

Evaluating the Sustainable Architecture Indicators in Tabriz Grand Bazar

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Abstract

The present study evaluates the sustainable architecture indicators of human relation with contemporaries in the Tabriz Grand Bazar and analyzes how the priorities of these indicators are implemented in this bazar. To achieve this goal, qualitative content analysis method is used. The data gathering tools used in this research is documentary and library studies and field studies in the form of questionnaires and observation. In this regard, at first, the sustainable architecture indicators are extracted based on international sustainable evaluation systems, such as LEED. In the second step, after validating the indicators, the audience's understanding of finalized indicators is evaluated. In order to achieve this goal, the quantitative data obtained through the completion of 320 questionnaires were analyzed using linear regression analysis in SPSS software. The results show that more than 85% of the indicators of human relation with contemporaries have a high impact on the realization of sustainable architecture. Thus, it can be said that the realization of the sustainability in Tabriz Grand Bazar is clearly understood by the audience, furthermore the public involvement and of vitality of the bazar spaces have the highest influence on the audience's understanding of sustainability in the Bazaar.

Keywords: Evaluating; Sustainable architecture indicators; Sustainable relations; Tabriz Grand Bazar.

1. Introduction

The concept of sustainability in the 1970s is the result of human awareness of environmental issues and socio-economic cultural problems. One of the most important goals of sustainable development is to preserve nature and to modify the common understanding toward it. The manifestation of sustainable development in the built environment is considered as sustainable architecture. The term "sustainable" is now widely used to describe a world in which human and natural systems can survive for a long time and be practical. "Sustainable Development" means providing solutions to technical,

physical, social and economic patterns of development that can address issues such as the destruction of natural resources, the degradation of biological systems, global pollution, climate change, excessive population growth, Injustice and the decline of human quality of life (Khanmohamadi, 2010: 12). Social sustainability is the capacity to provide a good quality of life by creating healthy and livable communities based on equity, diversity, connectivity, and democracy. This moral capital requires the maintenance and the replenishment of shared values and equal rights (Bertacchini et al., 2016). In this regard, it is necessary to define economic sustainability as the optimal employment of existing resources, so that a responsible and beneficial balance can be achieved over the long-term to reach the preservation of the capital. Economic sustainability concerns the real economic impact that a society has on its economic environment (Pettersen et al, 2017). The environmental sustainability is defined as the capacity to use natural resources without exceeding their regenerative capacity and protecting the “natural capital” to prevent harm to humans and the environment. This means constraining the scale of the human economic system within the biophysical limits of the overall ecosystem on which it depends; therefore, environmental sustainability is inherently linked with the concepts of sustainable production and sustainable consumption (Warner, 2015).

2. Literature Review

2.1 Sustainable Architecture

The most common form of sustainable architecture is architecture that is about sustainability. It embraces every building and built environment that contains sustainable components or provides information concerning sustainability. This information is varied ranging from building components, such as building materials and systems, to sustainable design tools and techniques, such as environmental impact assessment (EIA), life cycle assessment (LCA), and building evaluation systems (e.g. LEED and BREEAM), to general relationships between the built environment and environmental and social issues, such as addressing environmental concerns and social benefits in planning policies or architectural programming (Ten have, 2014). Architecture about sustainability usually comprises sustainable elements or sustainable strategies. While the elements encompass sustainable products, materials, and technical devices, the strategies include sustainable approaches in site selection and development, transport impacts, building configuration and orientation, selection of products and materials, energy conservation, use of renewable energy, water conservation, air quality, human comfort, operation and maintenance, renovation, and demolition (Vierra, 2014). Because of differences of project conditions, each project cannot accommodate all sustainable

elements and strategies, but select some that support each other and that are likely to respond to the particular approach. The diversity of implementation can be classified in various ways, for example, the three images of sustainable architecture, namely, natural, cultural and technical, the six competing logics of sustainable architecture, and the ten shades of green architecture (Becker, 2012).

2.2 Sustainable Architecture Evaluating System

Rating systems for assessing the environmental impact of buildings are technical instruments that aim to evaluate the environmental impact of buildings and construction projects (Bernardi et al., 2017). Among the set of sustainability rating systems, due to factors such as comprehensiveness, acceptability, responsiveness, availability of information as well as international performance and their multi-functionality and credibility, the LEED for US and Canada LEED have been chosen. The LEED guidelines toward each of sustainable relation have been extracted in order to reach the sustainable architecture indicators that are showed in the following table:

Table 1: LEED guidelines based on sustainable relations

LEED Canada	LEED US	Sustainable relations
Renewable energy Composite wood and Agrifiber products	Certified wood Renewable energy	Human relation with nature
Regional materials	Regional materials	
Insulating materials with low emissions Water use reduction Minimum energy performance Regional priority	Insulating materials with low emissions Water use reduction Minimum energy performance	
Maximizing green spaces Green power Alternative transportation Accessibility to public transportation adequate parking capacity Measurement and verification of base building Parking capacity based on non-residential, residential and mixed use projects. Community connectivity with density	Maximizing green spaces Green power Alternative transportation Accessibility to public transportation adequate parking capacity	Human relation with contemporaries
Daylight and views Increased ventilation environmental Tabacco smoke (ETS) control Thermal control Minimum IAQ (Indoor Air Quality) performance Construction IAQ management plan Indoor chemical and pollution source control Controllability of lighting smart system Light pollution reduction based on land use zoning	Daylight and views Eliminate light trespass from the building Increased ventilation environmental Tabacco smoke (ETS) control Thermal control Minimum IAQ (Indoor Air Quality) performance Construction IAQ management plan Indoor chemical and pollution source control	
Water efficiency A/C systems Innovative waste water technologies Water use reduction	Water efficiency A/C systems Innovative waste water technologies Water use reduction	Human relation with

Minimum energy performance Optimized energy performance Enhanced refrigerant management	Minimum energy performance Optimized energy performance	future generation
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So based on the table above and all the gathered information the final sustainable architecture indicators in each of the sustainable relations are written in the following table. It should be noted that all of these indicators are validated by the expert in the architecture and sustainable field through the Delfi method.

Table 2: Sustainable Architecture Indicator

Relations	Sustainable architecture indicator
Human relation with nature	Optimize consumption, Visual quality, Vitality and Flexibility, Context- oriented design,
	Optimize consumption, Vitality and Flexibility, Context- oriented design, Vernacular architecture, Integration
	Vitality and Flexibility,
	Optimize consumption, Context- oriented design, Vitality and Flexibility, Context- oriented design, Spiritual architecture
Human relation with contemporaries	Visual quality, Knowledge-based consideration, Context- oriented design, Vitality, lack of excessive material, lack of excessive material, Modesty in architecture
	Vitality and Flexibility, Context- oriented design, Vernacular architecture, lack of excessive material, lack of excessive material, Integration, Modesty in architecture, Collectivism
	Optimize consumption, Vitality and Flexibility, Human comfort, Renewability, Vernacular architecture
Human relation with future generation	Vitality and Flexibility

3. Methodology

To achieve the goal of the article, qualitative content analysis method is used. The data gathering tools used in this research is documentary and library studies and field studies in the form of questionnaires and observation. In this regard, at first, the sustainable architecture indicators are extracted based on international sustainable evaluation systems, such as LEED. In the second step, after validating the indicators, the audience's understanding of finalized indicators is evaluated. In order to achieve this goal, the quantitative data obtained through the completion of 320 questionnaires were analyzed using linear regression analysis in SPSS software.

4. Case Study

At this stage, the theoretical findings of the research in the case study have been evaluated. "To use theoretical analysis in the realm of action, it is necessary to inquire more deeply about the findings and the perception of the audience" (Tenhave, 2014: 53). Also, sustainable architecture has always emphasized on achieving sustainable development in different parts of the world by attempting to localize it (Jahanbakhsh, 2011). Therefore, in this research, the Iranian-Islamic Bazar has been used

as a sample to evaluate theoretical findings in an architectural case study from the perspective of the researcher and contemporary audience. Bazar, as the backbone of Iranian cities, is a very important urban element with economic and social power and scientific-cultural potential and also has been considered as a successful example of commercial spaces (Falamaki, 1993: 82). The grand bazar of Tabriz is located in the old and historical context of the city and still is the most important commercial and business center in the city of Tabriz (Soflaei, 2004: 25). The factors have been considered for choosing this bazar is the dynamic of the space, the age of the space, the existence of the physical and functional elements of Iranian-Islamic bazar in the space, the inclusion in the cultural heritage, and, finally, researcher's direct access to the space. So the grand bazar of Tabriz because of having all of these factors has been considered as a sample of this research (Figure 1).

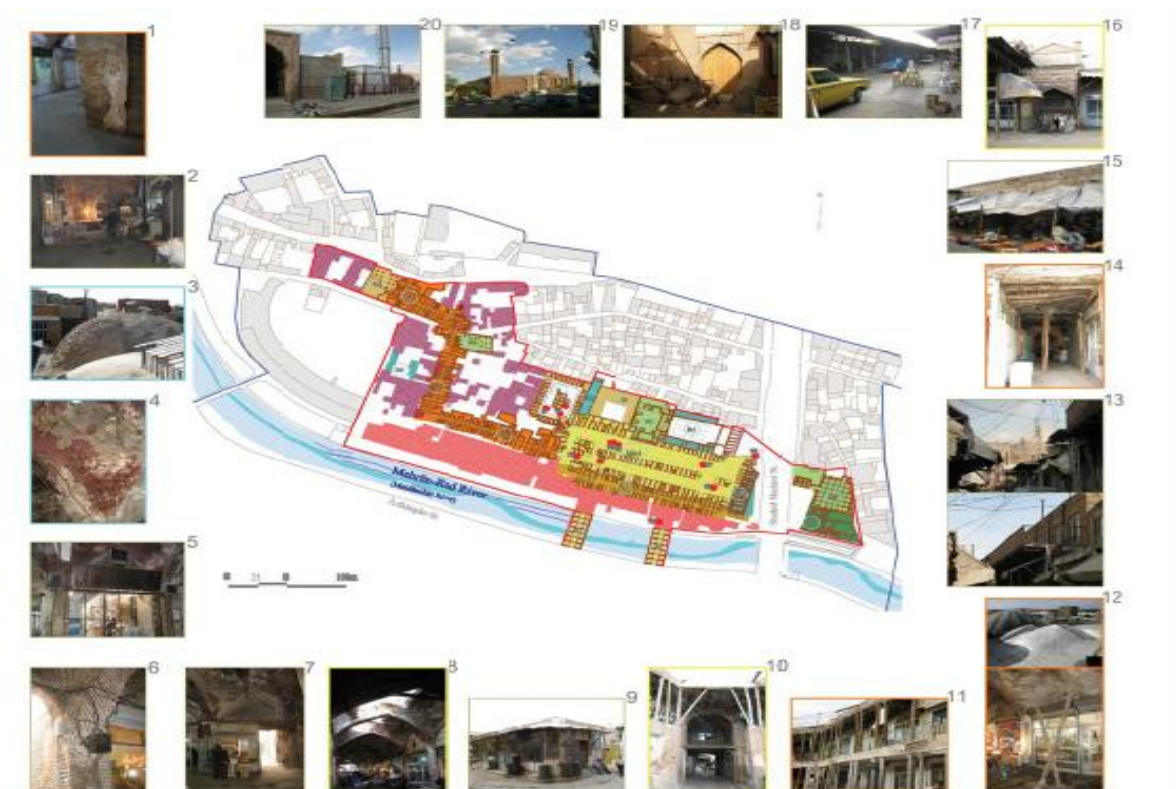


Figure 1: The Plan Of The Grand Bazar Of Tabriz

5. Evaluation of the Sustainable architecture indicators

In this part, the audience understanding of the research indicators and their impact on the human relation with nature, contemporaries and next generation will be discussed. Questionnaire respondents have been selected from store owners, citizens and residents of the surrounding area who are fully aware of the case study and constantly come to the bazar. In this regard, a semi-open questionnaire consisting of 66 multi-choice questions and 5 explanatory questions based on extractive indicators

have been used. This questionnaire is developed in the form of a 5-point Likert scale and its validity has been checked out through the content validity index (CVI) and its reliability has been calculated through Cronbach's alpha in SPSS software. The sample size required for research is 120 questionnaires based on Cochran's formula. In order to examine the audience's understanding of the influence of indicators on the sustainable relationships, the correlation between indicators and sustainable relationships is examined. Quantitative data obtained from the questionnaires completed by the research audience in the grand bazar of Tabriz has been entered into SPSS software and In order to analyze the correlation between the indicators with the sustainable relationships, linear regression has been used. In this regard, each of the human relations with nature, contemporaries and next generation have been considered as a dependent variable and indicators of sustainable architecture in each of the relationships were considered as dependent variable. The results are summarized in a following table for ease of presentation and comprehension (Table 5).

Table 3: The Linear Regression Of The Sustainable Architecture Indicators Of The Triple Sustainable Relations

Sig	T test	Beta coefficient	Indicator	Relation
0/000	8/130	7540/	Presence of nature	Human relation with nature
0/001	7/546	6540/	Vernacularism	
0/003	6/118	5380/	Vitality and Flexibility	
0/001	7/522	6730/	Optimized consumption	
0/002	5/148	4360/	Knowledge-based consideration	
0/000	7/965	7110/	Context- orientation	
0/003	0/457	3100/	Integration	
0/001	6/888	6480/	Semantic attention	
0/003	6/530	6120/	Visual quality	
0/001	7/546	5040/	Human comfort consideration	
0/000	5/542	4350/	Vitality and Flexibility	
0/002	7/759	5480/	Vernacularism	
0/001	6/488	6340/	Optimize consumption	
7/965	0/739	6790/	Renewability	
0/003	5/433	5710/	submissiveness	Human relation with contemporaries
0/003	5/803	2450/	Waste avoidance	
0/002	3/032	6370/	Context- orientation	
0/001	0/493	6810/	Human scale consideration	
0/000	5/582	6990/	public involvement	
0/000	5/594	4830/	Knowledge-based consideration	
0/002	7/757	5260/	Visual quality	
0/001	0/493	4110/	Vernacularism	

Based on the results of linear regression analysis, the presence of nature with a beta coefficient of 0/754 has the highest impact on human relation with nature. Therefore, a standard deviation in the

presence of nature indicator increases the level of human relation with nature about 0/754 SD in the spaces of grand bazar and vice versa. However, the integration indicator which based on the viewpoint of the audience has a beta coefficient of 0/310, has the least effect on human relation with nature in the bazar. This means that a standard deviation in the integration indicator, Although has insignificant effect on human relation with nature in the bazar, but it can increase or decreases the presence of this relation about 0/310 SD. In the human relation with contemporaries, the public involvement indicator with a beta coefficient of 0/699 has the highest impact on this relation. Therefore, a standard deviation in the public involvement indicator increases the level of human relation with contemporaries about 0/699 SD in the spaces of grand bazar and vice versa. In contrast, the waste Avoidance indicator which based on the viewpoint of the audience has a beta coefficient of 0/245, has the least effect on human relation with contemporaries in the bazar. This means that a standard deviation in the waste Avoidance indicator, Although has insignificant effect on human relation with contemporaries in the bazar, but it can increase or decreases the presence of this relation about 0/245 SD. Ultimately, In the last relationship of sustainability, human relation with next generation, the renewability indicator with a beta coefficient of 0.679 has the highest impact on this relation. Therefore, a standard deviation in the renewability will increase the level of human relation with next generation about 0/679 SD in the spaces of the bazar, and vice versa. However, the Vitality and Flexibility indicator with the beta coefficient of 0/435 indicated the lowest impact on the human relation with next generation. In the next step, the audience's response to the explanatory questions is discussed based on Gilham's Interpretative Analysis Method. This method involves 7 steps;

In the first step, the texts have been transcribed and the notes of the respondents have been reviewed in the order. Secondly, in each text, the main words and phrases have been highlighted. Also, repetitive clauses and sentences, deviant clauses, and other irrelevant data have been ignored. In the third step, some similar statements that emphasizing on the validity of the findings have been specified. Due to the interpretive approach, the concepts of the statements have been taken into account directly with the response of the respondents, and finally, important propositions have been extracted. In the fourth stage, when all the texts were reviewed, the researcher returned to the original text, reviewed them and made sure that he was not neglected in highlighting the basic words and phrases. In the fifth step, coding of the important statements has been implemented. In the sixth step, a review of the extracted points has been done and the level of necessity of each of the points has been determined based on the concepts contained in different parts of the questionnaire. Finally, in

the seventh stage, considering the importance of examining the relative frequency of the results of explanatory questions in order to achieve the general consensus of respondents, the percentage of each of the points has been calculated separately, and finally the unnecessary points based on the frequency percentage and the concepts contained in the answers texts have been eliminated. It can be noted that, based on table 3 the results of interpretive analysis of explanatory questions is similar to the result of linear regression method of quantitative data and both of these methods validate each other.

6. Conclusion

In this research based on its purpose that is evaluation of sustainable architecture indicators in the grand bazar of Tabriz based on the target group points of view, the indicators that are understandable and measurable by contemporary audiences have been extracted. In this regard, the necessity and importance of considering sustainability in architecture has been reviewed in the first step of the qualitative content analysis which is data preparation stage. Then the review of sustainable architecture's international evaluation systems and their applicable guidelines has been covered, which led to defining the sustainable architectural indicators as practical solution in sustainability. Furthermore, the validation of the defined indicators has been evaluated through the Delphi method. Final indicators include: Optimized consumption, Visual quality, Vitality and Flexibility, Context-orientation, Vernacularism, Semantic attention, Integration, presence of nature and Knowledge-based consideration In human relation with nature; Visual quality, Knowledge-based consideration, Context-orientation, Vitality and flexibility, waste Avoidance, Vernacularism, submissiveness, Integration, public involvement and Human scale consideration in human relation with contemporaries and Optimize consumption, Vitality and Flexibility, Human comfort consideration, Renewability and Vernacularism in human relation with next generation.

In order to evaluate the sustainable architecture indicators in the grand bazar of Tabriz, it is necessary to study the theoretical findings in the analysis unit. In this research, the evaluation of the indicators has been carried out by emphasizing on the understanding of the target audience. At this stage, by designing a semi-open questionnaire, the correlation between indicators and sustainable relationships using linear regression analysis method has been considered and by comparing the coherence between quantitative and qualitative findings as well as findings from direct observation, the results show that based on the perception of the respondent and the researcher, more than 79% of the indicators have a

beta coefficient greater than 0/5, It can be concluded that the realization of the sustainability in the grand bazar of Tabriz is clearly understood by the target audience.

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