International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 2, Issue 6, pp 5-9, August-2018

Assessment of Energy Performance of Courtyard in Sustainable Architecture

[1]Mehwish Soomro, [2]Bhai Khan Shar, [3]Ghulam Mustafa Soomro, [4]Muhammad Akram Akhund,[5]Ali RazaKhoso

[1]Department of Architecture, Mehran U.E.T. Jamshoro, Sindh, 76062, Pakistan
[2]Centre of Excellence in Art and Design, Mehran U.E.T. Jamshoro, Sindh, 76062, Pakistan
[3]Department of Geology, Sindh University Jamshoro, Sindh, 76062, Pakistan
[4]Civil Engineering Department, ISRA University Hyderabad, Sindh, 313, Pakistan
[5]Civil Engineering Department, Mehran U.E.T. Jamshoro, Sindh, 76062, Pakistan

***Abstract* - After the revolution of industries, men expected like never before to utilize energy, particularly the non-renewable energy sources and fossil fuels. Notwithstanding providing the comfort conditions to human life, an excessive amount of utilization of these vitality assets can affect the contamination, greenhouse gasses and demolition of atmosphere. The outcome is the fearsome of the earth and the coherence of lifecycle on the Earth. Subsequently, the natural worries in the 1970s caused the development of another idea authorized as sustainability in all disciplines and ventures. In this manner, development parts - as one of the primary buyers of sustainable energy are required to take after supportability standards, as different controls do. One of the procedures in arranging green architecture design to achieve the ideal use of hygienic energies and, along these lines, to decrease ecological contamination is to have courtyards around or within the structures. 'Courtyard' has good impact on energy performance and to reduce environmental pollution. Distinctive sorts of courtyards have been seen in various districts of the world; contingent on wind heading; sun's orientation, aesthetical perspective of the buildings and so on. This study considers the impact of various parts of a courtyards expanding on the hotness and comfort of the inmates. Current study is based on questionnaire survey, expert opinion, case studies, and literature review. It describes 'courtyard' as energy performance and thermal comfort to reduce environment pollution and requires adoption of green and sustainable architecture.**

Keywords: Courtyard, Energy Conservation, Environmental Pollution, Sustainable Architecture.

I. INTRODUCTION

The quickest development of populace and furthermore the expanding use of the petroleum derivatives these days have included extensively the speed of the basic status of ecological issues. The inadequacy of regular assets, the ascending of contaminating levels in environment, the ecological and common dangers because of the previously mentioned issues require appropriate organization, supportable utilize and the usage of immaculate and economic power sources. There is noteworthy attentiveness in regards to the declining vitality assets, for instance, the oil based commodities, petroleum products in late decades; Such as assets that have made in the midst of many a long time are not recoverable in examination with the use rate. Subsequently, it's fundamental to have multidirectional thought to the associated risks adjacent supportable progress. It has been clear in context of an examination in Europe that half of benefits utilization in nations is directed to building progression industry. Transportation depletes 25% of the noteworthiness [1].

In this way, supplanting and substituting an extent of these energies with clean energies and arranging and building in light of green design can be considered as imperative strides alongside better utilization of available assets. The present research is an endeavor to basically present the existent natural issues as per green design standards. In this manner, it additionally presents ideas of sustainable development and green engineering. At last, one of the customary design methods that are, utilizing patios is managed. Courtyard is alongside green design modifiers.

a) Sustainable Development

Environmental Conference of UNO is a basic occasion in social perspective in the midst of history just before general resources and the usage structures of earth. The predefined disclosure and 1974 KOKOIK have established the eccentricity and honesty of social-ordinary crises. Moreover, they have underlined upon the need of considering and indicating sound general frameworks with a particular true objective to resuscitate cash related and sensible characteristic updates. Moreover these endeavors impelled the "earth Commission" in 1992. In the midst of the predestined instruction, the 21 Affirmation and Rio Affirmation about

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 2, Issue 6, pp 5-9, August-2018

trademark and advance were reinforced. The 21 Affirmation fuses four pieces which are passed on in four essential parts and joins money related estimations, the key recourses in setting of advance, propping the lead parties, and the illustrative styles, in light of the 21 Affirmation and Rio assertion, all states are obliged to alter and mastermind sensible development systems according to their physical, climatic, social, political, and financial circumstances concerning their present workplaces and concealments [2].

An importance of sensible headway which is generally recognized is the clarification in Brut land report wherein it is communicated that "monetary change is the progression that fulfills the necessities of assets existing age aptitude to satiate their prerequisites" [3] and "improve the individual fulfillment inside the organic framework point of confinement and trademark resources limits" [4].

By the term headway, the relentless changes in the midst of several years and periods are suggested mostly in specific, communal, and judicious conditions of human improvement. Viable means stable and profitable process (Fig. 1). Other than that, the prescribed game plans displayed in that are strikingly with social-money related brief packaging cases of upgrades so that to discourage the way for such issues as the annihilation of regular alternatives, the crushing of bio-lives, the tainting of the earth, air modifications, inappropriate behavior and reduction of individual fulfillment [5].

In a manner of speaking, sensible change causes the congruity of "helpfulness of advantages", in moderate enveloping circumstances and besides "alteration and ability of social-pragmatic utilization of benefits. Concerning the above definition, practical change has three basic estimations: human, condition, and future. Close by it, human is advanced as one of the tomahawks of viable headway. Thusly, human change and his fulfillment are going before the cash situated and proficient progression.

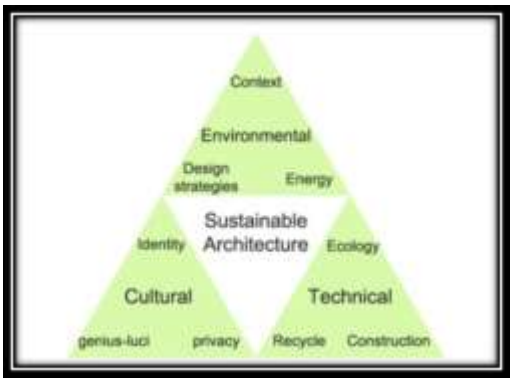

Figure - 1: Sustainable Development Pattern

b) Green Architecture

Reasonable improvement advances new considerations with terms, for example, green design, sustainable architecture, or potentially ecologic architecture.

Minding the nature of human life at introduce and later on, utilizing the resources that are versatile with encompassing condition while creating, assembling and notwithstanding obliterating them. Least utilization of petroleum products, most extreme use of perfect and sustainable power sources, and the security of local culture of every district are essential purposes of thought [5]. Williams [6] has summed up the above destinations in the three perspectives as natural, specialized, and social ones.

c) Housing Energy Proportion to National Energy Proportion

Concerning problems introduced in the current research, arrangement creators have made up their brains in numerous nations to center on sustainable power source assets and to substitute them with hydro carbonic vitality assets [7]. As it is seen in the photo, lodging vitality utilization comprises of 16 to half of aggregate vitality utilization in fourteen nations on the planet. Normal world vitality utilization is 30% [8]. As it was contended somewhere else, structures devour 33% of national vitality spending plan. The lodging structures have the key part in the specified measure of utilization. Accordingly, lodging vitality utilization must be decreased (Fig. 2). This is the reason the current research is an endeavor to current the utility of courtyards as a successful system to lessen vitality utilization.

d) Courtyard

In hot and dry climate courtyards are considered as heats of buildings. The extents and measurements are resolved in light of topographical scope, the reach out of need to shades, and the stretch out of sun oriented vitality ingestion generally. Other than that, green encompassing and water lakes inside courtyards affect the expansion of comparative dampness and mellowness of climate [10]. Besides, courtyards supportability perspective identified with green architecture would be under investigation.

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 2, Issue 6, pp 5-9, August-2018

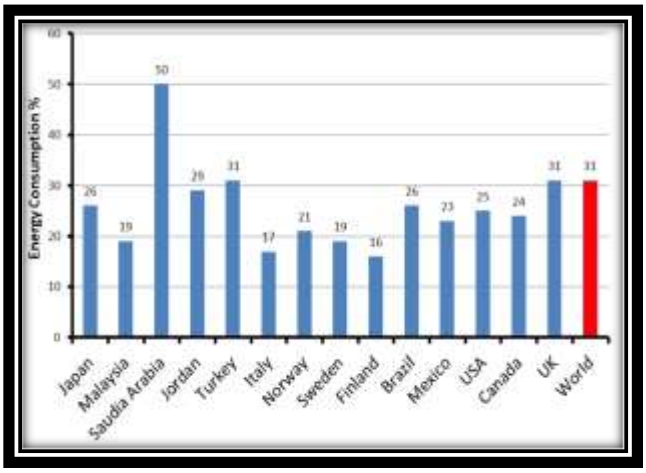

Figure - 2: Percentage of National Energy Intake

II. RESEARCH METHODS

The consolidated research technique and reenactment on the off chance that reviews are utilized as a part of the research. This Paper is an endeavor to survey the natural issues, vitality emergency, and the need of utilizing clean energies. In the interim, it mulls over the part of patios as a technique as per green architecture design objectives. Quantities of researches related to the current study were assessed before going any step ahead; all the papers were taken under consideration by taking related data and statistics in order to solidify the study. This highlights the building, those contribute to reduction in energy use were identified from the previous studies. Un-Structured interviews of architects, professionals and Environmentalists were also part of study in order to map out other factors if not present in questionnaire. Questionnaires were then prepared by considering all those factors and features. Questionnaires were filled up online as well as in hard form.

III. DATA COLLECTION

The purpose of this survey is to collect the data of public buildings of Hyderabad that either they have courtyard if yes, what are the impacts and benefits, to conserve energy and sustainability in architecture, if no; than what are the main reasons of not providing courtyard in the buildings. The benefits required for a courtyard buildings are found by reviewing literature, design guidelines and finally with the help of several interviews with planners, architects, engineers, managers and other stakeholders. The quantitative data collection technique used to collect the necessary data and to analyze the demand of courtyard design. Qualitative data collection technique is used to observe existing conditions of buildings.

TABLE I
Data Collection in Public Buildings

Data collection			
S. NO	BUILDING TYPES	NAMES OF BUILDING	ESTIMATED VISITORS/WEEK
1	BUILDINGS OF HYDERABAD	AGHA KHAN	3500
2		PUBLIC SCHOOL	5000
3		STATE LIFE BUILDING	9000
4		RAJPUTANA	6160

IV. DATA COLLECTION

The data collected through questionnaire forms and then scrutinized by using SPSS software version 24.0. To analyze the existing condition of commercial buildings, reason for no provision of accessibility facilities in commercial buildings. The questionnaires arranged in series and the data was put in the SPSS software to data analysis. It was categorized according to the research questions and the accurate results of the research were drawn accordingly.

For analyzing the information, Descriptive insights and connection technique used to summaries the figures. The information is definite, and data is on scales level, reviews or descriptive method and clear strategy used.

To analyse the data, a five point likert scale was adopted. For determining the level of significance were assessed with Statistical Software Package SPSS using Average Index (AI) method calculated with formula embraced from [11-12].

V. RESULTS AND DISSCUSSION

Table no.2 shows the results asked by the respondents regarding the features through which energy can be saved and the concept of conservation of energy can be achieved, successfully. Energy saving features e.g. Windows, courtyards, oriels, ducts an atrium were provided in the questionnaire and people were asked to rank the feature they think is most important and is effectively used in their respective homes. Courtyard was counted as second most important feature with score of 3.83 to conserve energy while people mostly don't have those in their homes.

TABLE II
Energy Saving Features

Energy Saving Features	PERCENTAGE					Score	Rank
	MOST IMPORTAN	IMPORTANT	AVERAGE	BELOW AVERAGE	LEAST IMPORTANT		
Windows/ doors/ventilators	62.50%	9.38%	3.13%	3.13%	21.88%	3.88	1
Courtyards/veranda	16.67%	58.33%	16.67%	8.33%	0.00%	3.83	2
Oriels	13.33%	6.67%	6.67%	40.00%	33.33%	2.27	5
Ducts	21.05%	5.26%	42.11%	15.79%	15.79%	3	3
Atrium	21.43%	0.00%	35.71%	21.43%	21.43%	2.79	4

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 2, Issue 6, pp 5-9, August-2018

A survey was conducted from the people of Hyderabad asking the main reasons of not having Courtyards in the modern buildings. Because of rapid growth in population and frequently migration from rural areas to urban areas the land is reducing day by day; this reason has mostly chosen by the people with top score of 6. Figure 3, present the reasons of not having courtyards in modern buildings.

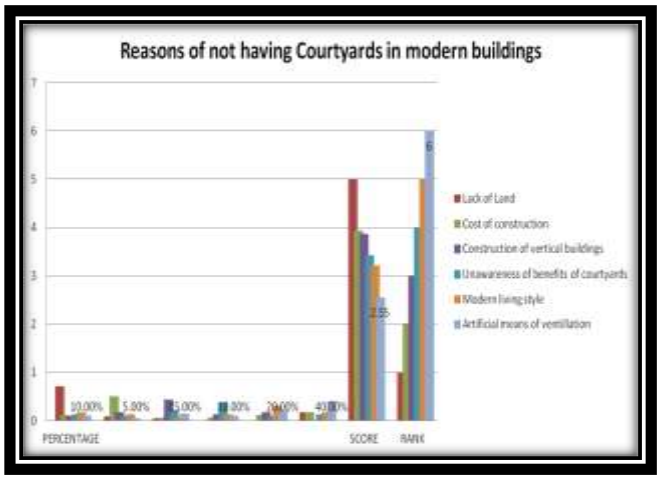

Figure - 3: Reasons of not having Courtyards in Modern Buildings

VI. CONCLUSIONS AND FUTURE RECOMMENDATIONS

These days, man has experienced dangers just like the reduction of the ozone layer, the development of warming of the Soil, destructive rain, and so forward. More accentuation for relating advances to induce freed of natural contamination, natural innovations and non-recharging energies in different preparations businesses are the foremost basic hurting reasons to the soil. So it is vital that the entire humanism works out and advancements in all fields would be attained in a way that's nearby attainable progression targetsand maintainable improvement destinations ought to be overseen. Along these lines, the subject of green plan and feasible design approach has picked up a significant degree of importance as an issue distinguished with condition.

This research is meant to elucidate the downfall of the courtyard space in the Hyderabad; three consecutive studies of the buildings were conducted in 2017 to 2018 In this research, the courtyard has been acquaint as an architectural practice in sustainable and green development to avoid environmental pollution .It (courtyard) is under scrutiny in three perspectives; specifically, specialized, social and ecological ones. (The three said viewpoints are the three state of affairs required to be thought about in practical improvement in Williamson's hypothesis). One can reach to the conclusion that courtyards-as compositional systems can satisfy the three said conditions. The results reveal that there is potential impact of court yard on the buildings as well as on the people using the courtyards. Wherein the following outcomes were acquired:

The structures remain healthy and there are no signs of damp or building syndrome were recorded. Persons using the buildings with courtyard found healthy and psychologically sound and satisfied and away from environmental constraints on their daily work. Court yard provide substation quantity of fresh air thus saves energy on cut of power in buildings; cost of purchase, installation and maintenance of appliances. Where courtyards are provided windows work efficiently and overall structure remain cool. It helps in growth of plantation that contributes in thermal comfort and beatification around the buildings.

ACKNOWLEDGEMENT

Thanks to Almighty Allah, who provided us with knowledge and will to achieve numerous milestones in life and without his blessings this study wouldn't have reached to completion phase. After Almighty Allah, Parents played an important role in personality development and with their untiring efforts we became able to map a way out of every tribulation during the study. Motivation, support and delivery of skills from our respected teacher had always been a tool to dig hard soils of complexity in lives. Their co-operation during this study made it easy to carry our fruitful results.

REFERENCES

[1] Hoseinmardi, H. *Grate Architecture and Sustainable Architecture*. Abadi 2006;42.

[2] Leghaee H, MohammadzadeTitkanloo H. Introduction for concept of sustainable urban development and urban planning. *HonarhayeZiba*, 1988;6:32–46.

[3] WCED. *Our Common Future (The Brundtland Report)*. Oxford University Press, Oxford, England, 1990.

[4] IUCN. *Caring for the earth: a strategy for sustainable living. Geneva, Switzerland*: IUCN 1991

[5] Gorjimalabani Y, Yaran A. Methods for Gilan sustainable architecture & comparison with Japan arrcitecture. *HonarhaieZiba* 2011;41:43–54.

[6] Williamson T, Radford A, Bennetts H. Understanding Sustainable Architecture. *Spon Press, London*, 2003 pp. 13-27, 2003.

[7] Omer AM. Energy, environment and sustainable development. *Renew Sustain Energ Rev* 2007;12:2265–2300.

ISSN (online): 2581-3048
Volume 2, Issue 6, pp 5-9, August-2018

[8] Swan L, Ugursal V. Modeling of end-use energy consumption in the residential sector: A review of modeing techniques. *Renew Sustain Energy Rev* 2009;13:1819–1835.

[9] Karakaya H, Durmus A. Investigation of efficiency and exergy loss in plate heat exchangers having spiral surface profiles. *EnergEducSciTechnol Part-A* 2012;28:577–590.

[10] Iranmanesh M, Taiari H, Azmoon,F. *Considering how to achieve techniques of gaining sustainable architecture on arid areas of Iran,* http://www.saba.org.ir/article-fa-177.html, October, 2011.

[11] Khoso, A. R., Akhund, M. A., Memon, A. H., Siddiqui, F., &Khahro, S. H. (2017). Health and Safety of Hyderabad Industries' Labor. *Engineering technology & applied science research*, 7(6), 2334-2339.

[12] Akhund, M. A., Khoso, A. R., Memon, U., &Khahro, S. H. (2017). Time Overrun in Construction Projects of Developing Countries. *Imperial Journal of Interdisciplinary Research*, 3(5).

Citation of this article:

Mehwish Soomro, Bhai Khan Shar, Ghulam Mustafa Soomro, Muhammad Akram Akhund, Ali RazaKhoso, "Assessment of Energy Performance of Courtyard in Sustainable Architecture", *International Research Journal of Innovations in Engineering and Technology (IRJIET)*, Volume 2, Issue 6, pp 5-9, August 2018.

****

