding of public on the topic of sustainability are tabulated below:

Table 1. Survey Questionnaire Results.

Section 1: Biography				
Qualification				
DAE / BTECH	Bachelors / Graduate	Masters		
4%	57%	39%		
Work Experience				
Less than 3 years	4 – 6 years	6 – 10 years	More than 10 years	
29%	42%	2%	27%	
Professional Role				
Client	Consultant	Contractor		
33%	31%	36%		
Section 2: Sustainability Acceptance				
Are you familiar with sustainable construction contracts?				
Very familiar	Somewhat familiar	Neutral	Somewhat unfamiliar	Unfamiliar
27%	44%	16%	13%	0%
How important do you think it is for the contract to be sustainable?				
Very important	Somewhat important	Neutral	Somewhat unimportant	unimportant
56%	40%	4%	0%	0%
How important is sustainability to you when selecting a contractor for a construction project?				
Very important	Somewhat important	Neutral	Somewhat unimportant	Unimportant
50%	18%	22%	0%	0%
Do you typically include sustainability requirements in your construction contracts?				
Always	Most of the time	Sometimes	Rarely	Never
24%	31%	18%	27%	0%
Would you be willing to pay extra for sustainable construction practices in a project? (consider yourself a client)				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
24%	47%	27%	2%	0%
Do you consider sustainability a requirement for project success?				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
29%	42%	24%	5%	0%
Have you previously worked on projects that required sustainable construction practices?				
Always	Most of the time	Sometimes	Rarely	Never
9%	16%	44%	24%	7%
How important it is for you to receive regular updates on the sustainability progress of a construction project?				
Very important	Somewhat important	Neutral	Somewhat unimportant	Unimportant
36%	42%	18%	4%	0%

Do you believe that sustainable construction practices can lead to cost savings in the long run?				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
42%	42%	14%	2%	0%
Do you believe sustainable contract clauses help in achieving sustainability goals?				
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
29%	46%	18%	7%	0%
Section 3: Challenges (Rating 1 to 5 with '1' being least challenging and '5' being most challenging aspect)				
Resistance from stakeholders				
1	2	3	4	5
4.44%	11.11%	37.78%	33.33%	11.11%
Lack of knowledge and expertise				
1	2	3	4	5
8.89%	15.55%	20%	42.22 %	13.33%
High initial costs				
1	2	3	4	5
2.22%	20%	24.44%	42.22%	11.11%
Limited availability of sustainable materials				
1	2	3	4	5
8.89%	22.22%	28.89%	37.78%	2.22%
Little motivation to implement sustainable contractual clauses				
1	2	3	4	5
8.89%	17.78%	31.11%	26.67%	15.56%
Construction process technicalities				
1	2	3	4	5
6.67%	24.44%	42.22%	22.22%	4.44%
Challenges in designing				
1	2	3	4	5
8.89%	35.55%	31.11%	22.22%	2.22%
Complex or unpredictable supply chains				
1	2	3	4	5
4.44%	17.78%	33.33%	37.78%	6.67%

Table 1: Survey Questionnaire Results shows the biographic data of the respondents in the Section 1.It can be observed that most of the respondents are having highest qualification as bachelors, most of them have work experience of 4-6 years and even though there isn't much of a difference among the employees from contractor, client, and consultant but most of them belong to contracting firms. This shows that the respondents are academically and professionally qualified enough to give a reasonable opinion. Section 2 then highlights the answers to the questions about sustainability awareness and acceptance made by our respondents. The respondents were supposed to answer by selecting the most relatable choice and then all the choices made are shown in the form of percentage. The choices made and the respective percentage of people who made them clearly depicts that majority of the respondents are quite well aware of the concept of sustainability, its importance in construction and while selecting a contractor for the job. Also, the data highlights that even though some of the respondents have been associated with projects that included sustainability aspects but they still most of them haven't been able to include it very often. Further-

more, majority of them are not only willing to incur extra costs but also think that including the concepts of sustainability can save costs in the long run. The Section 3 then focuses on the responses made against the challenges being faced by the local construction industry and their intensity was determined by asking the respondents to rate the level off challenge from 1 to 5 with 1 being least challenging and 5 being the most challenging aspect. The responses made against the rating 1 to 5 are then depicted in the form of percentage of people that made the specific response against each rating value. The results highlight that the challenges faced are of the intensity that cannot be ignored and some legitimate steps should be taken to fully implement the concepts of sustainability in our construction projects. Hence, the respondents are reasonably aware of the concepts of sustainability and they are willing to include them in their projects and are advocate of the idea of including the sustainable clauses in the contracts in order to ensure sustainability in construction projects.

4. Determining the most effective standard contract document to achieve sustainability:

The survey that we conducted to assess the public awareness of sustainability concepts revealed that in Pakistan's construction industry, the primary issue is not the lack of awareness and knowledge about sustainable practices among the professionals but rather their inability or unwillingness to implement sustainable practices due to various challenges. This gap can be addressed by incorporating legally binding requirements for both parties during contract formation, ensuring that sustainable practices are not only a voluntary action but a legally binding obligation. This approach would be a consistent adoption of sustainability in construction projects.

In Pakistan, the Pakistan Engineering Council (PEC) form of contract documents and Public Procurement Regulatory Authority (PPRA) regulations are used for the procurement of goods, works, and services. These documents are mostly based on the FIDIC Conditions of Contract for Construction (Red Book) that is a globally recognized standard. Even though the FIDIC standard contract document offer numerous benefits, such as compliance with international standards, clear risk allocation, and structured dispute resolution, enhancing efficiency and transparency, it is important to evaluate how well it addresses the aspects of sustainability in construction projects. We must consider whether FIDIC is sufficient in this regard or if a better alternative exists that more effectively integrates sustainability.

These are the various standard forms of contract documents used around the globe and we need to evaluate the best among them in terms of inclusion of the clauses of sustainability:

- FIDIC Conditions of Contract for Construction (Red Book)
- AIA General Conditions of the Contract for Construction (Document A232 2009 SP)
- CSI Construction Contract Administration
- NEC4 Engineering and Construction Contract 2017
- GC21 Edition 1 General Conditions of Contract
- CONSENSUS DOCS 200 Standard Agreement and General Conditions between Owner and Constructor 2017
- EJDC C-700 Standard General Conditions of the Construction Contract

4.1. Aspects of Sustainability:

Through a literature review, key aspects of sustainability were identified, which served as the basis for evaluating various standard contract documents to determine the most effective in terms of promoting sustainability. The identified aspects include:

1. Energy Efficiency [8]
2. Water Conservation [9]
3. Indoor Environmental Quality [10]
4. Waste Reduction [11]
5. Site Planning and Design [12]

6. Sustainable Materials [13]
7. Biodiversity [14]
8. Community Engagement [15]
9. Innovative Technology i.e. BIM [16]
10. Health and Safety [17]

Qualitative Multi Attribute Decision Making (MADM) Technique to determine most efficient Standard Contract Document:

For the detailed assessment of various standard contract documents listed before, a certain technique named MADM was adopted. In this technique the various contract documents were ranked on the basis of marks allocated against the presence of sustainability clause(s) to an extent;

- 10 marks: To the contract document that fully takes the sustainability aspect into account.
- 5 marks: To the contract document that includes the sustainability aspect but it is really vague with no specific details.
- 0 marks: To the contract document that does not mention the sustainability aspect at all.

Table 2. Comparative analysis by MADM technique

S.No.	Sustainability Aspects	FIDIC	AIA	CSI	NEC4	GC21 Edition1	Consensus Docs	EJCDC
1	Energy Efficiency	0	5	0	0	0	10	0
2	Water Conservation	0	0	0	0	0	5	0
3	Indoor Environmental Quality	0	5	5	0	0	5	0
4	Waste reduction	0	10	10	0	0	10	0
5	Site Planning and Design	5	0	10	0	10	5	5
6	Sustainable Materials	5	5	5	0	0	5	5
7	Biodiversity	5	0	10	0	5	10	5
8	Community Engagement	0	0	5	0	0	10	0
9	Innovative Technology	0	0	0	0	0	5	5
10	Health and Safety	10	10	10	5	10	10	10
Total		25	35	55	5	25	75	30

As per the Qualitative MADM analysis performed, it is evident that the Consensus Docs is by far the most efficient standard form of contract document that covers the maximum number of aspects of sustainability.

5. Results and Discussion

This study revolved around two main objectives; one being assessing the public awareness regarding the concepts of sustainability and other being analyzing various standard contract

documents in order to determine the most efficient document in terms of ensuring sustainability during construction projects.

To achieve the first goal, a comprehensive survey was conducted using a Google Forms questionnaire. The survey collected basic information about the respondents and provided insights into how well they understood sustainability, both individually and within the broader construction industry. The key finding from the survey was that Pakistan's construction industry is generally aware of sustainability concepts and is willing to incorporate them into their projects. However, while there is a good understanding of sustainability, the practical application of these principles on a regular basis remains a challenge. As far as awareness is concerned, the current industry is well acquainted but they are facing difficulty in practically incorporating the concepts of sustainability on a regular basis. This issue can be resolved by adding the sustainability clauses in construction contract documents and the respondents agreed that this approach can prove to be very useful since sustainability would become a binding obligation.

The second goal, which aimed to identify the most efficient standard contract document in terms of sustainability, was addressed through a comparative analysis of various internationally recognized contract documents. Using a qualitative Multi-Attribute Decision-Making (MADM) technique, "Consensus Docs" emerged as the most effective document for integrating sustainability into construction contracts.

Currently, Pakistan uses the FIDIC (International Federation of Consulting Engineers) standard contract document, which was found to be less capable of incorporating sustainability clauses compared to other documents. Based on this analysis, the study recommends that Pakistan’s construction industry and procurement authorities should consider adopting better options like Consensus Docs, which are more effective at embedding sustainability into contracts. Another possible solution would be to create a hybrid contract document by selecting the best sustainability clauses from different standard documents. This customized contract could improve procurement processes, ensure stronger and safer agreements, and better integrate sustainability principles, benefiting all stakeholders and the environment alike.

6. Conclusion and Recommendations

From the findings of this study, it can be stated that there is a considerable level of awareness and understanding of the sustainability principles by stakeholders in the construction industry in Pakistan but practical implementation of these principles is an issue. The focus on FIDIC contract documents as is the case currently falls short of achieving sustainable construction in construction projects. When comparing global standard contract documents, it was possible to determine that Consensus Docs is the most effective in mainstreaming sustainability. For the construction industry in Pakistan to be able to promote good green practice, it is advised that foraging Consensus Docs or formulating a hybrid contract which contains the best elements of various standards would be beneficial. Adopting the use of sustainability clauses, offering training and support for stakeholders, and promoting government support through adoption of sustainability policies will ensure the alteration of construction towards the usability of sustainability in a consistent manner for the well-being of the environment, most importantly, the construction industry and society too.

Author Contributions: “Conceptualization, Syed Muhammad Shahrukh Ali and Dr. Rana Rabnawaz Ahmed; methodology, Syed Muhammad Shahrukh Ali and Muhammad Taimoor Riaz; software, Muhammad Taimoor Riaz; validation, Syed Muhammad Shahrukh Ali, Dr. Rana Rabnawaz Ahmed and Shahzad Ahmed; formal analysis, Muhammad Taimoor Riaz; investigation, Muhammad Taimoor Riaz; resources, Syed Muhammad Shahrukh Ali; data curation, Syed Muhammad Shahrukh Ali and Muhammad Taimoor Riaz; writing—original draft preparation, Muhammad Taimoor Riaz; writing—review and editing, Syed Muhammad Shahrukh Ali; supervision, Syed Muhammad Shahrukh Ali; funding acquisition, Taha Shah..

Funding: This research received no external funding

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study

Data Availability Statement: Data supporting reported results can be accessed by requesting Muhammad Taimoor Riaz via email address: muhammadtaimoorriaz1@gmail.com

Acknowledgments: The authors would like to express their gratitude to everyone who assisted them with their research.

Conflicts of Interest: The authors declare no conflicts of interest

Abbreviations

The following abbreviations are used in this manuscript:

MADM	Multi Attribute Decision Making
PPRA	Public Procurement Regulatory Authority
PEC	Pakistan Engineering Council
GDP	Gross Domestic Product

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