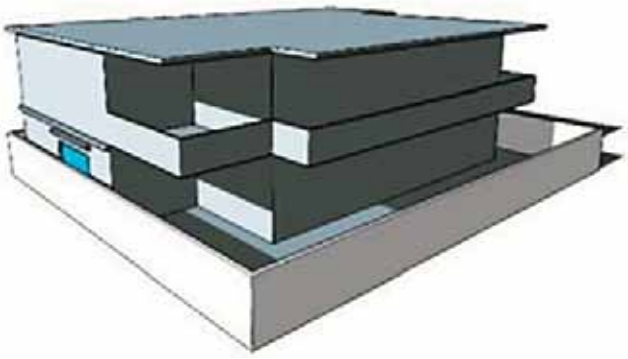
ISSN 1728-7715 (print)
ISSN 2519-5050 (online)

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING



VOLUME THIRTY-THREE
2023 (Second Issue)

ISSN 1728-7715 (print)
ISSN 2519-5050 (online)

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

VOLUME THIRTY-THREE
2023 (Second Issue)

Department of Architecture & Planning,
NED University of Engineering & Technology, City Campus
Maulana Din Muhammad Wafai Road, Karachi.

ISSN: 1728-7715 (Print)
ISSN: 2519-5050 (Online)
Journal DOI: https://doi.org/ 10.53700/jrap_neduet

Online publication available at:
www.jrap.neduet.edu.pk

Publication Designed at Department of Architecture and Planning
NED University of Engineering & Technology, Karachi

Published by NED University Press

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

Published by

NED University Press, Department of Architecture and Planning, NED University of Engineering and Technology, Karachi, Pakistan.
Email: ned_universitypress@neduet.edu.pk
URL: neduet.edu.pk/ned-university-press

Journal Management Support Team

Farida Ghaffar
(Assistant Professor, Department of Architecture and Planning, NED University of Engineering and Technology, Karachi)

Madiha Salam
(Lecturer, Department of Architecture and Planning, NED University of Engineering and Technology, Karachi)

Fariha Tahseen
(Lecturer, Department of Architecture and Planning, NED University of Engineering and Technology, Karachi)

Layout and Composition

Azeem Ahmed Khan

Printed by

Khwaja Printers, Karachi

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

Introduction

Focusing on research works relevant to the fields of architecture and planning, the Journal of Research in Architecture and Planning (JRAP) explores issues of relevance to both scholars and practitioners in the field of architecture, urban design, urban planning, built form heritage and conservation. JRAP was initiated in 2000 as a peer reviewed journal, initially published annually, however, since 2011 its frequency has increased to biannual. In addition to the papers received through our regular submission process, the two volumes also include papers selected from those presented at the annual Conference of Urban and Regional Planning, hosted by the Department of Architecture and Planning at NEDUET. Contributions to the journal on general topics are accepted any time of the year, and incorporated in upcoming issues after going through a peer review process. A post conference review is also undertaken for the selection of conference papers, before their publication. JRAP holds the privilege of being the first peer reviewed journal in the discipline of architecture and planning, published from Pakistan. Contributions are received from across the globe and on average half the papers included in JRAP are from international scholars.

As of 2018, the category entitled 'Young Scholar's Contribution' has been included in the Journal. In this category, papers from young faculty and early career scholars are accepted and editorial assistance and peer review feedback is provided to improve the research papers. One such paper is published under the head 'Young Scholar's Contribution' within each issue of JRAP.

Aims and Scope

The primary objective of JRAP is to provide an international forum for the dissemination of research knowledge, new developments and critique in architecture, urban design, urban planning and related disciplines for the enrichment and growth of the profession within the context. The journal focuses on papers with a broad range of topics within the related discipline, as well as other overlapping disciplines. JRAP publishes a wide range of research papers which deal with indepth theoretical reviews, design, research and development studies; investigations of experimental and theoretical nature. Articles are contributed by faculty members, research scholars, professionals and other experts. The Editors welcome papers from interested academics and practicing architects. Papers published so far have been on topics as varied as Housing, Urban Design, Urban Planning, Built Environment, Educational Buildings, Domestic Architecture, Conservation and Preservation of Built Form. All back issues are openly accessible and available online on the Journal's official webpage:
http://jrap.neduet.edu.pk/online_journal.html.

CONTENTS

Note: All the photographs included in this issue have been taken by the authors unless otherwise mentioned.

EDITORS' NOTE

Climate change across the globe is changing the approach of academics and researchers to subject and the second volume of 2023 includes papers that specifically all focus on researches oriented to viewing the analysis of built environments that create a better relation to the natural environment. The volume includes five papers. Two papers included are based in Nigeria, one of these appraises Green Building rating systems for the country. The other paper from Nigeria highlights how poor housing conditions create a major impact on health and wellbeing of residents. The other two papers in the volume share area specific research on use of passive strategies in house design, one based in the big city of Lahore and the other based in the mountainous city of Mansehra. The last paper of the volume is an indepth research on creating a comprehension of the understanding of poverty by those identified as poor, based on a survey of low income settlements in Karachi.

The first paper presents evidence on how poor housing quality leads to various health risks, illnesses, infectious outbreaks and distresses. It points towards the causes of poor habitability, recommending housing processes to include policies that minimize health risk. The long-term impacts of these health issues on people are of significance. The paper thus addresses an important concern with its research focus in Nigeria.

The second paper studies how there has been a transformation in the use of passive design elements from houses over decades, selecting houses for study from three different time periods. The study highlights the development of more aesthetically pleasing elements over those that offer comfort and better climatic relation in the city of Mansehra. Lack of proper enforcement and presence of building regulations are pointed out to be some factors responsible for this change.

The third paper studies awareness and implementation of passive design strategies by architects in Lahore city of Pakistan, through a survey method. It also highlights how client demands mostly compel architects to prefer aesthetically pleasing devices over considerations for passive design.

The fourth paper of the volume presents an appraisal of green building rating systems with particular focus on their effectiveness in achieving sustainable development in Nigeria. Despite its regional focus, the analytical approach is applicable in other parts of the world too and can be a good reference.

The fifth and the last paper of the volume is an insightful study using mixed methods to create an understanding of poverty, its multidimensioned reality and its perception by those recognized globally as poor.

The volume includes a book review of 'Saints, Sufis and Shrines - The Mystical Landscape of Sindh', authored by Zulfiqar Ali Kalhoro, in 2022. The book is reviewed by Sarah Sarmad.

Editorial Board

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING
Volume 33 Issue 2
ISSN (P) 1728-7715 - ISSN (E) 2519-5050
Journal DOI: www.doi.org/10.53700/jrap_neduet
Issue DOI: www.doi.org/10.53700/jrap3322023

MINIMISING HEALTH RISKS AND ENHANCING RESIDENTIAL BUILDING OCCUPANTS' SAFETY IN NIGERIA

Akande O. K., Obi-George L. C.**, Makun C. Y.***, Ekeke C. O.**** and Basil A. M.******

Article DOI:
www.doi.org/10.53700/jrap3322023_1

Article Citation:

Akande O. K., et al., 2023, Minimising Health Risks and Enhancing Residential Building Occupants'Safety in Nigeria, *Journal of Research in Architecture and Planning*, 33(2). 1-18.

* Akande O. K., Department of Architecture, Federal University of Technology, Minna, Nigeria.
akande.femi@futminna.edu.ng
** Obi-George L. C., Department of Architecture, Federal University of Technology, Minna, Nigeria.
*** Makun C. Y., Department of Architecture, Federal University of Technology, Minna, Nigeria
**** Ekeke C. O., Department of Architecture, Rivers State University , Nigeria.
***** Basil A. M., Department of Architecture, University of Nigeria, Nsukka, Nigeria.

ABSTRACT

Housing as an essential component of human life has not been given prominence in global health. Meanwhile, housing conditions can significantly impact the physical, mental, and social well-being of residents. In Nigeria, poor housing habitability is a threat to public health which has exacerbated building-related illnesses (BRI), and triggered outbreaks of infectious diseases among the residents. This research examined the quality of housing and habitability provision in Nigeria with a view to minimise health risks and enhance the residents' physical, mental, and social well-being. A structured questionnaire was administered to 120 respondents to solicit relevant data for the study. Descriptive and inferential statistics were used to analyse the collated data at various levels of the research. Findings indicate a significant effect of poor housing conditions such as inadequate ventilation, dampness, and overcrowding on the wellbeing of occupants in dwellings, which lead to outbreaks of infectious diseases such as respiratory illnesses, allergies, and psychological distress. The study concludes that inadequate and poor housing quality promote poor building habitability, causing outbreak of infectious diseases and increased health risk for occupants. The study recommends that authorities in the housing sector should provide policies to ensure adequate and well-constructed housing for adequate habitation, promoting health and safety of occupants and reducing the rate of outbreaks of infectious diseases. Also, there should be continuous public enlightenment among the people on the health implications of their living conditions to minimise health risk.

Keywords: Building habitability, diseases outbreak, health risk, residential houses, occupants safety, Nigeria.

INTRODUCTION

Housing is a significant factor in determining health, and inadequate housing is a serious public health problem (Krieger and Higgins 2002). Globally, World Health Organisation WHO (2009) evaluated the health status of Nigerians and reported that there is evidence that the main health indicators are impacted by housing conditions that results in outbreak of infectious diseases. Despite slight improvements, these problems have either persisted or gotten worse, and Nigeria's health outcome indicators are still high. Household and ambient air pollution is responsible for 99 deaths per 100,000 people (Anaemene, 2017). Housing quality, cost, location, social and community features are main factors that research has consistently shown to have significant impact on health (Rolfe et al., 2020).

For most countries in the globe, especially the developing ones, providing appropriate, high-quality housing for the populace has always been a big issue and task (Asa et al., 2017). Based on a variety of housing and health data sources, poor housing is linked to an increased risk of cardiovascular

diseases, respiratory diseases, depression and anxiety, rheumatoid arthritis, nausea and diarrhoea, infections, allergic symptoms, hypothermia, and physical injury from accidents (Rolfe et al., 2020). Improving housing conditions can both improve health and save money, as people with poor health and wellbeing are more likely to reside in subpar housing (WHO 2009). Numerous illnesses have been connected to substandard housing habitability. Few African nations are exempt from the housing shortage (Anaemene, 2017) while in Nigeria, between 14 and 16 million people lack access to suitable housing (Fakunle et al., 2018).

It is imperative that people's living conditions be improved in every society. The residential space of a person's house has a significant impact on his or her health and well-being. People's everyday lives are fundamentally shaped by where they live (Olukolajo et al., 2013). Howden-Chapman et al., (2011) posited that physically safe homes are essential for maintaining good physical and mental health. It can significantly improve health when suitable housing shields people and families from risky exposures and gives them a sense of security, privacy, stability, and control. Contrarily, poor housing adds to health issues such of injuries, chronic illnesses, infectious diseases, and a lack of healthy children development (Krieger and Higgins 2002). Poor housing habitability, such as crowded living quarters, insufficient ventilation, dampness, and mould, can cause a variety of health issues, such as allergies, asthma, and respiratory disorders (Holden et al., 2023).

It has been demonstrated that the well-being of people is significantly influenced by the standard of housing conditions. Furthermore, the housing stock has been under strain due to rapid urbanisation and population increase in many regions of the world, which has resulted in the spread of overcrowded and substandard housing (Odoyi and Riekkinen 2022). This trend is especially noticeable in developing nations like Nigeria, where the rise of slums and informal settlements was fueled by a lack of affordable housing. Furthermore, poor housing conditions can worsen social isolation, stress, and mental health consequences, particularly in low-income and vulnerable groups (Novak et al., 2019).

There is currently a dearth of research that examines the connection between housing conditions and well-being, particularly in low-income and marginalised groups, despite growing recognition of the significance of housing conditions for people' well-being (Sano et al., 2021). This research gap emphasises the importance of policymakers and practitioners in understanding the effects of substandard housing circumstances and creating practical plans for enhancing housing habitability and enhancing inhabitants' wellbeing and reduce health risk. The objectives are: (i) To investigate the links between housing conditions, occupants' well-being and the rate of outbreak of infectious diseases (ii) To identify factors that influence the quality of housing that result to poor building habitability. (iii) To determine strategies for improving housing conditions and minimize health risk by promoting the well-being of residents. The research is guided by examining the following hypothesis:

H0: There is no significant relationship between housing conditions on the well-being of occupant in residential dwelling

H1: There is a significant relationship between housing conditions on the well-being of occupant in residential dwelling

LITERATURE REVIEW

Housing is defined by the World Health Organisation (WHO, 2009) as a residential environment that comprises the physical structure used for shelter as well as any services, facilities, equipment, and devices required or wanted for the family's and individual's social, physical, and mental well-being. The built environment and housing have a significant impact on how people's health is shaped. Inadequate housing has historically contributed to the spread of disease, impacted people's physical and mental health, and raised mortality rates. To maintain wholesome living circumstances, public health measures have been implemented throughout modern history, including slum clearance, sanitation, and the provision of inexpensive housing (Ferguson et al., 2020).

Increased human well-being and ultimately decreased health care expenses should result from the provision of sufficient housing. But there is little research to back up these assertions; rather, it primarily focuses on the health effects of outside risks in the vicinity of residences (Palacios et al., 2020). Housing is more than just a physical structure; it also refers to the quality and condition of a home, as outlined in Maslow's hierarchy of needs (Hablemitolu et al., 2010). Proper housing is crucial for security, healthy growth, and overall well-being. Poorly maintained housing increases the risk of harm and injury, impacting the entire family's wellness (Krieger and Higgins 2002).

Several strategies can be used to reduce health risks and improve the safety of residents of residential buildings. Investigating the application of architectural strategies to

improve building occupant safety is one strategy (Isah et al., 2023). Understanding how indoor environmental quality (IEQ) affects occupant health and designing buildings with the best possible IEQ to protect health are also crucial (Glauberman, 2020). Furthermore, it is critical that residential building design take into account the unique needs of vulnerable groups, including the elderly, those with disabilities or chronic illnesses, and those from socioeconomically disadvantaged backgrounds (Awada et al., 2020). The indoor environmental quality, building design, and security measures are the main factors that affect health risks and safety of occupants of residential buildings. In addition to having an impact on indoor air quality (IAQ), factors like temperature, humidity, natural lighting, ventilation, and privacy in the room are crucial for overall comfort satisfaction (Mewomo et al., 2021).

Improving occupants' health and wellbeing requires ongoing building monitoring as well as fixing technical or design flaws. In order to promote zero-energy buildings, maintain indoor air quality, and lower health risks, ventilation must be balanced. Well-being and health are significantly impacted by housing conditions. Poor housing, linked to respiratory, cardiovascular, and infectious diseases, is especially valie for vulnerable populations like low-income individuals, ethnic minorities, and indigenous peoples (Howden-Chapman et al., 2022). Living space shortage has been identified as a risk factor for mental and behavioural illnesses, such as schizoaffective and schizophrenia disorders (Pevalin et al., 2017).

Furthermore, housing conditions may have an impact on indoor air quality and increase the chance of contracting infectious diseases (Akande et al., 2023). The necessity of safe and comfortable living conditions has been underscored by COVID-19 pandemic, as evidenced by lockdowns and reduced mobility (Capasso and D'Alessandro 2021). When viewed holistically and inclusively, housing retrofits and urban development have the potential to improve health and wellbeing. Housing is regarded as a critical infrastructure for enhancing and maintaining health and wellbeing outcomes (O'Sullivan et al., 2023). In relation to public health and well-being, housing conditions including the calibre of the building materials used, the structural integrity of the building, and the spatial arrangement have been the subject of research and policy (Stachura, 2013).

The total quality of living is largely influenced by the state of the internal and external housing environments. Empirical studies have demonstrated that the state of housing can directly impact homeowners' contentment with their homes (Kumar et al., 2021). Multidimensional approaches have been used to evaluate the quality of internal housing conditions, including the presence of sanitary and technical installations and standards of use (Wooszyn et al., 2023). It has been discovered that characteristics of high-quality buildings have a direct impact on homeowners' happiness, underscoring the significance of taking building quality into account when developing low-income housing (Stachura, 2013).

Adequate housing is essential for mitigating health risks and enhancing climate resilience; however, many homes still struggle with issues like excessive heat, cold, and ventilation, which can result in mould and dampness (Aigbavboa and Thwala 2014). More efficient housing policies that take into account the triple win of health, equity, improved public health, climate resilience, and environmental sustainability are required in order to address the intricate relationships that exist between housing, health, and the larger environment (Sharpe et al., 2018). These policies should adopt systemic approaches.

The well-being and health of residents can be greatly impacted by substandard housing conditions, which include inadequate ventilation, cramped living quarters, and homes that are wet, mouldy, and cracked. The way people interact with their neighbours and take part in community events can be impacted by these circumstances. Research have indicated a strong correlation between housing circumstances and mental health consequences, such as stress and anxiety (Newton et al., 2022). Physical health problems, including respiratory disorders and general poor health, can also result from inadequate housing (Jackelyn and Bina 2023). Furthermore, children's behavioural and emotional development, physical health, and academic performance can all suffer from homelessness and unstable housing (Gaylord et al., 2018). To protect people's health and wellbeing and that of communities, it is imperative that these housing conditions be addressed.

The spread of infectious diseases like cholera, meningitis, TB, and chickenpox can be aggravated by overcrowded housing conditions (Akande et al., 2018). A study by Lorentzen et al. (2022) reported that lead, cadmium, microorganism distribution, dust mite and cockroach allergens, peeling paint, and mould are among the characteristics of crowded housing that have been linked to adverse health effects. Furthermore, negative health effects like stress, sleep disturbances, and infectious diseases have been connected to crowded households (Jackelyn and Bina 2023). Further, crowding has been positively associated with

COVID-19 case rates, independent of density, socioeconomic and racial composition in neighborhoods (Mehdipanah, 2023). Therefore, overcrowded housing conditions can indeed facilitate the transmission of infectious diseases and have negative health consequences (Capasso and D'Alessandro 2021).

Numerous contexts have examined housing-related issues, including mould, dampness, noise, air quality, and material issues. Research has indicated that there are serious shortcomings in the habitability of houses and the surrounding area, such as moisture problems, crumbling facades, and hygienic concerns. Studies have revealed that mould and moisture are relatively common in European housing stock; estimates indicating that one in six homes in Europe may have these issues (Agyekum et. al., 2017).

A study carried out in Chieti, Italy revealed that a considerable proportion of homes had problems with mould and moisture, in addition to having insufficient floor space and not meeting the minimum legal requirements (Haverinen-Shaughnessy, 2012). Additionally, research on the relationship between housing and sleep health has shown that, among older adults from disadvantaged backgrounds, exterior housing issues are associated with reduced overall sleep time, more wake time following sleep onset, and lower sleep efficiency (Capasso and Savino, 2012).

The housing shortage in Nigeria is severe, especially in metropolitan areas with rapidly expanding populations (Idonije et al., 2022). Informal settlements lack basic utilities and are characterized by poor construction, insufficient maintenance, air pollution which exacerbates the outbreak of infectious diseases and increase the health risk among occupants (Udoh, and Uyanga 2013). However, a number of studies have found a link between substandard housing and residents' wellbeing in Nigeria. Approximately 28% of Nigerians live in housing units without toilet facilities, whereas 16% of the population does so, according to the Nigerian Bureau of Statistics (NBS 2020) report on housing and household survey. Manisalidis et al., (2020) suggested that these factors have been associated to adverse health outcomes, such as an increased risk of infectious infections, respiratory troubles, and mental health problems. Awe et al., (2023), specified that residents of subpar housing in Nigeria have a lower quality of life than those who live in appropriate housing. According to the study, people who live in subpar housing units score lower on measures of their physical, emotional, and social well-being.

Alabi and Balogun (2021) stated that residents of substandard housing in Nigeria were more likely to experience depression. According to the study, those who live in overcrowded and inadequately ventilated housing have a higher chance of developing depression than people who live in suitable housing. Based on the data on wellbeing in Nigeria related to housing circumstances, a poor living environment is linked to worse health outcomes and a reduced quality of life. For both people and communities, improving housing conditions can have major advantages. For instance, a study conducted in the US discovered that rehabilitating low-income housing with energy-efficient modifications improved health outcomes, such as decreased asthma symptoms, as well as reduced energy expenses for inhabitants (Breysse et al., 2017). Some of these dwelling issues that may have an impact on residents' wellbeing include indoor air quality, noise pollution, temperature extremes and housing quaility.

Factors influencing adequate housing habitability

Income and affordability

Nigerians struggle to afford housing, leading to overpopulation, poor living conditions, and informal settlements, with 70% living on less than $2 per day (Adedeji, et al., 2023).

Urbanization and population growth

Nigeria faces a housing shortage due to rapid urbanization and population growth, resulting in informal settlements and slums, unofficial settlements, and subpar housing in urban areas (Daniel et al., 2015; Akande, 2021).

Building materials and construction standards

Nigeria's subpar housing is due to inadequate materials, construction standards, and disregarded codes, resulting in unstable structures and collapsed structures. Factors include substandard workmanship, inadequate supervision, and subpar materials (Adedeji, et al., 2023).

Climate and environmental factors

The tropical climate in Nigeria can be hard on structures. The health of residents may be impacted by dampness and mould caused by poor drainage and ventilation systems. In some areas of the nation, flooding is a major issue that damages homes and forces evictions of citizens. Okon et al., (2021), stated that environmental degradation and climate change have a substantial impact on housing habitability in Nigeria.

RESEARCH METHODOLOGY

This study employed both qualitative and quantitative research methods. At its core, qualitative research asks open-ended questions like "how" and "why" that do not readily lend themselves to numerical replies. This type of study offers a deeper knowledge of experiences, phenomena, and context. Through qualitative research, it is possible to comprehend issues that are difficult to quantify, such as the human experience.

A comprehensive understanding of housing laws and housing needs planning in Bosso Minna was obtained through mixed-method research, which blends qualitative and quantitative research techniques. Both quantitative data and qualitative insights from focus groups and interviews were gathered, analysed, and interpreted with the help of mixed-method research. This method was used to evaluate the efficacy of current housing laws and pinpoint areas in need of development. In-depth insights into the experiences and viewpoints of people impacted by housing regulations were obtained through qualitative research techniques like site visits and interviews. Statistical information on housing trends and patterns were obtained through quantitative research techniques like census and GIS analysis. By integrating these methods, scholars can develop a comprehensive picture of Bosso Minna's housing predicament and offer well-informed suggestions for planning and policy.

Study Area

The study area Bosso estate is located in Minna the state capital of Niger state. Minna, the capital city of Niger State, in Nigeria's north central geopolitical zone. It is a large neighborhood that connects the cities of Abuja, Kano, Ibadan, and Lagos. It has a land size of 76,363 square kilometers. It is situated between the latitude and longitude values of 9.58 and 6.54 east of the Greenwich Meridian (see Figures 1 and 2). In Minna, there are 25 local government areas, one of which Bosso is one of the local governmet area that houses the study location “Bosso Estate” (Abd'Razack, 2012). The estate (Figure 3) is made up of 210 houses which comprises of 2 bedroom, 3 bedroom, and 4 bedroom apartments and the questionnaire distribution is 37%, 33% and 30% respectively. 36 houses were randomly selected for sampling based on the conditions of the houses.

Determining the population of the study location, NPC (2006) estimates that an average of 6 people live in a household which give the study population of 216. In research, various approaches are employed to determine the sample. The sample size is determined by the study's need for reliable and authentic findings in order to establish final conclusions (Akande, et al. 2015). According to Bulmer and Warwick (1993), "the size of the sample is more a question of convenience," and a compromise among various criteria (expenses and precision, for example). The sample size for this study was determined using Krejcie and Morgan (1970) reference. The sample size for the questionnaire survey was 120 respondents.

The study area was chosen because of the neglected, dilapidated condition of the homes here. The residents are now experiencing health issues as a result. Bosso Estate in Minna has subpar housing conditions compared to adequate housing quality, which results in issues with mould, dampness, noise, poor air quality, and thermal comfort. Additionally, poor housing conditions at the study site were associated with the selection of building materials, the construction method, and the availability of adequate professional services. In addition, properties with the worst environmental and property characteristics such as overcrowding and tenant abuse are found in high-density neighbourhoods like Bosso Estate. Furthermore, the community's dissatisfaction stemmed from their performance and inadequate infrastructure. The poor quality of housing in the area is a result of these factors as well as rapid urbanisation of the area and the absence of suitable housing regulations.

The Questionnaire Survey

Survey research design which involves the administration of questionnaires to the target population was applied so as to extract necessary information for this study. A total of 140 questionnaires were distributed, with 120 returned, with a ratio of 60 male respondents to 60 females. While, data were collected from 120 respondents who live in the study area using close ended questionnaires that were made easy to understand. The collected data was analysed using Statistical Package for Social Sciences version 22 and the results presented using texts, tables and charts for easy comprehension. The Cronbach’s alpha was used to establish the reliability and validity of the variable data in this study. Cronbach’s alpha factor typically varies within 0 and 1. Significantly the data collected factored a coefficient of 0.71 with 5 items (Table 1) analysed. Acceptable according to Ruchi et al., (2014), this in acceptable asserting that there is actually no lower limit to the coefficient, the closer Cronbach’s alpha coefficient is to 1.0, the greater the internal consistency of the items in the scale.

Figure-1: Map of Nigeria Showing Niger State.

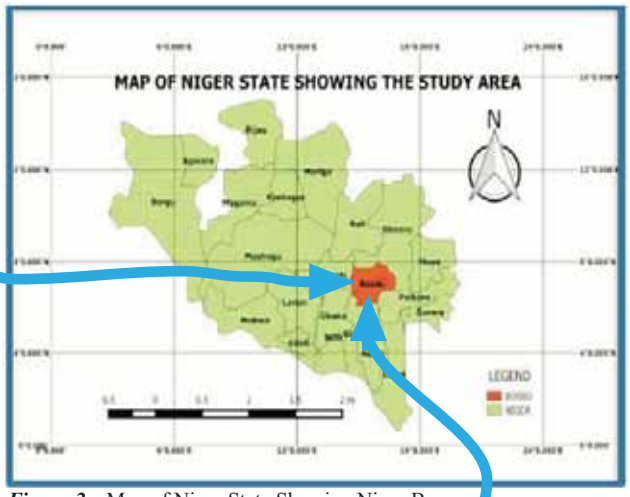


Figure-2: Map of Niger State Showing Niger Bosso.

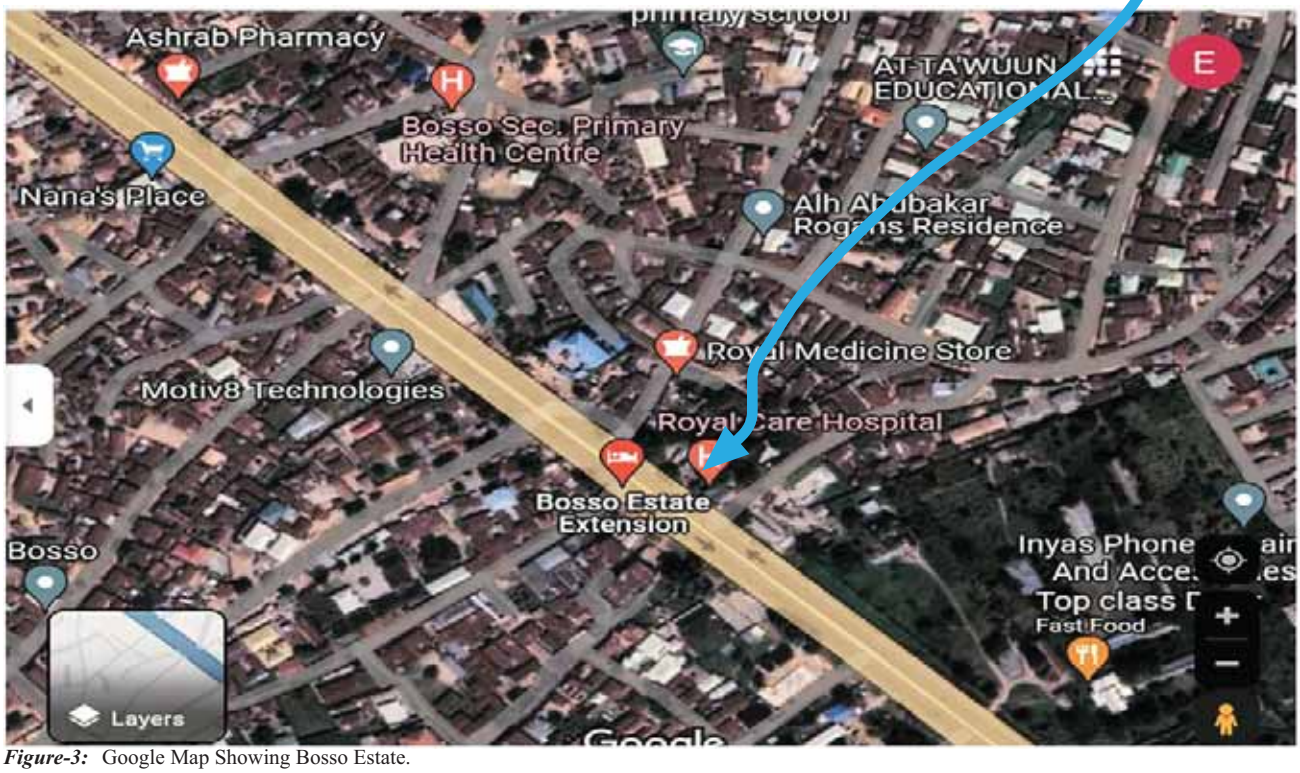


Figure-3: Google Map Showing Bosso Estate.

Data Presentation and Analysis

Quantitative data presentation involves arranging analyzed data that has been collected and interpreting the obtained findings or results. Statistical Package for Social Sciences (SPSS) version 22 was utilized to analyze the quantitative data. To display the results, tables and charts were utilized. An online questionnaire were administered through the use of Google form. A total of 120 responses were recieved. This represented 100% response rate and considered adequate for the analysis carried out according to Moser et al., (1984).

RESULT AND DISCUSSION

Table 2 shows the age range of respondents in the study. As shown, there are 22 respondents (18-24 years), 34 respondents (25-30 years), 22 respondents (31-45years), 42 respondents

(46 and above). This implies that most of the respondents are 46 and above years followed by 25-30 years. This data is in support of Balloun et al. (2011) research where there is need for multiple respondents in survey research for sufficient supporting evidence.

As revealed, there are 60 male respondents (50%) and 60 female respondents (50%). This implies that both male and female gender has equal respondents in the study. The analysis also shows the educational background of the respondents. The data shows that 40% of the respondents have bachelor degree, 15% had Master degree, 18.3% are HND holders, 5% are doctorate degree holders and 10% are ND holders while 8.3% have passed secondary school holders. This implies that the majority of the respondents are educated and the questionnaire will be well understood by the respondents. Table 3 present the findings on the effects of housing condition and its impact on building occupants. It can be seen that the respondents agreed on two of the six questions, with mean value of approximately 3. The result implies that the listed items affects the resident's wellbeing and health condition.

Similar result is demonstrated in Figure 4 which shows the outcome of the survey conducted to gather respondents' views on poor housing habitability and its impact on wellbeing and health. The findings obtained agrees with those of Owoeye, and Omole (2012) study that poor housing conditions and insufficient household services contribute 52.3% to environmental quality, air pollution, and infectious diseases.

Table-1: Reliability Test.

Section	Cases	Reliability	Interpretation
Section2	4	0.544	Moderately reliabe
Section3	5	0.606	Strongly reliable
Section4	6	0.677	Strongly reliable
Section5	10	0.699	Strongly reliable
Section6	6	0.718	Strongly reliable
Overall	33	0.659	Strongly reliable

Table-2: Demographics of Respondents.

Variable	Frequency	Percentage	Variable	Frequency	Percentage
Age			**Employment Status**		
18-24	22	18.3	Employed full-time	37	30.8
25-30	34	28.3	Employed part-time	12	10
31-45	22	18.3	Self-employed	41	34.2
46 and above	42	35	Unemployed	12	10
Gender			Retired	6	5
Male	60	50	Student	12	10
Female	60	50	**Monthly Income**		
Marital Status			Less than N50,000	42	35
Single	85	54.2	N50,00-N100,000	20	16.7
Married	53	44.2	N100,000-200,000	29	24.2
Divorced	2	1.7	N200,000-500,000	14	11.7
Educational Background			N500,000 and above	15	12.5
Secondry School	10	8.3	**Housing Type**		
HND	22	18.3	Self-contained apartment	17	14.2
ND	12	10	Room in a share apartment	7	5.8
Bachelor Degree	48	40	One bedroom apartment	9	7.5
Master Degree	18	15	Two bedroom apartment	44	36.7
Doctoral Degree	6	5	Three bedroom apartment	37	30.8
Other	4	3	Other	6	5
			How Many People are Living in Your Household		
			1-5	67	55.8
			6-10	37	30.8
			10 and above	16	13.3

The effects of housing condition on the occupants physical, mental and social well-being is presented in Table 4. From the result, over 2.50 mean value obtained indicates a positive relationship between them. This implies there is a strong relationship between variables or datasets presented. These findings are generally in agreement with study Cowie et al., (2015); Lorentzen et al., (2022) which examine the associations between the built environment and mental health and found strong relationship among the presented data.

The analysis also shows that 48.3% of the respondents occasionally experience temperature fluctuation, 39.2% frequently experience temperature fluctuation, and 8.3% always experience it while 4.2% never experience temperature fluctuation in their residence with a mean value of 2.51. This implies that the respondents frequently experience temperature fluctuation in housing. This can result in poor air quality which leads to increased respiratory infections and coughing. Cowie et al. (2015) found that air pollution

Table-3: Effects of Housing Condition and its Impact on Users.

Variable	Frequency (percentage)	Mean Value
How would you rate the overall condition of your current hoursing		2.34
Excellent	22(18.3)	
Good	48(38.3)	
Fair	41(34.2)	
Poor	11(9.2)	
How often do you experience cracked wall, dampness, mold or mildew in your house		2.81
Never	7(5.8)	
Rarely	25(20.8)	
Sometimes	71(59.2)	
Frequently	17(14.2)	
How Satified are you with the natural light in your house		2.51
Not at all satisfied	17(14.2)	
Slightly satisfied	46(38.3)	
Moderately satisfied	36(30)	
Very satisfied	21(17.5)	
How satisfied are you with the ventilation and air quality in your home		3.02
Not at all satisfied	2(1.7)	
Slightly satisfied	30(25)	
Moderately satisfied	52(43.3)	
Very satisfied	36(30)	
How satisfied are you with the assess tobasic amenities such as clean water and sanitation in your home		2.21
Not at all satisfied	32(26.7)	
Slightly satisfied	51(42.5)	
Moderately satisfied	17(14.2)	
Very satisfied	20(16.7)	
How satisfied are you with the level of noise pollution or disturbances from outside your home		2.95
Not at all satisfied	8(6.7)	
Slightly satisfied	28(23.3)	
Moderately satisfied	46(38.3)	
Very satisfied	38(31.7)	

causes harmful health outcomes, including increased mortality rates from heart attacks, strokes, lung cancer, chronic non-cancer lung disease, asthma attacks, and respiratory problems. Short-term exposure to PM and ozone also contribute to these issues.

A survey found that noisy housing conditions negatively impact occupants' mental well-being, with 49.2% of the respondents occasionally experiencing noise disturbance from their neighbourhood, 15.8% frequently experience noise disturbance, 3.3% always experience noise disturbance while 31.7% never experience noise disturbance with a mean value of 1.91 which implies that the respondents experience noise disturbance from their neighbourhood. This aligns with Akande et al., (2022) findings, which suggest high noise annoyance is linked to impaired mental health. The study suggests improved environmental quality in the built environment and synergistic interventions from architects, professionals, and environmental protection agencies to address urban environmental noise pollution in residential environments. Housing conditions that are noisy can have detrimental effects on mental health, such as contributing to anxiety and depression (Riva et al., 2022). Respiratory issues, infections, allergies, and asthma can result from damp or mouldy living conditions (Torresin et al., 2022; Agyekum et al., (2017).

In order to identify the factors that influence the quality of housing that result in poor building habitability, Relative Important Index (RII) was used. The Relative Important Index formula is given as:

$$RII = \frac{\Sigma W}{A*N}$$

Where W= Weight given to each statement by the respondent
A=Highest response integer which is 4
N=Total number of respondent for users=120

Findings as shown in Table 5 present the factors that influence the quality of housing resulting in poor building habitability. As can be seen, cultural and traditional beliefs and practices were ranked first as the factors that influence quality of housing and poor building habitability. Corruption and inefficiency in the housing sector, natural disasters and climate change, poverty were ranked 2nd, 3rd and 4th factors

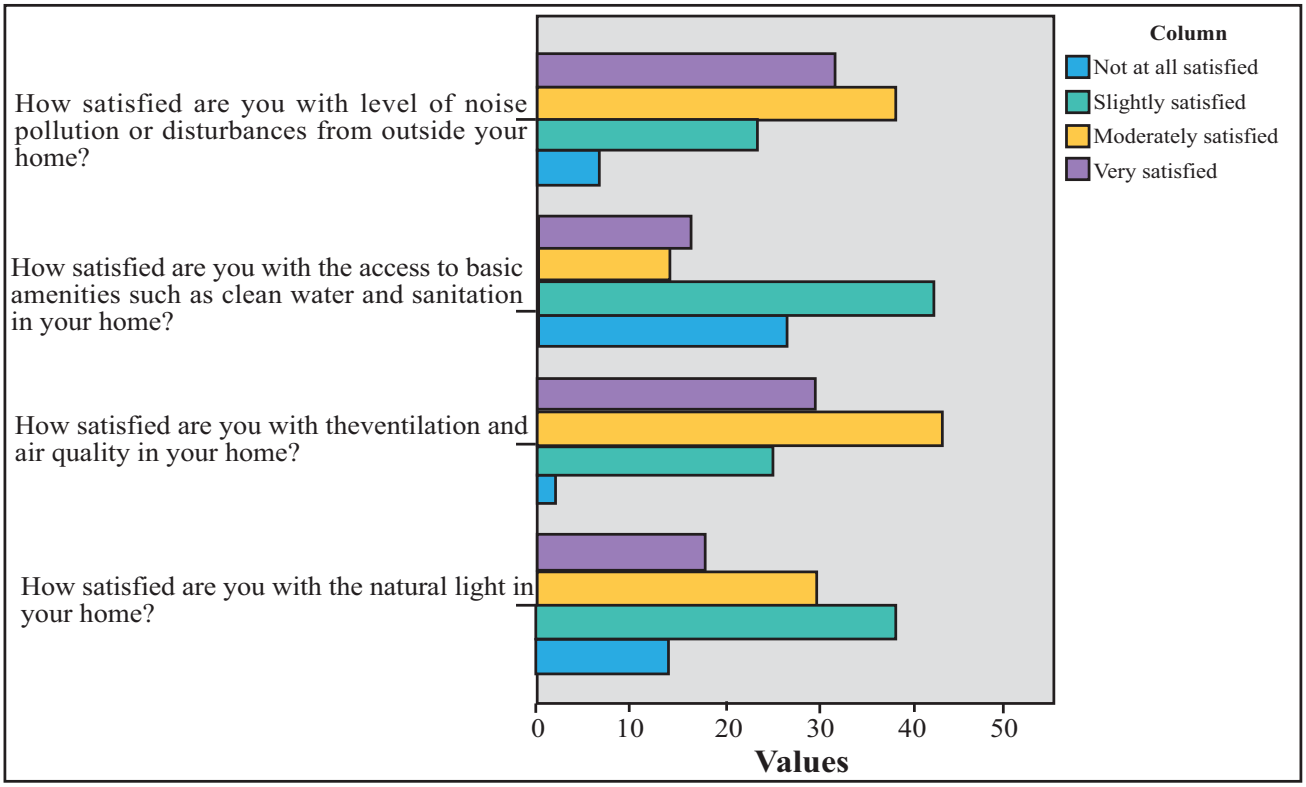


Figure-4: Effects of housing condition and its impact on users.

Table-4: Effects of Housing Condition on Physical, Mental and Social Well-Being.

Variable	Frequency (percentage)	Mean Value
How does the condition of your living space affect your ability to relax and unwind		2.50
Positively	29(24.2)	
Negatively	22(18.3)	
No effect	49(40.8)	
Don't know	20(16.7)	
How often do you feel stressed or anxious because of the condition of your living space		2.1
Never	30(25)	
Occasionally	50(41.7)	
Frequently	38(31.7)	
Always	2(1.7)	
How often do you experience noise disturbance from your neighbour		1.91
Never	38(31.7)	
Occasionally	59(49.2)	
Frequently	19(15.8)	
Always	4(3.3)	
How does the noise level affect your daily life and well-being		1.74
Not at all	47(39.2)	
Slightly	57(47.5)	
Moderately	16(13.3)	
Significantly	0	
How often do you experience temperature fluctuation in your housing?		2.51
Never	5(4.2)	
Occasionally	58(48.3)	
Frequently	47(39.2)	
Always	10(8.3)	
How does temperature fluctuation affectr your daily life and well-being		2.4
Never	14(11.7)	
Occasionally	56(46.7)	
Frequently	38(31.7)	
Always	12(10)	
How often do you experience physical injuries or accidents in your home due to poor lighting, cracked floors or other damages in the house		1.95
Not at all	44(36.7)	
Slightly	42(35)	
Moderately	29(24.2)	
Significantly	5(4.2)	

that influence housing condition while government policies and regulations, lack of access to finance, lack of maintenance and repair of housing, power shortage were ranked 7th, 8th, 9th and 10th.

Table 6 shows the strategies for improving housing conditions. From the analysis, six factors were suggested as ways to improve the condition of housing in the case area location. Upgrading existing houses has a mean value of 1.47, building new affordable housing has a mean value of 1.7, subsidising tax for first-time house buyers has a mean value of 1.9, enforcing building codes and regulations has a mean value of 1.8, improving personal hygiene has a mean value of 1.79, proper maintenance and repair of housing has a mean value of 1.55. This finding is in agreement with Tilburg (2017), who stated that strategies for improving housing conditions and minimising health risks include legal and policy interventions, housing improvement, economic crises, creation of a social housing stock, and behavioural factors. Legal and policy interventions can assist communities in addressing the adverse impacts of poor housing conditions and improving the health and safety of residents, especially vulnerable populations.

To examine if there is any relationship between housing conditions and the well-being of occupant in residential dwelling, a test of correlations between housing conditions on the well-being of occupant was carried out. This is to determine if there was any or no significant relationship between housing conditions on the well-being of occupant in residential dwelling. According to the findings from Table 7, there is a significant relationship between housing condition and its effect on well-being. The correlation coefficient of -0.360 and a p-value of 0.000 which is less than 0.05 obtained implies a negative relationship between the housing condition and well-being i.e. as the housing condition moves from not satisfied to satisfied by the respondents, its effect on physical, mental and social well-being reduces.

The individual relationship (one to one) relationship is presented in Table 8. From the Table, result shows there is a significant relationship between how often the respondent

Table-5: Factors that influence the quality of housing that result to poor building habitability.

Factors Influencing Housing Condition	**SA**	**A**	**SD**	**D**	**ΣW**	**RII**	**Rank**
Government policies and regulations	45 (37.5)	53 (44.2)	6 (5)	16 (13.3)	233	0.485	7
Poverty	39 (32.5)	45 (37.5)	13 (10.8)	23 (19.2)	260	0.542	4
Lack of access to finance	37 (30.8)	66 (55)	10 (8.3)	7 (5.8)	227	0.473	8
Poor urban planning and management	32 (26.7)	66 (55)	6 (5)	16 (13.3)	246	0.513	5
Rapid population growth	42 (35)	53 (44.2)	7 (5.8)	18 (15)	241	0.502	6
Corruption and inefficiency in the housing secotr	33 (27.5)	35 (29.2)	10 (8.3)	42 (35)	301	0.627	2
Cultural and Traditional Beliefsand Practices	13 (10.8)	45 (37.5)	31 (25.8)	30 (36.8)	308	0.642	1
Natural disasters and climate change	24 (20)	67 (55.8)	13 (10.8)	16 (13.3)	261	0.544	3
Lack of maintenance and repair of housing	36 (30)	69 (57.5)	12 (10)	3 (2.5)	222	0.463	9
Power shortage	55 (45.8)	48 (40)	4 (3.3)	2 (1.7)	217	0.452	10

experience cracked walls, dampness, mold or mildew in their homes and how often they feel stressed or anxious because of the condition of their living spaces, with a coefficient os 0.181 and a p-value of 0.048 which is less than 0.05. This implies that as their experienced of cracked wall, dampness, mold or mildew in their homes increases the property's they became more stressed or anxious about the condition.

A significant and positive relationship was found between cracked walls, dampness, mold or mildew and how noise level affects occupants daily life and well-being. Such a relationship was also fund between cracked walls, dampness, mold or mildew and the experience of temperature fluctuations in housing. This implies that the frequency of temperature swings in the house is connected to issues like cracked walls, moisture, mould, or mildew. High relative humidity and precipitation are linked to self-reported home mould, wet spots, and water damage.

A negative relationship between satisfaction with natural light and how the condition of their living spaces affect their ability to relax and unwind with a coefficient of -0.220 and a pvalue of 0.016 which is less than 0.05. This implies that as their satisfaction level increases from not satisfied to satisfied, the condition of their living spaces affecting their ability to relax and unwind reduces.

A significant and negative relationship was found also between how satisfied the respondents are with natural light in their home and how the respondent feel stressed or anxious because of the condition of their living spaces with a coefficient of -0.378 and a pvalue of 0.00 which is less than 0.05. This implies that as their satisfaction level increases from not satisfied to satisfied, the stressed and anxiety of the condition of their living reduces. Lastly there is a significantly negative relationship between how satisfied the respondents are with natural light in home and how often they experience temperature fluctuation with a coefficient of -0.233 and a pvalue of 0.010 which is less than 0.05. This implies that as their satisfaction level increases from not satisfied to satisfied, their experience of temperature fluctuation in the homes reduces. A negative relationship was found between how satisfied the respondents are with the ventilation and air quality in their home and how the respondents felt stressed or anxious because of the condition of their living spaces. This produced a coefficient of -0.341 and a pvalue of 0.00 which is less than 0.05. This implies

Table-6: Strategies for Improving Housing Conditions and Minimize Health.

Strategies for Improving Housing Condition	SA	A	SD	D	Mean Value	Decision
Upgrading existing houses	67 (55.8)	51 (42.5)	0	2 (1.7)	1.47	A
Building new affordable housing	38 (31.7)	76 (63.3)	6 (5)	0	1.7	A
Subsidizing tax for first time house buyers	50 (41.7)	45 (37.5)	10 (8.3)	15 (12.5)	1.9	A
Enforcing building codes and regulations	41 (34.2)	66 (55)	8 (6.7)	4.2	1.8	A
Improving personal hygiene	48 (40)	54 (45)	12 (10.8)	5 (4.2)	1.79	A
Proper maintenance and repair of housing	64 (53.3)	51 (42.5)	0	5 (4.2)	1.55	A

Table-7: Correlations Between Housing Conditions on the Well-Being of Occupant.

			Housing Condition	Effect on Well Being
Spearman's rho	Housing Condition	Correlation Coefficient	1.000	-.360**
		Sig. (2-tailed)	.	.000
		N	120	120

that as their satisfaction level increases from not satisfied to satisfied, the stressed and anxiety of the condition of their living reduces.

Further there is a significantly negative relationship between satisfaction are with ventilation and air quality in of home and the experience temperature fluctuation in their homes with a coefficient of -0.432 and a p-value of 0.00 which is less than 0.05. This implies that as their satisfaction level increases from not satisfied to satisfied, their experience of temperature fluctuation in the homes reduces. There is a negative relationship between satisfaction with ventilation and air quality in home and experience of noise disturbances from the neighourbood, and the effect of noise level on daily life and well-being with a coefficient of -0.186 and -0.207 and a p-value of 0.042 and 0.023 respectively. This implies that as their satisfaction level of ventilation and air quality increases from not satisfied to satisfied, their experience of noise disturbance and its affect on their well-being reduces.

There was a negative relationship between respondents satisfation with the access to basic amenities such as clean water and sanitation and now temperature fluctuation affect their daily life and well-being in homes with a coefficient of -0.182 and a p-value of 0.049 which is less than 0.05. This implies that as their satisfaction with the access to basic amenities level increases from not satisfied to satisfied, their effect of temperature fluctuation on their daily life and well-being reduces. There is a negative relationship between satisfaction with access to basic amenities such as clean water and sanitation and how they experience physical injuries or accidents in their home due to poor lighting, cracked floor or other damages and the noise level affect their daily life and well-being with a coefficient of -0.198 and -0.388 and a p-value of 0.030 and 0.00 respectively. This implies that as their satisfaction level of access to basic amenities such as clean water and sanitation increases from not satisfied to satisfied, their experience of physical injuries or accidents in home due to poor lighting, cracked floor or other damages and the noise level affect on their daily life and well-being reduces.

A negative significant relationship was found between satisfaction of respondents with the level of noise pollution or disturbances outside their home and condition of their living spaces affecting their ability to relax and unwind in their homes with a coefficient of -0.266 and a p-value of

Table-8: Relationship Between Housing Condition and Well-Being.

			How does the condition of your living space affect your ability to relax and unwind?	How often do you feel stressed or anxious because of the condition of your living space?	How often do you experience noise disturbances from your neighbours?	How does the noise level affect your daily life and well-being?	How often do you experience temperature fluctuations in your housing (too hot or too cold)?	How does temperature flusctuations affect your daily life and well-being?	How often do you experience physical injuries or accidents in your home due to poor lighting, cracked floors or other damages in the house?
Spearman's rho	How often do you experience cracked walls, damages, mold or mildew in your home?	Correlation Coefficient	-.99	**.181***	.160	**.271****	**.359****	**.370****	**.305****
		Sig. (2-tailed)	.283	**.048**	.081	**.003**	**.000**	**.000**	**.001**
	How satisfied are you with the natural light in your home?	Correlation Coefficient	**-.220***	**-.378****	.081	.056	**.233***	**.055**	-.137
		Sig. (2-tailed)	**.016**	**.000**	.378	.544	**.010**	.550	.135
	How satisfied are you with the ventilation and air quality in your home?	Correlation Coefficient	-.075	**-.341****	**-186***	**-.207***	**-.432****	.053	**-.270****
		Sig. (2-tailed)	.415	**.000**	**.042**	**.023**	**.000**	.567	**.003**
	How satisfied are you with the access to basic amenities such as clean water and sanitation in your home?	Correlation Coefficient	.031	-.071	-.125	**-.388****	.150	**-.180***	**-.198***
		Sig. (2-tailed)	.735	.438	.174	**.000**	.103	**.049**	**.030**
	How satisfied are you with the level of noise pollution or disturbances from outside your home?	Correlation Coefficient	**-.260****	**-.189***	**-.203***	**-.424****	-.053	-.174	.126
		Sig. (2-tailed)	**.004**	**.038**	**.026**	**.000**	.565	.058	.169
		N	**120**	**120**	**120**	**120**	120	120	120

0.004 which is less than 0.05. This implies that as their satisfaction with the level of noise pollution or disturbances from outside their home increases from not satisfied to satisfied, their condition of living spaces affecting their ability to relax and unwind in homes reduces. There is negative and significant relationship between satisfaction of respondents with the level of noise pollution or disturbances from outside and how often they feel stressed or anxious because of the condition of their living spaces, how often they experience noise disturbances from their neighbourhood, and how noise level affect their daily life and well-being in their homes with a coefficient of -0.189, -0.203, and -0.424 and a p-value of 0.038, 0.026, and 0.000 respectively. This implies that as their satisfaction level of noise pollution or disturbances from outside their home increases from not satisfied to satisfied, their experience how often they feel stressed or anxious because of the condition of their living spaces, how often they experience noise disturbances from neighbourhood, and how the noise level affect their daily life and well-being in their homes reduces.

CONCLUSION AND RECOMMENDATION

The research examines building habitability towards the outbreak of infectious diseases with a specific focus on minimising health risk for adequate physical, mental, and social well-being of the occupants in residential housing. Based on the study, the habitability of residential housing in the study location is poor, which promotes conditions like inadequate ventilation, dampness, and overcrowding lead to various health problems such as respiratory illnesses like allergies and psychological distress. Therefore, it is recommended that the government, housing developers, and stakeholders in the housing sector take measures to ensure that housing are designed and constructed to meet basic standards of health and safety. This can be achieved through the enforcement of building codes, policies and regulations, provision of adequate infrastructure and services, and promotion of sustainable and affordable housing initiatives. Additionally, there is a need for increased awareness and education on the importance of good housing conditions and their impact on the well-being of occupants. This can be done through public campaigns, community engagement, and provision of information to prospective tenants and homeowners.

REFERENCES

Abd'Razack, N. 2012. An Appraisal of Household Domestic Energy Consumption in Minna, Nigeria. IOSR, *Journal of Environmental Science, Toxicology and Food Technology*. 2. 16-24. 10.9790/2402-0231624.

Adedeji, I., Deveci, G., Salman, H. 2023. The Challenges in Providing Affordable Housing in Nigeria and the Adequate Sustainable Approaches for Addressing Them. *Open Journal of Applied Sciences.* 13. 431-448. 10.4236/ojapps.2023.133035.

Agyekum, K., Salgin, B., Kwame, D. 2017. Creating awareness on the negative impact of dampness on the health of occupants: A case for inhabitants living in damp buildings in Ghana in: *International Journal of Development and Sustainability*, 6(8) pp 1-18..

Aigbavboa, C., Thwala, W. 2014. Structural equation modelling of building quality constructs as a predictor of satisfaction in subsidised low-income housing. *Urbani izziv.* 25. S134-S147. 10.5379/urbani-izziv-en-2014-25-supplement-010.

Akande, O K., Yusuf, A., Sham, R. 2023. Effects of Indoor Environmental Quality in Urban Housing on Residents' Health and Wellbeing in Nigeria. *Environment-Behaviour Proceedings Journal.* 8. 157-165. 10.21834/ebpj.v8i23.4505.

Akande, O. K., Olagunju, R.E., Aremu, S.C., Ogundepo, E. 2018. Exploring Factors Influencing of Project Management Success in Public Building Projects in Nigeria. *YBL Journal of Built Environment.* 6. 47-62. 10.2478/jbe-2018-0004.

Akande, O.K. 2010. Passive Design Strategies for Residential Buildings in Hot-Dry Climate in Nigeria. In: Eco- Architecture III: Harmonization between Architecture and Nature. *Ecology and the Environment* Volume 128. Pp 61 - 71 WIT Press, UK.

Akande, O. K & Fabiyi, O & Mark, I. 2015. Sustainable Approach to Developing Energy Efficient Buildings for Resilient Future of the Built Environment in Nigeria. *American Journal of Civil Engineering and Architecture* 3,4, 144-152. 3. 144-152. 10.12691/ajcea-3-4-5.

Akande, O.K. 2021. Urbanization, Housing Quality and Health: Towards a Redirection in Housing Provision in Nigeria. *Journal of Contemporary Urban Affairs*. Volume 5 Number 1, pages 35– 46

Akande, O.K., Adenle, A.A., Emechebe, L.C., Lembi, J.J., Ahmed, S., Eze, C.J., Ajayi, M. R. 2022. "Implications of Residential Housing Exposure to Urban Environmental Noise on Resident's Wellbeing in Minna, Nigeria", *Khulna Univ. Stud.*, Pp. 154–166, Dec. 2022.

Alabi, M., & Balogun, F. 2021. Housing and Mental Health in Informal Settlements: A Case of Ibadan North Local Government Area of Oyo State, Nigeria. in: *African Journal for Psychological Studies of Social Issues,* 24. 123-135.

Anaemene, B. 2017. Health and Diseases in Africa. *The Development of Africa*. 2017 Oct 27;71:207–26. doi: 10.1007/978-3-319-66242-8_12. PMCID: PMC7122698.

Asa, A., Adekunle, O., Morakinyo, K., Opeyemi, & Musediq, O., Lawal, M., 2017. An Assessment of Housing Conditions, Characteristics and Neighborhood Quality in Ile -Ife, Osun State, Nigeria. 8. 86-104.

Awada, M., Becerik-Gerber, B., Hoque, S., & O'Neill, Z., Pedrielli, G., Wen, J., Wu, T. 2020. Ten questions concerning occupant health in buildings during normal operations and extreme events including the COVID-19 pandemic. *Building and Environment.* 188. 107480. 10.1016/j.buildenv.2020.107480.

Awe, F., Adeboye, A., Akinluyi, M., Okeke, F., Yakubu, S., Awe, F. 2023. Assessment of the relationship between housing quality and income in urbanizing city of Ado-Ekiti, Nigeria. *World Journal of Advanced Research and Reviews.* 18. 969-978. 10.30574/wjarr.2023.18.2.0941.

Balloun, J., Barrett, H., Weinstein, A. 2011. One is not enough: The Need for Multiple Respondents in Survey Research of Organizations. *Journal of Modern Applied Statistical Methods*. 10. 287-296. 10.22237/jmasm/1304223900.

Bulmer, M., & Warwick DP, eds. 1993. *Social Research in Developing Countries: Surveys and Censuses in the Third World.* London: UCL Press.

Breysse, J., Jacobs, D.E., Weber, W., Dixon, S., Kawecki, C., Aceti, S., Lopez, J. 2017. Health outcomes and green renovation

of affordable housing. *Public Health Rep*. 126 (1):64-75. doi: 10.1177/00333549111260S110.

Capasso, L and Savino A. 2012. Assessment of the hygienic and sanitary conditions of housing in a sample in Chieti (central Italy)]. *Ann Ig.* 24(1):41-6. Italian. PMID: 22670336.

Capasso, L., D'Alessandro D. 2021. Housing and Health: Here We Go Again. *Int J Environ Res Public Health.* Nov 17;18(22):12060. doi: 10.3390/ijerph182212060. PMID: 34831815; PMCID: PMC8624624.

Chen, Y.; Qin, X. 2022. The Impact of Extreme Temperature Shocks on the Health Status of the Elderly in China. *Int. J. Environ. Res. Public Health* 2022, 19, 15729.

Cowie, H., Crawford, J., Davis, A., Steinle, S., Reis, S., Dixon, K., Morris, G., Hurley, F. 2015. Air Quality, Health, Wellbeing and Behaviour. *IOM Working for a healthier future.*

Daniel, M., Wapwera, S., Akande, E., Choji, C., Aliyu, A. 2015. Slum Housing Conditions and Eradication Practices in Some Selected Nigerian Cities. *Journal of Sustainable Development*. 8. 230-241. 10.5539/jsd.v8n2p230.

Ferguson, L., Taylor, J., Davies, M, Shrubsole, C., Symonds, P., Dimitroulopoulou, S. 2020. Exposure to indoor air pollution across socio-economic groups in high-income countries: A scoping review of the literature and a modelling methodology. *Environ Int.* 143:105748. doi: 10.1016/j.envint.2020.105748.

Fakunle, A., Ogundare, J., Olayinka-Alli, L., Ogunronbi, M., & Bello, T., & Elujulo, O., & Olamide, O., & Saliu, I. 2018. Housing Quality and Risk Factors Associated with Respiratory Health Conditions in Nigeria. 10.5772/intechopen.78543.

Gaylord, A.L., Cowell, W.J., Hoepner, L.A., Perera, F.P., Rauh, V.A, Herbstman, J.B. 2018. Impact of housing instability on child behavior at age 7. *Int J Child Health Hum Dev.;* 10(3):287-295. PMID: 34531938; PMCID: PMC8442946.

Glauberman, G. 2020. Scoping review of fire safety behaviors among high-rise occupants: Implications for public health nursing. *Public Health Nursing*. 37. 10.1111/phn.12728.

Hablemitoðlu, Þ., Ozkan, Y., Purutçuoglu, E. 2010. The assessment of the housing in the theory of Maslow's hierarchy of needs. *European Journal of Social Sciences*, 16. 222-228.

Haverinen-Shaughnessy U. 2012. Prevalence of dampness and mold in European housing stock. *J Expo Sci Environ Epidemiol*. 22(5):461-7. doi: 10.1038/jes.

Holden, K. A, Lee, A. R, Hawcutt, D. B, Sinha, I. P. 2023. The impact of poor housing and indoor air quality on respiratory health in children. Breathe (Sheff). 2023 doi: 10.1183/20734735.0058-2023.

Howden-Chapman, P., Bennett, J., Edwards, R., Jacobs, D., Nathan, K., Ormandy, D. 2022. Review of the Impact of Housing Quality on Inequalities in Health and Well-Being. *Annu Rev Public Health.* 2023 3;44:233-254. doi: 10.1146/annurev-publhealth-071521-111836.

Howden-Chapman, P. L., Chandola, T., Stafford, M. 2011. The effect of housing on the mental health of older people: the impact of lifetime housing history in Whitehall II. *BMC Public Health* 11, 682 (2011).

Idonije, A. D., Idris, A., Haruna, M. J., Umar, K. H. 2022. Effect of Housing Deficit on National Development: The Nigerian Perspective. Zamfra Journal of Politics and Development, 3(1), pp. 11-11.

Isah, O. S. and Nuhu, A. A., and Suleiman, I. M. 2023 Enhancing Security in Residential Building through Architectural Approach: Improving Building Occupants' Safety through Additional Security Measures. *British Journal of Environmental Sciences*, 11 (2). pp. 12-22.

Jackelyn H., Bina, P. S. 2023. Shared and Crowded Housing in the Bay Area: Where Gentrification and the Housing Crisis Meet COVID-19*, Housing Policy Debate*, 33:1, 164-193, DOI:

Krieger J., Higgins D. L. 2002. Housing and health: time again for public health action. *American Journal of Public Health*. 92(5):758-68. doi: 10.2105/ajph.92.5.758. PMID: 11988443; PMCID: PMC1447157.

Kumar, P., Kumar, P., Garg, R., Garg, R. 2021. Urban housing: a study on housing environment, residents' satisfaction and happiness. *Open House International.* 46. 528-547. 10.1108/OHI-12-2020-0179.

Krejcie, R. V., & Morgan, D. W. 1970. Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610.

Lorentzen, J.C., Johanson, G., Björk, F., Stensson, S. 2022. Overcrowding and Hazardous Dwelling Condition Characteristics: A Systematic Search and Scoping Review of Relevance for Health. *Int. J. Environ. Res. Public Health* 19, 15542. https://doi.org/10.3390/ijerph192315542

Manisalidis, I, Stavropoulou, E, Stavropoulos, A., & Bezirtzoglou, E. 2020. Environmental and Health Impacts of Air Pollution: A Review. *Front. Public Health* 8:14. doi: 10.3389/fpubh.2020.00014.

Mehdipanah, R. 2023. Without Affordable, Accessible, and Adequate Housing, Health Has No Foundation. *Milbank Q; 101*(S1):419-443. doi: 10.1111/1468-0009.12626.

Mewomo, M., Toyin, J., Iyiola, C., Aluko, O. 2021. The Impact of Indoor Environmental Quality on Building Occupants Productivity and Human Health: A Literature Review. *Building smart resilient and sustainable infrastructure in developing conntries. limingstone, Zambia*.

Moser, K.A., Fox, A.J., Jones, D.R. 1984. Unemployment and mortality in the OPCS Longitudinal Study. *Lancet*. 8;2(8415):1324-9. DOI: 10.1016/s0140-6736(84)90832-8.

Mucci, N., Traversini, V., Lorini, C., De Sio, S., Galea, R.P., Bonaccorsi, G., Arcangeli, G. 2020. Urban Noise and Psychological Distress: A Systematic Review. *Int J Environ Res Public Health*. 11; 17(18):6621. doi: 10.3390/ijerph17186621.

Newton, D., Lucock, M., Armitage, R., Monchuk, L., Brown P. 2022. Understanding the mental health impacts of poor quality private-rented housing during the UK's first COVID-19 lockdown. *Health Place*; 78:102898. doi: 10.1016/j.healthplace.2022.102898.

Nigerian Bureau of Statistics. 2020. Housing and household survey.

Novak, N. L., Geronimus, A. T., & Martinez-Cardoso, A. M. 2019. Change in birth outcomes among infants born to Latina mothers after a major immigration raid. *International journal of epidemiology,* 48(3), 839-849.

NPC, 2006. National Population Commission, Population and Housing Census of the Federal Republic of Nigeria, Published official G*azette of the Federal Republic of Nigeria* 2(96)

Odoyi, E. J., Riekkinen, K. 2022. Housing Policy: An Analysis of Public Housing Policy Strategies for Low-Income Earners in Nigeria. *Sustainability 14*, 2258. .

Okon, E. M., Falana, B. M., Solaja, S.O., Yakubu, S.O., Alabi, O.O., Okikiola, B.T., Awe, T.E., Adesina, B.T., Tokula, B.E., Kipchumba, A.K., Edeme, A,B. 2021. Systematic review of climate change impact research in Nigeria: implication for sustainable development, *Heliyon,* Volume 7, Issue 9, .

Olukolajo, M. A., Adewusi, A.O. & Ogungbenro, M.T. 2013. "Influence of Housing Condition on the Health Status of Residents of Urban Core of Akure, Nigeria", *International. Journal of Development and Sustainability,* Vol. 2 No. 2, pp. 1567-1579.

O'Sullivan, K., Olin, C., Pierse, N., Howden-Chapman, P. 2023. Housing: the key infrastructure to achieving health and wellbeing in urban environments. *Oxford Open Infrastructure and Health*. 1. 10.1093/ooih/ouad001.

Owoeye, J., & Omole, K. 2012. Analysis of Housing Condition and Neighborhood Quality of Residential Core of Akure, Nigeria. *Mediterranean Journal of Social Sciences*. 3. 471-481.

Palacios, J., Eichholtz, P., Kok, N., Aydin, E. 2020. The impact of housing conditions on health outcomes. *Real Estate Economics.* 49. 10.1111/1540-6229.12317. . DOI:

Pevalin, D., Reeves, A., Baker, E., Bentley, R. 2017. The impact of persistent poor housing conditions on mental health: A longitudinal population-based study. *Preventive Medicine*. 105. 10.1016/j.ypmed.2017.09.020.

Riva, A., Rebecchi, A., Capolongo, S., Gola, M. 2022. Can Homes Affect Well-Being? A Scoping Review among Housing Conditions, Indoor Environmental Quality, and Mental Health Outcomes. *Int J Environ Res Public Health.* Nov 30; 19(23):15975. doi: 10.3390/ijerph192315975

Rolfe, S., Garnham, L., Godwin, J. 2020. Housing as a social determinant of health and wellbeing: developing an empirically-informed realist theoretical framework. *BMC Public Health* **20**, 1138 (2020). .

Ruchi B., Jihye K., Joyce E. 2014. Many Candidate Surveys on Program Evaluation: Examining Instrument Reliability, Validity and Program Effectiveness. *American Journal of Educational Research*. 2(8):683-690. doi: 10.12691/education-2-8-18.

Sano, Y., Mammen, S., Houghten, M. 2021. Well-Being and Stability among Low-income Families: A 10-Year Review of Research. *J Fam Econ Issues.* 42(Suppl 1):107-117.

Sauni, R., Verbeek, J. H., Uitti, J., Jauhiainen, M., Kreiss, K., Sigsgaard, T. 2015. Remediating buildings damaged by dampness and mould for preventing or reducing respiratory tract symptoms, infections and asthma. *Cochrane Database Syst Rev*. 25 (2):CD007897. doi:Ê.

Sharpe, R. A., Taylor, T., Fleming, L .E., Morrissey, K., Morris, G., Wigglesworth, R. 2018. Making the Case for "Whole System" Approaches: Integrating Public Health and Housing. *Int J Environ Res Public Health*. 24; 15(11):2345. doi: 10.3390/ijerph15112345.

Stachura, E. 2013. "A Study in Polish Housing Conditions. Methodology and Building Typology Characteristics" *Real Estate Management and Valuation*, vol.21, no.1, 2013, pp.25-31. .

Tilburg, W. C. 2017. Policy Approaches to Improving Housing and Health. *J Law Med Ethics*. 45(1:90-93. doi: 10.1177/1073110517703334.

Torresin, S., Ratcliffe, E., Aletta, F., Albatici, R., Babich, F., Oberman, T., Kang, J. 2022. The actual and ideal indoor soundscape for work, relaxation, physical and sexual activity at home: A case study during the COVID-19 lockdown in London. *Front. Psychol*. 13:1038303. doi: 10.3389/fpsyg.2022.1038303.

Udoh, U. and Uyanga, J. 2013. Housing Conditions and Health in Rural Nigeria: A Case Study Of Akwa Ibom State. *Res Humanit Soci*. 3. 34-41.

Wargocki, P & Wyon, D. 2016. Ten questions concerning thermal and indoor air quality effects on the performance of office work and schoolwork. *Building and Environment.* 112. 10.1016/j.buildenv.2016.11.020.

WHO 2009, Global Health Risks - World Health Organization. info/.../Global Health Risks_ report_full.pdf.

Wooszyn, R., Wooszyn, A., Stanisawska, J. 2023. Quality of housing conditions in rural areas in Poland at voivodeship level. *Annals of the Polish Association of Agricultural and Agribusiness Economists.* XXV. 10.5604/01.3001.0053.6817.

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING
Volume 33 Issue 2
ISSN (P) 1728-7715 - ISSN (E) 2519-5050
Journal DOI: www.doi.org/10.53700/jrap_neduet
Issue DOI: www.doi.org/10.53700/jrap3322023

TRANSFORMATION OF PASSIVE DESIGN ELEMENTS FOR ACHIEVING THERMAL COMFORT IN RESIDENTIAL BUILDINGS OF MANSEHRA CITY, PAKISTAN FROM 1990 TO 2019

Muhammad Ashar Awan*, Nazia Iftakhar**, Omer Shujat Bhatti***

Article DOI:
www.doi.org/10.53700/jrap3322023_2

Article Citation:

Awan M. A., et al., 2023, Transformation of Passive Design Elements for Achieving Thermal Comfort in Residential Buildings of Mansehra City, Pakistan From 1990 to 2019, *Journal of Research in Architecture and Planning*,33(2). 19-34.

* Muhammad Ashar Awan, Architect, Environmental Design Health and Nutritional Sciences, Allama Iqbal Open University.

** Nazia Iftakhar, Lecturer, Environmental Design Health and Nutritional Sciences, Allama Iqbal Open University.

*** Omer Shujat Bhatti, Research Associate, Environmental Design Health and Nutritional Sciences, Allama Iqbal Open University.

ABSTRACT

Among the most evolving issues in recent years, there is growing concern over global warming throughout the world. The construction industry has been considered among the major contributors to global warming. The use of building envelope along with the heating, cooling, and lighting design, operations, and infrastructures are the prime factors of this contribution. Due to this reason, the thermal comfort of buildings has become a major concern in building design globally. The following research explored the building design elements used for thermal comfort in residential buildings of Mansehra City of Khyber Pakhtunkhwa province in Pakistan and analyzed its transformation during the last three decades. The study proceeded by documenting and comparing various design elements to understand their transformation within documented time periods i.e. thermal mass, fixed shading devices, and the ratio of open and closed spaces. These elements were evaluated for their effectiveness in providing thermal comfort. It was concluded that these design elements have been adapted and modified with time with little concern for sustainability. It was found that the focus has shifted from building orientation, sun path, and wind directions to aesthetically pleasing forms only which makes them saleable and lack human comfort. The use of passive means to achieve thermal comfort was neglected. The research concludes by suggesting incorporation of appropriate thermal comfort components and methods into effective solutions for improved building designs, lower energy demand, and a better indoor atmosphere.

Keywords: Thermal Comfort, Passive Design, Residential Building, Mansehra City, Global Warming

INTRODUCTION

Urbanization is a serious concern in today's world. Rapid urbanization makes people more vulnerable to climate change impacts (Chai et al, 2022). Buildings are one of the primary sources of climate change and contribute significantly to global warming. Building construction, operation, and utilization have led to emissions of massive CO_2 in the ambient air (Neill, 2020). According to International Energy Agency (IEA) (2019), buildings and their construction are responsible for one-third of total global energy consumption and nearly 40% of annual global CO_2 emissions due to increase in energy consumption by structures. Numerous problems and challenges arise from the building sector in reducing CO_2 emissions (Ali et al., 2020). The exploitation of non-renewable energy resources, poor building design, and lack of sustainability consideration in urbanization have been holding back CO_2 emission mitigation measures in the building sector (Shaikh, 2021). Numerous factors contributed to this increase, including the growing demand for energy used in heating and cooling, increased house air conditioning capacity, and extreme weather conditions. The current state of climate change and the high level of energy consumption in building development are directed to address

these global challenges using sustainable building practices.

Pakistan is no exception as a developing country in South Asia, in facing an energy crisis with its shortage and an imbalance between demand and production. Along side, the country is also facing a high population growth rate. The population of the country has increased by 57% and expected to double in the next 30 years (Umar, 2018). Although Pakistan contributes not more than 1% of global Greenhouse Gas (GHG) emissions but has been amongst the most vulnerable country in the region facing climate change and global warming disasters (Abubakar, 2019). The effects of global warming may already be evident in terms of monsoon start and end dates, extreme weather conditions, floods, drought, and other natural disasters (Abbass et al., 2022). Almost 50% of the total primary energy is consumed by residential and commercial buildings in Pakistan that produce more than one-third of total CO2 emissions (Ghafoor et al., 2020; Rehman et al., 2021). The global energy consumption in residential buildings is highest at 22% (Anwar et al., 2021) with the increase in demand for energy in buildings reaching 24% globally by 2050 (Khan et al., 2022). In this context, the construction of buildings with enhanced energy characteristics is extremely inappropriate. Development in the use of passive techniques in new housing is undoubtedly an avenue that is being reconsidered in many parts of the construction industry (Tatarestaghi et al., 2018).

In Pakistan, the energy consumption by the residential sector is at the highest rate with 45% of overall energy consumption (Maan et al., 2021; Finance Division GoP, 2020). For designing energy-efficient buildings, the building codes of for mager cities are available but most cities are unable to develop proper codes of building bye-laws. Houses are constructed with no climatic considerations. Active systems based on personal choices are used to offer comfortable temperatures inside the houses with more energy use resulted in increase in cost eventually (Mahar et al., 2019). Taking advantage of natural energy flows to achieve thermal comfort is all about passive design. From building orientation to the building envelope, there is a variety of techniques that can be provided to achieve thermal comfort in residential buildings (Rajapaksha et al., 2003). By using appropriate passive design strategies buildings have the potential to save 50 – to 60% of energy (Ali & Rakshit, 2019). Studies reported that building orientation, layout, materials, envelope, thermal mass, window design, and shading provision, provision of courtyards, verandas are fundamental elements that maximize the use of natural ventilation and daylight to improve a building's performance and enhance indoor thermal comfort (Tatarestaghi et al., 2018; Maleki, 2011; Nugroho et al., 2020; Jamaludin et al., 2018; Shaheen et al., 2016; Chahal & Aulak, 2018; Loo et al., 2021).

Climatic challenges in developing countries tend to force the population towards survivability limits. The Earthquake of 2005 in Pakistan was such an event that resulted in revisiting some of the major applicable bylaws across the country. Being a major city hit by the incident, Mansehra as one of the largest cities in the KPK province had to revisit the design paradigm and shift to structural prioritization. Belonging to a highly mountainous region, the city is surrounded by dense forests and serene environments, a large population influx occurred leading to enhanced urbanization. Mansehra today has a better formulation of bylaws after the 2005 earthquake as compared to other small cities of Pakistan. However, these codes focused only on the building's structural elements rather than considering it as a unit. Even so, it was seen that there is a big difference between the existing standards in terms of structure and built form. There are no standards in the regulations relating to passive construction like thermal insulation or air leakage-tightness, etc. This has led buildings to overheat or cool during the changing of summer and winter seasons respectively. The study aims to contribute to the understanding of use of passive design elements in residential buildings to achieve thermal comfort and their transformation over a selected time period in Mansehra city. Multiple studies discuss the residential buildings of Pakistan, relating climatic conditions with the parameters of thermal comfort (Mahar, Amer & Attia, 2018; Nicol et al., 1999; Shaheen et al., 2016; Maan et al., 2021) and found knowledge gaps between the building design and climatic considerations (Mahar et al, 2019).

Not enough literature was available related to the residential buildings of Mansehra region. The purpose of the study was to assess the transformation of residential buildings with time and the objective was to evaluate and compare selected passive design parameters including thermal mass, fixed shading, and the ratio of open and closed spaces in residential buildings of Mansehra over three decades. Three houses were selected, documented and examined from each decade that is 1990-1999, 2000-2009, 2010-2019 as a sample for a true representation of the population based on the similarity of design replication in the explored overall context.

STUDY AREA:

Mansehra, situated in the Hazara Division of Khyber Pakhtunkhwa province has a total area of 4579 km² and has urban population of 87,657 out of a total population size 1,556,460 comprising about 49% male and 51% female population (Pakistan Bureau of Statistics, 2017). Located at 34°14' and 35°11' North latitude and 72° 49' and 74° 08'

East longitude, Mansehra is surrounded by Batagram and Kohistan districts from the north, Muzaffarabad district of Azad Jammu and Kashmir in the east, Abbottabad and Haripur districts in the south and Swat district in the west (Shakir & Ahmed, 2011) as shown in Figure 1. The city serves as a catchment area for towns such as Kaghan Valley, Batgram, Balakot, Shinkiari, and Baffa and provides urban infrastructure, social services, transportation, and employment to these smaller towns.

The climate of the district is warm in summer and cold in winter. The northern part, where there are high mountains, is cold in summer and very cold in winter due to the snow-capped mountains. Mansehra City consists of three types of land uses including residential, commercial, and industrial (Shakir & Ahmed, 2014). Most of the building stock is between ten and fifty years old. As stated by the Pakistan Bureau of Statistics (2017), the annual population growth rate of the city is 4.62%, which is higher than the annual growth rate of 3.58 percent projected (Pakistan Bureau of Statistics, 2017). The expansion of the city can be seen in Figure 2.

METHODOLOGY:

The research was primarily a comparative study in which diverse types of data were collected. The total housing units recorded an increase of 239275 in 2017 as against 172040 in 1998 (Pakistan Bureau of Statistics, 2017). The urban development of the city was visualized through Google Earth images. From the images, the housing growth was studied and marked in different sectors including housing growth during the 1990s, 2000s, and 2010s. Three of these areas were identified as having a representation of houses from each decade based on their construction period. The areas included are Safdar Road, Mohalla Dub No. 1, and

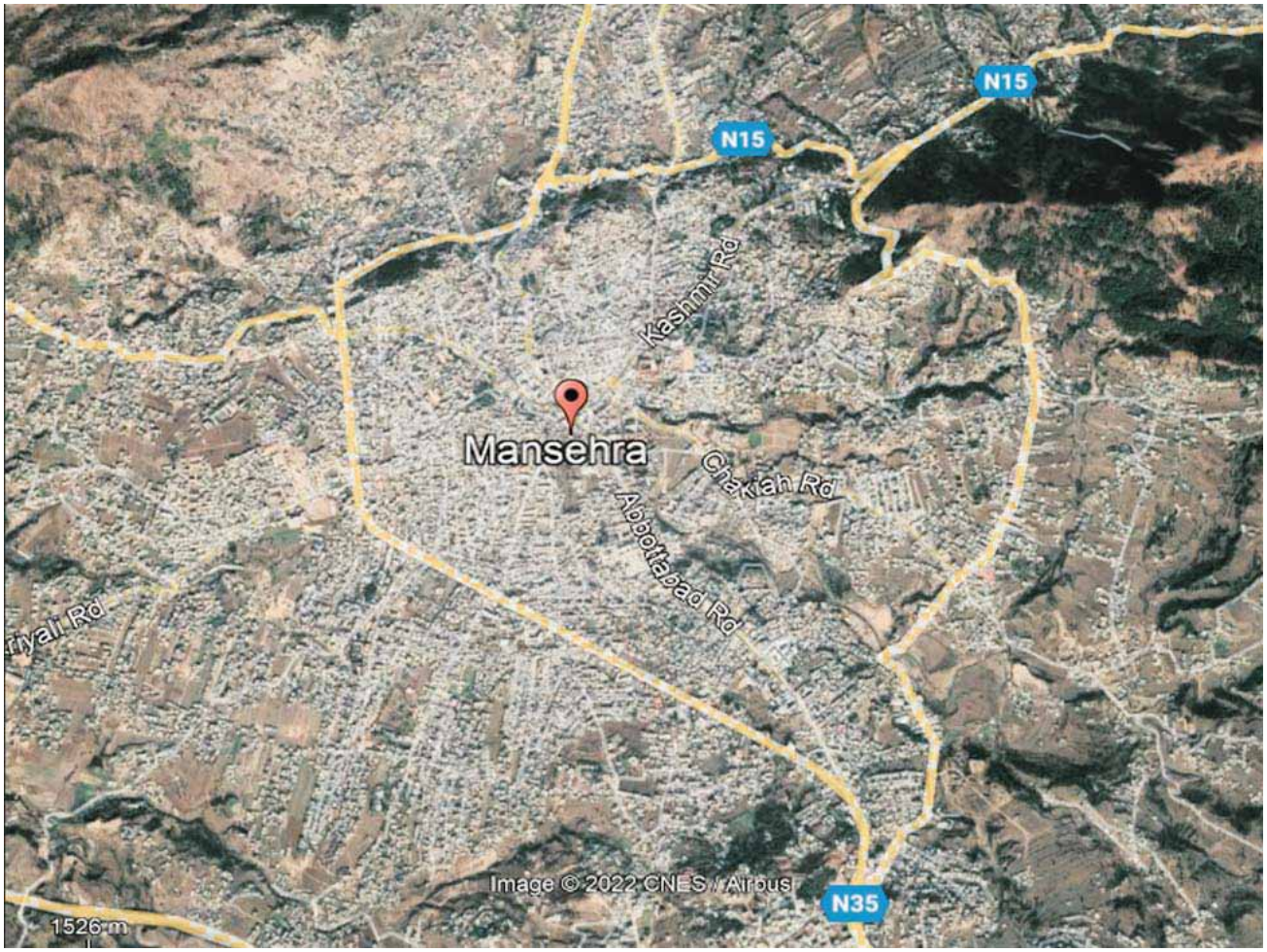


Figure-1: Location map of Mansehra district.
Source: Google Earth, 2022.

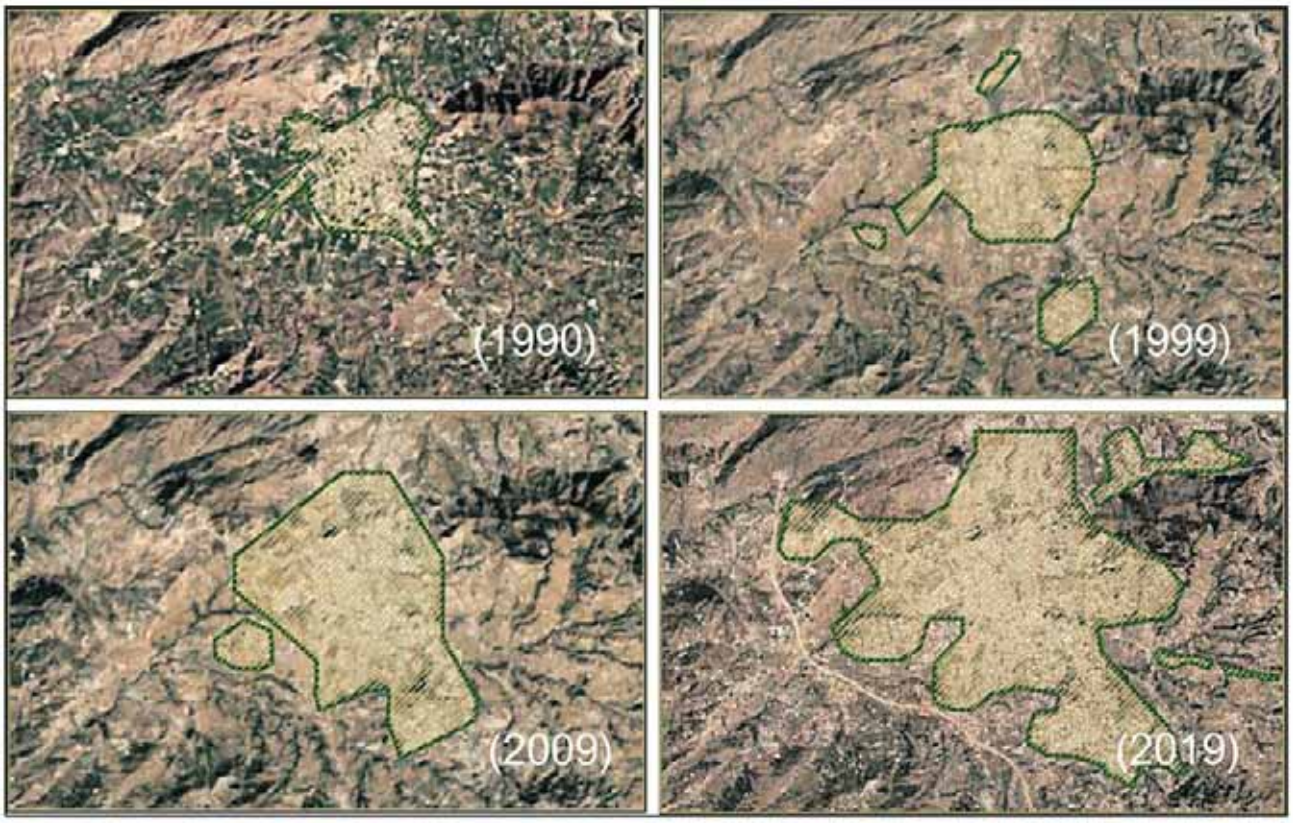


Figure-2: The expansion of Mansehra city from 1990 to 2019.
Source: Google Earth, 2021

Dub No. 2 as mentioned in Figure 3. Three houses were carefully chosen from each area. The selection criteria of houses were determined by the plot sizes that is one house from 5 to 7 Marla (152-212 sq. yds.), one house from 8 to 10 Marla (242-302 sq. yds.), and one house from 18 to 22 Marla (544-665 sq. yds.). After selection, analysis was done by comparing the selected passive design elements in selected houses. Software including Google Earth, AutoCAD, and Google Sketch up were used for the task.

FINDINGS:

Initially, in the context of Mansehra city, the concept of Mohallah or Neighbourhood respect was followed and people preferred to have similar size plots but over the last two decades the morphology has been segregated and even the most common form of land and development now have variation of plot sizes as well as housing units. Hence based on the housing unit size, economic and social groups have also originated breaking a monotony previously followed. The selection of areas was based on the availability of houses represented from each decade with size variations. All houses were evaluated based on the provision of selected passive features including thermal mass, fixed shading devices, and the ratio of open and closed spaces. Primary data was collected by mapping out a target area where houses from all three decades were located. Further, the data was analyzed by comparing selected passive elements in houses representing different decades. The collected data were tabulated and interpreted as percentages in SPSS version 22 and Microsoft Excel 2016 for analysis. Following are the details of selected houses from different decades.

Figure-3: Selected areas of Mansehra city.

Selected Houses from 1990-1999:

The houses were evaluated from selected localities to examine the passive features representing during 1990-1999. The variations in plot size contribute to differences in the design elements and open areas. The comparative analysis offers insights into shared and distinctive passive design features that characterizes the region. From thermal mass to open courtyards, the synergy of construction elements and their response to climatic conditions paints a vivid picture of thoughtful, context-specific architectural choices in this vibrant urban setting. The plan of the first house with 20 marla (600 sq. yds. approx.) plot size from Safdar Road shown in Figure 4 contains a front courtyard and veranda (a). No setback on the west side, resulting in west side windows with projections opening directly into the street (b). Veranda projection provides shade and serves as a sitting area (c) and east side windows with overhang projection (d). The next house from Dub No. 1 with 10 marla (300 sq. yds. approx.) plot size is shown in Figure 5. It consists of front courtyard and veranda acting as a sunspace, covered with a glazed surface partition (a). Internal windows in the courtyard have projections for reflected and diffused sunlight (b). There is a sitting area under the covered veranda for shade (c) and windows provided at the west side with projections and roof projection for shading (d).

The house details exhibited in Figure 6 from Dub No. 2 have a plot size of 7 marla (210 sq. yds. approx.) showing a courtyard and semi-covered veranda on the front side (a).

Table-1: Comparison between selected passive design elements of houses from 1990-1999.

S. #	Selected Elements	Passive	Design	House No. 1	House No. 2	House No. 3
1	**Thermal Mass**	Walls	Material	Brick	Brick	Brick
			Width	9 inches	9 inches	9 inches
		Floors	Material	PCC	PCC	PCC
		Roof	Materi	RCC	RCC	RCC
			Width	6 inches	6 inches	6 inches
2	**Fixed Shading Devices**	North	Material	-	-	-
			Size	-	-	-
		East	Material	-	-	RCC with a roof extension
			Size	6'x 2' x 5'	-	2'extended from wall
		West	Material	RCC with a roof extension	RCC with a roof extension	-
			Size	Shed from all sides of windows	Shed from all sides of windows	-
		South	Material	RCC with all roof extension, Veranda	RCC with all roof extension, Veranda	RCC
			Size	70'x 8'x 6'	-	32'x 10'x 6'
3	**The Ratio of Open and Closed Space**	Total Area		600 sq. yds	300 sq. yds	210 sq. yds
		Covered Area		230 sq. yds	150 sq. yds	80 sq. yds
		Semi Covered Area		60 sq. yds	42 sq. yds	42 sq. yds
		Open Area		300 sq. yds	78 sq. yds	48 sq. yds
		% Covered Areas		40	50	58
		% of Open Areas		60	50	42

Figure-4: Plan and views of house no. 1, Safdar road.

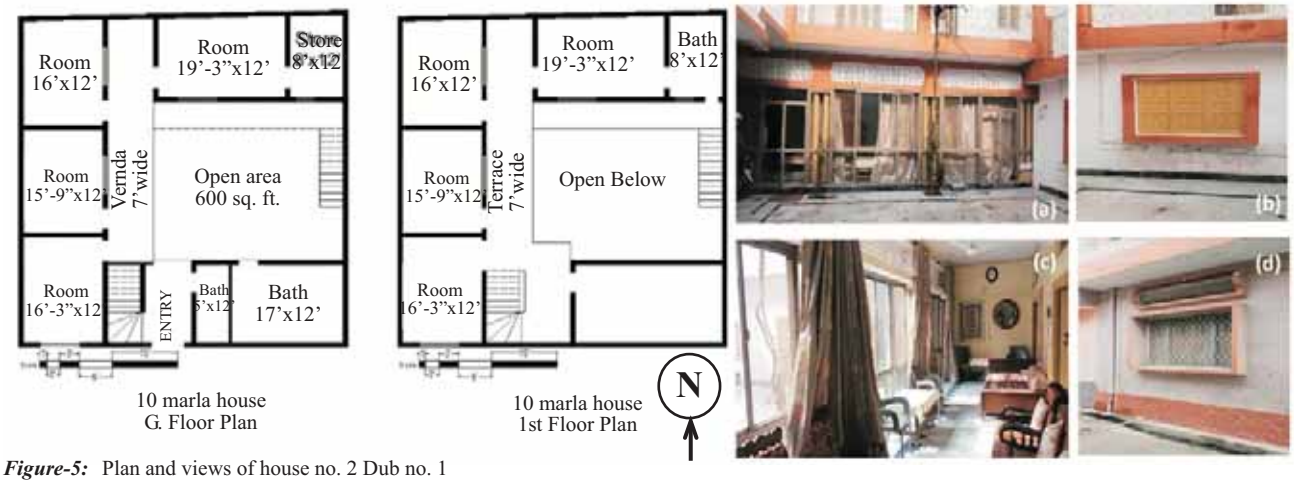


Figure-5: Plan and views of house no. 2 Dub no. 1

Projections over the veranda, windows, and ventilators allow protection from direct sunlight (b). Roof extensions toward the south, some merged with the front side courtyard (c) were also recorded. Table 1 shows a detailed comparison of all three selected houses. All houses have 9 inches-thick brick walls, plain cement concrete flooring, and common use of RCC roofs in all houses. All houses had roof extensions toward the south, sometimes merged with the front side courtyard. Veranda was identified as a significant element in all houses, varying in size. Provision of windows with shading and projections is also a common characteristic of these houses. East side windows are shaded with a 2-feet projection due to roof extension. Courtyards with Semi-open areas were located on the south side. The percentage of open area ranged from 43 to 60 percent based on plot sizes. The comparison highlights the common passive design features in houses from 1990-1999, including the use of verandas, roof extensions for shading, and specific window shading strategies. The variations in plot size contribute to differences in the design elements and open areas.

Selected Houses from 2000-2009:

Further, the selected houses from 2000-2019 reveal nuanced approaches to passive design and spatial organization. While

Figure-6: Plan and views of house no. 3, Dub no. 2.

the structural fundamentals remained consistent, the introduction of front terraces, changes in flooring materials, and strategic use of roof projections reflect an emphasis on both aesthetics and functional considerations. The varied approaches in each house highlight the adaptability of architectural designs to the specific needs of different plot sizes and orientations on Safdar Road during this timeframe. Figure 7 shows the first house has a plot size of 17 marla (512 sq. yds. approx.) from Safdar Road where windows and projections detailed in the front view (a). East side window carries an overhang, which is more of a design element (b). The south side has a roof extension acting as a projection, thus no overhangs are given for windows (c). The next house with 10 marla (300 sq. yds. approx.) plot size from Dub No. 2 is shown in Figure 8. A terrace can be seen on the first floor acting as a semi-covered area on the ground floor (a). South side windows along the setback are extended and have overhang projection (b). A shaded front area on the west side due to the terrace, allows indirect light (c). Northside has car porch covered with a terrace to give shade from direct sunlight (d).

The house mentioned in Figure 9 from Dub No. 1 covers the area of 7 marla (210 sq. yds. approx.). The front courtyard was attached to a semi-covered veranda (a). Well-lit veranda with indirect sunlight and sitting facilities (b) makes a comfortable semi outdoor space. East side window has extended roof projection acting as overhang(c). Table 2 shows a detailed comparison of selected houses. The wall size remained 9 inches thick, but a shift to marble flooring was observed. RCC roof thickness is standardized at 6 inches. Front terraces emerged as a common element, creating semi-covered verandas on the ground floor. Verandas are characterized by linear planning, covering the entire length with widths ranging from 7 to 12 feet and occupying 10 to 20 percent of the plot size. 2 feet of fixed RCC roof projections are provided on the east and west sides. Absence of shading is observed on the north side. The open area constituted approximately 30 to 36 percent of the total plot size. These are setbacks of 1.5 to 2 feet from boundary walls. Courtyards were paved with limited or no vegetation among selected houses. The analysis indicates a shift in flooring materials, the introduction of front terraces, and a decrease in the percentage of open areas during the 2000-2019 period. The strategic use of roof projections and setbacks reflects an evolving approach to passive design, emphasizing both aesthetics and functionality in the architectural landscape during this period of construction.

Selected Houses from 2010-2019:

The dynamic architecture during 2010-2019, found traditional design elements coexist with contemporary materials and spatial considerations. The blend of functionality, aesthetics,

Figure-7: Plan and views of house no. 1, Safdar road.

Figure-8: Plan and views of house no. 2, Dub no. 2.

and adaptability to modern construction practices suggests a distinct approach to architectural design during this period. The house mentioned in Figure 10 is 17 marla (512 sq. yds. approx.) located at Dub No. 2. There is an open courtyard (lawn) and semi-covered veranda at the front (a). Setback at the west side have windows with overhangs along with extended roof projections (b). The other house is at 9 marla (272 sq. yds. approx.) from Safdar Road is shown in Figure 11. A semi-covered veranda and terrace were visible from the front side (a). No specific projections over windows are noted, but an overall wall projection is present (b). Figure 12 shows the front view of the house located at Dub No. 1 (a). West side has windows with projections (b). The front view showcases a semi-open and open area (c), while the east side has a window with its projection detail (d).

Table 3 has a detailed comparison of all three selected houses from the selected houses of 2010-2019. Consistent 9-inch wall thickness was used across all houses. Two out of three houses were constructed using blocks, indicating a shift in construction materials. Common use of 6-inch RCC roofs in all houses. Marble emerged as the prevalent flooring material. Two houses featured 2 feet roof extensions from the east and west sides, complementing window projections.

Figure-9: Plan and views of house no. 3, Dub no. 1.

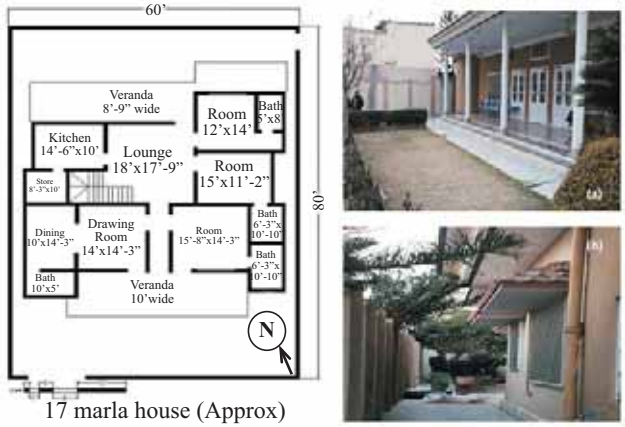


Figure-10: Plan and views of house no. 1, Safdar road.

Table-2: Comparison between selected passive design elements of houses from 2000-2009.

S. #	Selected Elements	Passive Design		House No. 1	House No. 2	House No. 3
1	**Thermal Mass**	Walls	Material	Brick	Brick	Brick
			Width	9 inches	9 inches	9 inches
		Floors	Material	Marble	Tiles	Tiles
			Width	1 inches	1 inches	1 inches
		Roof	Material	RCC	RCC	RCC
			Width	6 inches	6 inches	6 inches
2	**Fixed Shading Devices**	North	Material	-	-	-
			Size	-	-	-
		East	Material	RCC	RCC roof extension	-
			Size	2.5 feet projected roof	8' x 12" x 6"	-
		West	Material	-	-	RCC window projections
			Size	-	-	6' x 1.5' x 6"
		South	Material	RCC	RCC Veranda & Windows shade	RCC Veranda
			Size	7'x 2.5'x 6'	14' x 16" x 6" & 6' x 1.5' x 6"	40' x 8' x 6'
3	**The Ratio of Open and Closed Spaace**	Total Area		512 sq. yds	330 sq. yds	210 sq. yds
		Covered Area		300 sq. yds	219 sq. yds	135 sq. yds
		Semi Covered Area		30 sq. yds	39 sq. yds	38 sq. yds
		Open Area		120 sq. yds	72 sq. yds	53 sq. yds
		% of Covered Areas		70	67	58
		% of Open Areas		30	42	42

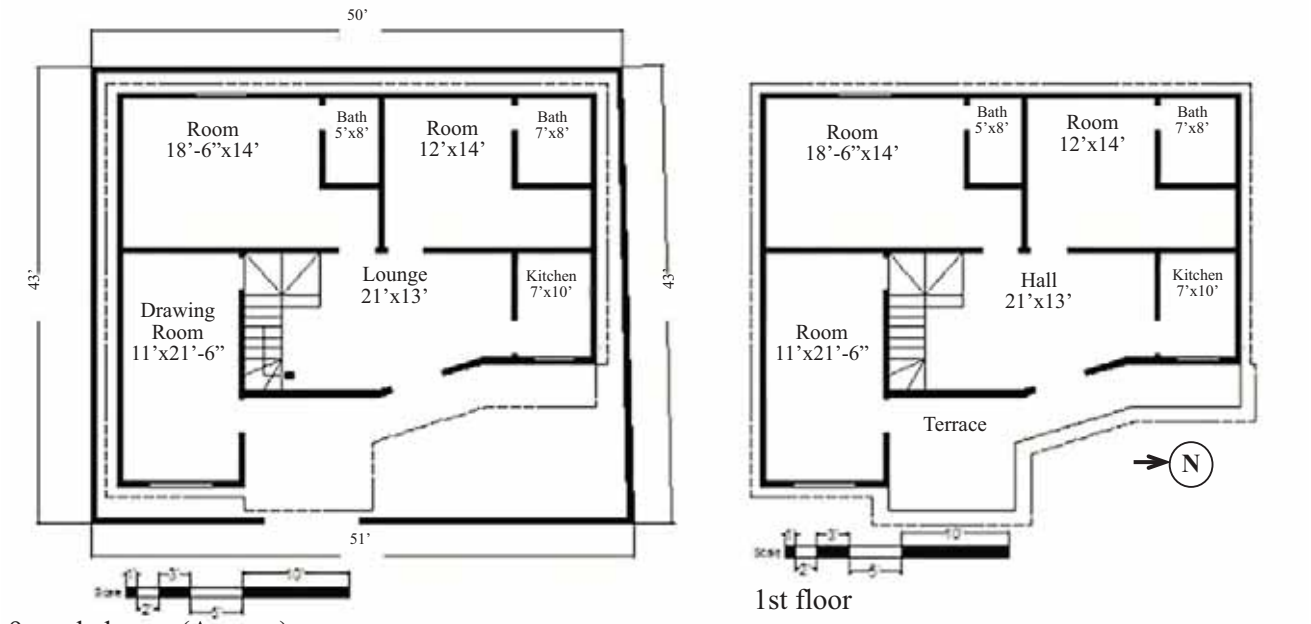


Figure-11: Plan and views of house no. 2, Dub no. 1.

Figure-12: Plan and views of house no. 3, Dub no. 2.

Where one house had a roof projection from the north side, serving as parking and laundry space. A reduction in the percentage of open area, now ranging from 27 to 30% of the total area. Semi-covered areas are utilized for parking. Therefore, a continuation of certain design elements, like semi-covered areas and roof extensions, with changes in construction materials were observed during 2010-2019. The shift towards block construction and the utilization of marble for flooring signify adaptability to contemporary construction practices. Additionally, the reduction in open area percentages suggests a more compact use of space.

Table-3: Comparison between selected passive design elements of houses from 2010-2019.

S. #	Selected Elements	Passive Design		House No. 1	House No. 2	House No. 3
1	**Thermal Mass**	Walls	Material	Brick	Hollow Brick	Blocks
			Width	9 inches	6 inches	6 inches
		Floors	Material	Marble	Marble	Marble
			Width	1 inches	1 inches	1 inches
		Roof	Material	RCC	RCC	RCC
			Width	6 inches	6 inches	6 inches
2	**Fixed Shading Devices**	North	Material	RCC window Shade	RCC roof extension	Veranda
			Size	6' x 1.5' x 6"	2 to 4 feet wide	8' x 12" x 6"
		East	Material	RCC roof extension	RCC roof extension	RCC roof extension / RCC Window shade
			Size	5' x 1.5' x 6"	2 feet wide	2 feet wide / 5' x 1.5' x 6"
		West	Material	RCC roof extension	RCC roof extension	RCC roof extension / RCC Window shade
			Size	2 feet wide	2 feet wide	2 feet wide / 5' x 1.5' x 6"
		South	Material	Veranda	-	-
			Size	25'x 8" x 6'	-	-
3	**The Ratio of Open and Closed Space**	Total Area		512 sq. yds	270 sq. yds	210 sq. yds
		Covered Area		360 sq. yds	195 sq. yds	15 sq. yds
		Semi Covered Area		23 sq. yds	60 sq. yds	15 sq. yds
		Open Area		128 sq. yds	15 sq. yds	33 sq. yds
		% of Covered Areas		70	72	71
		% of Open Areas		30	28	29

DISCUSSION:

Protection from radiant solar gain is the prime strategy in warmer climates for achieving thermal comfort. Without incorporating shading, building surfaces absorb excessive heat, raising the surface temperature. Therefore, it is important to shade the openings in buildings in such a way that it protects from summer sun and allows winter sun within the building. A transitional change can be seen in the selected case studies from 1900 to 2019. The concept of the veranda is observed to disappear from 2010 onwards. The reduction in the south shading area from 20% to 5% with an increase in build-up area from 50% to 70% was recorded. East and west side shading remained consistent but no separate shading for windows was used from 2010 onwards. The orientation of rooms toward the south with the presence of a courtyard and veranda enters air into the internal spaces during summer as well as allows ambient sunlight to come into the rooms as shown in the typical section of the model house from 1990-1999 (Figure 13).

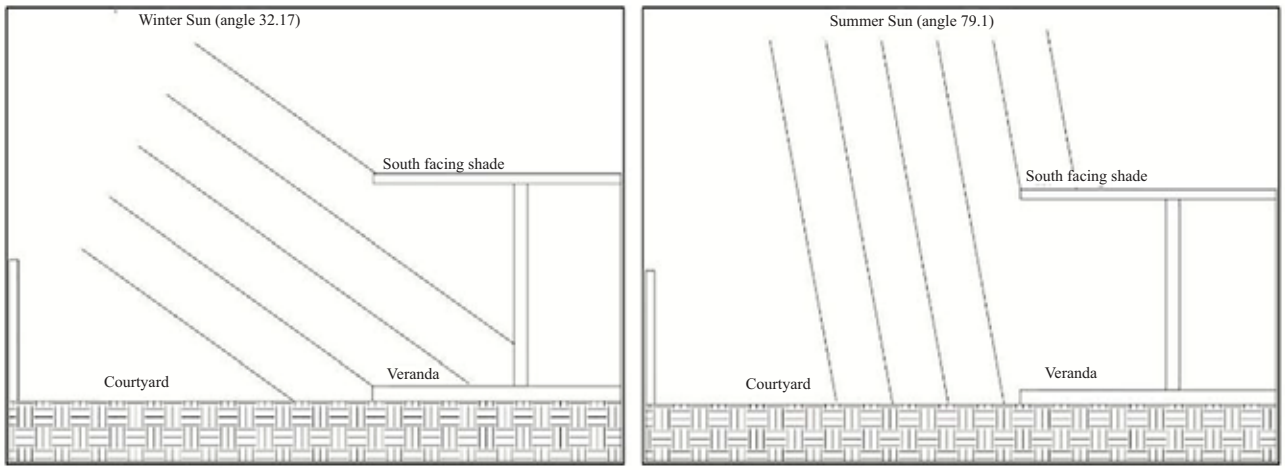


Figure-13: Section of typical house from 1990-1999 with summer and winter sun angle.

It is quite evident from the figure that the walls are completely protected from direct exposure to the sun during summers and winters. East and west sun exposures are problematic. Summer morning and afternoon sun altitude angles are so low that overhangs are seldom effective. The best alternative for these orientations is egg-crate shading. The windows and walls of 1900-1999 houses were totally exposed on the west and east sides. Exposed walls with window projections of 1.5 feet from the west and east sides allow morning and afternoon sun. A typical section of the 2000-2019 house (Figure 14) depicts that the walls are exposed to the south side with 2 feet setback from boundary walls and the central veranda provides shading and protection from direct solar gain into the rooms.

The walls are not completely protected through the roof projection during summer and are completely exposed on the south side. Also, the roof extended projection failed to protect the wall and windows from the summer heat, whereas during winters the boundary wall blocked some portion of the sun heat but the exposed walls take maximum sunlight. The east and west sides of the buildings were partially protected because of the small setback from the boundary walls. Illustrations shown in Figure 15 are model of houses developed in Google Sketch from the three-decade time period showing the effectiveness of overhangs on different sides during summer and winter seasons.

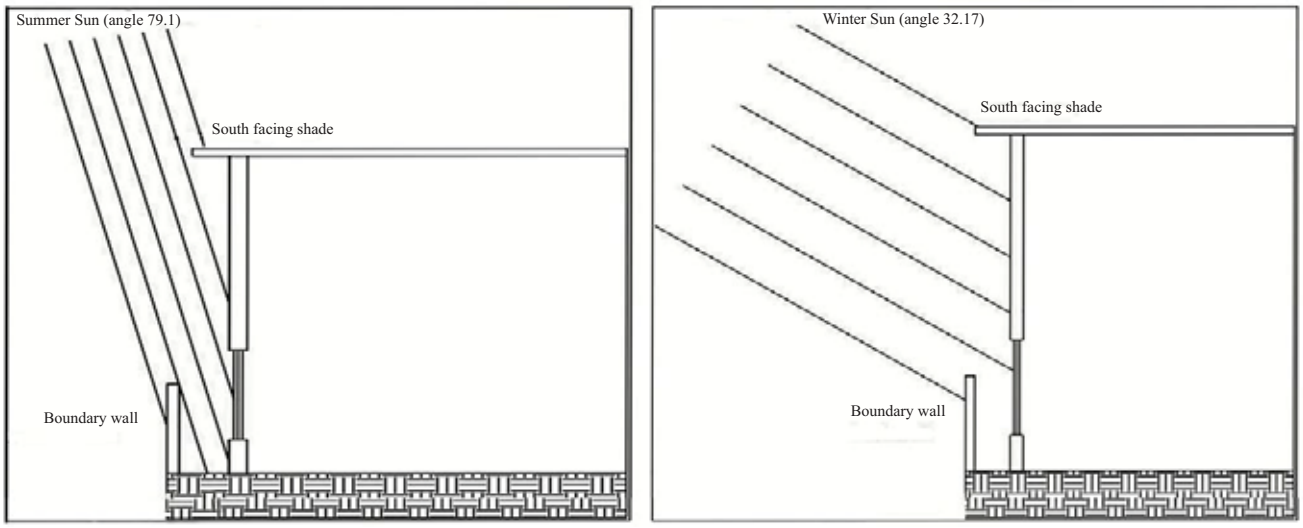


Figure-14: Section of typical house from 2000-2019 with summer and winter sun angle.

The existence of courtyards varied from 1900 to 2019. In the selected houses, the courtyards have been observed on the south side for maximum solar gain during winter seasons. Air circulates within buildings due to incident sun rays in the courtyard during summers. During 1990-1999, the open area was observed to be between 43 to 60 percent. Oriented on the south side, semi-open and open areas help in unobstructed and high airflow. Whereas, the percentage of open area during the 2000-2019 time is between 30 to 36 percent. During this time, the concept of a courtyard starts to vanish from the houses as only one house of this time was found with courtyard. The sizes of open spaces were also reduced and not sufficient to create a good airflow pressure difference. Setbacks of 1.5 to 2 feet from boundary walls on the right and left have also been observed but these cannot be considered as open space.

Finally, from 2010 to 2019, the open area is seen to further reduce to between 27 to 30 percent. With the increase in the covered area, open areas are now also used for parking. Although, the veranda as a semi-covered space can be seen in a few cases. Setbacks of 2 feet from the right and left sides form boundary walls that cannot be treated as open space for proper airflow and can be used for circulation only. Figure 16 shows the transition of open areas during the selected time frame.

The use of thermal mass in houses from 1990-2019 has not changed much but shifted from bricks to blocks. Since blocks are more economical and take less time to construct as compared to bricks. Both materials have heat retention and compensate for their low insulation value. The insulating rating (R-value) for the 4-inch-thick brick wall is 0.8 per

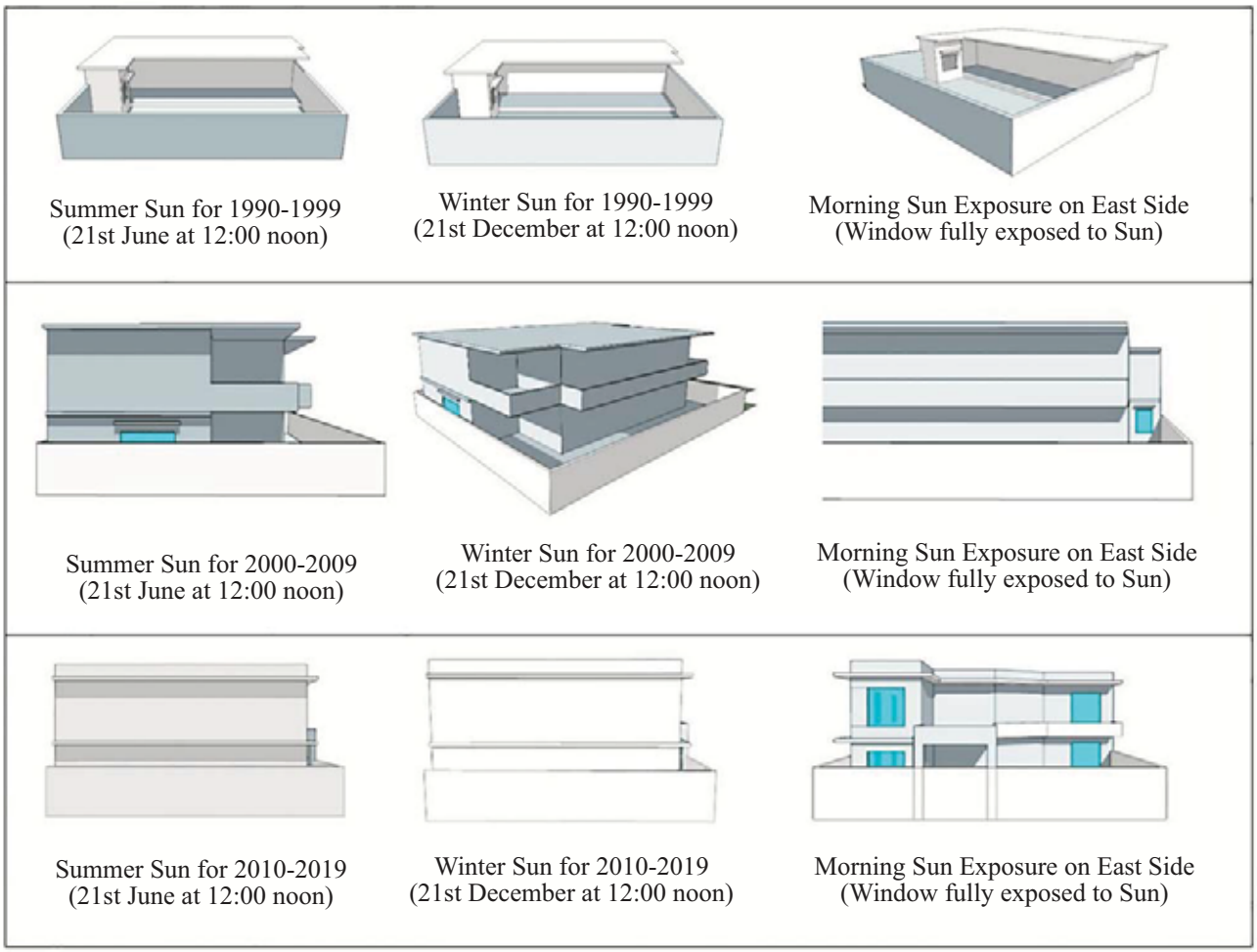


Figure-15: Effectiveness of shading devices during different times of the year of selected houses.

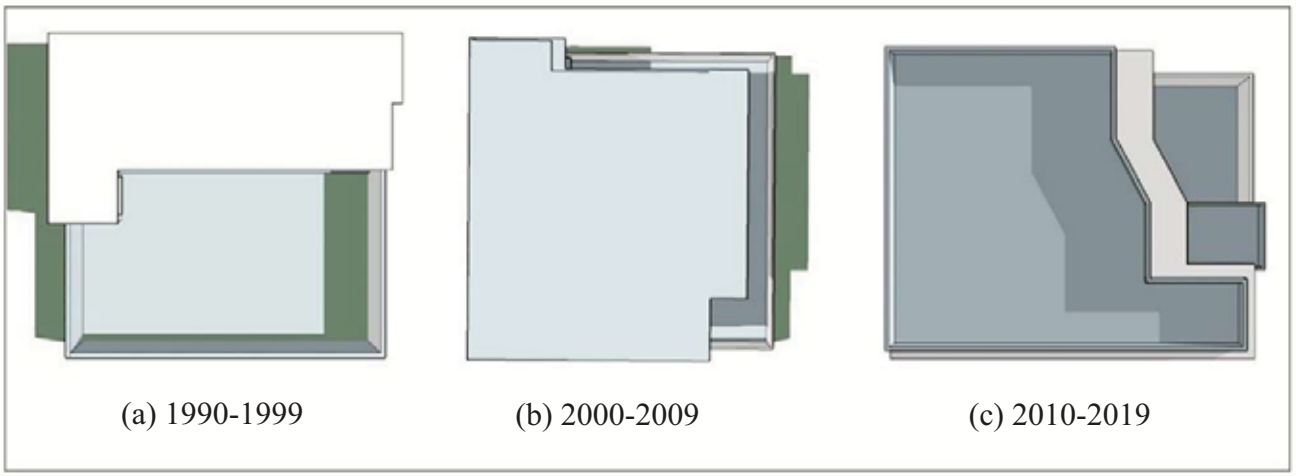


Figure-16: Transition of the open area from the top view of the model houses.

square feet whereas, the R value of the 8-inch conventional concrete block wall is 1.11 per square feet. Bricks have higher thermal mass than blocks which allows them to absorb more heat.

CONCLUSION

With lack of exploration of the passive design elements of the housing units towards end users' satisfaction and transformation from multiple timelines explored, the study was able to contribute to the existing body of knowledge in the following ways.

The study concluded that the windows or roof projections were consistent features from all selected houses. It clearly showed that people do consider the climatic conditions of Mansehra city over the modern-day outlook though in the current context it adds value to the saleable price of the housing unit as an asset. Sufficient shading was found in the south side but at the east and west sides shading with projections was not enough to fulfil the thermal comfort needs. It was though not comfortable as per discussion with multiple respondents, yet considering Mansehra a cold city in the overall context of the country, public lack of Eastern side projects and having ample sun during winters was evident. Though, the orientation of houses according to the sun's path was not the focus of design but people do have considered it along with Qibla direction (direction to Holy Kaaba) in the design of internal spaces. Kiln fired bricks was the main material or construction element that was extensively replaced by concrete blocks that have low insulation value though cost effective and easy to manufacture and procure in the context. Open and semi-open spaces including verandas and terraces are missing in recent times. This highlighted a transition from the traditional to more synthetic approach of a modern day villa without considering the implications of local culture and climate in design of a housing unit. Hence it has resulted in an increase of the ratio of the covered area from the previously built houses. The use of passive design elements to achieve thermal comfort was neglected and more space was occupied through built form. The new designs (2000-2019) are more focused on aesthetics than previous times (1990-1999). Hence the aesthetic transformation has started taking the respondents or indeed end users towards a loose target resulting in poor thermal performance of the house in long run. As a result, they consume more energy for heating and cooling of spaces and also have a negative impact on the overall environment along with increased energy demand. These have triggered lack of thermal comfort and increase cost of running and operations of houses. The study directs that building design should incorporate both passive and active strategies for thermal comfort with respect to the environment and climatic conditions in future design of the housing units in Mansehra. Local passive practices like south open courtyards with vegetation, verandas, and open terraces need to be revived with a modern touch to keep intact the aesthetics need. This will help to reduce energy demands and will help to maintain rising temperatures. It will also revitalize the old aspects of deep beauty, and sustainability with a sense of place, which is completely missing in modern design.

REFERENCES

Abbass, K., Qasim, M.Z., Song, H. Murshed, M., Mahmood, H., Younis, I. 2022. A review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environment, Science and Pollution Research*, *29*, 42539–42559.

Abubakar, S. M. 2019. Pakistan 5th most vulnerable country to climate change, reveals Germanwatch report. *The Daily Dawn*, *December 4, 2019*.

Ali, K. A., Ahmad, M. I., Yusup, Y. 2020. Issues, Impacts, and Mitigations of Carbon Dioxide Emissions in the Building Sector. *Sustainability*, *12* (18), 7427. https://doi.org/10.3390/su12187427

Ali, S. F., Rakshit, D. 2019. Utilization Passive Design Strategies for Analysing Thermal Comfort Levels Inside an Office Room Using PMV-PPD Models. In: Tyagi, H., Chakarborty, P., Powar, S., Agarwal, A. (eds) Solar Energy. *Energy, Environment and Sustainability*, Springer, Singapore, 35-57.

Anwar, M.W., Ali, Z., Javed, A. Din, E., Sajid, M. 2021. Analysis of the effect of passive measures on the energy consumption and zero-energy prospects of residential buildings in Pakistan. *Building Simulation, 14*, 1325–1342 (2021).

Chahal, K. S., Aulakh, R. S. 2018. Impact of Courtyard Planning on Spatial Design. Malaysian hospitals. *Procedia-Social and Behavioral Sciences*, *105*, 171-182.

Chai K-C., Ma X-R., Yang Y., Lu Y-J., Chang K-C. 2022. The impact of climate change on population urbanization: Evidence from China. *Frontiers in Environmental Science 10,* 945-968.

Finance Division Government of Pakistan, 2015. Pakistan Economic Survey 2019-20. *Economic Adviser's Wing, Finance Division Government of Pakistan, Islamabad.*

Ghafoor, G. Z., Sharif, F., Khan, A. U., Hayyat, M. U., Farhan, M., Shahzad, L. 2020. Energy Consumption and Carbon Dioxide Emissions of Residential Buildings in Lahore, Pakistan. *Polish Journal of Environmental Studies*, *29* (2), 1613-1623.

International Energy Agency. 2019. *Global Status Report for Buildings and Construction 2019*, IEA, Paris.

Jamaludin, A. A., Hussein, H., Tahir, K. M. 2018. Satisfaction of Residents Towards Internal Courtyard Buildings. *Journal of Design and Built Environment, 18* (2), 61-69.

Khan, M., Khan, M. M., Irfan, M., Ahmad, N., Haq, M. A., Khan, I., Mousa, M. 2022. Energy performance enhancement of residential buildings in Pakistan by integrating phase change materials in building envelopes. *Energy Report, 8,* 9290-9307. .

Loo. S-H, Lim, P. I., Lim, B. H. 2021. Passive design buildings: A review of configuration features for natural ventilation and daylighting. *Journal of Physics: Conference Series*, 2053

Maan, Y. A., Akhtar, M., Jamil, M. 2021. Role of Building Sector in Consumption of Energy in Pakistan. *Sir Syed Journal of Education & Social Research, 4*, (2), 236-242. .

Mahar, W. A., Verbeeck, G., Singh, M. K. & Attia, S. 2019. An Investigation of Thermal Comfort of Houses in Dry and Semi-Arid Climates of Quetta, Pakistan. *Sustainability, 11* (19):5203.

Mahar, W. A., Amer, M., Attia, S. 2018. Indoor thermal comfort assessment of residential building stock in Quetta, Pakistan. *European Network for Housing Research (ENHR) Annual Conference 2018*. Uppsala University, Uppsala, Sweden.

Maleki, B. A., 2011. Shading: Passive Cooling and Energy Conservation in Buildings. *International Journal on Technical and Physical Problems of Engineering (IJTPE), 9* (3), 72-79.

Neill, P. 2020. Construction industry accounts for 38% of CO2 emissions. *Environment Journal*.

Nicol, J. F., Raja, I. A., Allaudin, A., Jany, G. N. 1999. Climatic variations in comfortable temperatures: the Pakistan projects. *Energy and Buildings, 30* (3), 261-279.

Nugroho, A. M., Citraningrum, A., Iyati, W., Ahmad, M. H. 2020. Courtyard as tropical hot humid passive design strategy: case study of Indonesian contemporary houses in Surabaya Indonesia. *Journal of Design and Built Environment, 20*, (2), 1-12.

Pakistan Bureau of Statistics. 2017. Census Survey, Government of Pakistan.

Rajapaksha, I., Nagai, H., Okumiya, M. 2003. A ventilated courtyard as a passive cooling strategy in the warm humid tropics. *Renewable Energy, 28* (11), 1755-1778.

Rehman, A. U., Ghafoor, N., Sheikh, S. R., Kausar, Z., Rauf, F., Sher, F., Shah, M. F., Yaqoob, H. A. 2021. Study of Hot Climate Low-Cost Low-Energy Eco-Friendly Building Envelope with Embedded Phase Change Material. *Energies*, *14,* 3544. .

Shaikh, N. A. 2021. Carbon footprint and construction industry. *Pakistan & Gulf Economist*, *January 11, 2021*.

Shakir, M. M., Ahmed, S. 2014. Economic functioning of secondary cities of Pakistan and its integration with the physical land use: Case of Larkana and Mansehra. *Journal of Research in Architecture & Planning, 16*, 33-54.

Shaheen, N., Arif, S., Khan, A. 2016. Thermal Performance of Typical Residential Building in Karachi with Different Materials for Construction. *Mehran University Research Journal of Engineering & Technology, 35* (2), 189–198.

Tatarestaghi, F., Ismail, M. A., Ishak, N. H. 2018. A Comparative Study of Passive Design Features/Elements in Malaysia and Passive House Criteria in the Tropics. *Journal of Design and Built Environment*, *18* (2). 15-25.

Umar, M. A. 2018. Population control a way to tackle climate change. *The Express Tribune*, *April 30, 2018*.

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING
Volume 33 Issue 2
ISSN (P) 1728-7715 - ISSN (E) 2519-5050
Journal DOI: www.doi.org/10.53700/jrap_neduet
Issue DOI: www.doi.org/10.53700/jrap3322023

ADAPTATION AND AWARENESS OF PASSIVE DESIGN STRATEGIES IN CONTEMPORARY HOUSES OF LAHORE, PAKISTAN

Faiqa Khilat, Tahoor Zia**, Usman Awan****

Article DOI:
www.doi.org/10.53700/jrap3322023_3

Article Citation:

Khilat F., et al., 2023, Adaptation and Awareness of Passive Design Strategies in Contemporary Houses of Lahore, Pakistan, *Journal of Research in Architecture & Planning,* 33(2). 35-46.

* Faiqa Khilat, Assistant Professor, University of Management and Technology, Lahore, Pakistan.
faiqa.khilat@umt.edu.pk.
** Tahoor Zia, Research Assistant and Architect, University of Engineering and Technology, Lahore, Pakistan.
tahoorzia56@gmail.com
*** Usman Awan, Assistant Professor, University of Engineering and Technology, Lahore, Pakistan.
usmanawan@uet.edu.pk.

ABSTRACT

Passive strategies help us to achieve sustainable and environment-friendly, low-impact designs and solutions. Adaptation of these depends on climatic constraints and specific use, for instance, ventilation and natural lighting. To achieve a low carbon economy, mitigation approaches are incorporated worldwide where thermal comfort is achieved without using active means. These techniques can be adopted in all climates around the world, with respect to ventilation, orientation, thermal mass, shading devices, daylighting, etc. To cater to the challenges of climate change, mitigation approaches are being incorporated worldwide in the architecture industry to reduce reliance on active means. Their application not only improves health and well-being but is also energy efficient regarding electricity consumption and provides economic benefits for the users. The application of passive design is well-seen in commercial and residential projects. To understand the prospects of passive strategies, the research is carried out to identify current awareness and adaptation potential among architects and their clients in the residential sector of Lahore, Pakistan. The research survey has been done in the form of a questionnaire designed to analyze the application of passive design strategies by architects, awareness among their clients in contemporary residential architecture of Lahore, Pakistan. The research findings show that architects are well aware and positively use these strategies, however there is a gap in the awareness of clients. Most clients preferred active means, while a few clients were inclined towards passive means. The need to make clients more aware of the benefits of these strategies was a highlighted outcome.

Keywords: Passive design, passive strategies, energy efficient, sustainable, contemporary, residential, architecture.

INTRODUCTION

Passive design adaptation in building envelopes is among subjects discussed globally along discourses on climate change and related emerging theories. It addresses factors like greenhouse emissions and evident temperature discrepancies. Passive strategies encourage using natural sources and move towards sustainable and environment-friendly solutions. The benefits of the applications are a high level of comfort to the occupants and the provision of healthy living situations both in residential and commercial projects. Its awareness and adaptation are topics of consideration in changing world scenarios. Although, passive design strategies are not widely observed in residential buildings of Lahore, a prominent city major of Pakistan, the objective of this research is to investigate the reasons for their limited use. A questionnaire survey was conducted among practicing architects to investigate their point of view regarding the use of passive strategies and to study the demand of clients, in the context of Lahore city. Firstly, various form strategies including the orientation and building shape with respect to sun and wind directions, building materials, and addition of landscaping and water bodies were studied. Second, factors including daylighting, sun shading, screening and filtering devices, additional cavity walls, use of basements and courtyards were also studied in designing of projects.

The results of the study display that most architects are willing to adopt passive strategies while most clients are little aware of their benefits. Most of the clients are stuck to specific strategies and do not take risks to adopt others. They rather prefer to opt for trendy facade house designs.

RESEARCH METHODOLOGY

The mixed method research began with a literature review from books, websites, and was followed by an online questionnaire survey. Lahore is selected as the focus of this study as it experiences a broad range of climatic conditions, from very hot summers to cold winters. This makes the city a potential area to study that how buildings can be designed to naturally cope with this range. Additionally, many well-known architects have designed contemporary residential designs in Lahore, providing significant examples to analyze how they have used passive design techniques. Selected residences are analyzed considering the climatic conditions and corresponding use of passive strategies studied by conducting a virtual survey with a structured quantitative questionnaire. To propagate the survey among architects, the snowball sampling technique was used. 60 practicing architects responded and their data was used to frame this research. To augment the research, two design firms of practicing architects in Lahore shared their house design drawings. Their analysis illustrates the professional practice being carried out to address the passive strategies. The discussion brings together the essential findings to derive the conclusions. (Figure1)

LITERATURE REVIEW

The passive design addresses climate change which is a matter of extreme importance worldwide where several theories are emerging and under discussion (Saeed et al., 2013). Research shows that the factors of greenhouse emissions due to fossil fuels are resulting in evident effects on temperature variations and proposes a dire need for architects to design energy-efficient buildings (Saeed et al., 2013), where climate responsive strategies should be adopted to achieve sustainable solutions (Figure 2). It means that to get sustainable results, natural resources should be utilized rather than active means of energy resources. This also promotes healthy living conditions and economic benefits.

Passive design strategies encourage the use of natural sources in particular climates for lighting, heating, and cooling, considering various techniques to provide human comfort and well-being and sustainable solutions to the users. It is the domain of environmental design where comfort is achieved through various measures to attain the maximum benefit of natural means and non-reliance on artificial energy resources (Altan et al., 2016).

Passive strategies adaptation benefits

Passive strategies are considered to be modest and low cost as it takes the benefits of the available potential land opportunities of the site. Developed countries have sufficiently established the guidelines for the use of passive design for the builder to take benefit. Like in the United States of America, where passive solar adaptation and the use of passive strategies that enhance the internal comfort with use sunlight is in practice considered energy efficient according to the climate, advanced guidelines are available (Building & Associates, n.d.).

In the hot-dry region of Indonesia, an experimental approach was carried out to study the effect of courtyard design on energy efficiency. The research indicated that indoor temperature was lower by 4.9 – 7.3 C than outdoor temperature, thus illustrating that use of courtyard in contemporary houses was a feasible means to achieve cooling effect through full-day ventilation system (Nugroho, 2020).

Research by Udo Dietrich (2019) conducted in Brazil, compared contemporary and traditional houses with passive strategies. Through practical survey and simulations, the research concluded that passive measures as significantly valid solutions to protect against solar heat transfer.

An energy-efficient building design assures maximum comfort level to the occupants in performance and the designed activities. It reduces the usage of non-renewable

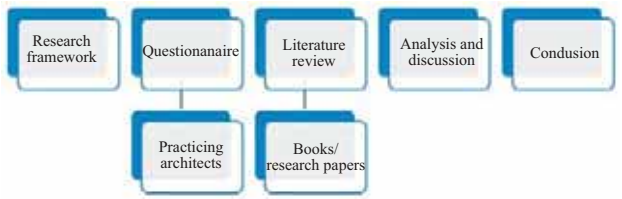


Figure-1: Methodological Framework.

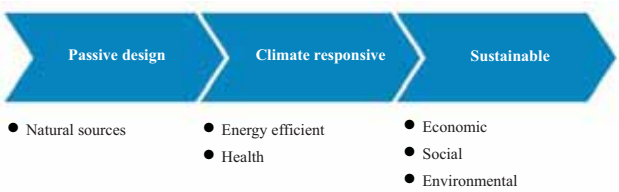


Figure-2: Sustainable Design Through Passive Strategies.

energy and considers the factors of energy cost. The socio-economic and environment-friendly design of the buildings should be considered to get sustainable solutions. This is conceivable with the low energy usage, providing a suitable indoor environment and resulting in good health. Eminent researchers showed that use of energy-efficient means in the designing of buildings have produced sustainable results and have effective results on human health and wellbeing. Naturally ventilated spaces considering the orientation and shape of the building, in comparison to other enclosed spaces, have proven to have given higher satisfaction levels for human health conditions (Sherali, 2014).

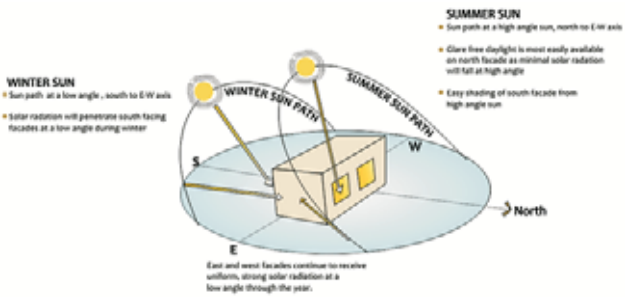
In the context of Lahore city, traditional house designs within the Walled City area were based on passive strategies with no use of air conditioning while contemporary houses are inseparable from air conditioners. These have become part of the contemporary lifestyle (Malik et al., n.d.). This study aims to fill the reseach gap, on how the client's demands and their view of buildings effect the use and design of passive strategies.

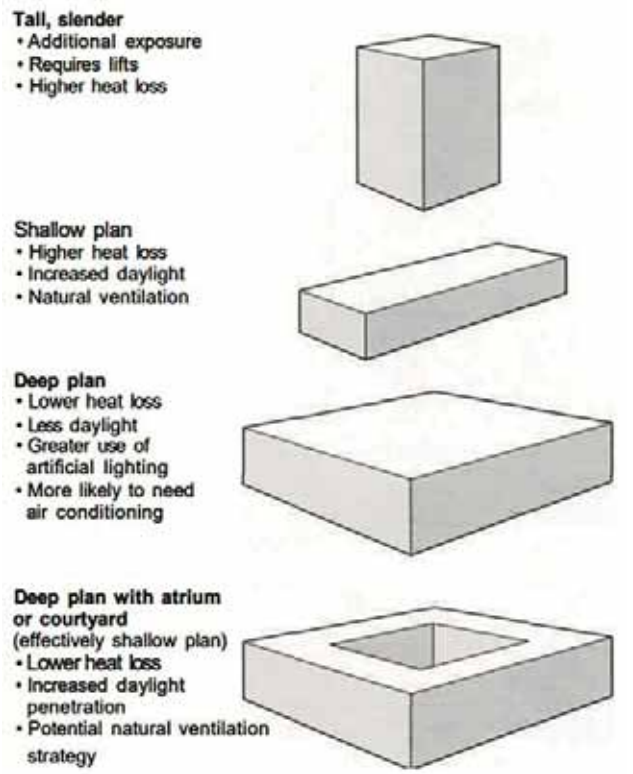
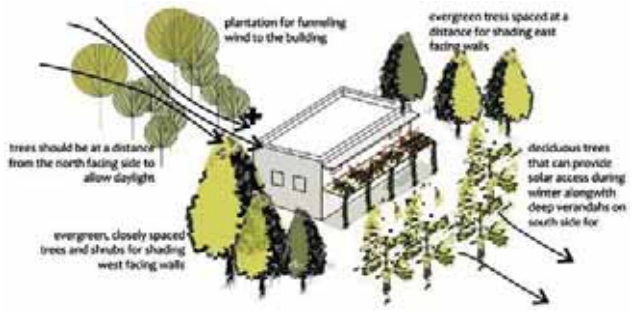
Passive house design

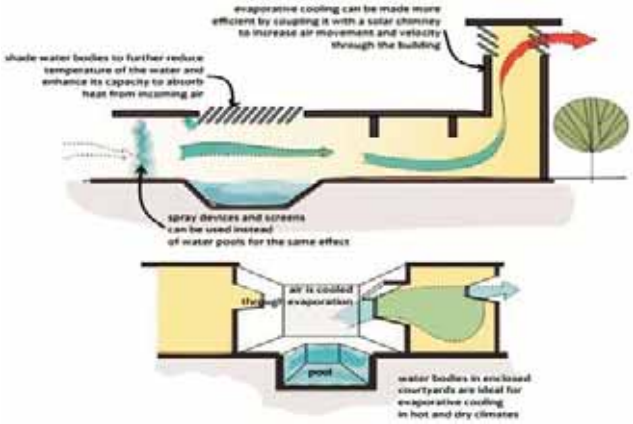
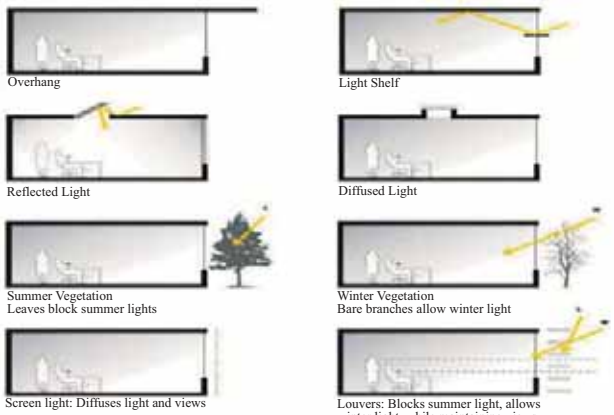
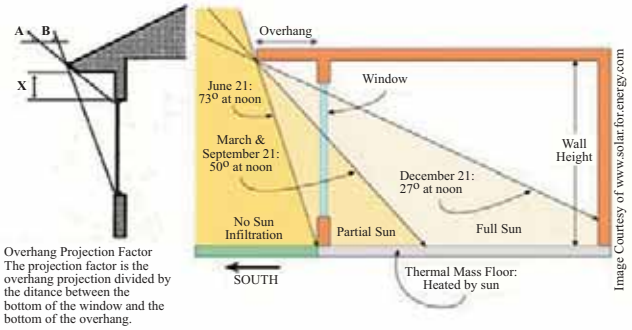
Passive house design principles revolve around the coordination of energy-related components to formulate design concepts and ultimate functions. The results are mostly taken into the building envelope by simple geometries fulfilling the passive requisite either heating or cooling depending on the requirement of site. Ultimately ensuring the appropriate level of comfort for the users (Gonzalo and Vallentin, 2014).

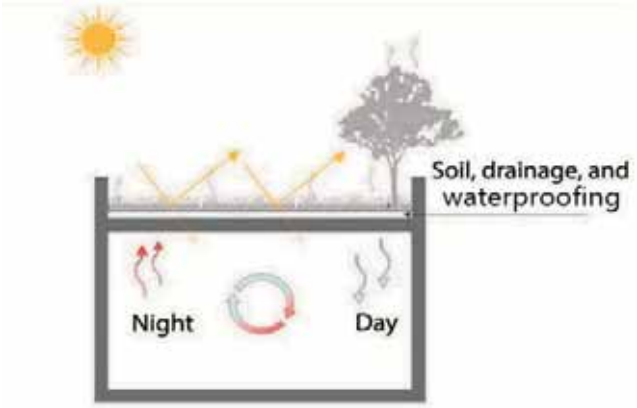
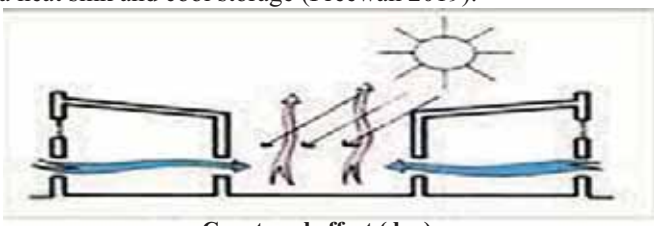
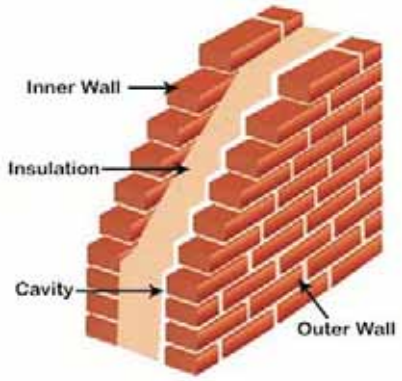
The building envelope contributes significantly in achieving thermal comfort through solar shading and orientation, controlling solar heat gains. Proper remodification, strategies and techniques application lower energy cost and promote sustainability (Mujahid et al., 2022). Moreover, to make good use of the wind in hot, tropical climates, courtyard, wind towers, and cross ventilation are considered where the desired comfort level is achieved in the buildings through stack effects (Malik, 2020). The following table outlines the academic and experimental approaches with examples identifying with different passive design strategies.

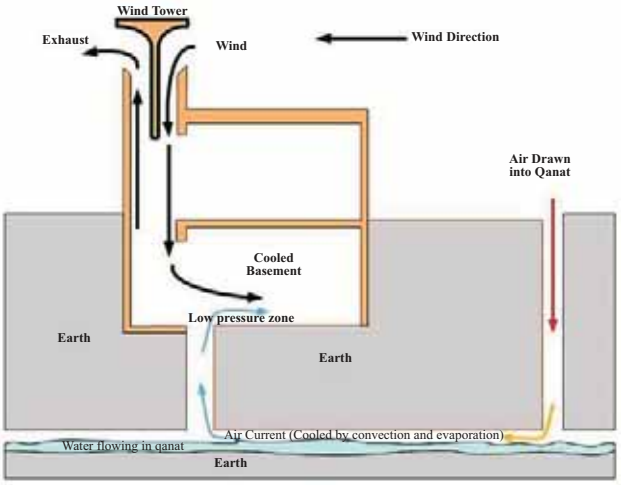
Table-1: Potential Passive Strategies for House Designs.

Strategies	Description	Benefit
Orientation	Orientation is defined as the placement of the building according to the direction of the sun and prevailing winds. The orientation of the building directs the size and location of the opeinings (Altan et al., 2016).  ***Figure-3:*** Building Orientation.	The building should be oriented to maximize winter sun and minimize summer sun (Jones 2004). North-facing windows benefit the most as they suffer the least solar gain. East-west facing is not recommended as they face the direct sun while south windows allow both direct and diffuse radiations (Jones 2004).
Materials	Environment-friendly materials are chosen according to the climatic conditions of the site. While choosing the materials, three properties of color, insulation, and assembly type should be considered, as these properties play a role in heat gain and loss (Altan et al., 2016).	The amount of heat and loss is also affected by the color of the finishing material (Altan et al., 2016).

Strategies	Description	Benefit
Building Shape	The shape of the building, its length, width, and height plays a major role in defining the building's thermal capacity and visual comfort (Altan et al., 2016).  ***Figure-4:*** Building Shape (Jones 2004).	Building block designs can influence wind flow, heat gain & loss, and natural ventilation achieved inside the building.
Landscaping	The use of landscaping helps to enhance or reduce the effect of microclimatic conditions on site. Designing soft and hard landscapes will affect the efficiency of the building. Trees and shrubs play a vital role in directing wind flow, providing shade, and acting as noise barriers (Altan et al., 2016).  ***Figure-5:*** Landscaping (Songa 2021).	Deciduous trees and vines help to reduce the solar heat and glare in reflected light from neighboring structures, water, or ground finishes (Jones, 2004).

Strategies	Description	Benefit
Water bodies	Water bodies are adapted to dry and hot climates. Using waterbodies for temperature reduction is a common method. With the process of evaporation, it gives a cooling effect.  ***Figure-6:*** Waterbodies work as evaporation (Songa, 2021).	Waterbodies help to cool the surrounding space by the removal of latent heat, thus providing cooling.
Daylighting	Daylighting is one of the most used passive strategies. It directs the location and size of the windows and shading devices, which helps to integrate daylight into the building (Jones 2004).  ***Figure-7:*** Daylighting (Ediael, et al., 2019).	If daylighting is designed according to the sun's path while considering its surroundings, it reduces the running cost and internal heat gains. This will also reduce the need for mechanical air conditioning. Daylight allows the natural light to penetrate up to 6 meters inside the window (Altan et al., 2016).
Shading/Louvers	Generally, horizontal shades work better in north and south orientations while vertical shades work better in east and west directions. While the combination of both will be required for harsh sun (Altan et al., 2016).  ***Figure-8:*** Shading (Associates 2016).	Shading is used to reduce heat gains during day and night temperatures. Shading devices do not allow the direct sun to penetrate but rather receive diffuse sun light (Altan et al., 2016).

Strategies	Description	Benefit
Roof garden	Roof gardening is the strategy that ceases solar radiation to reach the building below (Shrikant Pandey 2012).  **Roof garden** ***Figure-9:*** Roof Garden Strategy (Gou and Zhonghua 2018).	Roof garden helps to reduce the stormwater run-off, heat island effect, and CO2 from the atmosphere and maximizes the cooling effect of the building .
Courtyard	Courtyard strategy works to enhance microclimate and act as a heat sink and cool storage (Freewan 2019).  **Courtyard effect (day)**  **Courtyard effect (Night)** ***Figure-10:*** Courtyard Effect (Park, 2015).	Buildings with internal courtyards are solutions for hot climates to provide inner space with cool air and daylight (Freewan 2019).
Cavity Wall	It is the technique of creating a cavity (insulation) between two separate walls. This simple technique helps to work building efficiently.  ***Figure-11:*** Cavity Wall (Patel 2019).	Cavity wall works as a thermal insulator, and sound insulator, does not permit moisture content to penetrate, reduces weight on the foundation, prevent efflorescence, and are cheaper than a solid wall (The Constructor n.d.).

Strategies	Description	Benefit
Basement	At a depth of a few meters, the temperature of the Earth is below ambient temperature, which allows it to serve as a heat sink for basement rooms. The temperature of the Earth is constant, near to comfort zone, which makes this strategy applicable for different climates.  ***Figure-12:*** Cooled Basement.	The basement works best in hot arid climates. This strategy is useful for direct and functional responses. It provides cooler temperatures in summer. As the rooms are connected with Earth, it decreases the heat exchange with the outside temperature (Ahmadreza, 2015).

Analysis and Discussion

Contemporary house designing among architects of Lahore is showing up with a share of innovative experimentation and implementation of the latest technologies including passive strategies and techniques. Among many of the contemporary leading firms in Lahore, two examples have been studied in the research to get an idea of design practices regarding passive strategies. One of these is the architectural firm named, Galleria Design, working on concepts of passive strategies. With the analytical study of some of projects of Galleria design shows that architects have considered courtyard, cross ventilation, and roof garden to minimize the dense climate of Lahore while designing thier projects. With the creative use of such strategies in contemporary houses, clients are now inclined towards passive design techniques (Figure 13).

Another example of residential design is courtesy of Kaswa Design Services shows use of open patios in design and provision of cavity walls (Figure 14).

After reviewing the latest contemporary house design of leading firms, it is evident that clients are now informed and interested to adopt passive design solutions to mitigate the intense heat of Lahore. However, there is still a noticeable gap in their optimal use.

A survey was conducted of experienced architects in the field (Fig.15). The survey questionnaire was based on the idea of awareness of passive strategies among architects and demand of their clients. Identifying strategies that are observed to work better in Lahore's climate, the survey investigated their adaptation and architects' and clients' awareness and perceptions about using these strategies.

Passive design strategies adaptation in Lahore

On average, 35.7% of Lahore's practicing architects are familiar with the term passive design strategies. The graph bars from 1-5 show the lowest to highest scale according to awareness about passive strategies (Figure 16)

According to a survey most of the architects consider passive strategies while designing a contemporary house (refer to Figure 17).

While several architects are working on passive design strategies, the gap in the actual use of passive strategies is noticeable (Figure 18). Architects who are aware of these

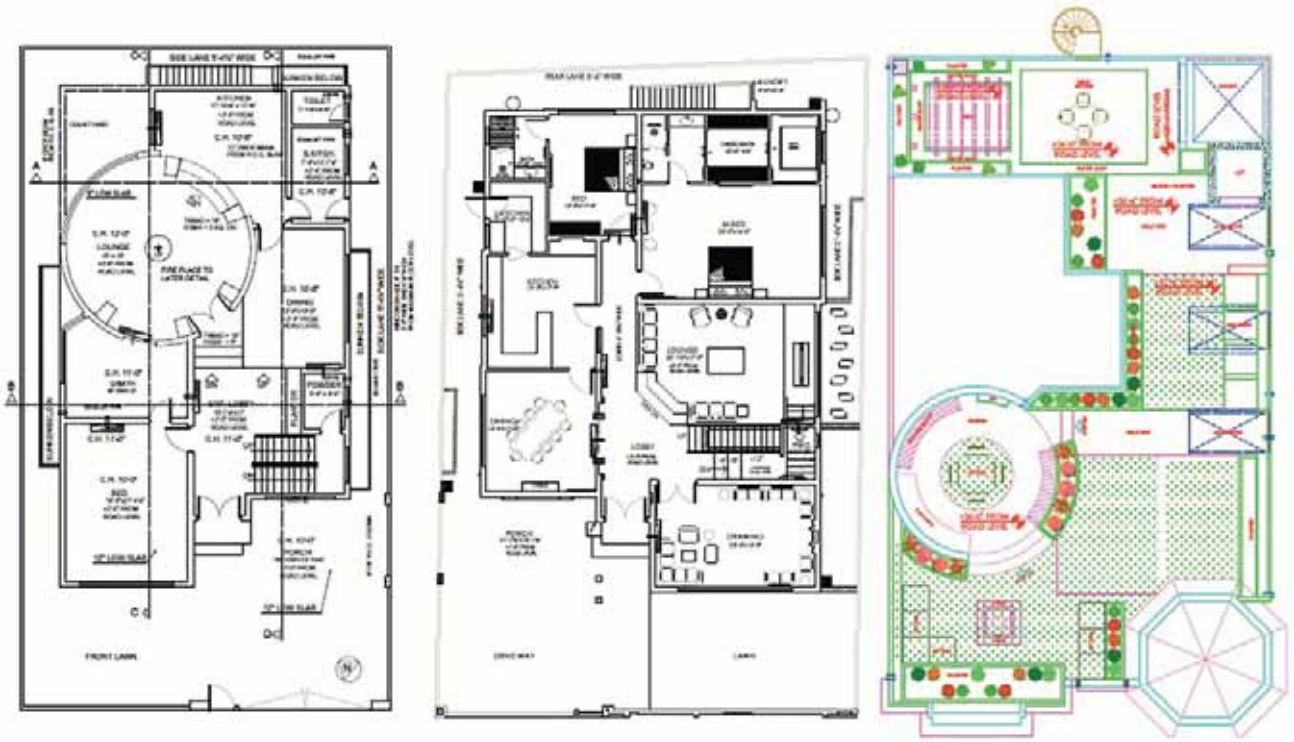


Figure-13: 4500 sq. ft. Area House Designs with Courtyard, Cross Ventilation, and Roof Garden Concepts.
(Source: Galleria Design)

Figure-14: House design with courtyard, cross ventilation, and cavity walls.
Source: Kaswa Design Services.

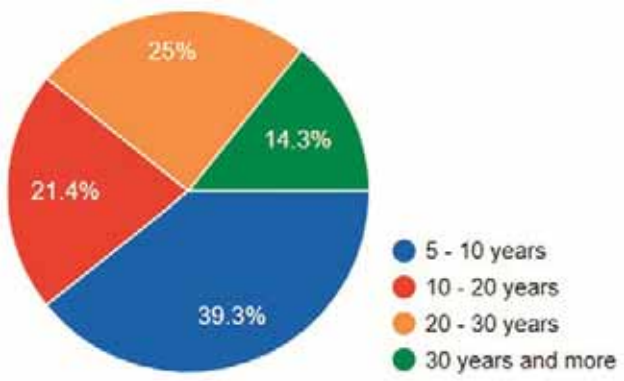


Figure-15: Field Experience.

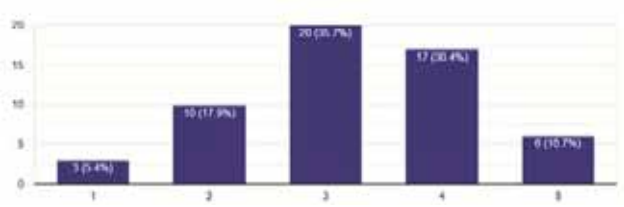


Figure-16: The Fame of Passive Design Strategies Among Practicing Architects of Lahore (1-5 Lowest to Highest).

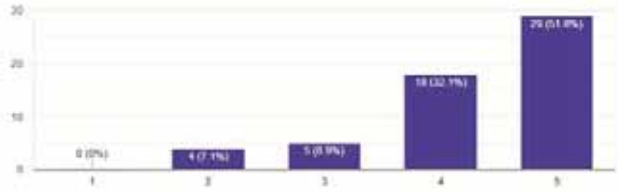


Figure-17: Adopting Passive Design Strategies While Designing a Contemparary House (1-5 Lowest to Highest).

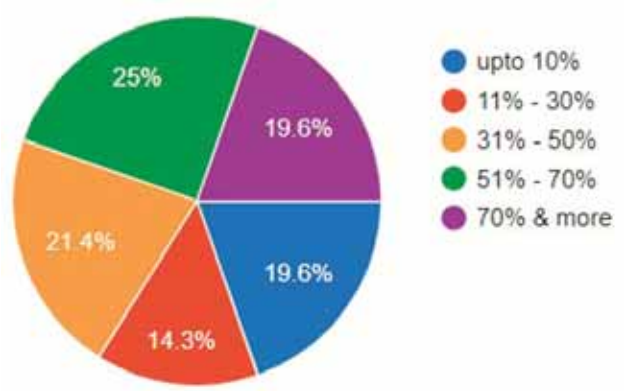


Figure-18: Percentage of Residential Projects based on Passive Strategies.

strategies, are not able to apply them in most of their projects. This is probably because of a lack of awareness among clients. According to the survey, 19.6% architects used passive strategies in only 10% of their projects, while another 19.6% architects have used passive strategies in more than 70% of their projects (Figure 19).

Passive Strategies Preference among Architects of Lahore

Building orientation is the most commonly used strategy by architects in residential projects to channel wind and optimum natural light. Among other well-utilized strategies are use of daylighting, environmentally friendly materials and finishes, landscaping, shading, use of shadows and courtyards (Figure 19).

Given Lahore's climatic conditions, the most workable strategies preferred by architects are orientation of building, use of materials, landscaping, daylighting, shading, and cavity wall. Although, basements are now allowed in residential societies and work best for hot summers and cold winters of Lahore, the use of the basement as a passive strategy is comparatively low. Similarly, waterbodies and building shapes are the lowest on the list of preferences. This is due to the use of large spaces and the high initial cost of these strategies, which makes them less workable (Figure 20).

It is clear from the pie chart that most architects prefer passive strategies due to their efficient working, while cost is the least consideration among architects when choosing the appropriate strategy (Figure 21).

Client Concentration on Passive Strategies

By contrast, survey results revealed that clients have greater preference for active means of ventilation. Social status, comfort parameters and norms are subjected to this, along with perhaps a lack of awareness of efficient passive strategies among clients (Figure 22).

Questions asking architects' opinion about clients brought out the sheer lack of motivation (46.4 percent) for adopting passive strategies, while 37.5% mentioned that clients were neutral about application of passive strategies (Figure 23).

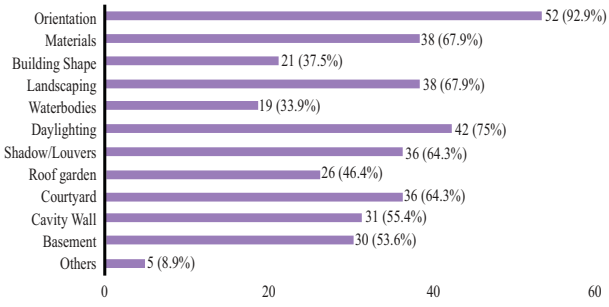


Figure-19: Familiar Passive Strategies Among Architects.

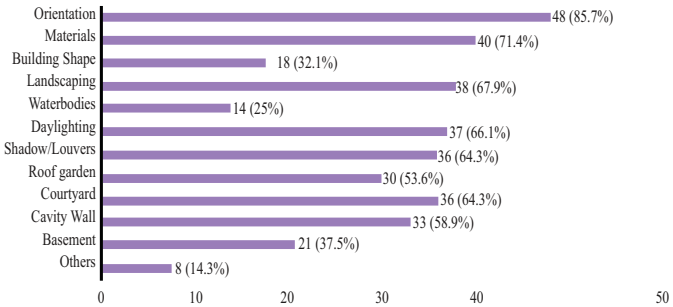


Figure-20: Strategies Preferred by Architects According to Lahore Climatic Conditions.

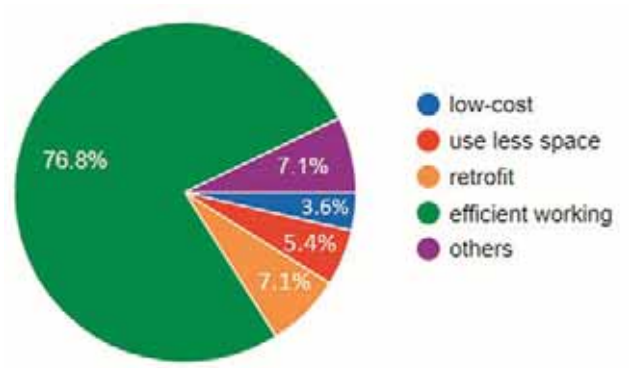


Figure-21: Preference of Specific Strategy by the Architects.

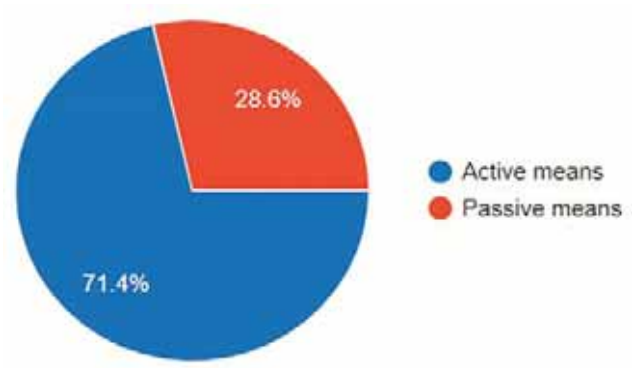


Figure-22: Client's Focus on the Ventilation System.

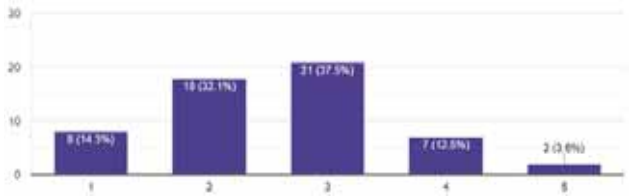


Figure-23: Client's Motivation for the Adaptation of Passive Strategies (1-5 Lowest to Highest Scale).

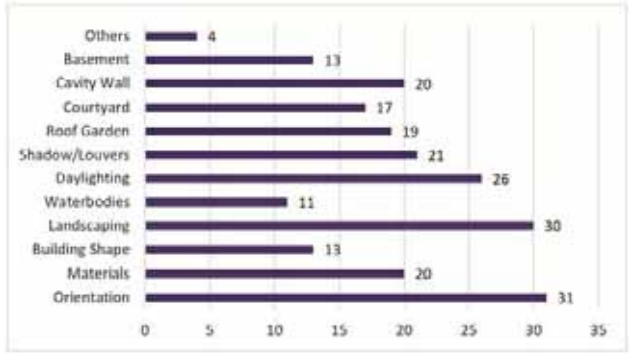


Figure-24: Familiar Strategies Among Clients.

While clients are familiar with passive strategies such as orientation, landscaping, daylighting, and use of basement, the most preferred strategies included orientation, landscaping, use of daylighting, louvers for shadow and cavity walls (refer to figure 24).

Clients prefer the above strategies because of their efficient working and consider the installation's cost effective and other minor factors (see figure 25).

FINDINGS

Out of 60 responses, 40% architects had experience of more than 30 years in their field. The first part of survey outlines adaptation of passive strategies among architects. Survey shows that while architects are much aware of benefits of adopting of such strategies but not all architects are able to use these in all of their projects. Only 19.6% of the architects have applied these strategies in more than 70% of their projects.

Considering the climate of Lahore and effective workability of the strategies, most architects preferred building orientation, shading, cavity wall, daylighting and landscaping in their projects. For study about clients demand, only 21% of architects believe that clients have basic knowledge of common passive strategies. Thus, 71% architects pointed that client demand for active ventilation over passive means.

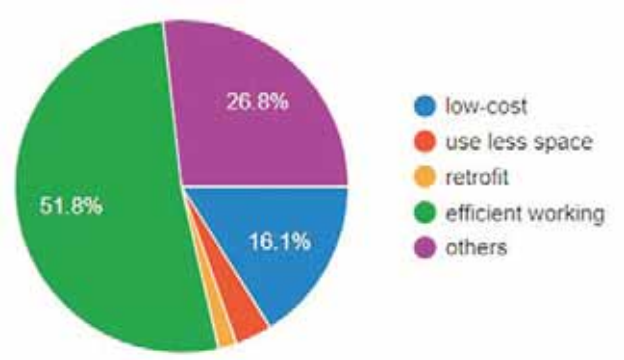


Figure-25: Reason for the Preference Above Strategies.

CONCLUSION

This research contributes to existing body of knowledge by exploring the adaptation and awareness of passive design strategies in contemporary houses in Lahore. The research focuses on the current state of adaptation of passive strategies. By analyzing built residential designs, the research also points out practices being adopted in architectural projects. Findings from the study addresses an important gap between academic and practice knowledge, as it aims to highlight the level of awareness for use of passive strategies among clients. This research supports the hypothesis that there is a major need to impart and inculcate awareness among clients. By identifying the barrier, this study promotes the use of passive strategies in residential architecture of Lahore and similar climatic regions in the country.

The survey results depict the contrasting component of awareness and adaptation among clients and architects in contemporary residential architecture in Lahore, Pakistan. Most architects are knowledgable about the benefits of passive strategies and prefer to use these in residential projects. However, most of the client's knowledge is somewhat limited to adaptation of orientation and building shape and they prefer to use active means rather than passive and focus to have a trendy house design over adapting passive strategies. This also becomes the reason that only 20% of the architects have worked on more than 70% of their projects with passive strategies. Among adapted strategies, building orientation is preferred by most architects for Lahore's climatic conditions. Other strategies used by architects are landscaping, daylighting, cavity wall, and the use of environment-friendly materials. According to the survey building shape and waterbodies are the least preferred strategies by architects. Although Lahore's hot and dry summers can work well for evaporation, however the addition of waterbodies would take up a large area and is comparatively costly, thus making it least preferable. This paper concludes that architects are aware of passive strategies and try to adopt them in their designs. With time, the relation of architects and clients are evolving in better terms. Now, while clients seem positive to adopt passive strategies due to the climatic condition of Lahore, but their knowledge and awareness of adaptation require endorsement to encourage the acceptance of climate-responsive designs and sustainable environments.

ACKNOWLEDGEMENT

As authors, we want to acknowledge the support and assistance provided by Galleria Design and Kaswa Design Services in facilitating our research process by sharing their designs. Our gratitude to all those architects who gave their valuable time to respond the questionnaire. Their contributions have been invaluable in ensuring the smooth execution of our study.

REFERENCES

Abuseif, M., Gou, Z., 2018. A review of roofing methods: Construction features, heat reduction, payback period and climatic responsiveness. *Energies*, 11(11), p.3196.

Aderonmu, P., Adesipo, A., Erebor, E., Adeniji, A., Ediae, O., 2019, November. Assessment of daylighting designs in the selected museums of South-West Nigeria: a focus on the integrated relevant energy efficiency features. In *IOP Conference Series: Materials Science and Engineering* (Vol. 640, No. 1, p. 012034). IOP Publishing.

Ahmadreza, F., 2015. Basements of vernacular earth dwellings in Iran: prominent passive cooling systems or only storage spaces? *International Journal of Urban Sustainable Development*, June, 7(2), pp. 232-244.

Altan, H., Hajibandeh, M., Tabet Aoul, K. A., Deep, A. 2016. Passive design. In Springer Tracts in Civil Engineering (pp. 209–236). Springer. https://doi.org/10.1007/978-3-319-31967-4_8

Anon., n.d. The Constructor. [Online] Available at: heconstructor.org/structural-engg/cavity-walls-construction-advantages/14000/#:~:text=Advantages%20of%20Cavity%20Walls,-Ad&text=Cavity%20walls%20give%20better%20thermal,are%20cheaper%20than%20solid%20walls.

Anon., n.d. What are Passive Design Strategies?. [Online] Available at: https://www.re-thinkingthefuture.com/sustainable-architecture/a3992-what-are-passive-design-strategies/

Associates, D. P., 2016. Sun Control And Shading Devices. [Online] Available at: https://www.wbdg.org/resources/sun-control-and-shading-devices

Dietrich, U., Garcia Rios, L., 2018. Passive adaptive strategies for the optimisation of comfort and energy demand in traditional and contemporary buildings in hot, humid climates. In *WIT Transactions on Ecology and the Environment* (pp. 39-49). WIT Press.

Eley, C., 1998. Passive solar design strategies: guidelines for home building. San Francisco, California, Passive Solar Industries Council, National Renewable Energy Laboratory.

Freewan, A.A., 2019. Advances in passive cooling design: an integrated design approach. In Zero and Net *Zero Energy. Intech* Open.

Gonzalo, R., Vallentin, R., 2014. Passive House Design: Planning and design of energy-efficient buildings. (No Title).

Jones, P., 2004. Energy efficiency in buildings.

Lee, M.S., Park, Y., 2015. The Courtyard as a Microcosm of Everyday Life and Social Interaction. *Architectural research*, *17*(2), pp.65-74.

Malik, A. M., Awan, M.Y., Gulzar, S., Ahmed, A., Rashid, M., 2020. Passive Techniques Analysis of Residential Buildings for Energy Efficient Modern Residences in Lahore. *Technical Journal of University of Engineering & Technology Taxila*, *25*(3).

Malik, A.M., Awan, M.Y., Gulzar, S., Haroon, F., Rashid, M., 2020. Redefined energy efficient strategies to achieve thermal comfort in contemporary houses in Lahore, Pakistan. *Technical Journal*, *25*(01), pp.1-7.

Mujahid, B., Jamil, F., Khilat, F., 2022. Energy Conservation Potential of Building Envelope: A Simulation based Comparative Analysis for Residential Buildings of Lahore, Pakistan. *Journal of Development and Social Sciences*, *3*(3), pp.342-350. Nugroho, A. M., Citraningrum, A., Iyati, W., Ahmad, M.H., 2020. Courtyard as tropical hot humid passive design strategy: Case study of Indonesian contemporary houses in surabaya Indonesia. *Journal of Design and Built Environment*, 20(2), pp.1-12.

Pardalos, P.M., Du, D.Z., Birge, J., Floudas, C.A., Giannessi, F., Sherali, H.D., Terlaky, T., Ye, Y., 2013. *Springer Optimization and Its Applications*. New York, NY: Springer.Pandey,

Patel, M., 2019. *Cavity Wall: Its Purpose, Advantages & Disadvantages.* [Online] Available at: https://gharpedia.com/blog/cavity-wall-advantages-and-disadvantages/

Saeed, F., Ahmed, S.T., Butt, A.Q., 2013. Simulation of electricity consumption for newly built residential buildings in Lahore. *J. Res. Archit. Plan*, 14, pp.55-60.

S., Hindoliya, D.A., Mod, R., 2013.Experimental investigation on green roofs over buildings. *International Journal of Low-Carbon Technologies*, *8*(1), pp.37-42.

Song, Y.L., Darani, K.S., Khdair, A.I., Abu-Rumman, G., Kalbasi, R., 2021. A review on conventional passive cooling methods applicable to arid and warm climates considering economic cost and efficiency analysis in resource-based cities. *Energy Reports*, *7*, pp.2784-2820.

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING
Volume 33 Issue 2
ISSN (P) 1728-7715 - ISSN (E) 2519-5050
Journal DOI: www.doi.org/10.53700/jrap_neduet
Issue DOI: www.doi.org/10.53700/jrap3322023

APPRAISAL OF GREEN BUILDINGS RATING SYSTEMS: FOCUS ON RELEVANT PARAMETRICS FOR ACHIEVING SUSTAINABLE DEVELOPMENTS IN NIGERIA

E. M. Erebor,* F. M. Adedire, S. J. Chen*****

Article DOI:
www.doi.org/10.53700/jrap3322023_4

Article Citation:

Erebor E. M., et al., 2023, Appaisal of Green Buildings Rating Systems: Focus on Relevant Parameterics for Achieving Sustainable Developments in Nigeria, *Journal of Research in Architecture & Planning*, 33(2). 47-61.

* Emokpae Murphy Erebor, Lecturer, Department of Architecture, Ajayi Crowther University Oyo State, Nigeria.
emokpaee@yahoo.com

** Funmilayo Mokunfayo Adedire, Associate Professor, Department of Architecture, Lead City University Ibadan, Oyo State Nigeria.
funmidire@gmail.com

*** Sonter John Chen, Lecturer, Department of Architecture, Federal University of Technology, Minna, Niger State Nigeria.
sontochen@gmail.com

ABSTRACT

Green rating systems for buildings are standardized measuring systems that quantify different buildings' sustainability levels. These have been proven to enhance the adoption of design methods that are less harmful to the environment, thereby making buildings environmentally, socially and economically viable in the long run. For any building to qualify as green certified, six crucial criteria need to be met, including the use of energy effectively, water use, sustainable sites, effective use of resources, operations while occupied resulting in its associated repair works while also considering the comfort levels of the building occupants. Several reasons might be responsible for non-availability of green building standards in Nigeria, including knowledge levels of the stated standards, an absence of regulatory policies, and an absence of clear certification standards in the country. The study seeks to identify green rating systems currently being used to access buildings globally and their current use in Nigerian building industry space assessment. This study aims to understand critical variables lacking towards attaining green building standards and certification of Nigerian houses. The study will also identify the use of an existing rating system in certifying a green building in Nigeria to highlight the levels of sustainability attained by the building and propose actions of improvements that will make green building ratings systems the norm while putting up a building to serve the various functions assigned in the Nigerian building construction space. A comprehensive literature review using search engines like Researchgate, Scopus and Google Scholar and articles found useful for the research spanning from 2008 to 2023 were included in study. The advantage of this study is that it serves as a reference for policymakers to effectively develop a green building policy for Nigeria. Secondly, it draws attention to building regulatory bodies for enforcing greening compliance building standards implementation within projects domiciled in the built environment. It also highlights advantages associated in terms of revenue generation for the respective bodies through payments for green rating systems applications in building construction projects. Thus, green building rating systems can increase sustainability levels of construction projects in the Nigerian built environment.

Keywords: Green, Buildings, Rating, Systems, Built, Environment, Nigeria

INTRODUCTION

Building construction significantly improves the quality of life of man and his household while addressing his societal needs and associated significant environmental challenges. Construction activities contribute 40% of powering and functional activities, 30% of harmful gas pollutants, and 17% of freshwater consumption (Li, et al., 2023). As a result of climate change and associated risks directly linked to the built environment affecting humanity at large scale, it has become expedient to find alternative solutions to environmentally friendly design and construction techniques at addressing these challenges (Michael, 2013). The author further believes that while these unique solutions have been adopted worldwide, Nigeria has not been left out of these adverse climatic conditions that have threatened to harm

the built environment globally. Therefore, building green and applying technologies associated with green standards and rating systems have been recognised as cutting-edge solutions to combat these issues. With its Green Building Councils, Europe has become a global leader in reducing wastages associated with building construction, thereby striving for net-zero resource usage (Anzagira, Duah, and Badu 2022).

However, adopting green building rating systems with their associated technology within less developed economies faces barriers related to both country-specific factors related to design and construction (Akcay 2023). These challenges have led to a call for a shift away from carbon-intensive construction techniques towards more environmentally friendly approaches (He, et al. 2018). Green buildings meet specific performance requirements while minimizing disruptions and providing ecological benefits (Li et al. 2023). These buildings often earn certifications through Green Building Rating Systems (GBRS) (Chaldy, et al. 2023). Governments worldwide promote green buildings for their sustainable use of materials and natural resources, enhanced living conditions for occupants, and environmental benefits (Li, et al., 2023).

Green buildings offer various advantages, including lower development and operating costs, increased user comfort, improved indoor air quality, enhanced durability, and reduced maintenance expenses (Zafar, 2017). They also contribute to resource efficiency and minimize environmental impacts. One essential tool for managing and measuring a building's green compliance level and success depends on its ability to comply with existing standards as set out by a green building rating system (GBRS) (Akinyemi, et al., 2017). This rating system provides a structured framework to monitor and enhance sustainability in construction. In South Africa, green buildings have great value for their economic benefits, such as reduced energy costs and recognition by industry rating systems (Sanboskani, et at., 2022). Standardised compliance systems associated with the greenness of a building's compliance levels relating to its environmental impact on the built environment qualitatively assess the structure's sustainability compliance level with the surrounding built environment. (Weerakoon, et al., 2023). They help inform assessors about a building's eco-friendliness and the extent of green features incorporated in its design and construction (Shan and Hwang 2018). These rating systems express a building's sustainability attributes (Ampratwum, et al. 2021).

Establishing a regulatory body that regulates green buildings within the practising environment is the first step in enforcing a building's greenness compliance levels with standardised systems, yardsticks and scaling techniques. (Akinyemi et al. 2017). These non-profit organizations shape tools to objectively rate a building's performance regarding ecology, environment, and spatial surroundings. Therefore, these already established greening tools (Building Research Establishment Environmental Assessment Methodology) domiciled in the U.K., and (Leadership in Energy and Environmental Design) in the US, emerged in the 1990s to promote sustainability in construction (Nduka and Sotunbo 2014). These systems provide scores for buildings' environmental performance, facilitating comparisons between different structures. Despite the growing awareness of the importance of measuring a building's greenness level in the Nigerian built environment by construction industry professionals, it still needs an effective green building rating system. This gap prevents buildings in Nigeria from being rated using established systems like LEED and BREEAM. Therefore, the research objectives highlight knowledge of greening tools in Nigeria's construction industry and identify the greening tools currently used by Nigerian construction stakeholders to achieve a robust, sustainable built environment for the Nigerian built Environment space. Additionally, the study aims to examine an existing green building in Nigeria certified by an established adopted green building rating system.

LITERATURE REVIEW

Green Building Drivers in the African Built Environment

Many vital drivers exist towards implementing green buildings in the built environment towards reducing carbon dioxide emissions into the environment, but Windapo (2014) defines a construction projects greenness level as those projects which have been subjected to a certified green rating system and therefore qualify it for an approved certification while also further noting that this is quite a new concept in Africa. The author then identifies the drivers of green buildings as two arguments: mainly due to preserving the environment and the ecology within its immediate environment and secondly due to economic factors which have seen the need to reconsider the cost of running buildings, providing financial savings and competitive advantages. According to Atanda and Olukoya (2019), the Nigerian built environment at both the urban and rural settings are faced with diverse challenges that range from urban sprawl, slum and squatter developments, land air and water pollution, flooding and erosion all contributing to serious environmental, economic and social challenges necessitating the need for a green building rating system to combat these challenges.

A recently conducted Southern African study on the advantages of building green, which is still in its infancy stage (Simpeh and Underwood 2018), has identified several advantages of these types of construction developments. These have been categorized as environmental, financial, economic, and social benefits, meaning that the buildings are comfortable for the occupants, healthy and aesthetically pleasing. In addition, these types of buildings are said to have market and industry benefits, opportunities for research and development in the green building field, advantages for collecting more tax revenue for the government from construction stakeholders for going green and climate-change-related benefits.

The Concept of a Buildings Greenness and Their Rating Systems in Construction Projects

Critical deficiencies identified by King (2008) in the greenness and sustainable development assessment of structures while embarking on construction deliverables is that the assessment process goes far beyond the design stage of a project. It is believed that this can be improved if the selection of more environmentally friendly designs are considered during the project appraisal stage. The author further suggests that as a rule of thumb, environmental issues regarding a project may be classified as principal and addressed earlier in project conceptualization phase, thereby mitigating adverse consequences that construction projects pose to the built environment as environmental hazard. Secondly and of significant importance is the possibility of using natural resources during the building construction phase and, finally, emphasizing reductions in remediation techniques and associated costs. Buildings consume much energy while using available resources in the built environment during construction. They are also major emitters of CO2 into the atmosphere, causing significant environmental risks and also causing unhealthy indoor quality to building occupants and the planet at large (Cascone, 2023). Thus among the numerous advantages of designing and constructing green buildings are the fulfilment of the essential elements of comfort and enhancing the health of the users (Purwaningsih, et al., 2018). While there is a lot of information on building green, there has been limited attention paid to using these environmentally friendly building construction techniques by construction stakeholders in the field of associated use of these construction techniques, which enhances sustainability in the long run. This, therefore, is responsible for the lack of adequate information on this current construction technique available in the body of knowledge regarding green design in less developed economies of the world.

Green buildings, according to Chen, et al. (2023) are considered buildings that offer their occupants more significant health benefits while also applying principles that emphasize their ecological balance which reduce environmental impacts on the immediate vicinity of the building construction site. This improves the productivity of the society in which the building is domiciled. Traditional buildings have been observed to have environmental issues associated with them while also consuming a lot of energy, causing a lot of environmental pollution and further leading to wastage of resources believed to be the dangers associated with these kinds of buildings, according to Wu, et al. (2023). Before the advent of a green building rating system, Song, et al. (2023) identified three milestones that initiated the establishment of this standard evaluation with the third being the most important. The authors identified this as a milestone discovery in winning the noble peace prize in 2007, acknowledging the influence of humans regarding climate change issues, the value of green building and their greenness levels for the construction stakeholder and the buildings occupants. Therefore, it is suggested that a green building evaluation system, which will be based on the building's physical framework, be constructed to achieve energy savings and consumption. Environmental challenges associated with high energy consumption levels of buildings have formed the bedrock in applying standard rating systems in construction projects worldwide (Nocerino & Leone 2023). These standards, which are used in measuring a construction projects sustainability by an assessment criteria is suitable for the purpose and encourages an adoption system of environmentally, socially and economically sustainable practices in three phases associated with the development of a construction project (design of the project, constructing the project and eventually demolition the building when its useful life has been exceeded) and therefore being a precious tool in assessing and guiding the construction industry towards becoming greener and environmentally friendlier (Marchi, et al., 2021).

Assessment tools in the view of Akhanova, et al. (2019) attempt to improve building functional performance systems while also aiding in decreasing the environmental burdens associated with buildings. Other deliverables are estimating the building's environmental influence, thereby objectively assessing and evaluating the building's development during construction. As a result of measuring the environmental friendliness of buildings and other associated deliverables, a measurement that meets a certified standard is necessary in guiding the ways buildings are rated (Purwaningsih et al. 2018). Further fall outs of these are the recommendations

by the authors that greening tools are required for its measuring in buildings. Therefore, existence of a wide range of institutions and standards for greening in buildings abound and these include the British greening tools BREEAM, the American greening tool-LEED, the Australian greening tools NABERS and GREEN STAR, and GREEN MARK which is widely used in Singapore. These rating systems mostly target critical criteria including passive design aspects, energy efficiency, life cycle assessment, incorporation of renewable energy systems and site planning, which Chodnekar, Yadav & Chaturvedi (2021) approve are well highlighted in most of the countries rating systems. In addition, the authors agree that wlmer worldwide, most countries are using international and nationally developed greening tools, it is noted that using these different tools depends on variant climatic conditions in each clime, building typologies and the respective economic and social priorities. Thus there is no one best fit all system for a particular climatic region.

Greenness Levels and Compliance Standards of Buildings in Nigeria

In order to achieve compliance levels of sustainable development by the building construction sector in developed and developing economies, it has been suggested that there are four basic actions that need to be taken by both governments and the private sector (Umar, et al., 2013). These are in the form of regulations, education and training programs, financial incentives and measures to changing market demands. It is the belief of construction stakeholders that the end state of the building sector is to ensure that the construction market demands for buildings that are high performance and sustainable. Developmental strides at enhancing standardization practices of green building developments and standard assessment tools within the Nigerian context need to be improved, which Akhanova et al. (2021) suggest are because there is no standard rating tool for use in the Nigerian Built Environment. The authors further allude to the fact that buildings also consume a lot of natural resources that harm the environment, which they statistically present as consuming 70% of cementitious materials and 25% of steel and virgin wood. In many developing countries and economies of the world, it is believed that there exist measures and practices developed to support sustainability and the greenness initiatives of buildings that has been in existence for quite some time now, but there have been many impeding factors that have been responsible for the slow advances in these societies as compared to global advances (Karaca, et al. 2020). Green buildings as a concept and development process started around 1960s during the world energy crisis which Zhang, et al. (2019) attributed to the reasons that spurred research into energy efficiency and decrease of environmental pollution and further led to the introduction of environmentally friendly building construction practices by construction stakeholders. Green buildings and their systems of ratings emerged in building construction projects in 1990 with the introduction of BREEAM and by 2010, 382 types of greening tools softwares worldwide were already available (Khan, et al. 2019). Such rating systems, in the long run, have the advantage of using tools in assessing a building's green aspects or sustainability attributes, thereby being able to establish building greenness compliance level based on the total points obtained during assessment criteria in the long run (Prabhakar, et al., 2023). These became an effective way of monitoring and enhancing the building's roles in reducing their environmental effects. This becomes necessary in developing economies due mainly to social, economic and environmental issues associated with neglecting these key strategies (Ali and Nsairat 2009).

As the upsurge in the attainment of green buildings in the built environment has continued to gain relevance, most developing and developed economies have adopted this all-encompassing phenomenon of a building greenness level, and Nigeria is also compliant with this (Nduka and Sotunbo 2014). The authors further highlight the need for facing the current challenges in the Nigerian region, like evolving performance standards evolvement of codes and standards at mitigating and developing the built environment. Nigerian enforcement agencies' in government have established laws like the Federal Environmental Protection Agency Act (1988), Policies on regulating the Nigerian Built Environment (1989) and the Environmental Impact Assessment Act of (1992). In addition, the authors highlight the influence that professional bodies and private organizations in Nigeria have contributed to this discussion through the establishment of the Greening Council of Nigeria with affiliation with the World Green Building Council.

This newly developed Green Building Council of Nigeria, according to the authors is yet to produce a rating tool, which has necessitated the willingness of the Green Building Council of South Africa (GBCSA) to allow a rating system in Nigerian Buildings known as the Green Star SA (South Africa) adoption pending using greening tools in the Nigerian construction industry in accessing building construction projects.

Advantages of Greenness Levels and Compliance Standards of Buildings in Sub-Saharan Africa

Bernardi, et al. (2017) highlight that Rachel Carson's book titled Silent Spring (1962) gave birth to the discussion on the harmful activities of humans on the environment, which gave rise to the current environmental movement the world over. Climate change repercussions and adverse effects are predicted to be experienced in different ways in Sub-Saharan Africa through both Natural and Human systems. These point to a warming trend most observable in the inland subtropics, with increases in temperatures being estimated at (4 Degrees) warming scenarios (Serdeczny, et al. 2017). Nigeria, despite being the largest economy in Sub-Saharan Africa, has faced challenges in the introduction and creation of an effective rating system. This can ensure that buildings are not only environmentally friendly but enhance comfort levels of building occupants (Olawunmi, et al. 2020). Therefore, it is essential to submit that greening tools are applied in determining the environmental damages buildings cause to the built environment, including urban projects and provisions of infrastructural facilities (Bernardi et al. 2017). Greening tools and software are currently applied in construction projects in Sub-Saharan Africa as an effective performance evaluation system ranging from civil works to infrastructural projects that have been embarked upon (Olawunmi et al. 2020).

The Council for the Regulation of Green Buildings in Nigeria

Nigeria has recently established a council for the regulation of green buildings. It is non-governmental, formed around 2011, with its primary mandate for advocating, educating, and setting greenness compliance levels of construction projects in the Nigerian built environment space. As an advocacy based organization, it is the voice of Nigeria's green building sector by catalyzing a positive change in the Nigerian Built Environment through direct engagement with the building construction stakeholders. On the other side, as an educational enhancement group on deficiencies regarding issues related to green buildings and enhanced built environments that are free of greenhouse gases and carbon dioxide emissions, the Green Building Council of Nigeria bridges this gap by organizing seminars and courses while also developing standards in delivering greenness within built environments. Thirdly, part of their mandate is establishing local greening tools for evaluating building construction projects which, in the long run, will guide developers, professionals and building construction stakeholders. Finally, the Green Building Council of Nigeria's certification system provides designers and developers with recognition of the greenness of their designs/buildings. Also, it offers products endorsement to vendors and manufacturers on the sustainability of their products.

RESEARCH METHODOLOGY

In embarking on the study, it was essential to systematically analyze secondary data obtained from existing literature from forty-five relevant articles through detailed content analysis from journal and conference articles obtained from Google Scholar, Semantics, and Scopus covering the period from 2008 to 2023.

Search for Publications

Information relevant to the study's key themes was obtained from the secondary database, which focused on the existing green building rating systems. For ethical reasons, the data was inspected thoroughly, categorized and synthesized for semantic reasons. In achieving this scientific review, the articles selected were the most relevant to the study's area of focus. These were Greening tools applications in Africa, the concept of greening and ratings systems in construction projects, the emergence of greening tools in Nigerian the advantages of greening tools in sub-Saharan Africa and the emergence of regulatory institutions and bodies and the application of the South African greening tools system, Green Star South Africa Rating tool for use in Nigeria and LEED certified buildings in Nigeria.

Selection Criterion

A thorough method of intensive exclusion and inclusion techniques enabled the researcher to remove all irrelevant data and concentrate on critical parameters associated with green buildings, green rating tools, climate change, and environmental impacts. The findings identified advantages and disadvantages associated with the programs and policies targeted at Green Building Rating Systems and their implementation in Nigeria. These were thoroughly evaluated to crystallize key findings as highlighed in Figure 1.

Data Analysis

As this was a qualitative study, all data were presented by content analysis structured design. These were done in order to identify the current gaps existing in the compliance levels of buildings and their greenness standards within the construction industry in Nigeria and the adopted strategies established for implementation.

Table-1: Green Star SA Category Weighting System for Use in Nigeria.
Source: South African Greening Tool for Implementation in the Nigerian Building Space 2014.

Credit No.	**Management**	**Scores**
MAN-1	South African manpower attendant	2
MAN-2	Applications during commissioning of the project	2
MAN-3	Deliverables	2
MAN-4	Third party input	1
MAN-5	Manual	1
MAN-6	Environment and associated deliverables	2
MAN-7	Wastes	3
MAN-8	Compliance with tightness of the structure	
MAN-9	Recycle- retail	
MAN-10	Man-10: managements and systems – retail & peb	1
MAN-11	Green lease - retail	
MAN-12	Compliance rules – multiple units residential	
MAN-13	Learning resources - peb	1
MAN-14	Life cycle costing - peb	1
MAN-15	Maintainability - peb	1
	Total	**17**
Credit No.	**Indoor Environmental Quality**	
IEQ-1	Rates of ventilation movement	2
IEQ-2	Change in air movement	
IEQ-3	CO2 compliance	1
IEQ-4	Daylighting	3
IEQ-5	Glares during daylighting	1
IEQ-6	Ballast	
IEQ-7	Lightings	1
IEQ-8	Building facades	2
IEQ-9	Temperature comfortability levels	2
IEQ-10	Building occupants comfortability	
IEQ-11	Materials that cause harm	1
IEQ-12	Acoustics	3
IEQ-13	Dangerous compounds	3
IEQ-14	Harmful organic compounds reductions	1
IEQ-15	Dryness levels	1
IEQ-16	Tenants exhausts and risers	1
IEQ-17	No Smoking	
IEQ-18	Places of respite and recreation – retail	
IEQ-19	space and outdoors for privacy- multiple units residential	
IEQ-22	universal access - multi unit res	
IEQ-23	stairs - peb	1
	Total	**23**
Credit No.	**Energy**	
ENE-0	CRs	0
ENE-1	GHEs	20
ENE-2	Metering's	3
ENE-3	LPD	
ENE-4	Lightings and Zonings	2
ENE-5	PEBs	3
ENE-6	Metrerings - RETAIL	
ENE-7	Heated Water - MULTIPLE UNITS RESIDENTIAL	
ENE-8	Usage of Energy - MULTIPLE UNITS RESIDENTIAL	
ENE-9	LEEG- MULTIPLE UNITS RESIDENTIAL	
ENE-10	EEAs - MULTIPLE UNITS RESIDENTIAL	
ENE-11	Unoccupied Spaces - PEB	2
	Total	**30**

Credit No.	Transport	Scores
TRA-1	Parking Provision	2
TRA-2	Transportation and Fuel Efficiency	2
TRA-3	Cycling Provision	3
TRA-4	Transportation for users	5
TRA-5	Accessibility Locally	2
TRA-6	Trip Reduction – Mixed Use – RETAIL	
TRA-7	VOEs– RETAIL & PEB	2
	Total	**16**
Credit No.	**Water**	
WAT-1	Occupant Amenity Water / WAT-1: Potable - PEB	12
WAT-2	Metering's for water usage	3
WAT-3	Watering of Landscaping	
WAT-4	Heat Rejection Water	
WAT-5	Consumption of water for fire emergncies	
WAT-7	Potable Water Efficient Appliances - MULTI UNIT RES	
WAT-8	Swimming Pool / Spa Water Efficiency - MULTI UNIT RES	
	Total	**15**
Credit No.	**Materials**	
MAT-1	Recycle	3
MAT-2	Reusability	5
MAT-3	Reusable materials	2
MAT-4	Fit-outs	
MAT-5	Natural concreting	3
MAT-6	Reinforcement	3
MAT-7	PVC minimisation	
MAT-8	Sustainable timber	2
MAT-9	Design for disassembly	1
MAT-10	Dematerialisation	1
MAT-11	Local materials	2
MAT-12	Efficient dwelling size - multi unit res	
MAT-13	Masonry - multi unit res & peb	2
	Total	**24**
Credit No.	**Land Use and Ecology**	
ECO-0	Conditional Requirement	0
ECO-1	Topsoil	1
ECO-2	Reuse of Land	2
ECO-3	Reclaimed Contaminated Land	2
ECO-4	Change of Ecological Value	4
ECO-5	Urban Heat Island – RETAIL	2
ECO-6	Outdoor Communal Facilities - MULTI UNIT RES	
ECO-7	Urban Consolidation - MULTI UNIT RES	
ECO-8	Community Facilities - PEB	1
	Total	**12**

Credit No.	Emissions	Scores
EMI-1	Refrigerants/gaseous ozone depleting potential (odp)	
EMI-2	Refrigerants/gaseous global warming potential (gwp)	
EMI-3	Refrigerant leaks	
EMI-4	Insulant odp	
EMI-5	Watercourse pollution	3
EMI-6	Discharge to sewer	5
EMI-7	Light pollution	1
EMI-8	Legionella	1
EMI-9	Boiler and generator emissions	1
EMI-10	Kitchen exhaust emissions - retail	
EMI-11	Atmospheric deterioration avoidance	1
	Total	**12**
Credit No.	**Innovations**	
INN-1	Innovative Strategies and Technologies	
INN-2	Exceeding Green Star SA Benchmarks	**5**
INN-3	Environmental Design Initiatives	
	Total	**5**

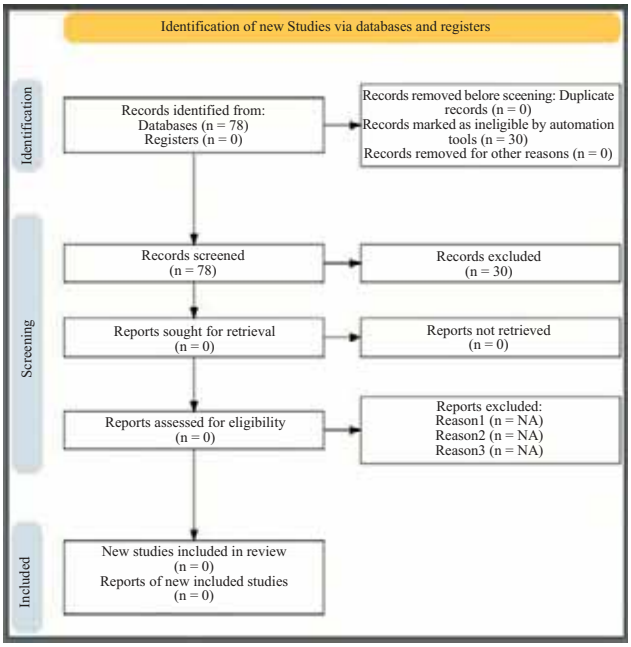


Figure-1: Prisma Template.
Source: https://estech.shinyuapps.io/prisma_flowdiagram/2024.

FINDINGS

Green Star South Africa Rating Tool for use in Nigeria

Efforts were made at implementing a regulatory policy framework for greenness levels of buildings in Nigeria, its environs and city spaces. Shaba and Noir (2014) in their study on the South African greening tool to be used in the Nigerian construction industry highlight that this rating system was used by the Australian Greening Council allowing use in Ghana, South Africa, Mauritius and Namibia. As a result of having an effective greening tool and rating system in the Nigerian built environment, the South African Greening Council is seeking approval from their Australian counterparts to use their adopted rating tool effectively in Nigeria for compliance and monitoring purposes. This they have further achieved by insisting on applying all Green Star SA v1 Design/As Built Rating tools for offices, retail centres, and multi-unit residential, public and educational buildings domiciled within Nigeria and referring to the certification as Green Star SA-Nigeria. This rating tool deals with nine different categories, each with a credit unit attached.

Leadership in Energy and Environmental Design (LEED)

Sustainability-related concerns are urgent issues that need worldwide solutions according to Bisegna, et al., (2018) are believed to have started in 1973 and 1979 when the energy crisis informed man of the dangers of over-relying on nonrenewable energy sources as a means of energy consumption and production. Since then, this has necessitated the concept of global warming, which has further exacerbated the need by several countries to reduce their Greenhouse gas emissions and energy consumption patterns and rates from their building construction projects (Jeong, et al., (2016). Bisegna et al. (2018) In addition, believe that a measure of sustainability is essential when a level of comparison is sought from different and competing alternatives in terms of materials, production, energy resources, and production processes. Green buildings are a

system whereby building construction professionals use and apply energy efficient designs with healthy advantages to building occupants, improving their comfort levels thereby reducing negative impact on environmental conditions within the surroundings (Larson, et al., 2008). In the US, the Green Building Council was formed in 1993, which was an agglomeration of a wide building construction influencers in the private and public spaces with a common interest in addressing the environmental issues related to building construction. Closely related to this was the establishment (LEED) greening tools in 1998, which intended to transform the building market with a system of compliance rules in the development of green buildings. It is also a rating system associated with various construction projects (Roosa 2020). Therefore, the LEED Green Building certification systems limit the energy use of buildings and address the sustainability aspects in construction (Amiri, et al., 2019). LEED is currently the best greening tool that is widely recognized for its versatility and compliance levels, which insists on taking actions that limit the energy consumption levels of buildings, thereby constructing them more sustainably (Amiri, et al., 2021). Rodriguez, et al., (2023) highlight in their research that having greening parameters involves categorizing buildings in a systematic hierarchy. They conclude that the first early building assessment tools like LEED and BREEAM allow for a complete greening assessment of multiple sets of building construction projects. The authors highlight that the two best rating tools in the building industry today comprise BREEAM and LEED, which can be applied to different building construction projects.

Amiri, Ottelin and Sovari (2019) highlight that the LEED rating system currently has five certification types, namely LEED building design and construction, LEED interior design and construction, LEED neighbourhood development, LEED building operations and maintenance and LEED for homes. Building certification levels are based on points

Table-2: Green Rated Buildings in Nigeria.
Source: United States Green Building Council 2023.

S. #	Name of Building	Project Type	Location	Rating
1	The Patheon	New Construction	Lagos, Nigeria	LEED v4
2	African Reinsurance Head office Building	New Construction	Abuja, Nigeria	LEED v4
3	Plot 989 Yedserem Steer Maitama	New Construction	Abuja, Nigeria	LEED v4
4	Our First Home	New Construction	Abuja, Nigeria	LEED v4
5	Karishma C.K. Manufacturing Ltd Factory	New Construction	Ogun State Nigeria	LEED v4
6	Prime City	New Construction	Lagos, Nigeria	LEED v4
7	Olarewaju Bello	New Construction	Lagos, Nigeria	LEED v4
8	World Bank Abuja	New Construction	Abuja, Nigeria	LEED v4
9	Place OC	New Construction	Owo, Ondo, Nigeria	LEED v4.1
10	Mr Emeka Ndu	New Construction	Lagos, Nigeria	LEED v4
11	U.S. Consulate General Lagos	New Construction	Lagos, Nigeria	LEED v4
12	Misa	New Construction	Lagos, Nigeria	LEED v4
13	No4 Bourdilon Street	New Construction	Lagos, Nigeria	LEED v3
14	P&G Nigeria MDO Warehouse	New Construction	Agbara, Ogun Nigeria	LEED v3 Silver
15	AfDB Nigeria Field office	New Construction	Abuja, Nigeria	LEED v3
16	U.S.Embassy Abuja-New Annex	New Construction	Abuja, Nigeria	LEED v3
17	Procter and Gamble Lagos Facility	New Construction	Agbara, Ogun Nigeria	LEED v3
18	Asdsds	New Construction		LEED v3
19	Procter and Gamble Lagos Master Site	New Construction	Lagos, Nigeria	LEED v3
20	1913-Ssa-Nigeria-D&M Base Ph	Existing Buildings	Port Harcourt, Nigeria	LEED v4
21	FDE1911 Blue Base Nigeria	Existing Buildings	Port Harcourt, Nigeria	LEED v4
22	3250-SSA-Nigeria-NTC Camp	Existing Buildings	Port Harcourt, Nigeria	LEED v4
23	AFREXIM Bank-Abuja Regional office	Core and Shell	Abuja, Nigeria	LEED v4
24	Heritage Place	Core and Shell	Lagos, Nigeria	LEED v3
25	Nestoil Tower	Core and Shell	Lagos, Nigeria	LEED v3 Silver
26	bba's Heart Montessori School	Schools	Lagos, Nigeria	LEED v4
27	RFA SH-Classroom South	Schools	Abuja, Nigeria	LEED v3
28	RFA SH-Classroom North	Schools	Abuja, Nigeria	LEED v3
29	Microsoft Nigeria	Commercial Interiors	Lagos, Nigeria	LEED 4 Silver

Table-3: LEED Scorecard Nestoil Corporate Headquarters.
Source: United States Green Building Council 2023.

	Sustainable Sites	**19/28**
SSP1	Control of environmental pollutants	0/0
SSC1	Effective selection of building construction site	1/1
SSC2	Building Density	5/5
SSC3	Brownfield Redevelopment	0/1
SSC4.1	General transportation access	6/6
SSC4.2	Green bicycle storage and changing rooms	2/2
SSC4.3	fuel-efficient vehicles	3/3
SSC4.4	parking	0/2
SSC5.1	Maintenance of the natural habitat	0/1
SSC5.2	open spaces provisions	0/1
SSC6.1	Storm water design -	0/1
SSC6.2	Storm water design -	0/1
SSC7.1	Heat island effect – non-roof	1/1
SSC7.2	Heat island effect - roof	0/1
SSC8	Light pollution reduction	0/1
SSC9	Tenant design and construction guidelines	1/1
	Water Efficiency	**6/10**
WEP1	Efficient use of water	0/0
WEC1	Landscaping and water efficiency	4/4
WEC2	Innovative Wastewater Technologies	0/2
WEC3	Water reuse Reduction	2/4
	Energy And Atmosphere	**15/37**
EAP1	Fundamental commissioning of building energy systems	0/0
EAP2	Minimum energy performance	0/0
EAP3	Fundamental refrigerant management	0/0
EAC1	Optimize energy performance	5/21
EAC2	On-site renewable energy	0/4
EAC3	Enhanced commissioning	0/2
EAC4	Enhanced refrigerant management	2/2
EAC5.1	Measurement and verification - base building	3/3
EAC5.2	Measurement and verification - tenant sub metering	3/3
EAC6	Green power	2/2
	Materials and Resources	**0/13**
MRP1	Storage and collection of recyclables	0/0
MRC1	Building reuse - maintain existing walls, floors and roof	0/5
MRC2	Construction waste management	0/2
MRC3	Materials reuse	0/1
MRC4	Recycled content	0/2
MRC5	Regional materials	0/2
MRC6	Certified wood	0/1
	Indoor Environmental Quality	**4/12**
EQP1	Internal air control quality	0/0
EQP2	No smoking	0/0
EQC1	Outdoor air delivery monitoring	0/1
EQC2	Increased ventilation	1/1
EQC3	Construction IAQ management plan - during construction	1/1
EQC4.1	Less harmful use of materials	0/1
EQC4.2	Less harmful materials usage in terms of paintings and coatings	0/1
EQC4.3	Less harmful materials flooring materials	0/1

EQC4.4	Less harmful composite and agri fibre	0/1
EQC5	Indoor chemical and pollutant source control	0/1
EQC6	Controllability of systems - thermal comfort	0/1
EQC7	Indoor temperature comfort - design	1/1
EQC8.1	Daylight and views - daylight	0/1
EQC8.2	Daylight and views - views	0/1
	Innovation	**2/6**
IDC1	Innovation in design	+1
IDC2	LEED Accredited Professional	+1
	Regional Priority Credits	**4/4**
EAC1	Optimize energy performance	+1
EAC5.2	Measurement and verification - tenant submetering	+1
WEC1	Water efficient landscaping	+1
WEC3	Watter use reduction	+1

Figure-2: Nestoil Corporate Headquarters.
Source: www.researchgate.net (2023).

allocated on how healthy buildings satisfy these criteria, which consist of Certified (40-49 points), Silver (50-59 points), Gold (60-79 points)and Platinum (80+ points). It further allows points for six other basic deliverables like sustainable sites, water efficiency, atmosphere and energy, materials and resources, indoor environmental quality and innovation. Energy-related credits have the highest score regarding this rating system, with 30% of overall credit scores, which usually results in a higher overall certification score.

LEED Certified Green Buildings in Nigeria

The United States Green Building Council believes buildings and communities will regenerate and sustain the vitality of all life within a generation. Their mission further states that transforming how buildings and communities are designed, built and operated enables an environmentally and socially responsible, healthy and prosperous environment that improves the quality of life (USGBC 2023). They intend to achieve this by subjecting buildings to the LEED Greening building tool. According to the US Greening Buildings Body, there are a total of 29 green buildings in Nigeria (Table 1).

According to the architects that designed this commercial complex (Adeniyi Coker Consultants Limited), it comprises 15 Storeys which is subdivided into different functional uses consisting of 7,500sqm of offices, 350sqm of accommodation spaces, a multi-storey parking facility as well as a recreational facility. This gigantic building is located at the intersection of Akin Adesola and Saka Tinubu streets in the Central Business District of Victoria Island Lagos State Nigeria. The buildings form was created using gentle curved horizontal surfaces of high performance glass with horizontal tubular details which accentuate the sweeping effects of the curved façade. Further to this are the functions of the arched curtain walls which are defined by surrounding of solid white metal panels to complete the contemporary composition of the magnificent edifice.

The LEED Score card for the Nestoil Building Project was categorized into seven sub-divisions namely:

1 Sustainability of the site
2 Efficiency in using water
3 Efficiency in using energy
4 Efficiency in the use of materials of construction
5 Efficient quality of the indoor environment
6 Creativity
7 Credits based on points gained

RESULTS

Buildings, which could take the form of houses, are essential for man's needs, as they not only shelter him but also act as man's investment, in hold, for future profit at retirement or old age. While this is notably important, these buildings continue to harm the ecosystem and the built environments in which they are domiciled. As a result of these harmful and costly associated damages to the built environment, countries worldwide have joined resources together to find

a lasting solution to the menace of global warming and environmental pollution. Further moves at enhancing eco-friendly sustainable development practices resulted in the signing of memorandums of understanding between countries like the Kyoto Protocol in 1997 and the Washington Earth Observation Summit in 2003 (Alotaibi, et al., 2023). A key component in determining the building compliance standards is adhererence to current environmental sustainability conditions. In addition, (Song, et al., 2023) all green building rating systems arrive at a best-fit green compliance rating system (Song et al., 2023). Another major determining factor for green building rating systems is consumption patterns of energy that have become alarmingly high, leading to the search for a globalized solution. Cai and Gou (2023) have suggested using rating systems to appropriately guide and promote building compliance ratings with green building construction methods and materials usage. The overall environmental efficiency of the world's building stock has seen the effects and advancements at which climate change has negatively impacted them. Therefore, the construction industry needs to discover newer ways and practices that are more environmentally friendly (Maqbool, et al., 2023). These may be in the form of green construction materials with more environmental advantages when applied. Therefore, by using both BREEAM and LEED and other recognized certification rating systems, they could enhance the attainment of low cost energy efficient buildings. While conducting a study in Kano, Alotaibi et al. (2023) believe that greening tools need to be adopted for compliance and greening standards in creating a sustainable building environment. They highlight the importance of green rating systems in establishing more sensible approaches to the current issues regarding environmental control and dominance. In addition, they agree there are few sustainable construction projects in Nigeria, which they attribute to a paucity of experience in greening processes and an absence of adequate government regulations and laws. lack of knowledge and derived advantages of greening construction projects in Nigeria are identified, thereby calling for more research in this area of awareness studies. This also aligns with the study by (Ibrahim and Raji 2018), who assert in their research of adoptions of greening tools in the city of Kano, North Western Nigeria, but efforts towards enhancing their high implementation compliance levels are not in synergy between concerned stakeholders. Atolaibi et al (2023) additionally, point that Nigeria's national laws and policies responsible for compliance with green construction and rating systems are ineffective towards enhancing compliance; as such, these should be further strengthened for sustainability and sustainable built environments. Agyekum, et al., (2020) in understanding adoption of greening tools in Ghana, also a developing economy like Nigeria, identify that there is little literature available on this subject in Ghana highlighting key variables responsible for adoption. These are observability of the benefits, government's commitment level, incorporation of green building certification codes by professionals and their regulatory organizations, and enactment of green certification concepts.

CONCLUSION

The study appraised green building rating systems focusing upon relevant parametrics at achieving sustainability within Nigeria as a case point. The study further identified the different green building drivers in the African Built Environment as environmental, financial, economic, and social benefits, meaning that the buildings are comfortable for the occupants and healthy while also being aesthetically pleasing. This was closely followed up by the concept of greening in buildings. The essentials of green buildings is that they are a system of assemblages that cause less harm to the areas they are domiciled. Green Buildings as a concept first came into existence after the energy crisis of 1960 with the introduction of which led to the introduction of BREEAM in 1990 further saw an increase in developments of other green building rating tools the world over as a way of addressing the threats of global warming. The study further discussed the world's leading green building rating tool, LEED and identified 29 projects in Nigeria that have been certified with the LEED rating system. The Nestoil Corporate Headquarters was used as a reference building to highlight the use of LEED as a rating tool on an existing project, reflecting the various aspects that were used in certifying this building as green. Although the Green Building Council of Nigeria in collaboration with the Green Building Council of South Africa, have agreed to use the Greening tool of South Africa in Nigerian as a certification system for ensuring green buildings, the Nigerian Built Environment still falls short of an effective local rating tool for certifying buildings green which has further exercabated the effects of building construction projects in the short term and the long run. There still appears a lack of willingness on the part of government at implementing regulatory and policy frameworks that will further reduce the effects of buildings on the Nigerian Cityscape. The GBCN of Nigeria continues to play its part in enlightening construction stakeholders regarding the harm caused by non-green-compliant buildings in the environment through training and workshop programs, but more is needed to mitigate the effects of construction projects in Nigeria. Therefore, further research concerning encouraging implementation of regulatory and policy frameworks within the built environment landscape in Nigeria

will effectively enhance certifications and green building standards. There should be the introduction of desk officers at the building regulatory agencies on the insistence of design and construction of green projects, which will further act as revenue generation for this arm of governments towards having resources to implement green building construction. Tax incentives are also suggested for building construction professionals and vendors that want to engage in the purchase and supply of green building construction materials. Policy and Regulatory frameworks that emphasize implementation strategies at improving the green building rating systems in Nigeria towards achieving sustainability and sustainable development should be the foremost priority and focus of all stakeholders concerned.

ACKNOWLEDGEMENTS

The authors appreciate the support of Ajayi Crowther University in conducting this study by the provision of the enabling environment for this purpose. The authors further acknowledge the writers of the research works referenced in study.

REFERENCES

Agyekum, K., Adinyira, E. and Ampratwum, G., 2020. Factors driving the adoption of green certification of buildings in Ghana. *Smart and Sustainable Built Environment*, *9*(4), pp.595-613.

Akcay, E.C., 2023. Barriers to Undertaking Green Building Projects in Developing Countries: A Turkish Perspective. *Buildings*, *13*(4), p.841.

Akhanova, G., Nadeem, A., Kim, J.R. and Azhar, S., 2019. A framework of building sustainability assessment system for the commercial buildings in Kazakhstan. *Sustainability*,*11*(17), p.4754.

Akhanova, G., Nadeem, A., Kim, J.R., Azhar, S. and Khalfan, M., 2021. Building information modeling based building sustainability assessment framework for Kazakhstan. *Buildings*, *11*(9), p.384.

Akinyemi, A.P., Adekunle, A.O., Joseph, O.O., Anthony, A.I. and Dabara, D.I., 2017. The need for green building rating systems development for Nigeria: the process, progress and prospect. *Academic Journal of Science*, *7*(2), pp.35-44.

Ali, H.H., Al Nsairat, S.F., 2009. Developing a green building assessment tool for developing countries–Case of Jordan. *Building and environment*, *44*(5), pp.1053-1064.

Alotaibi, B.S., Yahuza, M.S., Ozden, O., Abuhussain, M.A., Dodo, Y.A., Usman, A.G., Usman, J. and Abba, S.I., 2023. Sustainable Green Building Awareness: A Case Study of Kano Integrated with a Representative Comparison of Saudi Arabian Green Construction. *Buildings*, *13*(9), p.2387.

Amiri, A., Ottelin, J. and Sorvari, J., 2019. Are LEED-certified buildings energy-efficient in practice?. *Sustainability*, *11*(6), p.1672.

Amiri, A., Emami, N., Ottelin, J., Sorvari, J., Marteinsson, B., Heinonen, J. and Junnila, S., 2021. Embodied emissions of buildings-A forgotten factor in green building certificates. *Energy and Buildings*, *241*, p.110962.

Ampratwum, G., Agyekum, K., Adinyira, E. and Duah, D., 2021. A framework for the implementation of green certification of buildings in Ghana. *International Journal of Construction Management*, *21*(12), pp.1263-1277.

Anzagira, L.F., Duah, D.Y., Badu, E., 2021. Awareness and application of green building concepts by construction industry stakeholders of sub-saharan african countries. *Journal of Sustainable Development Studies*, *14*.

Atanda, J. O., Olukoya, O. A. (2019). Green building standards: Opportunities for Nigeria. *Journal of Cleaner Production*, *227*, 366-377.

Bernardi, E., Carlucci, S., Cornaro, C. and Bohne, R.A., 2017. An analysis of the most adopted rating systems for assessing the environmental impact of buildings. *Sustainability*, *9*(7), p.1226.

Bisegna, F., Evangelisti, L., Gori, P., Guattari, C. and Mattoni, B., 2018. From efficient to sustainable and zero energy consumption buildings: Green buildings rating systems. In *Handbook of Energy Efficiency in Buildings: A Life Cycle Approach* (pp. 157-205). Elsevier Ltd.

Cai, S., Gou, Z., 2023. A comprehensive analysis of green building rating systems for data centers. *Energy and Buildings*, *284*, p.112874.

Cascone, S., 2023. Digital Technologies and Sustainability Assessment: A Critical Review on the Integration Methods between BIM and LEED. *Sustainability*, *15*(6), p.5548.

Chadly, A., Urs, R.R., Wei, M., Maalouf, M. and Mayyas, A., 2023. Techno-economic assessment of energy storage systems in green buildings while considering demand uncertainty. *Energy and Buildings*, *291*, p.113130.

Chen, L., Huang, L., Hua, J., Chen, Z., Wei, L., Osman, A.I., Fawzy, S., Rooney, D.W., Dong, L. and Yap, P.S., 2023. Green construction for low-carbon cities: a review. *Environmental Chemistry Letters*, pp.1-31.

Chodnekar, H., Yadav, P., Chaturvedi, H., 2021, June. Review and assessment of factors associated with green building rating systems. In *IOP Conference Series: Earth and Environmental Science* (Vol. 795, No. 1, p. 012033). IOP Publishing.

He, Y., Kvan, T., Liu, M. and Li, B., 2018. How green building rating systems affect designing green. *Building and Environment*, *133*, pp.19-31.

Ibrahim, S.K., Raji, A.U., 2018, October. Green Commercial Buildings for Benefits Realization in Nigerian Construction Industry. In *Proceedings of International Academic Conferences* (No. 6709830). International Institute of Social and Economic Sciences.

Jeong, J., Hong, T., Ji, C., Kim, J., Lee, M., Jeong, K., 2016. Development of an evaluation process for green and non-green buildings focused on energy performance of G-SEED and LEED. *Building and Environment*, *105*, pp.172-184.

Karaca, F., Guney, M., Kumisbek, A., Kaskina, D. and Tokbolat, S., 2020. A new stakeholder opinion-based rapid sustainability assessment method (RSAM) for existing residential buildings. *Sustainable Cities and Society*, *60*, p.102155.

Khan, J.S., Zakaria, R., Shamsudin, S.M., Abidin, N.I.A., Sahamir, S.R., Abbas, D.N. and Aminudin, E., 2019. Evolution to emergence of green buildings: A review. *Administrative Sciences*, *9*(1), p.6.

King, D., 2007. Innovate Green Office: a new standard for sustainable buildings. *Proceedings of the Institution of Civil Engineers-Energy*, *160*(3), 105-111.

Larson, A., Keach, S., Lotspeich, C., 2008. Rating Environmental performance in buildings industry: Leadership in Energy and environmental design (LEED)-working paper.

Li, X., Feng, W., Liu, X., Yang, Y., 2023. A comparative analysis of green building rating systems in China and the United States. *Sustainable Cities and Society*, *93*, p.104520.

Maqbool, R., Thompson, C., Ashfaq, S., 2023. LEED and BREEAM Green Building Certification Systems as Possible Game Changers in Attaining Low-Cost Energy-Efficient Urban Housing Projects. *Journal of Urban Planning and Development*, *149*(3), p.04023024.

Marchi, L., Antonini, E., Politi, S., 2021. Green building rating systems (GBRSs). *Encyclopedia*, *1*(4), pp.998-1009.

Michael, B. (2013). Assessment and adaptation of an appropriate green building rating system for Nigeria. *Journal of Environment and Earth Science Vol*, *3*.

Nduka, D.O., Sotunbo, A.S., 2014. Stakeholders perception on the awareness of green building rating systems and accruable benefits in construction projects in Nigeria. *Journal of Sustainable Development in Africa*, *16*(7), pp.118-130.

Nocerino, G., Leone, M.F., 2023. Computational LEED: computational thinking strategies and Visual Programming Languages to support environmental design and LEED credits achievement. *Energy and Buildings*, *278*, p.112626.

Olawumi, T.O., Chan, D.W., Chan, A.P., Wong, J.K., 2020. Development of a building sustainability assessment method (BSAM) for developing countries in sub-Saharan Africa. *Journal of Cleaner Production*, *263*, p.121514.

Prabhakar, A., Abbassi, T., E Valsan, A., 2023. Comparative Analysis Of Major Green Building Rating Systems And Development Of Green Building Checklist. *Aswathy, Comparative Analysis of Major Green Building Rating Systems and Development of Green Building Checklist (April 14, 2023)*.

Purwaningsih, R., Prastawa, H., Susanto, N., Saptadi, S., Pirogo, B., 2018, October. Assessment of green building score based on greenship rating of the green building council of Indonesia. In *AIP Conference Proceedings* (Vol. 2019, No. 1). AIP Publishing.

Rodrigues, L., Delgado, J. M., Mendes, A., Lima, A. G., Guimarães, A. S. (2023). Sustainability assessment of buildings indicators. *Sustainability*, *15*(4), 3403.

Sanboskani, H., El Asmar, M., Azar, E., 2022. Green Building Contractors 2025: Analyzing and Forecasting Green Building Contractors' Market Trends in the US. *Sustainability*, *14*(14), p.8808.

Serdeczny, O., Adams, S., Baarsch, F., Coumou, D., Robinson, A., Hare, W., Schaeffer, M., Perrette, M. and Reinhardt, J., 2017. Climate change impacts in Sub-Saharan Africa: from physical changes to their social repercussions. *Regional Environmental Change*, *17*, pp.1585-1600.

Shaba, V., Noir, E., 2014. Local content report: green star SA for use in Nigeria. *WSP Group Africa (pty) ltd. Bryanston, Johannesburg, South Africa*.

Shan, M., Hwang, B.G., 2018. Green building rating systems: Global reviews of practices and research efforts. *Sustainable cities and society*, *39*, pp.172-180.

Simpeh, E.K., Smallwood, J.J., 2018. Analysis of the benefits of green building in South Africa. *Journal of Construction Project Management and Innovation*, *8*(2), pp.1829-1851.

Song, Y., Lau, S.K., Lau, S.S.Y., Song, D., 2023. A comparative study on architectural design-related requirements of green building rating systems for new buildings. *Buildings*, *13*(1), p.124.

Umar, U. A., Khamidi, M. F., Shika, S. A., Musa, U. (2013). Towards building energy efficiency for developing countries. *Bonfring International Journal of Industrial Engineering and Management Science*, *3*(1), 13.

Weerakoon, P., Thayaparan, M., Siriwardena, M., 2023, March. Analyzing the Contribution of Green Buildings Towards Circular Economy in Sri Lanka. In *Proceedings of the International Conference on Industrial Engineering and Operations Management*. IEOM Society International.

Windapo, A.O., 2014. Examination of green building drivers in the South African construction industry: Economics versus ecology. *Sustainability*, *6*(9), pp.6088-6106.

Wu, X., Cao, Y., Liu, W., He, Y., Xu, G., Chen, Z.S., Liu, Y., Skibniewski, M.J., 2023. BIM-driven building greenness evaluation system: An integrated perspective drawn from model data and collective experts' judgments. *Journal of Cleaner Production*, *406*, p.136883.

Zafar, S., 2017. Green building rating systems in MENA.

Zhang, Y., Wang, H., Gao, W., Wang, F., Zhou, N., Kammen, D.M., Ying, X., 2019. A survey of the status and challenges of green building development in various countries. *Sustainability*, *11*(19), p.5385.

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING
Volume 33 Issue 2
ISSN (P) 1728-7715 - ISSN (E) 2519-5050
Journal DOI: www.doi.org/10.53700/jrap_neduet
Issue DOI: www.doi.org/10.53700/jrap3322023

PEOPLE'S DEFINITION OF POVERTY: LESSONS FROM KARACHI'S LOW-INCOME SETTLEMENTS

Arif Hasan,* Amal Hashim**

Article DOI:
www.doi.org/10.53700/jrap3322023_5

Article Citation:

Hasan, A. and Hashim, A., 2023, People's Definition of Poverty: Lessons from Karachi's Low-Income Settlements, *Journal of Research in Architecture & Planning*, 33(2). 62-75.

* Arif Hasan, Architect / Urban Planner, Karachi.
arifhasan37@gmail.com

** Amal Hashim, Researcher / Master Student, University of Tours Polytechnic, France.
amal97.hashim@gmail.com

ABSTRACT

The following study was undertaken to explore how low-income communities/individuals understand poverty and the reasons behind their economic self-identification. The present study examines the perceptions, requirements, and needs of the lower-income demographic of Karachi but in their own words rather than allowing professionals to speak for them. Previous studies have established that improved transport and access to better housing, health, and education facilities are priorities determining level of poverty. But what stops the poor from being able to achieve such a standard of living in their daily lives. As part of the study, the authors conducted interviews of professionals and urban planners and contrasted their views regarding poverty with those of communities and individuals whose lived reality is in the midst of varying degrees of poverty.

Keywords: Urban poverty, low income, factors of poverty, Karachi, settlements, challenges, urban poor.

INTRODUCTION

The rate of urbanisation in Pakistan has been rapid in the past few decades. Based on the 2017 Population and Housing Census, Pakistan is experiencing the highest rate of urbanisation in South Asia with 36.4 percent of its total population residing in urban areas. As the country's largest city, with a documented population of 16.5 million people, Karachi contributes to 55 percent of the nation's federal tax revenue (UNDP 2019).

The condition of the city's infrastructure and the living standards of this substantial part of population (62 percent of the city's population lives in informal settlements due to a critical shortage of low-cost housing) are largely undesirable. Residents of low-income settlements in Karachi consistently encounter challenges regarding the provision of water, electricity, and gas. They also deal with significant health problems due to the state of sanitation systems which are either absent or highly deficient in most areas. Most buildings and/or living spaces suffer from inadequate ventilation and natural lighting. Additionally, inhabitants often must share a bathroom and kitchen with others, exacerbating their living conditions. Because the land is unleased, they face land tenure insecurity and constantly live in fear of eviction and/or demolition. Climate change is another factor they must contend with. Studies previously conducted regarding the topic by Hasan, A., et al. (2017), stressed that low-income populations are immensely susceptible to changes in climatic conditions and are usually the first to feel its impact.

Children of low-income families are unable to go to schools due to either a lack of them or because the costs are too high. Additionally, women face problems in working in the formal sector due to insufficient and inadequate public transport systems.

These challenges are only exacerbated when crises like COVID-19 or urban flooding occur. Densely packed as these settlements are, they are unable to deal effectively with the problems and/or the necessary safety measures due to a wide range of factors. For instance, hygiene and cleanliness requirements as detailed by the Government of Pakistan and the Would Health Organization (WHO) could not be adhered to due to a lack of water, space within homes, and a lack of ventilation and open spaces, among others. Unfortunately, these issues did not necessarily come up during the quantitative survey conducted in either the pilot phase or Phase II of the study. They were, however, brought up during interviews and focus groups with key respondents from all five low-income settlements.

RESEARCH METHODOLOGY

The research strategy was based around the attempt to study patterns and relationships around the factors that were identified and to interpret them using quantitative and qualitative methods. The study was divided into two phases: Phase I comprised of a literature review based upon which a pilot survey was conducted in the five low-income settlements selected by the authors. The literature review concentrated on gathering information from diverse sources such as news articles and analytical pieces from both local and international newspapers. Additionally, it included published research materials from reputable organizations, including the World Bank, international NGOs, and local community organizations. The principal objective was to prioritize reports that conducted surveys of impoverished populations in different countries, providing insights into their own perceptions of poverty, living conditions, and daily experiences. Furthermore, the study sought to understand the aspirations of this section of the population concerning national policies and aid agencies.

Development of community profiles of the five selected low-income settlements was also part of Phase I of the study. This was based on an evolved criterion, including parameters of target area selection including growth in the built environment of the area, religious and ethnic diversity, coastal neighbourhoods and the need to understand them, and the diverse stratification within low-income groups. Phase II comprised of a quantitative survey (based on the results of the pilot survey conducted in Phase I of the study) and qualitative interviews of 21 key respondents. The latter included academics, professionals, and urban planners as well as low-income residents. Though initially beyond the scope of the study, the authors later also decided to include a survey of 20 homeless individuals as part of Phase II.

LITERATURE REVIEW

Scholars have identified various levels of poverty: absolute, relative, situational, generational, rural, and urban poverty (Kumar 2018).

In 2014, the UN estimated "almost half of the developing world's population reside(d) in cities" (Auerbach, A. M. et al. 2018). As a result, poorer populations in urban settings have been growing in political and economic importance. Their issues, needs, and political life (especially in cities of the Developing World) are being increasingly studied in an attempt to find solutions and to alleviate this poverty. This has been an opportunity for all stakeholders involved – from iNGOs, IFIs (international financial institutions) to developmental aid programs – to define the parameters of poverty as well as what this sector of the population requires.

The difficulty in defining a clear socio-economic phenomenon, such as the above, is evident when considering the changing definitions of poverty by institutions like the World Bank and the United Nations throughout the years. The most commonly embraced definition, endorsed by the

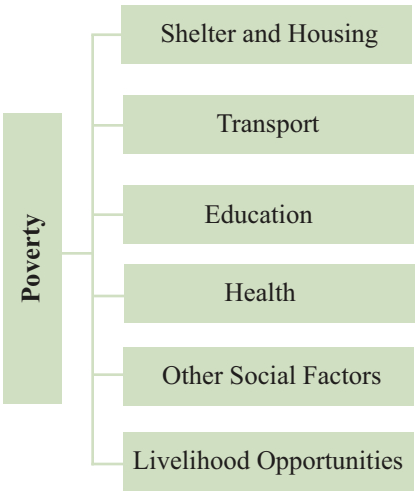


Figure-1: Representation of Poverty and its Linkages as articulated by the Respondents.

Table-1: Summarizing varying definitions of poverty.

Institution	Definition
World Bank	Economic: Those earning less than $1.90/day
World Bank	Lack of access to health, education, affordable and clean housing, sanitation and clean water, and political representation
Joseph Rowntree Foundation (JRF)	When someone's resources (especially material resources) are not sufficient for their needs (especially material needs)

World Bank, examines poverty solely from an economic perspective, disregarding its social, political, and cultural roots and effects, and categorizes individuals earning less than $1.90 per day as impoverished.

In addition to this, the World Bank also has another definition of poverty which includes the kind of access to healthcare, education, low-cost and suitable housing, sanitation systems and clean water, and participation in political life people have. Adjusting the latter multifaceted meaning of poverty with the former is difficult to do, especially in practical policy decisions. Some scholars and organisations have emphasized how inequitable using the economic understanding is. One of these organisations, the Asian Coalition for Housing Rights (ACHR), put forward a study which highlighted that the economic approach did not consider the day-to-day costs of living around the world. This is when the universal poverty line was marked at earning a minimum of $1.25/day (ACHR 2014). The study went on to state that the World Bank, which set this poverty line, was taking for granted that the world's poor could all be placed on one, same ground. As a result, what set the ACHR study (2014) apart from all others was its classifications of poverty into at least five different levels based on the living conditions of those they interviewed and studied. The individuals encompassed within the group range from the isolated homeless to those living in formalized or upgraded informal (usually known as slum) settlements.

Consequently, agencies working on poverty, both nationally and internationally, have made a conscious effort to shift away from an income-focused strategy. For example, the Joseph Rowntree Foundation (JRF) now understands poverty to be when an individual's resources, particularly material resources, fall short of their needs (Hall, S., Leary, K. and Greevy, H. 2018). Almost all other organisations providing aid agree that an understanding of poverty or deprivation must be multifaceted and can be alleviated only when all facets are given due importance.

According to the World Bank (2016), Pakistan's economic situation progressed incredibly between 2001 and 2014. It went on to state that the country had witnessed a substantial decrease in its official poverty rates which had decreased to 10 percent of the entire population (Mauswri, G. 2016). But, the report, released in 2016, also emphasized that more than 80 percent of the country continuously reported that their economic wellbeing either worsened or stayed consistent during this time. The above conflicting statements are the result of the World Bank having two official understandings of poverty causing confusion.

Furthermore, the Bank noted that even though people were seemingly spending more on luxury commodities, there was no significant enhancement in fundamental public services and that only the rich and/or well-connected could secure good employment or establish businesses (Mauswri. G. 2016). But, in their view, this did not add to the poverty experienced by people.

This study disagrees with the World Bank on the basis of the social and material dimensions of poverty, especially for a developing country like Pakistan which has weak public transport systems in nearly all cities. This acts as a hindrance for people looking for jobs or affordable housing. It is a universally accepted fact that when looking for accommodation, a major factor is the easy access to affordable transport and proximity to workplaces. In both scenarios, there is a lack of accessible homes at affordable prices (Hasan, A. 2021).

Informal Housing

Given rapid urbanisation, densification in cities is intense. This causes land and real estate prices to increase significantly, sometimes over a short period of time, resulting in the poor being unable to find suitable housing. As a result, they usually end up in settling in ecologically dangerous zones or set up temporary housing under bridges and in un-utilised

public spaces (ACHR 2014). The International Institute for Environment and Development (IIED) conducted a study in 2021 which determined that about "one billion urban dwellers live(d) in informal settlements" (Satterthwaite 2021) because it might be the sole choice "for low-income households" (Basile, P. and Ehlenz, M. M. 2020).

Other studies found that even in situations in which the State wants to support social housing (as a replacement for irregular settlements), these ventures are not allocated space in or close to the city centres. Being re-located to the peripheries of cities means a lack of affordable transport as well as other utilities necessary in the modern world. Studies also found that this type of forcible relocation causes a rupture in the "livelihoods, jobs, and the networks of solidarity that sustain them (the poor)" (Campos, M. Z. et al. 2022).

Universally, having to live in non-regularised settlements or in low-cost housing projects in the peripheries of the cities has harmed women and children the most. While men have to deal with the added cost of increased distance to their workplaces, women have to work on rebuilding social networks that allow them to work far from home while leaving their children at home. Their incomes also see a significant decline since they either cannot work anymore or work lesser hours in order to accommodate the added travel time (Avis, W. R. 2016). On the other hand, children are harmed because of a lack of schools in the new area. In most cases, previous schools are now too far to be sent to (Nikuze, A., et al. 2022).

In Karachi, a city of 16 million (Pakistan Bureau of Statistics 2017), some unregularized settlements face a population density of more than 1000 persons per acre. These overpopulated settlements face many health issues from a lack of ventilation, lack of open spaces and poor lighting to "conflict and other social problems" (ACHR 2014). Additionally, the recent COVID-19 pandemic brought to the fore that these settlements are in no means equipped to handle health or any other crisis. WHO-mandated Standard Operating Procedures (SOPs), for example social distancing and frequent washing of hands, could not be observed because of insufficient space in homes and water provision.

The urban flooding later in the year (August 2020) exacerbated the above-mentioned issues. Additionally, in response to the flooding, the government decided to carry out a largescale and indiscriminate eviction drive of, what were termed, "encroachments" on the stormwater drains (approximately 12,000 homes situated along three stormwater drains were earmarked for demolition) (Hasan, A. 2021). Those evicted received no compensation and therefore could not look for accommodation elsewhere and squatted on the remains of their destroyed homes. Due to the lack of safety from squatting, women had to quit working and children had to leave schools. Unfortunately, the latter would have happened even if they were relocated elsewhere, as mentioned earlier. A more systematic and holistic approach to dealing with informal settlements in ecologically dangerous zones is needed.

Furthermore, recently, the attempts to formalise unregularized and low-income settlements have encountered opposition by the political-developer-bureaucrat nexus. The "world class city" vision proposed for Karachi is harmful for the poor. It pushes them out of their homes into the peripheries of the city, thus also excluding them from their workplaces and recreational spaces (Fatima, A. and Mackloom S., 2021).

Informal Employment

An enduring understanding of why the poor generally tend to stay poor throughout their lives has been that they simply do not want to work. However, the International Labour Organisation (ILO) disagrees with the idea of the poverty trap and emphasises that the poor are too poor to not work. Instead, what has made them remain in this cycle of poverty is their working conditions (Mahmood, M. 2006) since most work in the informal sector or low-wage jobs and are thus, not secure in their work. As a result of their employment situations, most low-income families are unable to make any savings. They might also have pre-existing debt they are paying off, generational poverty, large families, or bad health exacerbated by low-nutrition foods and living conditions. Due to their low earnings, they also face difficulties in accessing credit facilities from formal institutions which means they are unable to upskill themselves or their children (ACHR 2014).

In Karachi, the largest city in Pakistan, 72 percent of the workforce is engaged in informal sector employment. This is a result of the electricity outages in the country that would frequently last long hours and forced heavy de-industrialization upon the city (Hasan, A. and Raza, M. 2015). Moreover, in 2019, the ILO revealed that the official hourly stipend rate in the country was less than a dollar ($0.70). In contrast, non-permanent work (as part of total employment) was greater than 70 percent which was one of the highest in South Asias.

A study conducted in 2018 examined the influence of urban violence on the informal economy and emphasised that

minimal labour legislation or social security laws in Pakistan or Karachi acknowledge the informal economy or its workforce (Brown, A. et al. 2017). Ultimately this makes them more vulnerable to crises, such as the global health crisis in 2020, compared to other sections of the population. The country's labour unions emphasise that about 35 percent of the entire informal labour works in the formal sector but, due to various reasons, is insecure in this employment (Latif, A. 2020).

The Urban Resource Centre (URC), Karachi conducted a study in 1989 on four streets in Saddar. The organisation found that hawkers collectively paid more than Rs. 10 million for "social protection". In 2022, this exercise remains alive and stakeholders in the informal economy continue to pay legal rent as well as enormous amounts of "protection" money to local authorities. Despite this, 9000 hawkers, including 82 women, were removed from Empress Market during an eviction drive in 2018. This increased their poverty leading them to take on more debts than they could pay off since they still had to pay rent and other utilities (Hasan, A. 2021).

In the Developing World, informal employment has an added gender aspect. In Pakistan, as in other countries of South Asia, women have to handle strict gender role ideologies, societal and cultural limitations on women's mobility and involvement in the labour force, a segmented labour market, and employers' gender biases that devalue female labour due to perceived family responsibilities" (ADB 2002). The 2017 Housing and Population census found that women in the workforce in Karachi amount to only 6.85% (Pakistan Bureau of Pakistan 2017).

Urban Governance

An IIED study conducted in 2000 reported that poverty alleviation was considered to be a policy issue for national and international agencies to prepare for rather than a problem that local governments could work on. But, the IIED goes on to state, local governments are in fact in charge of several duties that have a significant impact on most facets of poverty (Satterthwaite, D. 2000). Poorer sections of populations of the Global South usually see themselves not included in political life since development of their cities also tends to exclude them and is largely disadvantageous for them (ACHR 2014).

Inhabitants of unregularized settlements in Karachi must constantly deal with issues that come about as a result of the escalating privatisation of municipal services. As a result, they must either pay excessively large amounts (such as for electricity services) or face the possibility of no provision at all (such as for solid waste management). Besides this, parks and other recreational spaces are becoming more exclusive due to the charged entry system and parking facilities. This means that many low-income families are excluded from places of entertainment and relaxation (Hasan, A. 2018).

Electricity outage and costs affect the functioning of markets, workshops, and both formal and informal businesses. In addition, it affects the functioning of schools and neighbourhood health centres, who all have to depend on generators, increasing costs that are passed on to consumers. There is a close relationship between affordability of utilities and poverty. Similarly, the absence of adequate water supply, as well as its quality, creates serious issues related to hygiene and gastrointestinal diseases.

However, among major issues of governance are the conflicts of authority an sing between Karachi's municipal administration and other levels of government (provincial or federal) in terms of responsibilities or areas of jurisdiction. The city's wealth, the fact that its largely Urdu-speaking, and the capital of the province, all pits it against the Sindhi-speaking provincial government (Editor CSE 2016). An important point of contention is the KMC's budget – for example, in 2018, Karachi's GDP was $164 billion while KMC's allocated budget for the year 2018-2019 was only Rs. 27 million (KMC 2018-19). Local authorities are expected to generate independent income to strengthen their financial capabilities, yet many of their roles in Karachi have been assumed by the provincial government or occasionally outsourced to private enterprises. Furthermore, the Karachi Metropolitan Corporation (KMC) consistently encounters challenges in persuading the federal and provincial administrations to disburse its allocated portion.

Among the services of the KMC that have been privatised are development of water sources, generation and distribution of power, and price of sewage disposal. Instead, its role has been turned into that of a middleman between the consumers and those responsible for the production of these services. However, it is still the KMC that is blamed for the problems that inevitably occur with the services (Hasan, A. and Raza, M. 2015).

The inclusion of the local government, especially where basic utilities' provision (proper housing, job opportunities, social infrastructure) is concerned, is central to poverty eradication (Avis, W. R. 2016). For example, some of the

main factors impacting the health of poor residents is the low provision of clean water and sanitation facilities. If healthcare facilities were established that would provide services free of cost to the poorer sections of society, they would be able to reallocate their monthly budget to be able to spend more on education or to save (Satterthwaite, D. 2000).

Education

A 2018 UNICEF report found that youth in urban settings were more deprived than in rural settings – there was a lower chance of deprived children in urban areas of completing primary education over their counterparts in rural settings. A number of studies carried out in the Developing World reported that parents usually preferred to educate their children but then faced problems even though schools were "officially free" in most countries. One of the primary factors hindering children from going beyond just primary school were the "hidden costs of education": which include expenses for transportation, uniforms, books, and fees for extracurricular activities, among other things. Additionally, studies reported (ACHR 2014) that the educational achievement of students was also impacted by the constricted home environment, particularly in areas that faced frequent and long hours of electricity outages.

Unfortunately, Pakistan is very similar to the rest of the Developing World. People can choose from many different schooling systems although the State's education system is free for all till 16 years of age (Hunter, R. 2020). Despite this, poorer families are not able to send children to school because of the aforementioned hidden costs. UNICEF Pakistan has reported that as many as 44 percent of children who should be in schools are not in any kind of schooling system.

In addition to this, a report in 2019 stated that despite having teachers, bathrooms, electricity, and piped water, about 10 percent of Karachi's government schools had no students.

This is largely due to a widespread perception that the country's public schools are not worth sending their children to since the quality of education is very low. Additionally, parents also want to send children to English-medium schools for better job prospects, but public schools are Urdu-medium. Even poorer households prefer private, English-medium schools (Yousafzai, 2022). As a result, the 2017 Population and Housing Census noted that Karachi's literary rate was 78 percent in the 15-24 age group.

Housing

The Global South is progressively becoming more and more hostile to unregularized settlements within its cities. As such the response from governments and developers has largely been to destroy the settlement and remove the inhabitants. Scholars are calling this process "induced displacement" (Nikuze, A. et al., 2022) There are some situations where the inhabitants have been resettled through a plan, but the space allocated to them is usually far from the city centre, meaning the residents are unable to easily access the social and physical infrastructure of their city (Abebe, G. and Hesselberg, J. 2006). In 2006, a study was carried out in Ho Chi Minh City, Vietnam, which stated that communities generally want to upgrade their existing homes rather than live in apartments (Verschure, H., et al. 2006). This is because upgrading does not harm their pre-existing social networks and allows them to develop their houses slowly while still living within the city.

However, the question that needs to be asked is what are the reasons behind the high incidence of demolitions and evictions and on such a significant scale? In 2009, the Advisory Group on Forced Evictions (AGFE) in Turkey reported that this is because the stakeholders involved - planners/architects, politicians, and developers – were attempting to emulate the world class city model. Thus, land was not to be used just to provide housing or to generate income anymore. Instead, according to them, it should be used to also make airports, stadiums, Formula 1 circuits, and highways – things that would generate tourism and make their cities hubs for a global world. By adjusting the way the city is structured, stakeholders are also deciding who the city services and who it excludes (Baysal, C. U., Hasan, A. and Cabannes, Y. 2009). In Karachi, similar concerns are raised about a prominent construction firm whose renowned Bahria Town covers an area nearly comparable to that of Manhattan. There are significant allegations that the company obtained land using force and deceit, resulting in the demolition of numerous villages and displacement of their inhabitants (Zaman, F. and Ali, N. S. 2016).

A further issue is of the homeless population in cities worldwide. The UN estimates that there are about 1.1 billion homeless people across the globe. In its definition of "homeless", the UN includes the inadequately housed (which encompasses residents of unregularized settlements) and those that sleep on the streets (Speak, S. 2019). Many studies have highlighted the gender aspect of the homeless, especially

those on the streets – they have found it is usually men who have "no regular shelter". In Karachi, this segment of the impoverished population finds shelter through diverse negotiation methods, such as providing payment to the police or reaching agreements with shopkeepers. They also resort to sleeping or settling in places like shrines, mosques, and even cemeteries (Ahmed, N. 2020). The 2017 census reported only 5000 homeless people in Karachi (PBS, 2017). But Dr. Noman Ahmed's report on those living on the streets in the city indicates the number to be far higher than this.

A 2018 housing study reported that Karachi's demand for housing is approximately 120,000 units per year. Of this, only 42,000 units were provided by the formal sector. On the other hand, the informal sector builds approximately 32,000 units. Together these are still not enough to meet the demand which is increasing on a yearly basis. This has resulted in an augment gap in low-cost housing which is sometimes covered by densifying pre-existing housing stock (Ahmed, N. 2020). The recent Supreme Court judgements, declaring several unregularized settlements and markets as "encroachments" has only exacerbated an existing problem without providing a viable solution.

Furthermore, the pace of Karachi's expansion is influenced also by the rate of internal migration into the city from the country's rural areas. As of 2014, the city has seen an average of 50,000 per month immigrants from different areas (Hisam, Z. 2014). The International Organisation for Migration (IOM) revealed in 2019 that approximately 9 percent of the population they surveyed reported that they were migrating because they were going back to their homes in other parts of the country, therefore highlighting that there was significant seasonal and circulating migration. The rate of migration into Karachi is so high that unregularized settlements are sometimes divided into sections where families can live and those where spaces are rented out to single men. Both sections have different rental rates, and the latter often share one room and one kitchen between five or more men (Hisam, Z. 2014). Operators of the housing market in unregularized settlements are increasingly converting old homes into multi-storey buildings to be able to meet the gap between the demand and supply of housing. However, this has resulted in an almost complete change of social relations as well as the nature of the settlements (Hasan, A. and Raza, M. 2015).

DISCUSSIONS

It should be noted here that the subjects of the present study understand poverty because of how it affects their daily lives. By doing this they are implicitly denying that there is only one type or one level of poverty around the globe. In fact, Younus Baloch, Director of the Urban Resource Centre, Karachi divides the concept of poverty into two dimensions based on his experience in the field (Pakistan). According to him, there is firstly, a basic-level poverty, encompassing essential needs such as food, housing, water, healthcare, and nutrition to which not everyone in the Pakistani context is assured or entitled to from the State. The situation is so critical that many children face mortality even before birth due to the mother's inability to access adequate nutrition and food.

Secondly, there is a higher level of poverty involving the prerequisites for upward social mobility, including education, transportation, and decent job opportunities. Even in this realm, he says, a fair and equitable playing field is absent.

Denial of Poverty

A significant relevant conclusion of the field research participants, was the abundance of people who denied their poverty. However, they lived in low-income settlements, on unleased land or in non-approved buildings/homes and were unable to find housing in formal areas.

As indicated above in Figure 2, out of the 48 percent of survey participants who did not perceive themselves as poor, 56 percent believed they earned enough to support themselves and their families. Additionally, 23 percent thought they belonged to the middle-class because of cultural ties to the upper middle class. Therefore, the relationship of this section of the population to their poorer (and newer) neighbours might not be very friendly.

Conversely, 38 percent of those who identified themselves as poor stated that they attributed this sentiment to the increase in inflation. This suggests that this perception is a recent development, and they may not have regarded themselves as poor prior to the recent surge in prices.

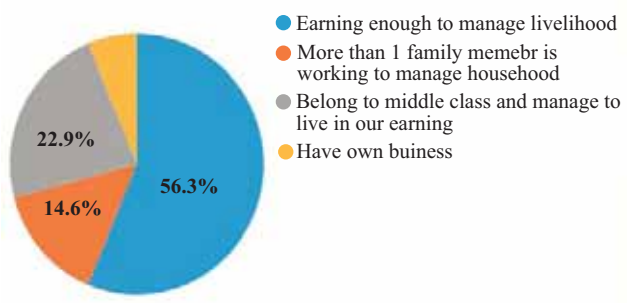


Figure-2: Reasons why people do not consider themselves poor.

Education

Professionals and activists alike called attention to the impact of education on an individual's ability to end his/her poverty. Dr. Noman Ahmed Urban Planner and Academic (interview, August 4, 2022), however, was critical of the hypothesis, pointing out that while the notion that education is the solution to societal issues, it is, in fact, the opposite that is sometimes true. Speaking specifically in Karachi's context, he stated that the quality of education in low-income settlements was not facilitating widespread upward social mobility. Instead, according to him, the focus should be diversified, and answers should be looked for in skill development and enhancement and providing financial aid for entrepreneurship ventures.

While nearly all community activists and professionals agreed with Dr. Noman regarding the need for vocational training centres in poorer settlements, Samiullah Mazari, a resident of Manzoor Colony, expressed a different sentiment. In his opinion, neither he nor any of his peers wanted their children to drop out of school and take up vocational skills. In fact, for most respondents, a key priority was quality education for their children, which for them meant private, English-medium education rather than public or religious schools/institutions. Mr. Mazari's view was that public schools, despite their low cost, had been corrupted by heavy politicization and the focus on imparting quality education to their students was missing.

Qualitative interviews conducted in other different low-income settlements revealed that young adults are predominantly choosing to pursue careers in nursing, with some of them opting to relocate abroad. Dr. Noman Ahmed understands this to be a difference between the old and the new poor where the former considered a life of poverty and deprivation to be their destiny and worked as domestic workers whereas the latter (or younger generations) recognize the shifts in society and are actively striving to alter their socio-economic standing through deliberate efforts.

Education for children from lower-income families was impacted further by the onset of COVID-19 and the ensuing lockdowns. The enrolment of children in schools decreased significantly especially since most public schools faced problems in transitioning adequately to online education as a result of a lack of WiFi access and electronic devices. In the post-COVID-19 world, the number of smartphones and laptops being used by students for education has increased as well. In recent times, according to Mohammad Toheed, Researcher at Karachi Urban Lab, education attainment suffered the most from the recent price increases, as the impoverished typically perceive it as unproductive (Interview July 24, 2022). As a result, they make the difficult choice between sending their children to school or ensuring that they are (well) nourished.

Housing

Previous studies conducted on Karachi have revealed that the city's two main problems are public transport and affordable housing. Results from the present study reinforced this. As mentioned earlier, 62 percent of the city's population lives in low-income, unplanned settlements. This is because formal planning, with its focus on building Karachi into a world-class city, has excluded the poor from the city. Not only have these settlements been built up slowly by the residents themselves but the acquisition of basic utilities such as electricity, water, and gas connections have also been the responsibility of the residents rather than the government.

A number of these settlements are on the periphery of the city, making it difficult for low-income citizens to access amenities which are predominantly located in the city centre. In an attempt to access these amenities and also lower their transport costs, the economically-disadvantaged try to live within or near these areas. However, the high land value (resulting from easy access to amenities and other facilities), means that the poor are forced to live in ecologically hazardous zones and plots of land, such as over stormwater drains (interview with Yunus Baloch, Director URC, July 23, 2022). Still, most find that it is cheaper to live there than in the margins of the city where transport links, utility connections, healthcare and recreation amenities are few and far in between and cost them more in the long run.

Given this high demand, single-storey homes are regularly built up into high-rise buildings not only by real-estate developers but also the owners themselves. Real estate agents in Manzoor Colony revealed that people build incrementally and add approximately 2-6 stories above the original house which is rented out for additional income.

Renting is also often seen as temporary while families try to save up for their own house. Many key participants disclosed that they made considerable efforts to acquire a home that they owned, even if it was not officially leased or sanctioned. According to them, the security they felt with their own residence outweighed any apprehension about potential demolition by government authorities. A resident of Machar Colony stated that she left a pakka house she

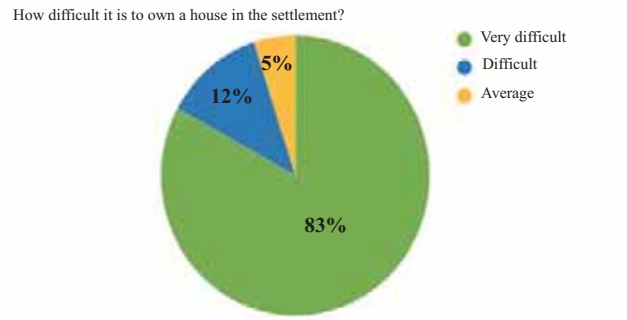


Figure-3: Respondents' perception of whether owning a house in their current area is difficult.

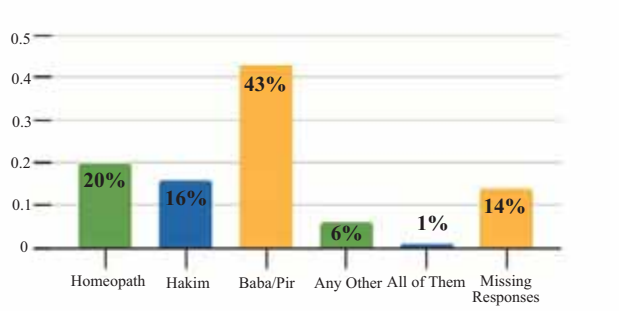


Figure-4: Percentage of people opting for non-allopathic treatment methods.

was renting for a kacha house that her family built from their savings on illegally reclaimed land (Interview of resident, Amna, Machar Colony, August 5, 2022). Key participants at Manzoor Colony further revealed in a foam group discussion that if the criteria for poverty included renting a house/space, "the number would increase to about 50 percent" of the settlement's population.

Health

The quantitative survey conducted during Phase II of the study revealed that people from low-income settlements are increasingly switching to homeopathy and religious scholars as forms of treatment rather than allopathic treatment. There are several reasons for this: some settlements have no medical dispensaries, allopathic doctors servicing low-income settlements are usually thought of as quacks and are considered unreliable, and medicines prescribed by allopathic doctors are too expensive to sustain. Some key respondents also revealed that government health facilities, including maternity clinics and hospitals, are at least five kilometres or more from their settlements. Public hospitals are free of cost in Pakistan and patients arly have to pay for medicines. However, the distance forces them to seek cheap and easily accessible treatment which often does not mean allopathic medicine.

Regarding the generally high prevalence of health issues, such as stomach and skin diseases, several respondents blamed the high populations densities of specific neighbourhoods or close proximity to an open drain and sewerage system. According to Amna, a key respondent living in Machar Colony, the cleanliness of the lanes deteriorated the farther one moved away from the open sea.

This problem is further compounded by the fact that many settlements have poor sewerage infrastructure, and pipes are not serviced adequately despite being very old. In Haji Ghulam Zakariya Goth, for instance, a pit latrine is the only source of disposal for Shireen Khan, a resident, due to a lack of sanitation systems in the settlement (Interview, August 28, 2022).

Some respondents further connected health issues, especially among children and young adults, to nutrition (or a lack thereof). Nasira, Khel Coordinator at Imkaan (NGO in Machar Colony), stated that children, especially girls, faced difficulties in classes, especially gymnastics, since the food they consumed regularly was insufficient in nutrition. According to her, insufficient access to adequate nutrition was resulting in physical frailty so much so that their regular menstrual cycles were significantly influencing their academic performance (Interview with Amber Ali Bhai, General Secretary of Shehri CBE, July 23, 2022).

Urban Mobility

Karachi as a mega-metropolis necessarily needs inexpensive, secure, and dependable public transport and is a major determinant in where many people live and work, the schools and institutes they can access, and the opportunities available to them. Amber Alibhai, General Secretary of Shehri CBE, points to "capacity to travel decently" as a measure for poverty. She adds that residing near their workplace is a survival strategy for impoverished communities; otherwise, they would deplete their funds (due to high transportation expenses) before the month ends.

Concurring with the aforementioned, 71 percent of survey participants revealed that their choice of current habitation was based on the distance from their workplace. However, given the lack of public transport avenues available in Karachi, primary research revealed low-income communities are beginning to rely on private transport systems to move around the city.

This rise in the use of private modes of transport affects women and children disproportionately: since motorbikes, because of their design and usage are tilted towards men, women are compelled to rely on public transport for commuting or any other transport needs. A key participant from Pahar Ganj, reported that she had to use the chinqi to get to her yoga classes despite the fact that her family owned two motorbikes (Interview with Ruth Farhad Akhtar, August 16, 2022).

The absence of affordable and secure public transportation affects not only the job opportunities that women are able to avail but also the recreational opportunities accessible to the poor. Amna, a resident of Machar Colony, states that they cannot even think of taking their children out of picnics or family outings, stating that they cannot travel by bus if they have the children with them. Consequently, they have to hire a Suzuki van (which costs about Rs. 2000) and gather 10-12 people to collectively be able to afford the total expense. This obviously means that recreation, while not being high on the list of priorities, is not an everyday possibility.

The Gender Issue

In all of the previously detailed themes, there seems to be one constant – women are disproportionately impacted by poverty and rising inflation. According to Farhat Parveen, Director of Now Communities, underprivileged women hold multiple burdens – all working women must juggle the responsibilities of maintaining their homes and families as well as their careers. This, she states, is the dilemma of balancing their reproductive and productive labour.

In the modern world, however, this balance is becoming increasingly difficult to achieve – the urban working woman must rely on family systems (that are increasingly breaking down) to take care of her children while she works. A lack of alternative and affordable care opportunities means that the extended family is the only option available to her. The issue is worsened by the fact that women are generally unable to use family planning methods due to a variety of reasons – lack of awareness, they might be too expensive, or they do not use them because of religious and social taboos.

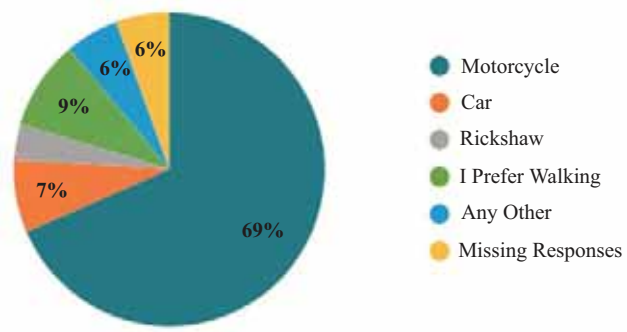


Figure-5: Private Forms of Commutation in the City.

Furthermore, they are under consistent pressure from their families who "permit" them to work outside their homes and do so in fear of having this "permission" revoked by the men of their family. In some cases, Farhat Parveen stated, women reported that their families preferred for them to work in factories or offices in which they were provided with transport. This, she believes, is to control their movement because it is widely believed that women should only go to work and back home, with no detours and no freedom.

COVID-19 only increased the cases of gender-based violence and suicide among women from low-income settlements, reported Farhat Parveen. The reasons she gives for these are control over their social networks and televisions and use of mobile phones coupled with an overall worsening financial situation. And despite the fact cases khula (women applying for divorce) also increased significantly during the same period, the number of women who are legal owners of property is abysmally small in Karachi. This makes them financially and socially insecure because they cannot depend on anything (financially or socially) in emergency situations. As a result, they are forced to choose between financial instability or domestic abuse.

In an effort to address the gender imbalance, Dr. Noman Ahmed proposed that social spaces be redefined to establish parity between the sexes. He postulates that women's involvement in public spaces and public life of the community could have the potential to alter even the internal family dynamics of these women. However, here, too, women face major issues resulting from being unable to organise themselves effectively primarily due to a lack of "permission" from their families.

Footpath Dwellers

As mentioned earlier, Phase II of the field research comprised of in-depth interviews of 20 homeless individuals/families. During this fieldwork, it came to light that the homeless are not a homogenous group and can be divided into at least two categories (detailed below).

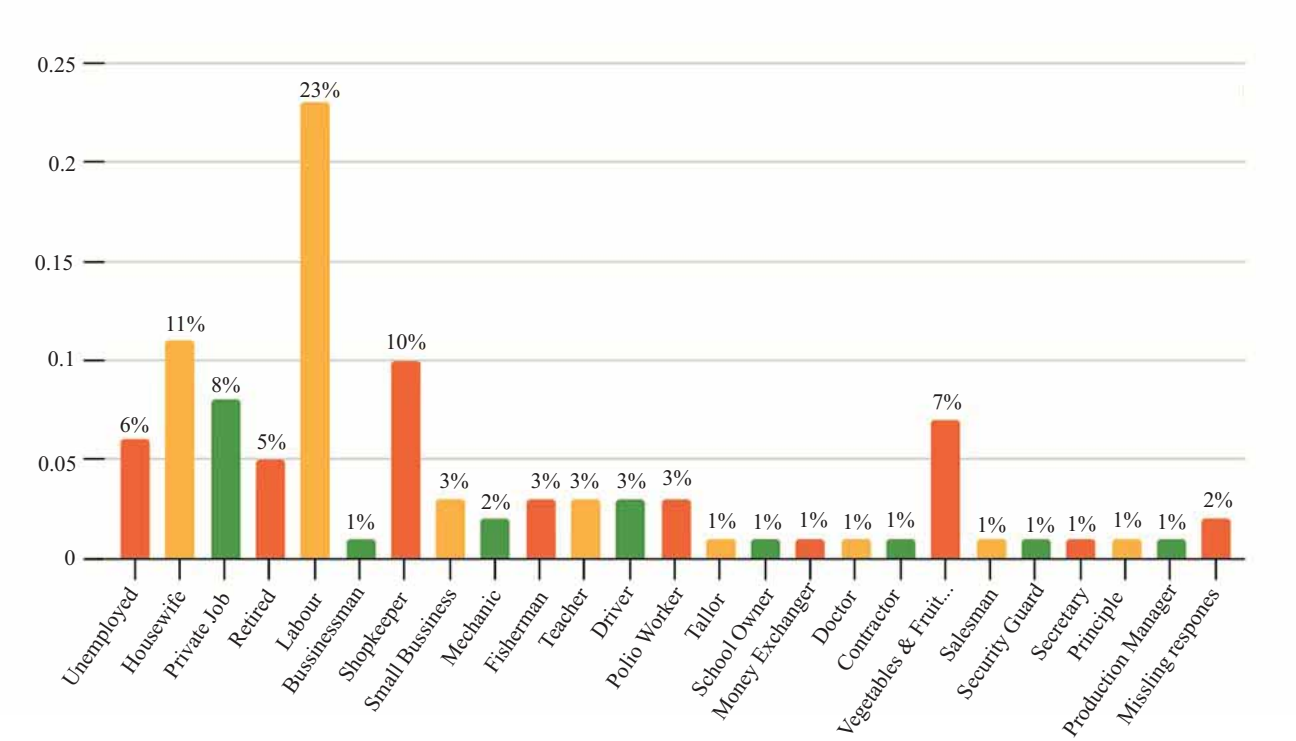


Figure-6: Nature of Job of Respondents. 11 percent of female survey respondents that they were housewifes.

Group 1

This group is made up of those (mostly men) who have permanent homes in the city but find it too expensive to go home from work every day and therefore choose to sleep under bridges or on sidewalks to save commute costs. They visit their families on a weekly basis on average and had their clothes washed at home. During the week, they use the bathrooms at a nearby mosque or hotel. These people are not bothered by the KMC or other authorities as long as they keep the space they occupy clean.

Group 2

People in this group are largely families living under bridges or flyovers or renting beds in open air hotels. They are mostly circulating migrants who have no permanent homes within the city. They use cheap dry cleaning services and use public toilets for which they pay between Rs. 10-30 per person. Most of them work as day wage labour but some had their own thelas (carts) on which they sell fruits and vegetables. Nearly all of them had had interactions with the KMC, police, or other authoritative figures in some way. Some had even faced eviction from their previous dwellings. Nevertheless, almost all of them possessed their CNICs and recognized its significance.

CONCLUSIONS

The above discussions and literature review have been instrumental in emphasizing the fact that urban poverty is multidimensional and using any one aspect from which to analyse it through will result in major discrepancies and injustice. This shows through in the definitions of the UN and that of the World Bank. The former for example, states that all those that are inadequately housed are homeless. In the case of Karachi, this would then mean that more than half of its population is homeless.

However, the above understanding of homeless ignores the fact that the poor build incrementally. They add to their homes a little at a time by participating in saving schemes and committees and therefore, their understanding of a "home" is very different from that of a bureaucratic and academic institution like the UN. This factor is very important because it needs to be accommodated within the formal planning process of cities. Urban planners and professionals are falling short of their responsibility to create an inclusive city when they do not take into account the ways in which the poor navigate their own realities.

Additionally, the UN definition also fails to consider the very important fact that the poor are not granted legal utility

connections for decades at times. They have to fight and protest and make negotiations with government authorities to be able to gain these. In cases where this is not possible or where they have legal connections but no (proper) services, they have to rely on informal means of accessing basic utilities. Manzoor Colony for instance has a legal water connection. However, the supply is inadequate for their daily needs and therefore, they have to buy additional tankers which is a significant added cost in their monthly expenditure. How this impacts their life and living standards needs to be investigated further.

On another note, the fieldwork revealed that technology has now become a crucial part of everyone's lives, particularly since the COVID-19 pandemic. Digital education therefore needs to be considered within institutions. Additionally, the use of smartphones and laptops has a significant impact on social relations which must be investigated and understood to map future societal trends.

Furthermore, there is a serious lack of women's participation in the labour force. The 2017 Population and Housing Census of Pakistan revealed that only about seven percent of women are employed in Karachi (Hasan, A, Hashim, A. and Alvi, D. 2022). Working women in Pakistan need to consider several factors when looking for employment. As mentioned earlier, their ability to work is precarious because of the "permission" granted to them by men. Additionally, their choice of work is dictated not by the remuneration they would receive but by the transport links available and its cost.

On the other hand, the interviews, particularly those of the planners, revealed that there is a significant lack of emphasis on acquisition of services and planning for land-use that is beneficial for the poor. Furthermore, the way these two aspects affect the lives of women is also not considered during the planning process. Academia is failing in this regard to create a pro-poor world of thinking and inclusivity since it is not creating a space where these issues are brought up in the classroom and sustainable solutions found for them.

REFERENCES

Abebe, G. and Hesselberg, J. 2015. "Community participation and inner-city slum renewal: relocated people's perspectives on slum clearance and resettlement in Addis Ababa," in: *Development in Practice*, 25(4).

ADB. 2002. *Poverty in Pakistan: Issues, Causes, and Institutional Responses,* Islamabad: Asian Development Bank.

Ahmed, N. 2020. "Shelterless in Karachi," *Daily Dawn newspaper*, February 23.

Asian Coalition for Housing Rights (ACHR). 2014. "Housing by People in Asia." *ACHR Newsletter* No. 19.

Auerbach, A.M., LeBas, A., Post, A.E., & Weitz-Shapiro, R. 2018. State, Society, and Informality in Cities of the Global South. *Studies in Comparative International Development*, 53(3), 261-280. http://dx.doi.org/10.1007/s12116-018-9269-y

Avis W. R. 2016. "Informal Settlements," *Urban Governance.*

Basile, P. and Ehlenz, M. M. 2020. "Examining Responses to informality in the Global South: A framework for community land trusts and informal settlements," *Habitat International*, Vol. 96.

Baysal, C. U., Hasan, A. and Cabannes, Y. 2009. Advisory Group on Forced Evictions (AGFE) Report to the Executive Director of the UN Habitat Program.

Brown, A., Mackie, P., Dickenson, K. and Ahmed, S. 2017. *The Informal Economy in Urban Violence, Karachi - Pakistan*, UK: Cardiff University.

Campos M. J. Z., Kain J. H., Oloko M., Scheinsohn M., Stenberg J., and Zapata P. 2022. "Residents' collective strategies of resistance in Global South cities' informal settlements: Space, scale and knowledge," *Cities*, Vol. 125.

Editor, “If you look at Karachi and who plans it, the decisions are made by those who do not understand the problems of the ordinary people,” LSE Blogs, December 13, 2016

Fatima A. and Macktoom S., 2022, “Contesting Smartness in an unequal Karachi,” *Prism, Dawn.*

Hall, S., Leary, K., and Greevy, H., 2014. *Public Attitudes towards Poverty*, York: Joseph Rowntree Foundation.

Hasan, A., Hashim, A.and Alvi, D. 2022. “ What the Census Tells Us about Karachi,” *Eos,* Dawn, July 31. https://www.dawn.com/news/1702463

Hasan, A. Pervaiz A., and Raza M., 2017. *Drivers of climate change vulnerability at different scales in Karachi*, London: IIED. Available at https://www.iied.org/10805iied

Hasan, A. and Raza, M. 2015. *Impacts of economic crises and reform on the informal textile industry in Karachi*. IIED Working Paper.

Hasan, A. 2021. *Search for Shelter*, Karachi: Oxford University Press.

Hasan, A. 2021. “Created Homelessness,” *Daily Dawn newspaper.*

Hasan, A. 2021. “Karachi’s Street Economy,” *Daily Dawn newspaper*, January 3.

Hasan, A. 2018. “The Crisis of Urban Housing,” Available at http://arifhasan.org/development/urban/the-crisis-of-urban-housing

Hassan, M. and Malik, U. A. (eds) 2018, *Development Advocate, Pakistan - Sustainable Urbanization*, Islamabad: UNDP Pakistan.

Hisam, Z. 2014. “City and the migrant labour,” *Daily Dawn newspaper*, June 30.

Hunter, R. “Education in Pakistan,” Education System Profiles, World Education News + Reviews (WENR), February 25, 2020.

IOM. 2019, August. “Pakistan Migration Snapshot”. International Organisation of Migration, Regional Office for Asia and the Pacific.

ILO Regional Office for Asia and the Pacific. 2020. “Asia-Pacific Employment and Social Outlook, 2020: Navigating the crisis towards a human-centred future of work” International Labour Organisation.

KMC, “Budget at a Glance,” Karachi Metropolitan Corporation, Budget 2018-2019, http://www.kmc.gos.pk/Contents.aspx?id=152

Kumar, G., 2018. “What is Poverty and its Types,” in: *Jagran Josh.* Available at www.jagranjosh.com/

Latif, A. 2020. *Millions of Pakistani laborers struggle amid covid-19 lockdown*. Anadolu Agency.

Mahmood M., 2006, “Working Paper 46: Poverty Reduction in Pakistan” in The strategic impact of macro and employment policies,” International Labour Organisation (ILO).

Mansuri, G. 2016. “Who is poor in Pakistan today? Raising the basic standard of well-being in a changing society,” *End Poverty in South Asia,* October 12. https://blogs.worldbank.org/endpovertyinsouthasia/who-poor-pakistan-today-raising-basic-standard- well-being-changing-society

Nikuze A., Flacke J., Sliuzas R., and Maarseveen M. V. 2022. "Urban induced displacement of informal settlement dwellers: A comparison of affected households' and planning officials' preferences for resettlement site attributes in Kigali, Rwanda," in: *Habitat Journal*, Vo. 119.

Pakistan Bureau of Statistics. 2017. "Final Results – Census".

"Poverty Defined," Blog for Compassion, https://www.compassion.com/poverty/what-is-poverty.htm

N.d. "What is Poverty?" Economic and Social Inclusion Corporation, New Nouveau Brunswick, Canada. https://www2.gnb.ca/content/gnb/en/departments/esic/overview/content/what_is_poverty.html

Satterthwaite, D. 2021. *Upgrading informal settlements in the global South: transforming relations with government, transforming lives.* London: International Institute for Environment and Development.

Satterthwaite, D. 2000. "Towards More Pro-Poor Local Governments in Urban Areas," in: *Environment and Urbanization*, Vol. 12, No. 1.

Speak, S., 2019, May. The state of homelessness in developing countries. *Presented at: United Nations expert group meeting on "Affordable housing and social protection systems for all to address homelessness",* pp. 22-24.

UNICEF Turkey, 2018. "Millions of the world's poorest urban children are more likely to die young and less likely to complete primary school than their rural peers - UNICEF," Press Release November 27.

UNICEF Pakistan, "Education,",

Verschure, H., Hasan, A., Boonyabancha, S., Nguyen, M.H. and Tran, V.K., 2006. "Evaluation and Recommendations for Infrastructure and Resettlement Pilot Project Tan Hoa-Lo Gom Canal Sanitation and Urban Upgrading Ho Chi Minh City".

Yousafzai, A. 2022. "10pc of Karachi's public schools have zero students — but 317 teachers," *The News*, March 14.

Zaman, F. and Ali, N. S. 2016, "Bahria Town Karachi: Greed Unlimited," *Daily Dawn newspaper,* April 18.

LIST OF INTERVIEWS

Interview with Mr. Younus Baloch, Urban Planner and Academic, July 23, 2022

Interview with Dr. Noman Ahmad, Urban Planner and Academic, August 04, 2022

Interview with Zahid Farooq, Senior Manager Urban Resource Center, Pahar Ganj, July 26, 2022

Interview with Amna, Resident of Machar Colony, August 5, 2022

Interview with Mr. Toheed, Researcher at the Karachi Urban Lab, July 24, 2022

Interview with Ruth Farhad Akhtar, Pahar Ganj, August 16, 2022

Focus group at Manzoor Colony, August 4, 2022

Interview with Amna, Machar Colony, August 5, 2022

Interview with Shireen Khan, Haji Ghulam Zakariya Goth, August 28, 2022

Interview with Amber Ali Bhai, General Secretary of Shehri CBE, July 23, 2022

Interview with Farhana Arshad, Manzoor Colony, August 4, 2022.

Interview with Umar Rehman, Khyber Town, Baldia, August 30, 2022.

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING
Volume 33 Issue 2
ISSN (P) 1728-7715 - ISSN (E) 2519-5050
Journal DOI: www.doi.org/10.53700/jrap_neduet
Issue DOI: www.doi.org/10.53700/jrap3322023

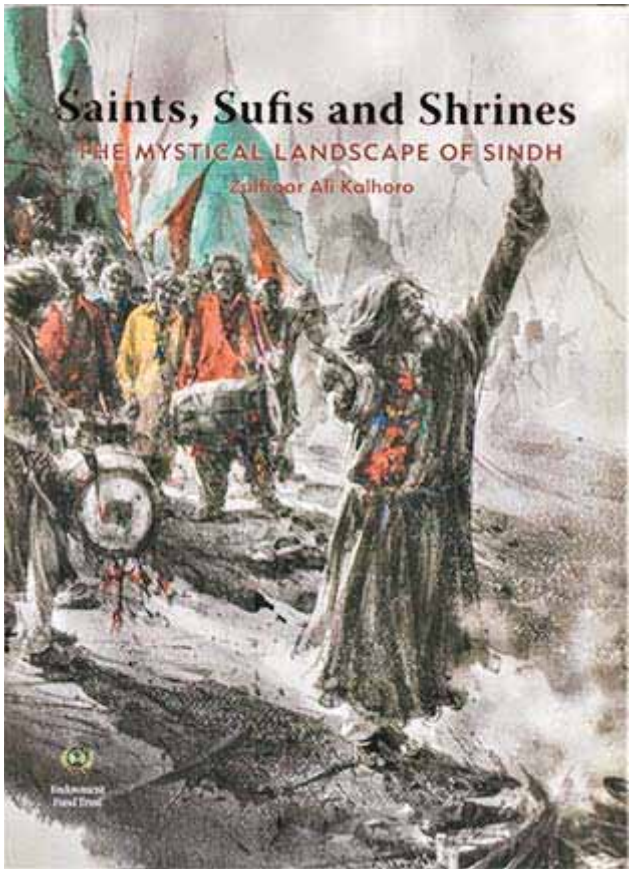
SAINTS, SUFIS AND SHRINES - THE MYSTICAL LANDSCAPE OF SINDH

Zulfiqar Ali Kalhoro

Reviewed by Sarah Sarmad*

BOOK REVIEW

Saints, Sufis and Shrines - The Mystical Landscape of Sindh authored by Zulfiqar Ali Kalhoro examines the intricate social, religious, and cultural contexts in which Sufism flourished in Sindh. The purpose of the book is to develop the interest of international academics in Sindh's rich Sufi heritage. The author plans to write three volumes in this series, with this one being the first. It comprises saints and shrines from every region of Sindh from the thirteenth to the twentieth centuries, both known and less known. This book has around fifty-five articles on various saints and shrines. These articles discuss the saints and talk about their significance in Sindhi society and culture in bringing socio-political and religio-cultural changes in the mystical landscape of Sindh.



This engaging and thoroughly researched book offers insight into Sindhi Sufism in its multiple facets. It goes into detail on how Sufism is Islam's preserved spiritual path. Drawing on a thorough study of Muslim writings and traditions, the author posits that Sufism is not an innovation but rather the continuation of a thinking process that connects Muslims to their religious predecessors.

It presents a perceptive analysis of how Sufism interacts with both Muslim and non-Muslim society. This book discusses both Muslim and Hindu saints as well as their shrines. All of these shrines serve as examples of religious harmony and tolerance where people of many faiths can mingle and communicate while letting go of prejudice through the enjoyment of Sufi music and poetry. Families of Hindus from marginalised castes are frequently spotted at the shrines, which reflects both their widespread appeal and inclusivity. The centuries-old shared heritage of Sindh has been carried on by devotees of both religions. One of the many Sufi shrines in Sindh where people of various religions gather to seek comfort and transcend all religious boundaries is the shrine of Shah Abdul Latif Bhitai.

* Lecturer, Department of Architecture and Planning, NED University of Engineering and Technology, Karachi.
sarahhafeez2@gmail.com

Pictures of all the shrines discussed makes the book even more interesting. It also discusses the architecture of the shrines from inscriptions to the tileworks which gives insight into the preservation of the shrines. It covers the people who are guardians of the shrines who welcome both Muslims and Hindus and proudly tell that they themselves belong to both religions.

Readers are free to escape the illusion of putting Sufism in a box with restrictions and rigid boundaries. The meaning of Sufism is liberated by Kalhoro's work. He describes how Sufism is not like a structured phenomenon with a clear beginning and end. Instead, it is a complicated world, all on its own.

The subject of *Saints, Sufis, and Shrines - The Mystical Landscape of Sindh* is a one that has not received much scholarly attention, and this book is a commendable contribution to it. Based on 244 pages, the book is simple to read and can readily capture the interest of both layman readers and scholars. Academics may use this publication as important reference on the subject in the years to come.

Journal of Research in Architecture and Planning

Journal of Research in Architecture and Planning is the official journal of NED University of Engineering and Technology, Karachi. The Journal publishes two volumes biannually. The primary aim of the Journal is to provide an international forum for the dissemination of research and new development in architecture, planning and urban design. The Journal presents advanced knowledge and new research contributing towards enrichment and growth of the profession.

SUBSCRIPTION INFORMATION

One year (2 issues) paid subscriptions for each section of to **Journal of Research in Architecture and Planning** are available at following rate:

☐ For Pakistan Rs. 500/- ☐ Rest of the World US$ 50/-

Single issue of Journal can be purchased at the following rate:

☐ For Pakistan Rs. 250/- ☐ Rest of the World US$ 25/-

ADDRESS INFORMATION:

First Name_____ Last Name_____

Title _____ Company_____

Department _____

Street Address_____

City_____ State/Province _____

Country_____ Zip/Postal Code_____

E-mail Address_____

Please write your cheque/bank draft in favour of Chairman, Department of Architecture and Planning.

Online Transfers can be made:
Account No.: 495-8
Bank Name: National Bank of Pakistan
Branch: NED University Main Campus, Karachi
Swift Code: 1063

For Further Information Contact: jrap@neduet.edu.pk

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

INVITATION FOR PAPER CONTRIBUTIONS

ISSN 17728-7715 (Print), ISSN 2519-5050 (Online) - listed in Ulrich Periodical Directory

Journal of Research in Architecture and Planning is an initiative taken by the Department of Architecture and Planning, NED University of Engineering and Technology, to provide a medium for communicating the research and the critique in the broader domain of architecture and planning in Pakistan and beyond. From 2011, the Journal of Research in Architecture & Planning is published biannually; covering topics related to architecture, planning and related subjects. JRAP is an Open Access journal licensed with Creative Commons.

For our forthcoming issues of the Journal, the editorial board invites contributions from researchers, scholars, architects and planners. The papers can be based on ongoing researches or analytical and hypothetical concepts related to relevant fields. Interested authors should download and read the Instructions to Authors Manual (http://www.neduet.edu.pk/arch_planning/NED-JRAP/guidelines.html) for all details of requirements, procedures, paper mechanics, referencing style and technical review process for submitted papers. Submission and Publication in JRAP is free of charge.

FORMAT

Article Size	5000 words to 7000 words (please consult the journal office in case you wish to send a longer article)
Page Size	A-4 **Page Layout** Portrait
Font Style	Times New Roman
Font Size	10
Visuals	All visuals (photographs, direction maps, diagrams, Google maps etc.) shll be in Jpg/Tiff format with minimum 300 dpi resolution at actual print size, These shall be properly captioned and clearly referred in the text. please do not insert them in the text.
Drawings	AutoCAD drawings shall be converted in tiff format with a readable size and legend.
Submission	Online submission through the journal portal and submission portal web address.
Referencing System	Harvard Style

Previous issues of JRAP have covered following topics:

Townscapes	Vol. 1, 2001
Townscapes II	Vol. 1, 2002
Transportation in Architecture	Vol. 2, 2003
Conservation and Culture Heritage	Vol. 3, 2004
Form, Design and Details	Vol. 4, 2005
Urban Design Case Based: Theory and Practice(I)	Vol. 5, 2006
Urban Design Case Based: Theory and Practice(II)	Vol. 6, 2007
Architectural Education	Vol. 7, 2008
Architectural Practice	Vol. 8, 2009
Architecture for Housing	Vol. 9, 2010

Later Biannual issues from 2011-2022 have covered varying topic range:

- Architectural philosophy
- Architectural history
- Building conservation
- Building integrated renewable energy technologies
- Conservation led urban regeneration
- Eco-housing, Interactive architecture
- Land use planning
- Low carbon impact buildings
- Secondary cities
- Sustainable architecture
- Urban ecology/ Urban renewal / Urban sprawl
- Urban sustainablity / Urban transportation
- Urbanization

BOOK REVIEW: Contributions for our 'Book Review' section are welcome in the form of a brief summary and a sample of the publication related to the field of archiecture, planning and development.

For Further Information, please write to JRAP Editor
Dr. Masooma Shakir at jrap@neduet.edu.pk

City Campus | Maulana Din Muhammad Wafai Road, Karachi - 74200 PAKISTAN
Phone | (9221) 99213058 (9221) 32620793 **Fax** | (9221) 99213058 & 99261255
Email | jrap@neduet.edu.pk crd@neduet.edu.pk
Website | www.jrap.neduet.edu.pk

Department of Architecture and Planning,
NED University of Engineering and Technology,
University Road, Karachi-75270.
Tel: (92-21) 99261261-68 Fax: (92-21) 99261255
www.neduet.edu.pk
crd@neduet.edu.pk