Developing a Green Building Assessment Criteria System for Construction Industry in Pakistan

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***Abstract*: Growing concerns about the adverse effects of construction industry towards environment have increased the popularity of green building (GB) certification system globally. Numerous international GB rating tools have been developed providing a yardstick for measuring building sustainability. However, there is a clear lack of research on establishing a baseline to develop a new credit criterion for a specific country according to its own local context. Therefore, by integrating criteria from different rating tools used globally, this research proposed a key credit criterion for assessment of GB in Pakistan. An extensive literature review was carried out to develop the basis for selecting a credit criterion based on widely used GB rating tools namely – BREEAM, LEED, CASBEE, IGBC, GREEN STAR, GREEN MARK, BEAM PLUS and GBI at international level. The outcome of this research was a green building assessment tool, consisting of seven credit criteria based on triple bottom line method. Later the questionnaire and unstructured interviews was conducted for assessment and applicability of proposed credit criteria. The results showed that the respondents (main players of the construction industry) did not have the same level of knowledge regarding the GB concept. Most of them were unable to name leading assessment tools and very few had idea about the credit criteria of these assessment tools. However, most of the respondent rate energy efficiency as the main criterion followed by materials and water efficiency respectively. The presented research provides insight into GB rating systems and broaden the understanding of stakeholders on GB benefits and encourage them to adopt it.**

***Keywords*: Credit criteria, Construction industry, Green building, Rating tools.**

I. INTRODUCTION

Construction industry is an important sector of the economy with multiple backward and forward linkages with socio-economic development, environment friendly infrastructure and sustainable growth in the country. It has considerable impacts on society since constructing buildings mainly involves the usage of fossil fuels throughout their construction, occupancy, renovation, and demolition stages. They emit toxic gases that are harmful to humans and the entire environment [1]. According to the World Business Council for Sustainable Development, 40% of total energy consumptions are accounted by building blocks which generate greenhouse gas (GHG) emissions and trigger global warming. By 2035, global buildings will have 42.4 billion tons of carbon emissions, an increase of 43% over 2007 [2]. Furthermore, construction materials and buildings are extremely durable, and therefore, they continue influencing environment and society for long periods of time. These facts have prompted the creation of GB standards, certifications, and rating systems aimed at mitigating the impact of buildings on the natural environment through sustainable design and guidelines. In other words, sustainable building structures are called GB.

GB construction promotes a healthier, more resourceful building, renovation, operation, preservation and demolition models. This approach can and only be achieved by collective efforts of the working body of the construction industry (engineers, contractors, consultants, etc.), with the help of the outside enforcer (government) and finally the public, which is the end-user of it [5]. Currently many GB certification systems are in operation around the world, specifically depending on the climate and social characteristics of each country. Some of these certification systems are used for both domestic and international projects extensively [7]. LEED-USA, BREEAM-UK, GREEN STAR-Australia, GBI-Malaysia and GREEN GLOBES are some of most well-known certification standards used globally.

The concern for GB has been increased over the past decade, which in turn gave rise to the need for assessment, rating or certification tools. The purpose of an environmentally friendly building assessment system is to examine the life cycle performance of the "whole building" and compare it to performance standards [6]. However, with regard to Pakistan, there is still lack of research concerning the existing practices and systematic review of prevailing body of knowledge in construction industry. Such research will play a critical role to not only identify the quality of current practices but also help to achieve sustainable construction goals quickly. Currently, Pakistan is going through water scarcity, shortfall of electricity, poor industrial conditions, economic slumps, rapid-paced urbanization, poverty and 15 depletion of natural resources. The design of the structure and implementation of the GB criteria is also a developmental stage. A relevant credit criterion for GB assessment can help in fighting a battle against these issues. was carried out.

Thus, this study will conduct an analysis of the major GB rating systems which is considered by far the most comprehensive and methodological tools used globally to get conclusive list of credit criteria most suitable for local context of Pakistan. The study will also check the applicability of proposed criterion through questionnaire and unstructured interviews conducting from

stakeholders and practitioners of Pakistan construction industry for their assessment and consent. The findings of this research will help raise awareness and adoption of the green certification system in construction industry of Pakistan and eliminate knowledge barriers to move forward to achieving sustainable construction.

II. LITERATURE REVIEW

A. Green Building Rating System

GB rating certification is the focus of various researchers over the past 20 years, but no logical assessment of the detailed standards and update process for each rating system [11]. Several studies reflect that buildings have a substantial degree of commitment in contaminating the environment [13]. As a result, the development of various rating systems, assessment tools and sustainable or green development methods has increased rapidly. These rating tools use hierarchical criteria systems to evaluate the sustainability of buildings [14]. So far there are two evaluation tools are developed for the construction sector. Standards-based system and the life cycle assessment method. In criteria-based system point values are allocated according to the scale. LEED; GB Tool; BREEAM; Eco Profile (Norway)-Byggforsk (2005) and Environmental status (Sweden)-Miljöstatus föreningen (2005) [21][6][10][17]. In life cycle assessment tool, weighting method is used. The main purpose of the system is to select architectural design, building materials and local practical options during the design phase of the buildings Bees (USA)-OAE (2004); Beat (Denmark)-DBRI (2005); Eco Quantum (Netherlands) and KCL Eco (Finland)-KCL (2005) are included in this category [2][16][10][15]. BREEAM is the world's longest established environmental assessment methodology. It was developed in United Kingdom in 1990 by building research established global ltd [24]. The US Green Building Council was established as a non-profit organization in 1993. The committee is made up of a group of stakeholders, including engineers, designers, architects, contractors, owners, product manufacturers and environmentalists in the construction industry. To change the traditional way of building construction, US Green Building council established LEED in 1998 under a pilot version [19-24].

B. Green Building System in Pakistan

The design guidelines for GBs in Pakistan are mainly developed by Pakistan Green Building Council (PGBC). The environmental team at Landscape looks forward to contributing to the PBGC's local standard development for GBs in Pakistan. Pakistan has been committed to addressing growing environmental challenges since the 1980s. Currently, approximately 18 to 20 buildings in Pakistan are LEED certified and registered with the US Green Building Council. These include the British Council Library in Lahore, NCC, Mega Corporate Office and Karachi Citi plan. The Coco-Cola Pakistan Icecek plant in Multan and the World Bank country office in Islamabad. The Pakistan Green Building Council (PGBC) is responsible for the development of a design guide for GBs in Pakistan. Landscape's environmental team is looking forward to contributing to the development of PGBC's local standards for GBs in Pakistan [33]. For the successful adoption of GB certification and practices in developing countries like Pakistan, financial and regulatory incentive programs are important. [32-36]. In addition, raising customer awareness of the benefits of GBs is one of the basic actions to encourage GB [29].

III. MATERIALS & METHODS

A. Research Methodology

1) Research Method

The methodology adopted in this research is based on multi-dimensional design strategy that involves a mainly two approaches – qualitative and quantitative. Both approaches include detailed literature review (critical and comparative analysis), and, fieldwork approach (questionnaire and unstructured interviews). To determine the qualitative part, an analysis of the major GB rating systems which is considered by far the most comprehensive and methodological tools used globally was carried out. The review specifically focused on the credit criteria used by each rating system to get the conclusive list of credit criteria which were then identified based on the local context of Pakistan. After identification of such credit criteria, a comparison was carried out between selected assessment rating tool systems to evaluate the score of each credit criteria based on their usage and functionality. Finally based on the comparison result, the proposed credit criteria system was developed at given point scores to identify the most and least important credit criteria.

In the second, quantitative part, the proposed credit criteria were sent to Pakistan's different construction industry players and stakeholders to assess their perception regarding understanding of GB certificate and their consent on our proposed credit criteria. The overall purpose of this approach was to identify the credit criteria, indicators and parameters that should be involved in the assessment system and to define scores for each of them according to focus group. The focus group includes variety of stockholders; fresh graduate architects, designers, contractors, experts, decisionmakers, laymen, members of construction association and, member of governmental associations. The online questionnaire through google forms and unstructured interview was conducted. The questionnaire is aimed to investigate the credit criteria that must be adopted for the assessment tool, suitable for the GB construction of Pakistan along with the rudimentary knowledge about GB construction. The questionnaire was divided into three major parts as follow: (a) the first part focuses on the socio-demographic profile of the respondents, (2) the second part focuses on their knowledge and awareness regarding GB concepts and sustainable construction standards and finally, (3) the third part focuses on their opinion regarding the proposed credit criteria in this research. Before

being distributed to all respondents, the questionnaire was first discussed with the experts of the related field and in the academic side. The examination was conducted by the supervisor and scrutinized thoroughly. Total fifty five questionnaires were distributed to different respondents in construction companies, among them forty one responded and their response were analyzed accordingly. Quantitative methods were used to analyze the response and comparison of the answers and in the end the results were compiled with authors remarks.

2) Development of proposed credit criteria

GB assessment tools offer a means to demonstrate that a building has been successful at meeting an expected level of performance in a number of declared criteria. To define such criteria in the local context of Pakistan, this research suggests the new credit criteria for GB. The proposed credit criteria were developed concerning aspects, categories, and indicators acknowledged at the local context within which the tool is developed. In the light of the various assessment tools being used worldwide, tabular representation was formed in this section for the selection of key credit criteria.

Table 1 shows the selected eight assessment tools representing established key credit criteria along with allocated credit points for each GB tool. In certain instances, the key credit criteria do not perfectly overlap with the credit points given in the rating tools. Therefore, attributing credit points to the identified key credit criteria was difficult in certain instances. As a result, if there is any credit point which does not fit into these seven key credit criteria, it is separately attributed. There were certain credit points, which can be classified under two credit criteria. As an example, low emitting material in LEED system can be identified in material criterion and as well as IEQ criterion (united states GB council) in such cases, it is attributed to IEQ criterion that credit point is used.

Table 1: Credit criteria of selected green rating tools

LEED *(building design and construction -115 credit point)*	***BREEAM*** *(breeam new construction-international -130 credit points)*	***GREEN STAR*** *(Design and as Built-100 credit points)*	***GREEN MARK*** *(Non-Residential New buildings version 4.1-183 credit points)*
Location & transport (20)	Management (23)	Management (14)	Energy efficiency (116)
Sustainable site (10)	Health and wellbeing (17)	Indoor environment quality (17)	Water efficiency (17)
Water efficiency (12)	Energy (27)	Energy (22)	Environmental protection (42)
Energy and atmosphere (35)	Transport (12)	Transport (10)	Indoor environmental quality (8)
Material and resources (14)	Water (6)	Water (12)	Other green features (7)
Indoor environmental quality (18)	Material (11)	Material (14)	
Regional priority (4)	Waste (6)	Land use and ecology (6)	
Integrative process (1)	Land use and ecology (12)	Emission (5)	
Accredited professional (1)	Pollution (13)	Innovation (10)	
Innovation (5)	Innovation (10)		
GREEN BUILDING INDEX *(Non- Residential e 94 credit point)*	**IGBC Rating** (*IGBC Green New building-96 credit point*)	**BEAM PLUS** (*BEAM PLUS New Building version 1.2-140 credit point)*	***CASBEE*** *(CASBEE for new construction).*
Energy efficiency (35)	Sustainable architecture & Design (5)	Site aspect (24)	Indoor environment (Q)
Indoor environmental quality (21)	Site selection and planning (14)	Material aspect (23)	Quality of services(Q)
Sustainable site planning & Management (16)	Energy efficiency (28)	Energy use (48)	Out environment (Q)
Material and resource (11)	Building material & Resource (16)	Water use (10)	Energy (L)
Water efficiency (10)	Indoor environmental quality (12)	Indoor environmental quality (35)	Resources & material(L)
Innovation (7)	Innovation (7)	Innovation & addition (5)	Off-site environment(L)

As it can be seen in Table 1, each of selected GB rating tools has different credit criteria for the assessment of the GB. However, there were certain credit criteria which were considered in common by most of the rating tools. For example, energy and IEQ criteria are addressed by all selected rating tools. Further, water criterion is also directly considered by all the rating tools except for CASBEE rating. Although a direct credit criterion is not established on water efficiency for CASBEE, in the resources and material credit criteria, the credit points such as water saving, rain water re-use in detail similar to other rating tools. Material and resources and sustainable sites are another important credit criterion which were established by the majority of the rating tools except for green mark. However, in green mark, environmental performance criterion covers up wide range of the aspects.

They are the CASBEE rating tool does not allocate point to each credit criteria. Therefore, each credit point is evaluated based on scale ranging from level 1 to level 5. Further, if there are no weighting factors given all credit points are assumed to be equal importance, and there is no order of importance for credit points. Therefore, when allocating points for key credit criteria, each credit point given the value "1". When all the credit points are attributed, the author arrived at the final percentages for each key credit criterion for each rating tool.

3) Comparison of key credit criteria and their score

Based on analyzing the main characteristics of selected rating systems used in different countries and studying the local context, the researcher defined seven main categories for the assessment tool based on the triple bottom-line criteria namely; site, energy,

water, IEQ, materials, waste and pollution and finally management. Waste and pollution were also common criterion, including credit points governing both construction and operational waste, air pollution due to fossil fuel combustion, air and noise pollution during the construction and light pollution. Site criterion includes all credit points covering the selection of the site with the minimum impact on the environment. Finally, management criterion was also considered common which includes all the management attributes e.g., quality management, procurement selections and selection management of the project.

Table 2 shows the relative scores of selected seven key credit criteria of each rating tools. According to the comparison 'energy' criterion has the highest consideration on all rating tools expect for CASBEE with 30.43% of score. The reason for significant concentration on energy credits by most of the green rating tools is because there will be an upward trend in energy demands in the future. The "IEQ" criterion is given the second priority in CASBEE, this is green most consideration with gaining 25.30% of the total scores. The 'water' criterion is given a similar focus in each tool where the normalized scores are ranging from 7% to 19%. Where Beam plus and CASBEE being the lowest and IGBC being the highest. In 'material' criteria, LEED focus on improving the recycling rate of building materials and use ratio of local materials and strengthen the building materials recycling to promote GB materials performance.

Table 2: Scores for key credit criteria for each rating tools

Rating Tool		SITE	ENERGY	WATER	IEQ	MATERIAL	WASTE & POLLUTION	MANAGEMENT & OTHERS	TOTAL
LEED	SCORE	17	35	15	18	12	12	1/5	115
	%	14.78	30.43	13.04	15.65	10.43	10.43	0.87/4.35	100
BREEAM	SCORE	14	30	15	15	13	18	23/2	130
	%	10.77	23.08	11.54	11.54	10	13.85	17.69/1.54	100
GREEN STAR	SCORE	7	24	14	17	14	11	12/1	100
	%	7	24.00	14.00	17.00	14.00	11.00	12.00/1.00	100
GREEN MARK	SCORE	8	91	20	35	18	4	7/0	183
	%	4.37	49.73	10.93	19.13	9.84	2.19	3.83/0	100
GBI	SCORE	9	37	11	21	6	6	3/1	94
	%	9.37	39.6	11.7	22.34	6.38	6.38	3.19/1.06	100
BEAM PLUS	SCORE	13	48	10	32	19	12	1/5	140
	%	9.29	34.29	7.14	22.86	13.57	8.57	0.71/3.57	100
IGBC	SCORE	11	28	19	12	13	5	2/6	96
	%	11.46	29.17	19.79	12.5	13.54	5.21	2.08/6.25	100
CASBEE	SCORE	6	7	6	21	10	4	2/27	83
	%	7.23	8.43	7.23	25.30	12.05	4.82	2.41/32.53	100

IV. RESULTS

A. *Identification of the key credit criteria*

GB credit criteria is a multi-dimensional tool which respects different environmental, social, and economical issues. Therefore, the process of building score system for each criterion should be comprehensive and flexible. This process should adapt comparative judgments for pair-wise comparison of criteria and based on each rating tool's established framework. Finally, the priorities of credit criteria and their respective scores are synthesized into an overall rating based on which the key credits are declared.

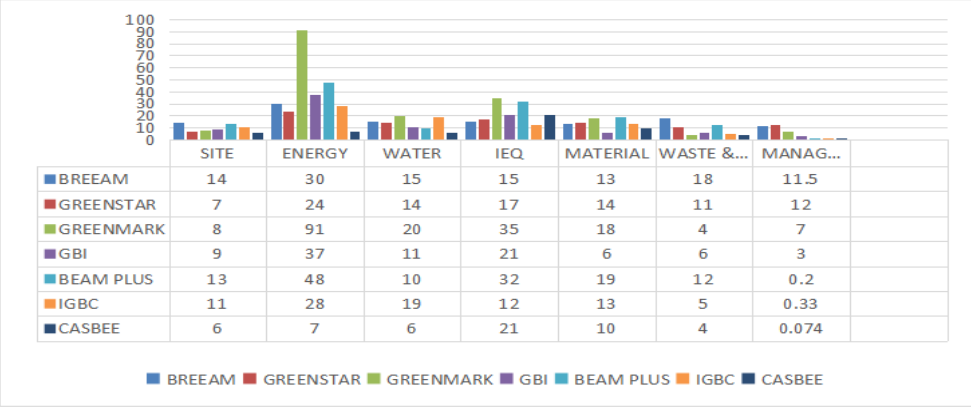

Fig. 1: The bar chart of the assessment tools and their credit criteria

The final results are shown in the fig. 1 and Table 3. As it can be seen in the chart and table, the highest points are given to the energy criteria with credit points of 91 by GREEN MARK followed by BEAM PLUS, GBI, LEED, BREEAM, IGBC, GREEN

STAR and lowest being CASBEE. The criteria that comes after is IEQ followed by water, Site, Material, Waste and Pollution and last being the Management.

Table 3: Established credit criteria

S.NO	CRITERIA	CREDIT POINT	WEIGHATGE
1.	Site	10	10%
2.	Energy	30	30%
3.	Water Efficiency	15	15%
4.	Indoor Environment Quality	15	15%
5.	Materials	15	15%
6.	Waste Pollution	10	10%
7.	Management	3	3%
8.	Others (Transport, Location, Innovation).	2	2%
	TOTAL	100	100%

Table 3 introduces the key credit criteria for the assessment of GB construction in Pakistan. Each assessment category is identified by a number of indicators. The score and nature of indicators varies from one category to another according to the category itself and its importance matching the local context. As well as, each indicator is defined through a number of parameters. In respect to these criteria, each category is required to apply main sustainable concepts according to certain classification of items. Table 3 of credit criteria was later used in the questionnaire.

B. Assessment results of the proposed credit criteria

In this section the response of the respondent is presented to assess the applicability of the proposed credit criteria for Pakistan's' construction industry.

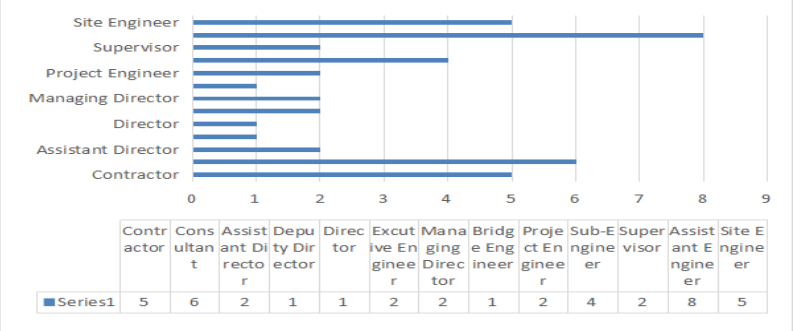

Figure 2: Profile of respondents

Fig. 2 shows the profile of respondents. The respondents held many different positions with varying degree of experience. There were thirteen different positions held by the respondents taken part of this study. The position with the highest number of respondents was assistant engineer (with 8 peoples), followed by consultant (6 people), contractor and site engineer sharing the number of (5 people). Sub-engineer, manager director, project engineer and supervisor were of (2 people) and rest of the job titles were director, bridge engineer and deputy director who held only one respondent respectively.

The Table 4 presents the summarized results of questionnaire and interviews in terms of indicators for each category individually. In the initial object, the respondent's overall knowledge about GB assessment tools and its importance was testified. Identification of such information was considered necessary to scoring of indicators for developing assessment tool; it is the second stage after establishing the indicator.

Table 4: Summary of the results of questionnaire

NO.	OBJECTIVES	INDICATORS	RESPONDENTS	COMMENTS
1.	To examine the knowledge about the green building construction with all the stakeholder.	A. Awareness of the GB	About 26 of the respondents said they are aware of it and rest 15 said they aren't.	Most people were aware of the it. But more awareness is required to promote GB construction.
		B. Benefits of GB	About 24 of the respondents said they are aware of the benefits it can render and rest 17 said they aren't.	
		C. Ways to promote GB	About 23 of the respondents said by government, 8 respondents said by private, 7 respondents said about others (without mentioning which) and the rest 3 respondents said must be both government and private.	Government should take steps to promote GB concept, then it falls upon the private part to do for the betterment of the surrounding and society.
		D. Knowledge about assessment tool	About 36 respondents out of 41 said yes, they have heard about assessment tools and they know what they are in GB.	The responses were positive since most of them knew about it.
		E. Consultant's concern in GB.	21 people said the consultant should be involved in the matter of the GB and rest 20 said no.	The consultant should be involved in the GB for better results and awareness should be increased too.

		F. Naming of the leading assessment tools.	Very few people said they can name the leading assessment tools. About 13 out of 41 said yes, they can and rest 28 said no.	The respondent did new about the assessment tools, but they were not able to name them even the leading one. awareness in our industry is surely required.
		G. Knowledge about credit criteria for assessment.	15 people said that they know about the criteria for assessment and rest 26 people said they don't know about credit criteria.	Very few people had idea about the criteria despite knowing about the assessment tools.
		H. Know about "triple bottom line" criteria.	17 respondents out of 41 said yes, they know about it and rest large amount of said no they didn't.	It is merely social, economic and environmental. but very less people are aware of it.
		I. Key credit criteria for assessment tools in Pakistan.	Out of 41 respondents, 16 said economic parameter, 11 said environmental parameter, 9 respondents said social and few 4 people said both economic and social.	While considering assessment tool the economic parameter should be prioritized followed by environmental and social. so, it is better to keep both environmental and economic in mind while considering the assessment criteria in Pakistan.
2.	Development of established key credit criteria for the assessment of GB construction in Pakistan.	A. SITE	30 respondents out of 41 agreed to our score, 7 respondents disagreed with few suggestions and 4 people didn't respond at all.	Very few people had disagreed just 7 people. So, the score is decreased by one point compensate in total. the changed score is of 9 points.
		B. Energy	22 out of 41 agreed to the score established in the tool and 15 respondents disagreed with few suggestions and 4 didn't respond at all.	Since many respondents have disagreed to our established score. so, increasing it to 32 points.
		C. Water efficiency	33 out of 41 respondents agreed to our established score just 4 people disagreed remaining 4 didn't respond at all.	Since most of the people agreed to our proposal so the score for this criterion is decreased by 1 point to compensate in total. so, the new score is 14 points.
		D. Indoor environmental quality	32 respondents out of 41 agreed to our score and 5 people disagreed with some suggestions remaining 4 people didn't respond at all.	Since most people have agreed so score for this is decreased by 1 point to compensate in total. So new score is 14 points.
		E. Materials & resources	26 respondents out of 41 agreed to our established score, about 11 people disagreed and remaining didn't respond at all.	Since the respondents have disagreed more by 11 people so increasing the points by 1 point to make it 16 points.
		F. Waste pollution	32 respondents out of 41 agreed to our established score, about 5 disagreed and 4 people didn't respond it.	Since most people have agreed to our score so the score for this criterion is reduced by 1 point to compensate in total .so new score is 9 points.
		G. Management	28 points agreed to our established score out of 41 and 9 disagreed and 4 people didn't respond at all.	Since most people have disagreed to our proposed score so improving the criteria score by 1 point to make it 4 points.
		H. Others	33 people agreed to our score out of 41 and 4 disagreed. remaining 4 didn't respond at all.	Since most of the people have agreed to our score so the score for this criterion remains unchanged.
		I. Total score	34 respondents out of 41 agreed to our established score with just 3 disagreed and reaming 4 didn't respond at all	Since most of the people have agreed to our score so the score for this criterion remains unchanged.

The second objective covers respondent's opinion regarding the proposed credit criteria in this research. Respondents were asked to rank the credit criteria from the highest to the lowest according to their importance. Overall, they argued that all the suggested credit criteria are important and should be considered in the assessment criteria. There were no additions from the respondents. In this established credit criteria, some of the respondents agreed but the credit criteria of energy, material and management the most disagreements were observed. some of the respondents suggested the score up to which the particular criteria must be increased and some just put their emphasis by starting to focus or simply improving it. The score was improved for energy by 2 points while that of material and management was increased by 1 point. The point from the criteria of water efficiency, indoor environmental quality and site were deducted by 1 point to compensate for the increment. However, the points for the others and total score were maintained as unchanged.

The ranking of credits from the most important to the least by respondent's presented in the Table 5. After making few changes in the established credit criteria by considering the opinions of the respondents, the modified list of credit criteria tool is established for the assessment of GB of Pakistan. The top four criteria make the 76% of the total score. which means these are the one which should be considered most important for the assessment of the GB in Pakistan.

Table 5: Modified credit criteria based on respondents' suggestions

S.NO	CRITERIA	CREDIT POINT	WEIGHATGE
1.	Energy	32	32%
2.	Materials	16	16%
3.	Water Efficiency	14	14%
4.	Indoor Environment Quality	14	14%
5.	Site	9	9%
6.	Waste Pollution	9	9%
7.	Management	4	4%
8.	Others (Transport, Location, innovation)	2	2%
	TOTAL	100	100%

Categories are different from one region to another, and they depend mainly on the local context. Countries can learn from each other's work and ideas and they should use the work of experts as inputs to their discussion. In this regard, the proposed seven

categories in this research were evaluated at global scale to get the general idea of relative importance of each category. Although, there are similarities on the category level between developed and developing countries, there are differences in the weighting of each category. Yet, some indicators and parameters were added, and others were omitted, depending on the local context of Pakistan that were ranked according to their importance and represented through their scores. Because of the energy crisis, shortage of natural resources and water efficiencies were considered as the crucial categories in the green construction practice in Pakistan. Selection of categories, indicators and parameters depended mainly on the ranking of the importance and relevance to the local situation.

Table 6: Importance of Suggested Credit Criteria at Global Level

Regions	**American, Eu, Asia pacific M.E & N. A**		**Europe, Middle East, & NA**		**Asia Pacific &South Africa**		**South East Asia**		**South East Asia**		**South East Asia**		**East Asia**		**South Asia**		**South Asia**	
Tool	**LEED**		**BREEAM**		**GREENSTAR**		**GREENMARK**		**GBI**		**BEAM PLUS**		**CASBEE**		**IGBC**		**(PGBC)**	
Site	35	14.78%	14	10.77%	17	7%	08	4.37%	09	9.73%	13	9.29%	06	7.23%	11	11.46%	10	10%
Energy	35	30.43%	30	23.08%	24	16%	91	49.73%	37	39.6%	48	34.29%	07	8.43%	28	29.17%	30	30%
Water	15	13.04%	15	11.54%	14	24%	20	10.93%	11	11.7%	10	7.14%	06	7.23%	19	19.73%	15	15%
IEQ	18	15.65%	15	11.54%	17	17%	35	19.13%	21	22.34%	32	22.86	21	25.30%	12	12.5%	15	15%
Material	12	10.43%	13	10%	14	14%	18	09.85%	06	6.38%	19	13.57%	10	12.05%	13	13.54%	15	15%
Waste pollution	12	10.43%	18	13.8%	11	11%	04	2.19%	06	6.38%	12	8.57%	04	4.82%	05	5.21%	10	10%
Management	01	0.87%	23	17.69%	12	12%	07	3.83%	03	3.19%	01	0.71%	02	2.41%	02	2.08%	03	03%
Others		4.35%	02	1.54%	01	01%	00	0%	01	1.06%	05	3.57%	27	32.53%	06	6.25%	02	02%
Total	115	100%	103	100%	100	100%	183	100%	94	100%	140	100%	96	100%	83	100%	100	100%

V. CONCLUSIONS

An assessment tool with efficient and relevant credit criterion for GB is important. By integrating criteria from different rating tools used globally, this research proposed a key credit criterion system for assessment of GB. The outcome is a GB assessment tool for construction industry in Pakistan. It is recommended that this system is a powerful GB rating system for Pakistan because it is based on scientific research and technical knowledge, participated multi-stakeholders' knowledge and experiences in collaborative process. In addition, the assessment framework suits the local context of Pakistan; its culture, issues, resources, priorities, practices and institutions. As well as, this assessment system is validated regarding to sustainable goals and famous green assessment tools – BREEAM, LEED, CASBEE, IGBC, GREEN STAR, GREEN MARK, BEAM PLUS and GBI– in real building projects. The energy efficiency is the main criterion for all the rating tools followed by materials and water efficiency respectively. By examining the certification systems currently in operation in each country, it can be understood that their assessment methods and systems vary in degree according to the climate and social characteristics of each country. Based on the point score evaluation the new credit criteria was developed for construction industry of Pakistan. Which was later sent to the different stakeholders and practitioners of Pakistan construction industry for their assessment and consent. The results showed that the respondents (main players of the construction industry) surveyed in this study did not have the same level of knowledge regarding the green construction concept. Nonetheless, mostly had heard about the GB concept and many also knew its benefits. The respondents emphasized on government as a main way to promote GB and afterwards comes the emphasis on private. The respondents agreed to very much extent for the involvement of the consultant for the better results in the project.

The respondents had an awareness regarding the assessment tools which are used for analyzing the performance of the GB. However, most of them were unable to name leading assessment tools and very few had idea about the credit criteria of these assessment tools. The respondents put more focus on the economical parameter for the credit criteria for the assessment tool of the GB followed by the environmental parameter then some suggested for the social parameter. Very few suggested both economic and environmental parameters should be considered.

VI. RECOMMENDATIONS

This research suggests a number of recommendations to develop GB assessment tool in local context of Pakistan. First, as with the increase of the population and the environmental pollution, Pakistan's construction industry must take measures to mitigate the adverse effect of the environmental change to avoid perils for the future generation. In this context concerned stake holders should take measures to enhance awareness by many folds in GB construction. They must arrange awareness -oriented programs in their respective organization.

Second, the Government should also put efforts to promote and make others enact the adoption of green construction in growing industry by providing some polices like tax exemption and privilege. Multi-stakeholders should participate in developing such approach, as it requires participating and collaborative process. Experts, designers, elected officials, working group, agency players, and others should be introduced as key participants in this process.

Third, the assessment framework should suit the local context of the country; depending on its culture, issues, players, practices and institutions. It will be essential for each country to design its own indicators in its own way to serve its shared goals.

Finally, it is also suggested that the GB council of Pakistan should consider the adoption of the proposed credit criteria tool in this research for the assessment of the GB construction.

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