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Barriers to Social Sustainability in Residential Building Construction in Afghanistan

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Abstract

Although socially sustainable buildings are becoming increasingly popular worldwide, past studies indicate that when policymakers support sustainable building development, the social dimension is often given less attention or is entirely disregarded. There is not much research that focus on the challenges of socially sustainable buildings in Afghanistan. This research investigated the factors that hinder implementation of social sustainability in residential building construction. The study collected data from construction professionals and employed Exploratory Factor Analysis (EFA) and Varimax for analysis. The findings are critically analysed and discussed. The results indicate that there are six underlying factors for the barriers to socially sustainable building construction in this context. Among these barriers, lack of urban planning, awareness, and economic incentives are rated as the greatest impediments to social sustainability in residential buildings. The primary goal of this study is to reduce the barriers' dimensionality to make it easier for practitioners to overcome challenges. Moreover, to inform decision-making in the industry and encourage the adoption of more socially sustainable construction practices.

Keywords

Social sustainability, residential building, barriers, afghanistan, factor analysis

INTRODUCTION

Since the publication of the United Nations Brundtland Report in 1987, the concept of Sustainable Development has been a significant global debate, as it emphasizes the responsible use of resources by current generations without jeopardizing future generations' ability to meet their needs. According to [1], this definition is widely accepted for sustainable development. The meaning of a built environment has evolved and continually developed. The authors [2] argued that the current terminology for environmental sustainability is insufficient for creating a built environment that offers environmental, social, cultural, and economic benefits. Leading professionals in the field now prioritize ecological and community restoration or regeneration as sustainability goals, measuring success through improvements in health and well-being for all [2]. Sustainable building development policies often overlook the social dimension, according to previous research. Over the past decade, theoretical frameworks for defining and studying social sustainability have been developed [3].

According to [4], [5], social sustainability is centered around individuals and their relationships with the environment as one component of the three interconnected measurements of supportability, alongside economic and environmental sustainability. The definition and conceptualization of 'social sustainability' remain unclear [6]. The meaning of social sustainability continues to evolve in various contexts. [7] Under the holistic approach, client satisfaction is ensured , and collaboration with all stakeholders (clients, providers, agents, and the local community) is facilitated by addressing their needs throughout the development process, from commissioning to demolition. The study by [8] proposes social supportability as a strategy that combines physical planning and social foundations to empower well-being, fulfill people's living and working requirements, encourage civil engagement, and offer social amenities. Social maintainability prioritizes individuals' natural intuitions.

Kabul, the capital city of Afghanistan, is home to over 5 million residents and was initially designed for only 1.5 million people [9]. Buildings constructed after 2001, predominantly in unregulated sectors that disregard master plans and architectural norms, exhibit inferior quality. This country's-built environment sustainability is just beginning to develop [10]. Buildings substantially influence a city's social, economic, and environmental sustainability, according to [3]. This research intends to assess the social sustainability of Kabul's residential buildings by gathering data there.

According to [10], Kabul's construction sustainability is poor. In 2019, Afghanistan's first LEED-certified building (World Bank Building in Kabul) was constructed, advocating for sustainability, but it still relies on eco-technologies rather than harmonizing design with local social and ecological systems. The introduction of Western housing through rapid reconstruction imported cultural conflicts and left substantial environmental impacts [11].

Modern Western project designs lack community acceptance, making them financially unsustainable [12]. Focusing on the social aspects of sustainability is essential for a more sustainable construction industry.

In developing countries, projects frequently fail to consider social sustainability factors, such as residential building projects in Afghanistan [12]. In this context, the focus has been on the environmental dimensions of sustainability. According to [11], relying solely on global sustainability practices and technological advances is insufficient for designing a sustainable built environment. In sustainable design, the local context and user values play vital roles. In this study, we will explore the local professionals` viewpoints on the obstacles to social sustainability in Afghanistan.

The widespread adoption of social sustainability in building construction projects remains hindered despite its significance [3]. The exponential increase in population and building construction in Kabul caused considerable issues by a sustainability standpoint [10]. Based on the obstacles identified by previous studies, such as those by [3], [13], we examine the barriers related to social sustainability in the building construction sector.

Identifying barriers to social sustainable development is crucial when evaluating a country’s sustainable development level. Establishing social sustainability schemes, prioritized for each country, can be a crucial step to enabling responsive sustainability assessments for buildings. Recognizing obstacles to social sustainability in residential building construction is vital for devising targeted measures, boosting awareness, and implementing successful policies to improve social sustainability results in the sector [14]. Identifying barriers is crucial to achieving social sustainability in residential construction. Identifying barriers to social sustainable development is crucial when evaluating a country’s sustainable development level. Recognizing obstacles to social sustainability in residential building construction is vital for devising targeted measures, boosting awareness, and implementing successful policies to improve social sustainability results in the sector [14].

RESEARCH SIGNIFICANCE

This study is intended to analyse the barriers to social sustainability in residential building construction in Afghanistan using exploratory factor analysis (EFA). The research focused on Kabul city, the capital of Afghanistan. The study aims to reduce the dimensionality of the barriers in this context.

METHODOLOGY

This questionnaire data on the observed variables (barriers) will undergo exploratory factor analysis. This study pinpoints and dissects the fundamental causes of resistance to social sustainability in Afghan residential buildings. This study examines the influences of social sustainability hindrances on residential building construction in Kabul by collecting data from construction professionals with relevant experience. These factors include observable variables within the scope of the model. This study identified the primary obstacles through principal component analysis.

A. IDENTIFIED VARIABLES FROM PREVIOUS LITERATURE

A comprehensive study of global scholarly literature has yielded a list of impediments to social sustainability in housing. The selection of barriers in this study has been subjective, determined by their significance to developing nations and the frequency of scholarly discourse, as evidenced by citation counts.

These hurdles are deemed appropriate for assessing social sustainability in housing as they represent the prevalent challenges encountered by numerous countries in tackling social sustainability.

Table 1 Potential Barriers to Social Sustainability

Code	Description	Citation
X1	Lack of awareness	[15], [15], [3], [16], [17], [14],
X2	The regulations are not clear	[18], [19], [3], [16], [20], [21],
X3	Inadequate governmental rules, standards, and codes	[15], [3], [22], [16], [17], [23],
X4	Construction practitioners are not well informed about sustainability	[24], [22], [13], [20], [21],
X5	Cultural resistance	[15], [25], [3], [26], [13], [8], [14],
X6	Lack of market potential	[18], [3], [13], [27], [21], [14],
X7	Insufficient research	[28], [25], [3], [29], [8], [17], [30],
X8	Lack of economic incentives	[15], [3], [22], [13], [8], [21], [14],
X9	Lack of residential buildings as references	[31], [28], [19], [3], [26], [8],
X10	Hard to measure financial benefits	[31], [15], [3], [13], [27], [8], [30],
X11	Lack of collaboration between construction companies	[3], [26], [13], [29], [17], [14],
X12	Limited number of trained workers	[31], [28], [3], [22], [17], [30],
X13	Limited competent leadership	[31], [15], [3], [22], [17],
X14	Unawareness of low life cycle costs among individuals	[18], [19], [24], [13], [32], [14],
X15	Designers do not consider social sustainability criteria	[19], [25], [26], [28], [20], [30],
X16	Insufficient public spaces for individuals	[3], [22], [21],
X17	Hard to quantify their benefits	[18], [28], [24], [30],
X18	Investors face financial challenges	[3], [29],

Table 2 Potential Barriers to Social Sustainability (cont.)

Code	Description	Citation
X19	Lack of assessment method	[28], [30],
X20	Prolonged planning before initiating the project	[25], [26],
X21	Professionals lack sufficient experience	[25], [3],
X22	Fear of higher investment cost	[15], [3], [24], [16], [30],
X23	Few sustainable materials are available	[15], [13], [17], [14],
X24	Stakeholders lack easy guidance, technical skills, and strategies	[31], [3], [26], [8],
X25	limited availability of bank loans	[18], [28], [15], [24],

B. QUESTIONNAIRE DESIGN

A closed-ended questionnaire survey will be used to gather data for the analysis of barriers to social sustainability. A questionnaire is among the most effective methods for gathering quantitative data. In sustainability research, survey data have been extensively used [8]. The questionnaire intends to assess the significance of obstacles to social sustainability. A five-point Likert scale (Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), and Strongly Agree (5)) was employed to evaluate impediments to social sustainability in this survey. The questionnaire consisted of three sections: introduction, assessment of the barriers, and demographic data of the respondents. We have provided further information about social sustainability, including such as definition, criteria, and examples for consideration in the introduction section. Respondents can either agree or disagree with the barriers statements. Finally, the respondents will provide their personal information to assess their suitability for the research.

C. QUESTIONNAIRE REVIEW

The questionnaire survey will be preceded by a review of the questionnaire. Experts with extensive experience in Afghan housing construction will assess the questionnaire contents. The construction industry's social sustainability practices background should be taken into account when evaluating whether the questionnaire effectively addresses all potential barriers and whether any adjustments need to be made to the survey accordingly. Feedbacks will solidify the questionnaire design.

According to [33], an essential step before distributing a questionnaire to respondents is for experts to critically assess it. Careful consideration and formulation of the responses can simplify the process of knowledge elicitation from experts. The expert review process ensures that the questionnaire aligns with the research objectives and ensures effective data collection.

The specialists in this initial survey and evaluation will be given a form to assess the significance of the impediments in relation to the context of Afghanistan, along with a comment box to express their insights or feedback.

D. PILOT TEST

Assessment of the variables gathered from the preliminary survey will be conducted via questionnaire distribution in the main survey. A pilot test was conducted before the main survey to ensure questionnaire comprehension and proper question formulation. A pilot test is recommended prior to conducting the main survey. The pilot test will use a revised questionnaire based on the preliminary survey findings.

During the pilot testing phase of questionnaire research, crucial objectives are achieved. The content validity, acceptability, and feasibility of a questionnaire can be assessed by researchers [34]. Ensuring accurate measurement of the intended constructs and domains is essential in this step. Pilot testing refines question wording to improve clarity and decrease ambiguity [35] and [36]. Through a pilot study, researchers can detect and correct any flaws in the questionnaire before conducting the main research [37].

E. DATA COLLECTION

Since a complete roster of eligible experts was unavailable and barriers to contacting them existed, a non-probability sampling technique, which involves participants' self-selection, was used [16]. A purposive snowball sampling method was used in this study for valid and efficient sample acquisition. This method, which has been adopted in earlier construction engineering and management research [16], [38], gathers information from participants who either participated in the study or were recommended by others.

Social media platforms such as WhatsApp, Facebook, and LinkedIn, were utilized to contact professional active there, however for other professionals who were not active in social media, we contacted them through email. Furthermore, all contacted respondents were asked for share the online questionnaire with other professionals in their cycle to ensure that a diverse number of respondents from civil engineers, architects, urban planners, etc. professionals in Kabul with relevant backgrounds, at least two years of experience in building construction projects, at least handled one to two residential building projects, and age over 20 years, were considered for the analysis.

F. DATA ANALYSIS METHOD

Exploratory Factor Analysis (EFA) uncovers a data set's underlying structure, without imposing a preconceived structure. EFA identifies a minimal set of item groupings that illuminates correlations among numerous connected variables [28]. In this investigation, factor analysis (FA) will be used to identify the underlying constructs of barriers for social sustainability by reducing the number of items.

The selection of an appropriate sample size is essential for the cridibility of exploratory factor analysis results. Choosing an appropriate sample size is crucial for obtaining significant factor solutions and reliable results. Several references offer valuable insights into determining the number of EFA respondents. A total of 100 respondents were analyzed as described in [28]. The authors of [8], [19] considered sample sizes of 114 and 120 participants, respectively. Maccalum [39] pointed out that the number of necessary samples depends on factors like communality and overdetermination levels. Therefore, 120 respondents will be considered in this study.

The Likert scale's internal consistency should be evaluated by calculating Cronbach's alpha coefficient when using a questionnaire [28]. The Cronbach alpha coefficient (ά) measures the dependability of the obtained factors, ranging from 0 to 1. A value increases with a more reliable measurement scale. A reliability coefficient of less than 0.70 [8] undermines the confirmation of a scale's reliability.

The suitability of the data for Exploratory Factor Analysis (EFA) was assessed using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. These tests assess the suitability of data for factor analysis by evaluating sampling adequacy and intervariable correlations [28]. A KMO value of 0 implies an enormous difference between the partial-correlation and total-correlation sums, suggesting a diffused correlation pattern that renders FA inappropriate. Based on [8], [28], a satisfactory FA requires a KMO value greater than 0.50 and a significant Bartlett's test of sphericity. Nearly compact correlation patterns suggest a KMO value close to 1, ensuring reliable and clear factors. The significance threshold of Bartlett's test was set to below 0.05 [28].

Principle Component Analysis (PCA) is utilized for factor extraction and data dimensionality reduction, transforming the original variables into principal components that are uncorrelated and maximally account for data variance. [22] emphasized PCA's role in dimension reduction and factor extraction as a mathematical tool for extracting a reduced space of a few uncorrelated factors from multiple correlated variables. In factor analysis, the Varimax rotation technique maximizes the variance of the squared loadings to obtain clearer and more interpretable factor structures [22].

RESULTS AND DISCUSSIONS

This chapter outlines the statistical analysis and results of the data collected from both the preliminary and main surveys through the questionnaires.

B. PRELIMINARY SURVEY

In the initial investigation, we used a 5-point Semantic Scale to gauge the relevance of the variables for this context, with 1 denoting not relevant, 2 as slightly relevant, 3 as quite relevant, 4 as relevant, and 5 denoting very relevant. The preliminary survey checks the applicability of the identified variables to the Afghan context. The expert can also provide comments and introduce additional relevant variables in the comment column.

C. PRELIMINARY SURVEY RESPONDENTS

The individuals selected for the preliminary survey or review of the questionnaire possessed expertise in sustainable construction in the Kabul, Afghanistan context.

Six experts participated in the research. At least three experts are recommended for this stage based on previous research [8], [40]. The table 2 displays the respondents' profiles. Among these respondents, two had doctoral degrees, while four others had a master's degree. Some of them had academic experience, while the rest were doing nonacademic jobs. All respondents had more than 15 years of experience in construction, while their experience in sustainable construction was between 5 and more than 15 years. Most of them handled more than 8 building projects in Kabul.

D. PRELIMINARY SURVEY RESULTS

For each variable, mean item scores for all barriers are calculated to determine their relevance. The variables considered for the main survey must have a minimum average mean score of 3.00 [40].Variables with an average score below 3.00 are not considered relevant for measuring the construct. Variables with an average score below 3.00 were excluded from the main survey.

The four variables, Investment cost, Construction materials, Guidance and strategy, and Bank loans, have an average score below 3.00. The four variables mentioned will be excluded from the main survey for this study. 21 other relevant variables will be sent for data collection to measure the factors obstructing the implementation of social sustainability in residential buildings.

A. PILOT TEST RESULTS

Civil engineers, architects, structural designers, and other construction professionals participated in the pilot test. These respondents, who had to comprehend the residential building's condition or performance and the community participation process during development, needed qualifications that were comparable to those of the main survey participants. All respondents were males who worked in both public and private agencies. Their age ranges from 27 to 35 years. Their experience in building construction was between 3 and 10 years, while their experience in sustainable construction was between 0 and 5 years. Most of them had a master's degree in related fields while their fields of study included structural engineering, civil engineering, architectural engineering, construction project management, and civil environmental

Table 2 Experts profile

No	Respondent	Education	Position	Experience	Experience in Sustainability	Number of Projects	Age
1	Expert 1	Master's Degree	Senior Architect	> 15 Years	10 - 15 Years	> 8	> 50
2	Expert 2	Master's Degree	Kabul Mayor	> 15 Years	10 - 15 Years	> 8	30-40
3	Expert 3	Doctoral (PhD)	Lecturer	> 15 Years	10 - 15 Years	5 - 6	40-50
4	Expert 4	Master's Degree	Developer	> 15 Years	10 - 15 Years	> 8	> 50
5	Expert 5	Master's Degree	Professor	> 15 Years	> 15 Years	> 8	> 50
6	Expert 6	Doctoral (PhD)	Architect	> 15 Years	5 - 10 Years	> 8	30-40

engineering. Finally, they have been involved in at least 4 building construction projects.

The questionnaire was pilot tested 10 times before being deemed clear to the respondents. Following each pilot test, the questionnaire draft was fine-tuned based on the feedback from the respondents for subsequent use. After assessing the responses from the 10 pilot test participants, the questionnaire was deemed ready for distribution in the main survey.

E. MAIN SURVEY RESPONDENTS' PROFILE

The participants completed the survey using an online questionnaire. A total of 136 complete responses were received, and 123 fulfilled the requirements for analysis. 13 did not meet the eligibility criteria for this study, which includes having experience in construction, related field of study, at least 1 to 2 projects handled, and at least being more than 20 years old. Furthermore, some responses were not considered due to incorrectly selected options. For example, some respondents selected less than 2 years of experience in construction, but for experience in sustainable construction, they have chosen 5 to 10 years of experience.

1. GENDER

From the obtained data, 117 persons were male and 6 were female, constituting approximately 4.9 % of the respondents. The following figure shows the gender percentage comparison.

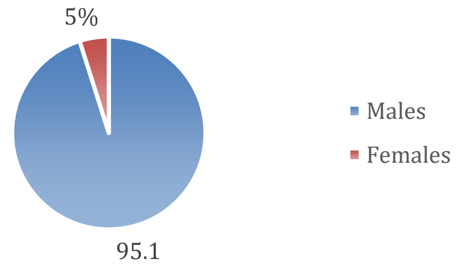

Figure 1 gender percentage comparison

2. RESPONDENTS' AGE

65 individuals were within the age range of 20 to 30 years, 47 individuals were within the 31 to 40 age group, 5 individuals were between 41 and 50 age groups, and 6 individuals were over 50. Age group calculations were based on the questionnaire data. The figure below shows the age groups indicated.

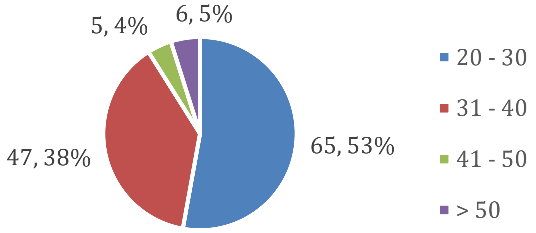

Figure 2 Comparison of the age group percentages

3. RESPONDENTS' EDUCATION

The Educational background of the respondents was analysed; 54 of them had a bachelor's degree, 60 had a master's degree, and 9 of them had a doctoral degree in related fields. A large proportion of the respondents held a master's degree in the relevant fields. The figure below shows the percentage of each.

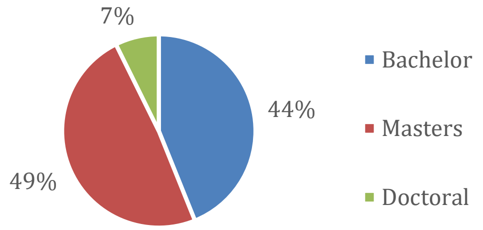

Figure 3 Educational level of respondents

4. RESPONDENTS' FIELD OF STUDY

The data obtained and the field of study of the respondents are analyzed; 72 of them have studied civil engineering, 35 have studied architecture or architectural engineering, 8 have studied construction project management, 3 have studied urban design and planning, and 5 other respondents have studied other related fields. A large proportion of respondents held a degree in civil engineering. The results of the analysis are presented in the figure below.

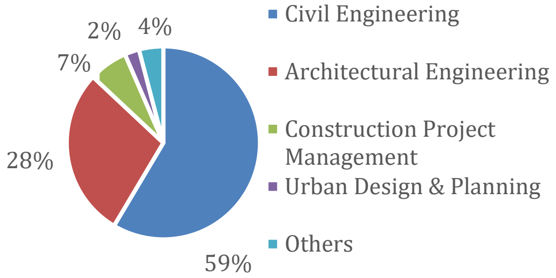

Figure 4 Field study of respondents

5. RESPONDENTS' INSTITUTION

From the obtained data, 51 respondents worked in the public sector and 72 were involved in the private sector. The following figure shows the percentage comparison.

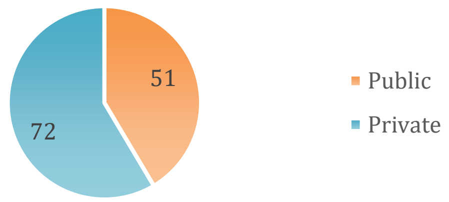

Figure 5 Respondents based on their institution

6. RESPONDENTS' POSITION

From the data received from the respondents, 46 participants were civil engineers, 30 participants who were architects and designers in this sector, there were 4 quality control/assurance, 6 construction managers, and 11 project managers. Finally, 26 other respondents held miscellaneous positions, such as mechanical, electrical, surveyor, owner, developer, and master's students with relevant experience in the field. According to the aforementioned data, most civil engineers responded to the questionnaire. Respondents based on their positions are illustrated in the following figure.

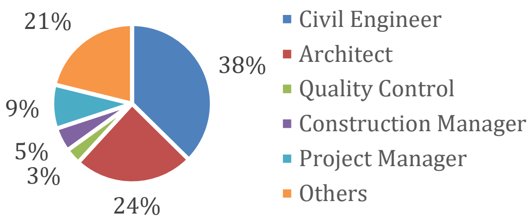

Figure 6 percentage of respondents based on positions they held

7. RESPONDENTS' WORK EXPERIENCE

According to the data obtained from the questionnaire, 57 respondents had work experience between 2 and 5 years, 17 had work experience between 5 and 10 years, 19 had work experience between 10 and 15 years, 15 had more than 15 years of work experience, and 15 others had less than two years of work experience. Years of work experience in building construction is considered suitable for this research objective, if at least they have experience in construction and have already handled projects in Afghanistan. Respondents without experience were excluded. The percentage of respondents based on their work experience is illustrated in the following figure.

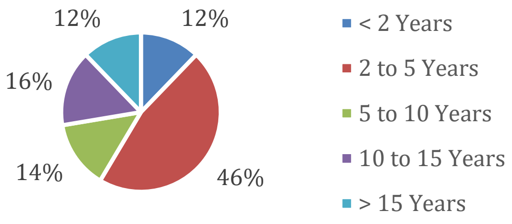

Figure 7 Percentage of respondents based on work experience

8. RESPONDENTS' WORK EXPERIENCE IN SUSTAINABLE CONSTRUCTION

As per the data obtained from the questionnaire, 43 respondents had less than 2 years of work experience in sustainable construction, 48 had 2–5 years of work experience, 12 had 5–10 years of work experience, 17 had 10–15 years of work experience, and 3 respondents had more than 15 years of work experience in sustainable construction. All experience groups in sustainable construction in building construction are considered suitable for this research objective because sustainable construction is a new concept and Afghanistan is an underdeveloped or developing country. The percentage of respondents based on their work experience is illustrated in the following figure.

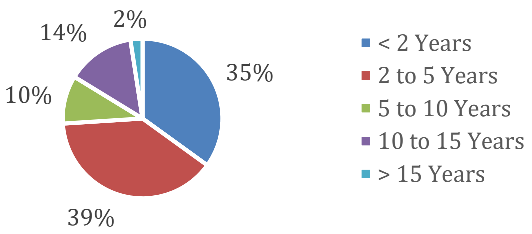

Figure 8 Percentage of respondents based on work experience in sustainable construction

9. NUMBER OF PROJECTS COMPLETED BY RESPONDENTS

The data obtained from the respondents about the number of building construction projects that they have ever completed or have been involved in are as follows; 37 of them had completed 1 to 2 projects, 38 of them had completed 3 to 4 projects, 13 of them had completed 5 to 6 projects, 3 of them had completed 7 to 8 projects, and 32 of them had completed more than 8 projects, which represents around 26 % of the total respondents. Therefore, according to these results, we observe that most respondents completed at least three to four building projects. The insights gained will be significant and reliable for these research objectives. The percentage of respondents who completed projects is illustrated in the figure below.

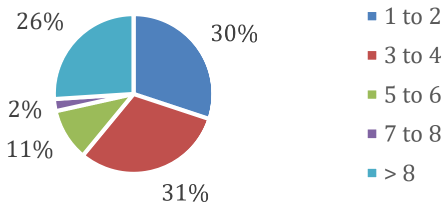

Figure 9 Percentage of respondents' number of completed projects

F. DESCRIPTIVE ANALYSIS OF VARIABLES

This section describes the recapitulation of the responses obtained from respondents for each variable. Means and standard deviations were calculated and analysed. As a result of this process, the variables are sorted in order of higher mean values to those with lower mean values. This process will help simplify the interpretation process.

Table 3 Descriptive analysis of the main barriers survey results

Code	Mean	SD	Rank
X16	4.50	0.717	1
X1	4.28	0.696	2
X8	4.28	0.696	2
X2	4.14	0.681	3
X14	4.05	0.625	4
X7	4.03	0.849	5
X9	3.99	0.835	6
X3	3.97	0.905	7
X11	3.93	0.827	8
X13	3.93	0.787	9
X6	3.85	0.887	10
X12	3.83	1.046	11
X10	3.67	0.910	12
X20	3.65	1.056	13
X4	3.62	1.098	14
X15	3.56	0.898	15
X21	3.52	0.953	16
X19	3.33	0.964	17
X17	3.32	0.944	18
X5	3.31	1.001	19
X18	3.16	1.119	20

From the results obtained, the five variables with the highest mean values among the barriers to social sustainability are as follows; the first-ranked variable is urban planning with a mean value of 4.50, the second-ranked variable is two, which are awareness and economic incentives with mean values of 4.28 both, the third-ranked variable is regulations with a mean value of 4.14, the fourth-ranked variable is life cycle costings with a mean value of 4.05, and the fifth-ranked variable is research with a mean value of 4.03.

G. VALIDITY TEST

The validity and reliability tests will dictate which variables will be investigated further in this study. In this study, the researcher verified the validity of the data collected through a questionnaire to ensure accurate findings. Each instrument's validity was examined using the Pearson correlation test between items and the total items, resulting in a p-value for each item. if the p-value is greater than the confidence level of 5 %, namely 0.05, then the data are invalid. From the results obtained, all variables (barriers) have a P-value of less than the confidence level; therefore, all variables are valid and can be used for further analysis.

H. RELIABILITY TEST

The Cronbach's alpha coefficient was calculated to assess data reliability. It has been mentioned by previous researchers that this coefficient should be greater than 0.7 to ensure reliable data. Here, is the result of the reliability test.

Table 4 Reliability Test value for barriers

Case Processing Summary				**Reliability Statistics**	
		N	%	Cronbach's Alpha	N of Items
Cases	Valid	123	100.0	0.765	21
	Excluded	0.0	0.0		
	Total	123	100.0		

Based on the above table, the Cronbach's Alpha is more than the threshold of 0.7; therefore, it can be concluded that the data are reliable for further analysis in this research.

I. FITNESS TEST (VARIABLE FEASIBILITY ANALYSIS)

In this research, the fitness of the data for factor analysis was assessed by examining the values of Kaiser-Meyer-Olkin (KMO) test values for Measuring Sampling Adequacy (MSA). This process, as the first stage for factor analysis, determines whether the existing variables are worthy of keeping for further analysis or not. Additionally, the variables must be ensured to be related to each other, which can be checked using the variable interdependence test. Variables that only correlate with each other are used for factor analysis. Variables that are almost uncorrelated with other variables are excluded from the process. Barlett's test was used to examine variable interdependence. Here are the results of the KMO and Barlett's test tabulated below.

Table 5 KMO-MSA test results and Barlett's test for barriers

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.689
Barlett's Test of Sphericity	Approx.Chi-Square	537.876
	df.	210
	Sig.	0.000

As we can observed from the table above, the KMO-MSA for barriers is more than 0.5 and Barlett's test value is less than 0.05; therefore, we can conclude that the sample is adequate with sufficient correlation between the barriers.

Once the data are determined suitable for factor analysis based on the KMO values, the anti-image covariance matrix is calculated. This matrix provides information about the correlation between each variable and its corresponding "anti-image," which represents the variance of a variable that is not shared with other variables. Therefore, variables suitable for further analysis can be determined. Any variable with less than 0.5 value (KMO-MSA) in the diagonal matrix must be removed from the list. The MSA values are summarized below.

Table 6 MSA values obtained from anti-image covariance matrix test results for barriers

Code	**MSA**
X1	0.710
X2	0.692
X3	0.746
X4	0.582
X5	0.689
X6	0.779
X7	0.757
X8	0.666
X9	0.785
X10	0.755
X11	0.656
X12	0.714
X13	0.659
X14	0.743
X15	0.665
X16	0.631
X17	0.743
X18	0.633
X19	0.645
X20	0.564
X21	0.550

From the results obtained, all variables (barriers) have MSA values greater than 0.5, indicating that all correlations between variables are strong. No variable was excluded, and all barriers were considered worthy of further analysis.

J. FACTOR EXTRACTION

After checking the data for reliability, validity, fitness, and suitability, the next step was to conduct factor analysis and extract the constructs. Through this process, hidden factors are detected from the existing barriers, and two or more variables are grouped under one factor. The extraction of the factors in this research were extracted using Principal Component Analysis (PCA), which is based on diversity, eigenvalues, and total cumulative percentages.

Table 7 Total Variance Explained (Barriers), factor extraction

Component	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.437	21.479	21.479	3.437	21.479	21.479	2.064	12.899	12.899
2	1.665	10.407	31.886	1.665	10.407	31.886	1.839	11.495	24.394
3	1.488	9.301	41.187	1.488	9.301	41.187	1.768	11.051	35.446
4	1.337	8.357	49.545	1.337	8.357	49.545	1.628	10.174	45.620
5	1.178	7.360	56.904	1.178	7.360	56.904	1.462	9.135	54.754
6	1.066	6.661	63.565	1.066	6.661	63.565	1.410	8.810	63.565
7	0.848	5.301	68.865						
8	0.776	4.849	73.714						
9	0.753	4.705	78.419						
10	0.648	4.048	82.467						
11	0.605	3.783	86.250						
12	0.576	3.602	89.852						
13	0.508	3.173	93.025						
14	0.396	2.476	95.501						
15	0.381	2.383	97.884						
16	0.339	2.116	100.000						

The analysis continues by examining the number of factors formed, which can be found in Table 6. Factors are indicated by components with an eigenvalue of 1 or more than 1, which can be found in the total column. The eigenvalue shows the relative importance of each factor in calculating the variance of the total existing variables. Hair et al (2010) explained that the loading factor can also be determined by looking at the number of samples; 0.3 for 350 samples, 0.35 for 250 samples, 0.50 for 120 samples, 0.55 for 100 samples, 0.60 for 85 samples, 0.65 for 70 samples, and 0.75 for 50 samples. In this study, the sample size was 123; thus, a loading factor of 0.50 was used as the minimum for inclusion in further analyses.

For the analysis of barriers to social sustainability, six components have a value of more than 1 after the third iteration. The cultural resistance barrier with a factor loading of 0.469 was eliminated in the second iteration. Lack of motivation for designers, insufficient government policies, insufficient economic Incentives, and prolonged pre-contract planning had loading factors of less than 0.5 and were removed in the third iteration of the analysis. The third iteration formed six factors with reliable factor loadings, which explained the cumulative variance percentage of 63.565 %. Table 6 presents the factor formatting barriers to social sustainability.

Figure 10 Sree Plot of factor extraction for social sustainability barriers

The Communalities value determines the diversity of the initial items, which can be explained by the formed factors. A recapitulation of the communality's values can be seen in the table below.

Table 8 Communalities among barriers

Communalities		
Code	**Initial**	**Extraction**
Zscore: X1	1.000	0.538
Zscore: X2	1.000	0.634
Zscore: X4	1.000	0.754
Zscore: X6	1.000	0.623
Zscore: X7	1.000	0.587
Zscore: X9	1.000	0.609
Zscore: X10	1.000	0.649
Zscore: X11	1.000	0.592
Zscore: X12	1.000	0.626
Zscore: X13	1.000	0.595
Zscore: X14	1.000	0.543
Zscore: X16	1.000	0.728
Zscore: X17	1.000	0.595
Zscore: X18	1.000	0.713
Zscore: X19	1.000	0.648
Zscore: X21	1.000	0.736

From the results obtained, it can be seen how much of the variables can be explained by the factors formed. for instance, variable X1 has a value of 0.538, indicating that 53.8% of the variable of X1 can be explained by the factors extracted.

K. FACTOR ROTATION

Factor rotation was carried out because the initial factor model tended to be unstable, because it still had almost the same factor loading values for each factor. Factor rotation clarifies the distribution of variables among formed factors. The existing variables have been iterated several times to obtain more stable and better factors. The selection of variables into factor components can be seen from the variable correlation value, which is the largest among the six existing factor components for barriers. Each factor comprises several variables.

It is assumed that the factors are not correlated in this study; therefore, varimax rotation was used. After thorough analysis, the final stage is to group the variables based on the factors formed, and then to name the factors based on the variables contained in each factor. Furthermore, the factors names are subjective in this study.

Table 9 Rotated factors loading for barriers of social sustainability

Code	Variable (barrier)	Component					
		1	2	3	4	5	6
	Factor 1:Stakeholder-Related Constraints						
X10	Hard to measure the financial benefits	0.707					
X14	Unaware of their low life cycle costs among individuals	0.673					
X09	Lack of residential buildings as reference	0.651					
X13	Limited of competent leadership	0.630					
	Factor 2:Financial/Technical Constraints						
X18	Investors face financial challenges		0.819				
X19	Lack of assessment method		0.764				
X17	Hard to quantify their benefits		0.614				
	Factor 3: Political Constraints						
X01	Lack of awareness			0.717			
X02	The regulations are not clear			0.702			
X06	Lack of market potential			0.654			
	Factor 4: Professional Constraints						
X11	Lack of collaboration between construction companies				0.748		
X12	Limited number of trained workers				0.718		
	Factor 5: Knowledge Constraints						
X04	Construction practitioners are not well-educated in SS					0.815	
X21	Professionals lack sufficient experience					0.766	
	Factor 6: Academic inadequacy barriers						
X16	Insufficient public spaces for individuals						0.841
X07	Insufficient research						0.691

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization (7 iterations)

The component matrix in Table 8 explains the variables contained in the factors formed. By determining the highest number of factor loadings, the location of the variable in the factoring was determined.

L. DISCUSSION

The research identified factors hindering the implementation of social sustainability in residential buildings, especially those constructed in Kabul in the last 20 years. The buildings in the last 20 years met low sustainable criteria, and the social sustainability criteria were not considered during the different stages of development.

6 factors for barriers to social sustainability formed after factor analysis. Further explanations will be given about each factor that, according to the researcher, can be used as a result of this research. The explanation of the factors formed is based on the communalities of the variables forming the factors.

Factor 1: Stakeholder-Related Constraints

The stakeholder-related factor is the first among all factors to explain the highest variance value (21.5 %) of the total variance. Therefore, this factor imposes the greatest impediment on the implementation of social sustainability in residential buildings.

This factor identifies hard to measure the financial benefits, unaware of their low life cycle cost among individuals, lack of residential buildings as reference, and Shortage of competent leadership. The stakeholders encountered hardships while considering their profitability as the benefits of social sustainability are not mostly expressed in terms of financial profits. The long-term environmental and social benefits outweigh the initial costs, according to several studies, but these benefits are less often articulated in financial terms [15], [18]. Furthermore, author [30] stated that limited understanding of the benefits of sustainable construction in South African construction industry is due to ignorance of the life cycle cost benefits. Educating construction clients and other stakeholders on the overall life-cycle cost benefit of sustainable construction is deemed necessary. The idea that sustainable construction has higher investment cost is more of an assumption made without thorough analyses of the overall life-cycle cost by construction participants [31]. Therefore, educating the stakeholders can be done through organizing seminars, workshops and other public functions geared towards enlightening the public as regards the benefits of building sustainably.

Aghimien [18] argued that lack of exemplary projects that clearly demonstrate the benefits of sustainable construction causes the clients to ignore considering sustainability in their projects. When there is little or no existing sustainable construction projects to serve as a guide, there is bound to be problems in constructing one. The need for adequate information on past sustainable construction projects is crucial to create a roadmap in achieving sustainability in subsequent ones. As clients are one of the main stakeholders, their decisions make a huge difference in the process, and it leaves little room for other stakeholders to use sustainable practices. The client's resistance to change can be solved by educating them about sustainable practices because they usually stick to the practices they already know. Oke [41] stated that if sustainable construction is to improve in developing countries using sustainable practices, then clients need to demand it.

Additionally, lack of competent leadership is a great barrier to adoption of sustainable practices. Ametepey [15] argued that the management and leadership of the construction industry and individual organizations have a major role to play in achieving successful implementation of innovative strategies. The success of sustainable construction implementation lies in the commitment of managers and leaders in developing and implementing an effective plan and adequately providing the required resources and support to manage changes arising from the implementation.

Therefore, lack of competent leadership and lack of reference project to demonstrate their low life cycle costs and prove their benefits, caused the stakeholder to be afraid of their low return on their investments.

Factor 2: Financial/technical Constraints

The second factor that imposes the greatest challenge in implementing socially sustainable buildings is financial/Technical constraints. This factor explains 10.407 % of the total variance. This factor contains three variables: investors' financial limitations, lack of assessment methods, and difficulty quantifying the benefits of socially sustainable residential buildings in terms of money.

The influence of financial/technical barriers on sustainable development implementation is well documented in [3], [15]. The additional expense of improving sustainable construction has been cited by many researchers. Construction companies mostly focus on their short-term profits, and the long-term benefits of social sustainability for buildings are complex to quantify in terms of money. There are no assessment methods in place that construction companies use to comply with social sustainability requirements; therefore, they find themselves limited financially due to these complexities in quantification.

A fundamental question on whether and how social sustainability can be measured and assessed in the construction is also the subject of several studies that imply the development of indicators/attributes framework. For example, an assessment framework by prioritizing social sustainability criteria in residential building construction was proposed in the context of Iran [42]. They mentioned that to be able to develop an assessment framework for a specific context, we need to know the specific characteristics of that context. Therefore, lack of assessment method for social sustainability in a specific context, cause the practitioners to encounter difficulties in quantifying the benefits.

As per the [3] finding, difficulty of translating social benefits into monetary/financial values and due to the lack of a clear body of evidence regarding economic feasibility and predictions related to the implementation of sustainable practices, contractors are reluctant to implement social sustainability measures [3]. This means that the practitioners are afraid of higher investment costs. Therefore, they find themselves financially limited in implementing sustainable practices.

Factor 3: Political Constraints

The third factor with a variance value of 9.3 % imposed barriers to the implementation of social sustainability in residential building construction in the Afghan context. This factor has been documented in previous studies, such as [15] and [3]. They stated that this factor affects the implementation of sustainable goals in regions influenced by political influence. This factor identifies a lack of awareness among individuals, lack of regulations, codes of practice, policies, procedures, ambiguity in existing ones, and lack of market potential.

Insufficient or inadequate regulations and policies create significant challenges for attaining sustainability in construction works. The results from [3] demonstrated that one of the main obstacles is the lack of knowledge of the legislators and regulators related to the social sustainability aspect of buildings. It directly reflects the development of inappropriate legislation, regulations, standards, etc., which is the second most urgent barrier in their results. The barrier "Lack of specification of mandatory regulations supporting social sustainability" is the third most critical barrier in their study and could also be interpreted because of the legislators' unawareness and not understanding about the importance of the social sustainability of buildings for tenants and community well-being. Aligned with their results, therefore, the lack of awareness among legislators and in general all stakeholders cause inappropriate rules, regulations, codes, and specification formation.

The market potential will improve if the government has appropriate policies and procedures for rising awareness and appropriate regulation formation for the stakeholders to follow for implementation such as seminars, trainings, and conferences about social sustainability to spread awareness among the professionals and all other individuals. Author [30] stated that sustainable construction concept would be successful if stakeholders especially government put in place legislation that will require cooperate sustainability policies and the development of various policy documents to enforce sustainability in all aspects of their development. Furthermore, in that study in Ghanian context [43], respondents were asked whether they will implement the concept on their own or because of legislation from government. The results indicated that almost all the respondents overwhelmingly agreed that rules and legislation from government will be required to enforce the concept thereby binding them to implement it. Therefore, it can raise the adaptation level and also the market potential.

Factor 4: Professional Constraints

This factor is identifying two barriers in the observed variables list which are Lack of collaboration between construction companies, and Shortage of trained workers. This factor explained around 8.357 % of the total variance in this analysis. This factor is documented by [3].

They argued that lack of cooperation and exchange of information between different stakeholders is an important barrier. Commonly, the time allocated for planning and designing of buildings is usually very limited and insufficient for a comprehensive and detailed consideration of all factors influencing the design on different levels. The cooperation and communication between the interested parties (necessary for proper implementation of social sustainability measures) could be long lasting and laborious, so it represents a complementary challenge for designers and other interested parties.

Shortage of trained workers and in general the technical incompetence of important stakeholders [3] may be a consequence of the fact that social sustainability practices are not the obligatory part of building design; that's why, key actors are reluctant to learn and acquire new knowledge and transfer it to the labours who really perform the physical works in the construction site.

In conclusion, lack of collaboration between construction companies slows down the process of sustainable development adaptation in the building construction sector. Additionally, shortage of trained labours for socially sustainable construction poses great impediment for implementation of sustainable construction.

Factor 5: Knowledge Constraints

This factor is one of the main barriers for adaptation of sustainable building construction in Afghanistan. This factor identifies construction practitioners and other individuals are not well-educated about social sustainability of residential buildings, and professionals lack sufficient experience as the observed variables. This factor contented about 7.360 % of the total variance in this study. Knowledge constraints is reported in previous studies [15], [28]. Author [15] stated that sustainable construction can be hindered by ignorance or a lack of common understanding about sustainability. They argued that hindrance due to a lack of information was an experience common to most stakeholder groups in the construction industry. In some cases, stakeholders admitted to being unaware of sustainable measures or alternatives within their jurisdiction. Likewise, installing sustainable technologies and materials requires new forms of skills and knowledge. It was evident from the research that not all those with responsibilities in this area had the necessary experience or expertise to meet the challenges. There are several stakeholders in a construction project, and they might have different understandings about sustainability. Therefore, it is important to educate the stakeholders and train experts to avoid misunderstandings and speed up adaptation.

A study in case of Ghana [43] argued that to be able to adopt and implement sustainable construction concept in the construction industry, there is the need for all stakeholders in the construction industry to be aware and to also have some knowledge of the concept. They also consider the lack of application of sustainable practices because of lack of understanding and knowledge. Additionally, lack of monitoring and enforcement of legislation [3], [43] causes the professionals to be not considerate about sustainability knowledge and expertise.

Factor 6: Academic inadequacy barriers

The last factor formed in this study is academic inadequacy barriers. This was reported by [3], [19] in their analysis of barriers to sustainable construction. This factor identifies lack of urban planning (Inadequate public spaces for individuals) and Insufficient research from observed variables. This factor with least percentage of defined variance values explained about 6.7 %. Lack of sufficient academic information on sustainable construction in educational institutions causes the slow adoption of innovative and sustainable ideas in the respective context. The low level of awareness and understanding among academicians and consequently among the students in the universities in Afghanistan cause the low level of research on these issues.

Moreover, the lack of safe, inclusive, green, and public spaces, in particular for women and children, older persons, and persons with disabilities is considered one of the significant obstacles [3] that prevents the successful adoption of social sustainability practices. The root of this problem partially lies in inadequate urban planning in the past, especially in densely populated areas, due to lack of understanding of concept of sustainability by the planners and designers. Thus, overcoming it is a challenge that requires full research in all aspects of social sustainability in the context of Afghanistan to understand all related factors for a proactive planning, designing and implementing. The urban planning will improve with improvements in academic studies and educational institutions.

CONCLUSIONS

The social sustainability factors that impact residential buildings in Afghanistan were examined. Prior to data collection, experts evaluated the contextual relevance of the variables. Six industry experts participated in the preliminary survey. 4 of the 25 barrier variables received scores below 3 on the semantic relevance scale, as determined by the survey results. Investment cost, guidelines and strategies, construction materials, and bank loans are the four variables that will not be further analysed. A total of 136 construction professionals participated in the main data collection, of which 13 did not fulfil the inclusion requirements. A total of 123 other respondents were included in this research. The participants are mostly males, work in the public and private sectors in Kabul, aged more than 20, at least have a bachelor's degree in a related field, have construction experience, and at least must handle 1 to 2 projects in Kabul, Afghanistan.

In the descriptive analysis of social sustainability barriers, lack of urban planning had the highest mean score (4.5) on a 5-point Likert scale. The second major obstacle is insufficient awareness among individuals and inadequate economic incentives for construction companies. The third, fourth, and fifth impediments for not adopting socially sustainable buildings are the absence of regulations, the unawareness of low life cycle costs among individuals, and the paucity of research for improvement.

The data were subjected to validity, reliability, sampling adequacy, and correlation tests using Pearson's correlation coefficient, Cronbach's alpha coefficient, Kaiser-Meyer Olkin (KMO), and Barlett's test, respectively. Those who passed all the tests are now eligible for further analysis. 6 factors: Stakeholder-Related Constraints, Financial/technical Constraints, Political Constraints, Professional Constraints, Knowledge Constraints, and Academic inadequacy Constraints were extracted during the factor analysis of barriers to socially sustainable construction. Through varimax rotation, four variables were removed because their correlation loadings were less than 0.5, and 63.565 % of the total variance was accounted for by these factors. Successfully addressing these six factors will facilitate the adoption and implementation of socially sustainable building constructions.

LIMITATIONS

Despite the thorough and meticulous research, some limitations remain to be addressed. The following limitations and suggestions for improvement are discussed in this research.

1. These findings can only be applied to residential buildings constructed in Kabul. This concept's applicability to other building types and regions requires further investigation.
2. This study identified the factors influencing socially sustainable housing. Factors related to drivers should be explored and analysed.
3. Data were collected from only professionals in the field using an online questionnaire; therefore, future research should focus on collecting data from all stakeholders to analyse differences in their perspectives.

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