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# 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.

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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](http://jrap.neduet.edu.pk/online_journal.html).

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

## EDITORS' NOTE

There are five papers included in this volume. Two of the papers focus on the impacts of COVID-19 on housing and urban spaces respectively. One of these papers is situated in Lagos, Nigeria and was part of a presentation made at the 5<sup>th</sup> Conference of Urban and Regional Planning, organized by the Department of Architecture and Planning in 2021. The other paper, which is paper 4 within this volume, is situated in Lahore, Pakistan. Both the papers present policy and planning related implications as a result of the various social and economic changes in the face of the pandemic.

The focus of the first paper is on the relationship between shortage of housing and empty office spaces within the city of Lagos, in the face of COVID-19. The argument put forth is that new norms have emerged as a result of the pandemic, and these need to be catered for in cities of global south.

The second paper goes back in history and analyzes the role of 'water' as a design element within Mughal architecture. It investigates how Mughals have used water as a representation of power to control the temperature as well as for aesthetic purposes by creating lakes, canals, springs, fountains, and pools.

The third paper uses a qualitative research method, and analyzes fifteen different cases of house layouts from three major cities of Pakistan. The objective is to measure integration, space-link ratios and difference factors to understand factors impacting relationship between different internal spaces of middle income urban houses. The fourth paper is a qualitative study related to the impact of the pandemic on urban livability with a focus on public spaces and claims to be a research that would be helpful for architects, designers and urban planners for making pandemic resilient urban spaces in the future.

The fifth paper also relates to the impacts of the pandemic but in an implicit manner. It focuses on the relationship between optimal performance of Accident & Emergency (A&E) Department of any hospital and the related issue of planning. The underlying assumption here is that situations like COVID-19 would be frequently experienced in the future, thus hospitals need to plan and prepare accordingly, especially the A & E Departments.

This volume also includes book review of "The Arts and Crafts of the Hunza Valley in Pakistan – Living Traditions In The Karakoram", by Jurgen Wasim Frembgen and reviewed by Madiha Salam.

### Editorial Board

# COVID RUINS, TOMORROW'S HOMES? ANALYSIS OF AN ADAPTIVE RE-USE APPROACH TO AFFORDABLE HOUSING FOR METROPOLITAN CITIES IN THE GLOBAL SOUTH

Chinonyerem Ugwuonah\*

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## ABSTRACT

Acute housing shortage and empty office spaces are likely to emerge as critical urban issues of the post-pandemic (COVID-19) metropolitan cities, considering that the 'new norms' of existential patterns have brought about visible socio-economic impacts. With the remote work lifestyle, the commercial real estate litter with underutilised public buildings. Thus, begging the question "could these corporate buildings effectively transform to provide affordable housing in metropolitan cities?" This paper focuses on adaptive reuse as an urban resilience strategy for metropolitan cities in the global south, using Lagos, Nigeria, as a context for the study. The opportunities and challenges of adaptive reuse are considered by reviewing the responses of cities to similar urban crises in the past. Existing literature was reviewed and analysed through a comprehensive desktop research to understand the urban implication of unused spaces in developing countries, effect of policy on adaptive reuse and the implication of adaptation outcomes on affordability. Based on the findings, a research gap was identified. Primary data was collected using online survey and the results were analysed. An adaptive reuse strategy is recommended for housing the youths and the middle class in underused cooperate buildings within cities of developing countries. This paper concludes that reuse of office spaces provides an excellent opportunity for a sustainable housing strategy in metropolitan cities of developing countries through tactical designing and planning approaches, informed by the peculiarities of the society identified within participatory design processes.

**Keywords:** Urban Strategy, Global South, Pandemic, COVID-19, Changing Urban Pattern, Affordable Housing, Circular Economy, Housing Crisis, Sustainable Spaces, Adaptive Reuse

## INTRODUCTION

The Coronavirus pandemic (COVID-19) has affected establishments in varying degrees by significantly reducing human interactions within the urban infrastructure (Ayoob and Amir, 2020). These 'new norms' of existential patterns have also brought about visible socio-economic impacts which will become evident in the future, particularly in the real estate market (Javed, Zahoor and Saeed, 2020; Kaisse et. al., 2020; Mhlanga and Moloi, 2020; Mhlanga and Moloi, 2021). Also, the COVID-19 crisis highlights the importance of housing as a frontline shield against the pandemic (WHO, 2007; 2020) as well as the importance of high-quality public spaces, improved infrastructure networks and environmental

policies (Ayoob and Amir, 2020). Thus, demonstrating the deep connection between health and living conditions.

According to the United Nations (UN) Secretary-General, adequate housing has become even more critical in the face of a pandemic. Thus, creating opportunities for more people to live in healthy homes is critical for a stronger global economy (United Nations, 2016; 2020). Due to the pandemic's effect on economies and remote work lifestyle, the commercial real estate litter with underutilised public buildings.

Considering that urbanisation is a global trend (UN Habitat, 2001), the United Nations Sustainable Development Goal



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SDG-11(United Nations, 2016) acknowledges that cities will continue to provide housing for the exponentially rising number of urban dwellers in the coming decades (UN-Habitat 2001; 2006). The influx of people, incessant occurrences of natural disasters, political unrest, the rising cost of land acquisition and construction has made access to affordable housing even more challenging in most cities (UN-Nations, 2020). Thus, increasing social inequalities and proliferating slum dwellings within city centres and their periphery (UN-Habitat, 2003).

Adequate housing has remained an intractable problem within urban areas, especially for developing countries encumbered by the sprawling complexities of urban poverty and bad governance, in the face of a rapidly growing population (Bhalla, 2002; Ogunnaike, Squires and Booth, 2013; Yeboah, 2005). The issues discussed in this paper are global; however, the research focuses on metropolitan cities in developing countries with Lagos, Nigeria, as a relevant study context.

In response to part 1 of SDG 11, the main objective of this paper is to analyse the possibility of repurposing post-COVID commercial real estate ruins as a rapid circular economy approach to providing affordable housing in metropolitan cities of developing countries. Although COVID-19 is not the first global pandemic crises in human history, there is still limited literature regarding the resulting urban transformations (Ayoob and Amir, 2020, Bernstein, et. al., 2006). This study aims to fill the gap in literature by discussing post pandemic responses and transformation of the urban environment. It also aims to contribute to the research on adaptive re-use of buildings, particularly within the context of sustainable urban crises management in the global south.

This study differs from other scholarly works (Kassie, et. al., 2020; Kievani and Werna, 2001; Okpala, 1992; Olotuah, 2002; Sharifi and Khavarian-Gorms, 2020) in its approach to the affordable housing discourse. Sustainability, waste depletion and community revitalisation are the common goal for adaptive reuse. While existing research focuses on this concept as a form of heritage and cultural preservation (Bullen, 2004; Othman and Elsaay, 2018), this paper discusses adaptive reuse as an urban response with emphasis on the metropolitan cities of the global south. Thus, analysing the pandemic's effect on the commercial real estate market; highlighting the opportunities for innovative re-use of infrastructural waste as a rapid response to housing needs in developing countries.

First, the paper reviews existing literature to discuss relevant topics such as the COVID-19, housing crises, affordable housing and the circular economy. It further analyses the context of study- Lagos, Nigeria, to better understand existing urban issues in metropolitan cities of developing countries. Additionally, the paper discusses the opportunities and challenges of adaptive re-use by reviewing the strategies used by various cities in the past. It then presents a summary of research findings based on the outcome of the online survey carried out.

A crucial outcome of this study would be to open the conversation about repurposing existing underutilised spaces for affordable housing rather than erecting new buildings, as well as the re-organisation of living spaces within emerging and established cities, especially after a paradigm distortion in the conventional housing and zoning ideologies because of the COVID-19 pandemic.

## BACKGROUND

The mid-2020 update of the World Economic Situation and Prospects (WESP), United Nations Department of Economic and Social Affairs (UNDESA) estimates that over 34 million people were pushed into extreme poverty that year (United Nations New York, 2020). Congruently, the World Bank reveals an ominous prediction that the plummeting economic growth will push about 71-100 million people into extreme poverty (Sumner, Hoy and Ortiz-Juarez, 2020; World Bank, 2020).

Housing affordability differs from city to city and can be approached through a quantitative or qualitative perspective (UNDESA, 2020). The Federal Department of Housing and Urban Development (FDHUD) defines an “affordable dwelling” as one that a household can obtain for thirty per cent or less of its income (United Nations, 2020) .

Affordability regarding housing has also been argued to be a social construct that should be considered based on recognisable levels, especially varying income levels. However, Bohdan (2010) disagrees with simply assessing housing affordability based on the average cost of apartments and the citizens' income ratio because it does not consider regional development peculiarities (Torluccio and Dorakh, 2011).

The precise definition of the term is ambiguous (Torluccio and Dorakh, 2011) however, there is a common goal—addressing the housing needs of the lower or middle-income households (Begum, 2015). Most relevant to this discussion is the Kaissie et. al.'s (2003) description of housing

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affordability (Kaissie et. al., 2020) as a component of a comprehensive strategy for cost reduction, relative to market housing cost and rental value, irrespective of sizes, material applications, maintenance cost and durability for any scheme. Apart from the economic perspective, affordable also means physically adequate and fit for human habitation (United Nations, 2020). Thus, a house cannot be considered affordable if it is overcrowded and unhealthy. This perspective also considers other elements required to make a home conducive to living such as water, electricity, and gas. In Lagos, it is estimated that about 40 - 75% of the population lives in deplorable conditions within squatter settlements (Opoko, et. al., 2020). Thus, highlighting a housing affordability situation that falls short of all standards of measurement is described here.

The UN considers access to quality affordable housing a fundamental approach towards reducing urban poverty and improving equal opportunities for sustainable growth (United Nations, 2020). In keeping with the UN SDG 11, to reduce the number of slum dwellers by 2030, non-profit financing (mortgages and loans) has started emerging for the poorest populations (UN-Habitat, 2003). However, the housing market in Lagos still struggles with aligning housing needs with housing demand, as the private developers are more concerned about profitability and have no interest in serving the needs of the low-income earners from which the housing needs stem (Wallace and Allake, 2019).

Although non-governmental organisations (NGOs) and international organisations have successfully collaborated with private investors to provide affordable housing interventions within vulnerable communities, a significant housing gap is yet to be breached (Begum, 2015; Rehman, 2005; UN-Habitat, 2014). The UN analysis of housing affordability in the last twenty years shows that regardless of increasing demand, housing (including rentals) has remained grossly unaffordable for most of the world population (United Nations, 2019; 2020; UNDESA, 2020; Wallace and Allake, 2019). The pandemic further intensified concerns for affordable housing supply due to construction delays and economic decline following the extended lockdown period. Hence, the need for architects and developers to consider proactive circular economy approaches that unlock the potentials of underutilised office spaces as tools for solving affordable housing needs within metropolitan cities.

The circular economy is a closed-loop economic system that focuses on systems thinking as a sustainable approach to closing the raw materials cycle by changing the approach

to value creation and preservation, based on 3R approach -reduce, re-use and recycle. Architectural projects need to evaluate the entire system of buildings from the design stage until post-occupancy in compliance with the 3R approach, to provide buildings a chance to a second life, without constituting environmental problems. This approach is valuable and promoted to be used in contexts like Lagos, where residents are faced with severe housing shortage.

## CONTEXTUAL ANALYSIS

The urban settlement within Lagos, Nigeria sprawls over three core islands (Lagos Island, Lagos Mainland, and Victoria Island) interconnected by bridges. Until 1991, Lagos was the capital of Nigeria with suitable urban infrastructure and employment opportunities. However, the population of the city began to swell due to rural- urban migration; a consequence of the government failing to improve economic systems in the rural areas by establishing appropriate land reforms and updating agricultural technology practices. These issues are still prevalent today (Emordi and Osiki, 2008; Oduwaye, 2009; Olajide, Anunbiade and Bishi, 2018; Onilude and Vaz, 2020). Due to census inaccuracies, the actual population of Lagos is not known. However, it is estimated by the Lagos Bureau of Statistics to be about 26 million (Wallace and Allake, 2019). The University of Toronto Global Institute predicts that by the end of the century, Lagos will become the world's largest city, based on the projection that the city's population would have grown to 88 million (Hoornweg and Pope, 2016).

Lagos Island and its adjoining neighbourhoods (Ikoyi and Victoria Island) form the Central Business District (CBD) and historical core of the megacity, consisting of warehouses and government buildings (Emordi and Osiki, 2008). Built along the marina and sandwiched between the two socially distinct habitats- the island and the mainland, Lagos Island is the densest district in terms of physical development (Adeoye, 2010). It provides a good backdrop for the urban and architectural issues discussed in this paper.

The development of Lagos city was based on the 1979 master plan, which contained a planning and development framework for the metropolis. The strategies involved expanding existing public infrastructure and facilities to accommodate population pressure, establishing economic centres, and constructing 1.4 million housing units (Morka, 2007). Unfortunately, due to distortions by the government and minimal implementation, less than 10% of the proposed housing needs were met by the expiration time of the plan in 2000 (Abosede, 2006). The inability of the existing

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housing and urban infrastructure to meet demands at a commensurate level has resulted in acute housing shortage of about 5 million, representing 31% of the estimated national housing deficit of 18 million (BBC Africa, 2017; Emordi and Osiki, 2008; Nwanna, 2012). Consequently, more environmental and urban planning challenges have risen such as overcrowding, unplanned settlements, urban sprawl, abuse of wetlands, land and water pollution due to industrial activities and poor waste management (Adedayo and Malik, 2015).

Qualitative housing remains a matter of trepidation for the government and individuals (Begum, 2015). According to Abosede (2006) over 70 per cent of Lagos metropolis population lives in rooming types with an occupancy ratio of eight to ten persons per room, lacking essential services and amenities required for a healthy living. Factors such as the cost of building materials, deficiency of housing finance arrangement, stringent loan conditions from mortgage banks and government policies have stifled the efforts of NGOs, government, and private sector developers to bridge the gap between housing demand and supply.

Considering that housing commodification is still deeply embedded with social change, developers target expatriates and a small group of Nigerians with disposable income, high enough to afford luxury housing solutions as second homes. A good example is the Eko Atlantic project intended to reduce housing shortage in Lagos by providing accommodation for 450,000 residents and 300,000 commuters within a luxury apartment (Umar, Ogbu and Ereke, 2019). Due to the exorbitant pricing of these properties, even the emerging middle class is left with very few housing options (Badmos et. al., 2020; BBC Africa, 2017; Ezema, Opoko and Oluwatayo, et. al., 2016; Olajide, Agunbiade and Bishi, 2018). Additionally, mass housing projects by the government elude the slum-dwelling families because these homes are bought by the ruling class and subleased at unaffordable prices (Umar, Ogbu and Ereke, 2019; Ogunnaike, Squares and Booth, 2013). Consequently, Lagos is overdeveloped, with a reasonable number of unaffordable and empty buildings. (Habitat for Humanity, 2021; UN Habitat, 2006; United Nations, 2020; UNDESA, 2020).

This situation is likely to be aggravated because the economies of developing countries have become even more volatile post COVID-19 pandemic. Due to the high unemployment rate, there has been an increase in entrepreneurial and informal economic activities. In addition, most of the country's educated youth population classify as 'houseless persons' (Ogunnaike, Squires and Booth, 2013).

In this case, the key factor for homelessness is not completely influenced by low-income level but the unavailability of housing and a hiked renting cost (Adeshokain, 2019). In addition, due to poor documentation, it is difficult to paint an accurate picture of Lagos, Nigeria's housing deficit (Wang and Maduako, 2018). It is estimated that the city's housing shortage is about 5 million housing units, hence, an overpriced housing market automatically excludes the middle class (Opoko, et. al., 2020). Adedayo and Malik (2015) and Badmos et al. (2020) observed that there is a positive correlation between the highest educational level attained and the monthly income of residents, as well as between income and rent paid. Thus, implying that with increased income, people are willing to secure better accommodation outside slums, if housing is made available (Adedayo and Malik, 2015).

The government's urban renewal strategies within Lagos have only succeeded in a private sector-led gentrification (Abosede, 2006; Bhalla, 2002; Boland et. al., 2020) and an overabundance of business within the Lagos Island district land, as commercial space owners feel pressurised to meet up with the high level of business activities (Adeskoka, 2019). However, it is important to mention that some of these corporate buildings have remained empty for many years. As the country's capital moved to Abuja, government parastatals moved their offices to the new capital, leaving these giant edifices to govern the skyline with no importance. Consequently, the urban voids have become hideouts for hoodlums and an informal shelter for young Lagosians who cannot afford homes closer to work and school (Fairmade, Soginka and Siu, 2018; Wahab, 2020).

A guardian columnist survey reveals that about sixty structures within the CBD between a minimum of five floors to a maximum of twenty floors with an average of 6000m<sup>2</sup> per floor are empty and unused (Wahab, 2020; Yakubu, 2019). The above statistics show that these buildings can reduce the 3 million housing deficit in Lagos by 10% if innovatively repurposed (Viola and Diano, 2019). In addition to the government-owned buildings, there are even more recent commercial developments within the adjoining districts that have remained empty in the last five years due to high renting prices (Adedayo and Malik, 2015; Adeshokan, 2019). With the unforeseen aftermath of the COVID pandemic, the CBDs of metropolitan cities are likely to become further emptied as most companies embrace smart working while the hard-hit ones never return to the highstreets.

Analysing affordable housing interventions in Lagos and globally, it is important to highlight that most strategies



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favour new buildings as solutions to housing deficit (United Nations 2020; Wallace and Allake, 2019; World Economic Forum, 2019). Considering that the contextual realities are not factored into the design and implementation stages of most luxury housing projects, the outcome is a plethora of unsustainable buildings that partly or entirely depend on artificial lighting and ventilation systems. Thus, this paper focuses on a housing supply strategy for metropolitan cities in developing countries that critically analyse the development of a wasted infrastructure as opposed to a resilient urban plan.

## RESEARCH METHODOLOGY

Qualitative and quantitative research approach was taken to derive the information used in this study (Baxter and Jack, 2008). Existing literature was reviewed and analysed through a comprehensive desktop research. Based on the findings, a research gap was identified; primary data was collected using online survey and the results were analysed. Limitations of this research include the scarcity of comprehensive information on existing office to residential reuse ratios, especially in the global south, as most projects focused on the revitalisation of historical buildings which were mostly repurposed for any other use but residential.

## DISCUSSION

### *Adaptive Reuse: Opportunities and Challenges*

The Department of Environment and Heritage of Australia (2004) defined adaptive reuse as a process that changes a disused or ineffective item into a new item that can be used for a different purpose (Desilva and Perera, 2016). The current pandemic can be considered an urban trauma due to the unforeseen disruptions it has caused to the social and cultural network of cities (Boland et. al., 2020). Although the pandemic's effects are largely considered negative, it has also succeeded in highlighting the flaws of the current urban strategies, thus, opening opportunities for designers to unlock public resources through creative planning strategies. The pandemic has highlighted the need to ensure that the urban planning and zoning systems are re-strategised to help cities recover from the trauma induced by the rapid transformation of urban patterns and accommodate preventive measures (Ding, 2008).

Over the years, adaptive reuse has become a sustainability based heritage preservation practice for preventing functional obsolescence and extending the useful life of historic buildings (Bullen and Love, 2011, 2011a). In the last decade, cities such as Amsterdam, London, New York, Toronto, Melbourne,

Perth and Tokyo have tried to balance the vacancy levels with declining demand for office spaces within downtowns and CBDs emptied out by the great depression. Hence, the repurposing of vacant office spaces into residential blocks has been used as a useful strategy (Bullen and Love, 2010). Although the drivers for adaptive reuse have been similar-demography, household compositions, rent gap between office and residential properties, changing attitudes and housing demand, the government strategies differed, but the results have been different. For Toronto, the government played a proactive role by strategically targeting the downtowns and converting only the most suitable office buildings. Thus, yielding an addition of about 9000 dwellings to the downtown area and dropping the office vacancy rates to normal. While in London, the government was not as proactive, hence the impact of their contribution was not outstanding (Remoy and Van der Voordt, 2014).

The driver for adaptive reuse in New York and Tokyo were tight housing market strategies and a high supply of obsolete buildings (Remoy and Vand der Voordt, 2014). For Manhattan, the government was supportive and active; hence, the government initiated Lower Manhattan Revitalisation Plan to subsidise the cost of transforming obsolete office buildings into studios and small apartments for first-time renters. From 1995- 2005 more than sixty office buildings were converted and the number of inhabitants in the area grew (Remoy and Van der Voordt, 2014).

On the other hand, in response to improved office market after the ninety's recession, Tokyo added new office buildings to the market. However, the office occupancy decelerated because of the dot-com bubble burst in 2002-2003 (Dougherty and Eavis, 2020). Unlike Manhattan, the local government had little influence on the urban developments and the tenancy perspectives for newer and larger office buildings were still decent, while the expectations for the existing buildings were low. Thus, demolition and new construction became a more desired choice than adaptation. The outcome of this strategy was an increase in the size of the urban fabric and little space for new buildings. However, as Tokyo worked towards the target to reduce energy use and greenhouse gas emission, there was a renewed focus on conserving the urban fabric and sustainability which had opened adaptive reuse opportunities.

The real estate market scenarios discussed above highlight drivers for adaptive reuse as sustainability aims, the high vacancy rate for office buildings and the shortage of affordable housing. They also underline five major obstacles: physical design, location, financial and legal aspects and a

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changing real estate market with a growing gap between demand and supply (Ball, 1999; Ramoy and Van der Voordt, 2014; United Nations, 2014). Most importantly, the above scenarios reveal the importance of a proactive government in making adaptive reuse a resilient post-traumatic response tool for cities (Remoy and Van der Voordt, 2007; 2014; Viola and Diano, 2019).

### ***Changing Cities: Challenges and Opportunities***

In the past, cities have had to reinvent themselves to deal with trauma in the event of manmade and natural disasters (Bernstein et. al., 2006; Sharifi and Khavarian-Garmsir, 2020). However, glitches exist in the adaptive reuse strategy for buildings which prevent or limit outcomes (Desilva and Perera, 2016; Gann and Barlow, 1996). This paper discusses the challenges and opportunities of adaptive reuse under following broad heads:

#### ***Design and Financial Impact***

With the arrival of the pandemic, work patterns lead to a decline in the need for office spaces and commercial real estate owners started to consider leasing their spaces for other uses, such as laboratories and restaurants (Boland et. al, 2020). At the same time, housing remained the least probable function because of the cost-prohibitive aspects of converting offices to homes, such as installing new plumbing fixtures and partitioning (Bullen and Love, 2011; Dougherty and Eavis, 2020). However, the above challenge opened opportunities for cost-effective innovations, experimentation with locally available materials, new skills and job opportunities (Gann and Barlow, 1996). For instance, partitioning elements could be governed by waste reuse innovations. Hence, there existed an opportunity to address waste management concerns in developing countries by recycling and repurposing solid and agro-generated waste for energy-efficient construction materials (Umar, Ogbu, Ereke, 2019).

Various authors have highlighted ways in which agro-waste materials can be applied to achieve lightweight, affordable, energy-efficient and sustainable partitioning, as well as their mechanical properties and how they can be adapted to relevant standards (Madurwar, Ralegaonkar and Mandavgane, 2013). However, to successfully apply the above in the delivery of affordable, desirable and sustainable spaces, further investigation is required to understand environmental performance and techno-economic feasibility of the materials within specific locations and climatic conditions.

### ***Policy and Zoning Restrictions***

The aim of planning policies and zoning codes is to guide the urban system towards setting goals based on the images of the desired future (Oluwole, 2011). However, they are also capable of suppressing variety and threatening local and individual forms of autonomy (Bullen, 2007; Bullen and Love, 2011). UN-Habitat (2006) identifies urban planning as a major tool by which sustainable urban development can be achieved. For metropolitan cities in the western world, urban development must adhere strictly to zoning plans. Consequently, converting building functions can become a delayed process, considering that buildings are subject to local policy and zoning rules that require lengthy public processes to change (Ball, 1999). In many sub-Saharan African cities, the current urban planning and development visions described by UN-Habitat (2014) as 'modernist dream', have failed to acknowledge the existential realities.

In Lagos, the outcome of imposing inappropriate regulatory frameworks is a lack of respect for the official regulations. Hence, there is a growth in the number of informal settlements, as most urban housing developments occur outside the official regulation without approval from the Lagos State Physical Planning and Development Agency (LASPPDA) (Oduwaye, 2009). Consequently, complexities degrading urban aesthetics, such as overpopulation have led to rapid territory expansion and pressure on the infrastructure.

On the other hand, there is the scenario of relaxed policies in countries like England. Considering the sense of urgency required to provide affordable housing, the policy for converting office buildings to affordable homes skip important local authority approval steps. A resulting outcome as seen in the case of the Terminus house (Moore, 2020) is a capitalist stimulated misuse of an excellent opportunity to provide affordable housing which immolates the fetish of quality. This case study emphasizes the disadvantages of handing over power to developers and eliminating standardisation rules ensured by local policies. Rather than creating suitable homes, the outcome of similar developments would result in modern slums.

Thus, the urban system needs to reimagine itself to make sense of these abrupt changes that exceed its capacity of integration. Therefore, in response to the sectoral impact caused by the COVID-19 pandemic, it is crucial to consider a tactical urban planning strategy that instigates recovery through flexible planning policies (Lahoud, 2016). This would mean creating hybrid territories that allow buildings and urban spaces to take on multiple functions within their

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life span in a socially, economically and environmentally sustainable way. This strategy can help achieve the above urban objective and requires institutions, particularly government, to play a significant role.

## ANALYSIS

The COVID-19 pandemic brought adaptive re-use to the spotlight for city planners and the professionals began to consider preservation strategies for disappearing city centres and business districts. However, there was still no unanimous agreement on the appropriate strategy that met all the stakeholders (developers, owners, and occupiers) needs. In the absence of adaptive reuse strategies, urban voids were created (De Silva and Perera, 2016).

An online survey was designed and shared with a target population which included landlords (15.2%), estate agents (12.1%), architects (66.7%), and contractors (6.1%) in Lagos, Nigeria. Over 50% of the total respondents affirmed that Covid -19 had significantly affected their businesses; for (42.4%) significantly and for (9.1%) very significant. 93.9% of the respondents affirmed that adaptive reuse of building is a useful tool for urban regeneration. 78.8% of the architects had designed office spaces and a majority (62%) of the architects prioritised building services in their design; 44.8% prioritised lighting, 48.3% considered ventilation while 41.4% considered adaptive reuse strategies. Therefore, although the respondents agreed that adaptive reuse is a useful urban regeneration tool, the results show that it is the least considered factor during the conceptual stages of the design process.

Furthermore, 58% of the respondents (architects) indicated that they had been involved with converting office buildings to another use. 78.6% of the above group of respondents converted office spaces to commercial use (stores, museum, libraries), 14.3% converted to hospitality (hotels, guesthouses) while 28% converted to residential use. Thus, affirming the assertion that even in the situation where adaptive reuse is necessary, residential use may not be the first choice. From the multiple responses to identifying the challenges faced when executing an adaptive reuse project, 57.1% identified finance as a major constraint, with 33.3% indicated non supportive policies as an issue, 23.8% indicated location as a problem, 28.6% indicating design as a hinderance while 9.5% identified zoning as a key challenge.

Although zoning was the least prioritized issue faced during an adaptive reuse project, this result may be a unique scenario for a city like Lagos where the zoning laws are not strictly followed due to the systemic loopholes that allow lobbying.

This situation often results in the issuance of inappropriate development permissions that do not respect the city's urban plan. It can also be argued that the zoning chaos could be because of overpopulation, in the absence of a masterplan that fits the needs of a growing population, zoning laws become obsolete.

Assessing the impact of the pandemic on the commercial real estate, 78.8% affirmed that COVID-19 had significantly changed the level of demand for office spaces, while stating remote working and downsizing as reasons for diminished demand. However, some of the respondents pointed that in the absence of remote working options, offices may require even larger spaces to ensure adequate distancing to prevent contagion. Although 54.5% of the respondents thought that the impact of the pandemic on the commercial estate would not last long, while 15.2% thought that it would create a lasting impact and 30.3% were indifferent.

Although most respondents considered adaptive reuse a tool for urban regeneration as mentioned above, there was a contrasting outcome in which 42% of the respondents had a negative response to the idea of reusing office buildings for affordable homes in Lagos. 39.4% had a positive response while 18.2% were neutral.

Regarding the factors that deterred the positive outcomes of adaptive reuse in a multiple response question, 52.9% of respondents highlighted 'cost', 50% chose 'profit-driven development', 44.1% highlighted 'policy', 35.3% chose 'government interest', 32.4% identified 'zoning' as a deterring factor, while 32.4% highlighted 'lack of awareness'.

Assessing self-governance as an approach to sustainable neighbourhood in Lagos, 15.2% of the respondents agreed that it would be highly efficient, 60% of the respondents agreed that it would be efficient, 21.2% were neutral to the idea, while only 3% thought that it should not be considered.

Finally, the respondents were asked to suggest tactical design approaches that would make future office spaces easily adaptable to residential use. A summary of the responses are as follows:

- Adaptive reuse should be considered in the placement of building services (plumbing) and ventilation during the design process.
- Flexible/modular spaces and partitioning
- Modified zoning to incorporate mixed use



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- Decentralised building services for easier re-use
  - Adjustment of government policies to encourage a wider acceptance and use of locally available materials.
  - Provision of subsidies and micro loans towards housing for youths and middle class.
  - Flexible spatial layouts

## CONCLUSION AND RECOMMENDATION

The COVID-19 pandemic has offered an unprecedented opportunity for architects and urban planners to identify the pitfalls of existing planning strategies by accelerating the already changing social and economic patterns. The housing sector is particularly hard hit by the urban legacy of the pandemic. Thus, the post-pandemic city is likely to face two grave challenges- acute housing shortage and high vacancy of commercial spaces. This research aims to understand the under-explored possibilities of increased housing supply within metropolitan cities of the global south through the adaptive re-use of office spaces. In addition to acute housing deficit, metropolitan cities of the global south, such as Lagos in Nigeria, face other urban issues, such as rapid and unregulated urbanisation, overcrowding, concentrated poverty, unemployment, insecurities, income and social inequalities.

An analysis of strategies adopted by cities in solving similar urban problems and the outcome of the survey highlights the challenges of converting office spaces to residential use, such as location, financial impact, policy, changing market value and design. Thus, implying that the abundance of office buildings may not translate to the abundance of housing units, considering that the buildings may be unsuitable for conversion due to risks of structural decay or inability of the original design to adapt to any other use. Identifying the opportunities and challenges has enabled a balanced view of the adaptive re-use debate presented. Thus, emphasising the architect's ability to solve the above problem in the future by carefully considering possible second life functions of buildings from conceptual design stages. However, in the case of a successful transformation of

obsolete spaces, proper documentation of the process is necessary, providing a platform for further research and improved implementation of the discussed urban strategy.

The pandemic has highlighted the multifunctional possibilities within living spaces as well as the importance of quality of homes. Thus, by creating spaces that allow occupants to reorganise the layouts to suit desired building functions is essential. Therefore, architects need to start considering design models with a greater sensitivity towards issues of interconnection, attachment and interdependence.

Although policies could be a bottleneck to rapid housing solutions and diversity, entirely excluding local policy is also not satisfactory, because it can encourage substandard housing that does not meet the public health requirements, thus, increasing the number of vertical slums and further reversing progression of the SDG 11.

For adaptive re-use to become an effective strategy that drives the formulation of public policy in tackling the issues identified within the current building stock, more empirical research is required to scrutinise its contribution to sustainability. Additionally, inclusion zoning may be considered as a strategy for building hybrid urban territories. This strategy requires that a particular number of units in new projects be set aside for families under a given income threshold (typically 80% of the area median income) at an affordable price.

Finally, it is evident that the current urban development strategy in the metropolitan cities of developing countries has disregarded socio-economic data in planning and redevelopment processes. Ignoring participatory tools and methods have resulted in the existence of management problems and poor community organisation. This, highlights the dangers of making the municipality the sole decision maker. In the absence of government interest and subsidy, housing development projects become inevitably led by the profit driven private sector. Hence, the emergence of more luxurious housing solutions that do not meet residents' socio economic and spatial needs, as well as the gentrification of neighbourhoods.

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## REFERENCES

- Abosede, F., 2006, "Housing in Lagos Mega City: Improving Livability, Inclusion and Governance," in SERAC International Conference: Building Nigeria's Capacity to Implement Economic, Social and Cultural Rights: Lessons Learned, Challenges and the Way Forward, Abuja, Nigeria.
- Adedayo, A. F., and Malik, N. A., 2015, "Factors influencing the growth of slums in Lagos metropolis, Nigeria," *Ethiopian Journal of Environmental Studies and Management*, 8 (2):113-119.
- Adeoye, A. A., 2010, "Lagos State Geography Information Infrastructure Policy (LAGIS) as a tool for mega city development: Opportunities and Challenges," FIG Congress 2010 Facing the Challenges, Sydney.
- Adeshokan, O., 2019, "Room for the Night: Lagos Priced-out Residents Seek Shelter in Abandoned Buildings," viewed 20-12-2021, from <https://www.reuters.com/article/us-nigeria-cities-homes-idUSKBN1YL15I>
- Ayoob S., and Amir R. K., 2020, "The COVID-19 Pandemic: Impacts on Cities and Major Lessons for Urban Planning, Design, and Management," *Science of the Total Environment*, 749, 142391.
- Ball, R. M., 1999, "Developers, Regeneration and Sustainability Issues in the Reuse of Vacant Buildings," *Building Research and Information*, 27(3): 140-148.
- Badmos, O. S., Callo-Concha, D., Agbola, B., Rienow, A., Badmos, B., Greve, K., and Ju"rgens, C., 2020, "Determinants of Residential Location Choices by Slum Dwellers in Lagos Megacity," *Cities*, 98, 102589: 1-13.
- Baxter, P. and Jack, S., 2008, "Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers," *The Qualitative Report*, 13(4): 544-559.
- BBC Africa, 2017, "Lagos Living: Solving Nigeria's Megacity Housing Crisis," BBC, viewed 20-12-2020, from <http://www.bbc.com/news/world-africa-38688796>.
- Begum, H., 2015, "Improving Access to Housing for Low Income Communities in Dhaka: From Rhetoric to Reality in Community Participation," PhD Thesis, School of Engineering and Built Environmental Science and Engineering Faculty, Queens and University of Technology.
- Bernstein, M., Kim, J., Sorensen, P., Hanson, M., Overton, A. Hiromoto, S., 2006, "Affordable Housing and Lessons Learned from Other Natural Disasters," In *Rebuilding Housing Along the Mississippi Coast: Ideas for Ensuring an Adequate Supply of Affordable Housing* (pp. 7-16). Santa Monica, CA Rand Publishers.
- Bhalla, S. S., 2002, *Imagine There's No Country: Poverty, Inequality and Growth in the era of Globalization*, Wshington D.C. Peterson Institute.
- Bohdan, N., 2010, *Regional Innovation Policy*, Novopolotsk, Polotsk State University.
- Boland, B., De Smet A., Palter, R., and Sanghvi A., 2020, "Organization and Real Estate Practices. Reimagining the office and work life after COVID-19. McKinsey and Company," viewed 20-11-2020, from <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/Organization/Our%20Insights/Reimagining%20the%20office%20and%20work%20life%20after%20COVID%2019/Reimagining-the-office-and-work-life-after-COVID-19-final.pdf>
- Bullen, P. A., 2004, "Sustainable Adaptive Reuse of the Existing Building Stock in Western Australia," In F. Khosrowshahi (Ed.), *20th Annual ARCOM Conference*, 1-3 September 2004, Heriot Watt University-Volume 2, London, Association of Researchers in Construction Management.
- Bullen P. A., 2007, "Adaptive Reuse and Sustainability of Commercial Buildings," *Facilities*, 25: 20-31.
- Bullen, P.A. and Love, P. E. D., 2010, "The Rhetoric of Adaptive Reuse or Reality of Demolition: Views from the Field," *Cities*, 27(4): 215-224.
- Bullen, P. A. and Love, P. E. D., 2011, "Factors Influencing the Adaptive Re-use of buildings," *Journal of Engineering, Design and Technology*, 9(1): 32-46.



- 
- Bullen P. A., and Love, P. E. D., 2011a, "A New Future for the Past: A Model for Adaptive reuse decision-making," *Built Environment Project and Asset Management*, 1(1): 32- 44.
- De Silva, D. and Perera, B.A.K.S., 2016, "Barriers and Challenges of Adaptive Re-Use of Buildings," Conference Proceedings of Institute of Quantity Surveyors, Sir Lanka Annual Technical Sessions, Colombo.
- Ding, G., 2008, "Sustainable Construction – the Role of Environmental Assessment Tools," *Journal of Environmental Management*, 86: 451-64.
- Dougherty, C. and Eavis, P., 2020, "Tenants' Troubles Put Stress on Commercial Real Estate," *The New York Times*, viewed 12-12-2020, from <https://www.nytimes.com/2020/06/05/business/economy/coronavirus-commercial-real-estate.html>
- Emordi E.C. and Osiki O. M., 2008, "Lagos: The 'villagized' City Information," *Society and Justice*, 2(1): 95-109.
- Ezema, Opoko and Oluwatayo, E., 2016, "Urban Regeneration Through State-led, New-Build Gentrification in Lagos Inner City, Nigeria," 11: 135-146.
- Farinmade, A., Soyinka, O., and Siu, K. W. M., 2018, "Assessing the Effect of Urban Informal Economic Activity on the Quality of the Built Environment for Sustainable Urban Development in Lagos, Nigeria," *Sustainable Cities and Society*, 41: 13–21.
- Gann, D. M., and Barlow, J., 1996, "Flexibility in Building Use: The Technical Feasibility of Converting Redundant Offices Into Flats," *Construction Management and Economics*, 14(1): 55–66.
- Habitat for Humanity, 2021, "Affordable Housing in Developing Countries," viewed 12-12-2020, from: <https://www.habitat.org/emea/about/what-we-do/affordable-housing>
- Hoornweg, D. and Pope, K., 2016, "Population Predictions for the Worlds Largest Cities in the 21st Century," *Environment and Urbanization*, 29(1):195-216
- Javed, A. I., Zahoor, Z., and Saeed, S., 2020, "Effect of COVID-19 and Emerging Trends of Higher Education in Pakistan," *Research Journal of PNQAHE*, 2(1):1-7
- Kassie, B. A., Adane, A., Abebe Kassahun, E., Ayele, A. S. and Kassahun Belew, A., 2020, "Poor COVID-19 Preventive Practice Among Healthcare Workers in Northwest Ethiopia," *Advances in Public Health*, 2020: 1–7.
- Kievani, R. and Werna, E., 2001, "Modes of Housing Provision in Developing Countries," *Progress in Planning*, 55: 65-118.
- Lahoud, A., 2016, "Post-Traumatic Urbanism," *Archit Design*, 80(5), 14–23.
- Madurwar, M. V., Ralegaonkar, R. V. and Mandavgane, S. A., 2013, "Application of Agro-waste for Sustainable Construction Materials: A review," *Construction and Building Materials*, 38: 872–878.
- Mhlanga, D. and Moloi. T., 2021, "COVID-19 and Sustainable Development Goals: A Comparative Analysis of Zimbabwe and South Africa", *African Renaissance*, 18(1): 247-269
- Mhlanga, D., and Moloi, T., 2020, "COVID-19 and the Digital Transformation of Education: What are we Learning on 4IR in South Africa?," *Education Sciences*, 10(180):1-11.
- Moore, R., 2020, "It's Like an Open Prison': The Catastrophe of Converting Office Blocks to Homes," *The Guardian*, viewed 31-12-2020, from <https://www.theguardian.com/society/2020/sep/27/housing-crisis-planning-converting-office-blocks-homes-catastrophe-jenrick>
- Morka, F. C., 2007, "A Place to Live: A Case Study of the Ijora-Badia Community in Lagos, Nigeria," Global Report on Human Settlements, viewed 21 08 2021, from: <http://www.unhabitat.org/grhs/2007>
- Nwanna, C. R., 2012, "Gentrification in Lagos state: Challenges and prospects," *British Journal of Arts and Social Sciences*, 5(2): 163–176.

- 
- Oduwaye, L., 2009, "Challenges of Sustainable Physical Planning and Development in Metropolitan Lagos," *Journal of Sustainable Development*, 2(1): 159.
- Ogunnaike, A., Squires, G. and Booth, C., 2013, "A Pluralistic Conceptual Model for Affordable Housing in Lagos, Nigeria," *WIT Transactions on Ecology and the Environment*, 179: 523-533.
- Okpala, D.C.I., 1992, "Housing Production Systems and Technologies in Developing Countries: a Review of the Experiences and Possible Future Trends/Prospects," *Habitat International*, 16(3): 9-32.
- Olajide, O. A., Agunbiade, M. E., and Bishi, H. B., 2018, "The Realities of Lagos Urban Development Vision on Livelihoods of the Urban Poor," *Journal of Urban Management*, 7(1): 21–31.
- Olotuah, A., 2002, "Recourse to Earth for Low-Cost Housing in Nigeria," *Building and Environment*, 37(1): 123-129.
- Oluwole, O. A., 2011, "The Urban Housing Crisis and a Cultural Framework for Housing Policy: The Ajegunle Community Case Study," Thesis Submission, Doctor of Philosophy, Nottingham Trent University.
- Onilude, O. and Vaz, E., 2020, "Data Analysis of Land Use Change and Urban and Rural Impacts in Lagos State, Nigeria," *Data*, 5(3): 72 1-19.
- Opoko, A. P., Oluwatayo, A. A., Amole, B. and Adeyemi, E., 2020, "How Different Actors Shape the Real Estate Market for Informal Settlements in Lagos," *Environment and Urbanization*, 32(2): 371–388.
- Opoko, A.P. and Oluwatayo, A., 2014, "Trends in Urbanisation: Implication for Planning and Low-Income Housing Delivery in Lagos, Nigeria," *Architecture Research*, 4: 15-26.
- Othman, A. A. E. and Elsaay, H., 2018, "Adaptive Reuse: An Innovative Approach for Generating Sustainable Values for Historic Buildings in Developing Countries," *Organization, Technology and Management in Construction*, 10: 1704–1718.
- Rahman M. M., 2005, "Participation by the NGOS in Housing for the Urban Poor in Bangladesh" *BRAC University Journal*, 2(1): 43-55.
- Remøy, H.T. and Van der Voordt, T.J.M., 2014, "Adaptive Reuse of Office Buildings into Housing: Opportunities and Risks," *Building Research and Information*, 42(3): 381–390.
- Sharifi, A., and Khavarian-Garmsir, A. R., 2020, "The COVID-19 Pandemic: Impacts on Cities and Major Lessons for Urban Planning, Design, and Management," *The Science of the Total Environment*, 749, 142: 1-14.
- Sumner, A., Hoy, C. and Ortiz-Juarez, E., 2020, "Estimates of the impact of COVID-19 on global poverty", viewed 2-8-2021, from [https://www.researchgate.net/publication/350178217\\_COVID-19\\_and\\_Sustainable\\_Development\\_Goals\\_A\\_Comparative\\_Analysis\\_of\\_Zimbabwe\\_and\\_South\\_Africa](https://www.researchgate.net/publication/350178217_COVID-19_and_Sustainable_Development_Goals_A_Comparative_Analysis_of_Zimbabwe_and_South_Africa).
- Torluccio, G. and Dorakh, A., 2011, "Housing Affordability and Methodological Principles: An Application," *International Research Journal of Finance and Economics*, 79: 64-78.
- Umar, K., Ogbu, C. and Ereke, E. 2019, "The Challenges of Infrastructural Development in Nigeria: An Assessment of The Pains And The Gains," *Int. J. Polit. Sci. Develop*, 7(4): 101-108 .
- UN- Habitat, 2003, "The Challenge of Slums: Global Report on Human Settlements," viewed on 3-12-2020, from: <https://www.un.org/ruleoflaw/files/Challenge%20of%20Slums.pdf>
- UN- Habitat, 2001, "Cities in A Globalizing World", Global Report on Human Settlements," viewed 2-12-2020, from, <https://mirror.unhabitat.org/content.asp?typeid=19andcatid=555andcid=5374>
- UN-Habitat, 2014, "The Right to Adequate Housing. Fact Sheet No. 21/Rev.1," viewed 3-12-2020, from: [https://www.ohchr.org/documents/publications/fs21\\_rev\\_1\\_housing\\_en.pdf](https://www.ohchr.org/documents/publications/fs21_rev_1_housing_en.pdf)
- UN- Habitat, 2006, "State of the World's Cities: The Millennium Development Goal and Urban Sustainability 2006/7: 30 Years of Shaping the Urban habitat Agenda," Earthscan, London, viewed 3-11-2020, from [https://sustainabledevelopment.un.org/content/documents/11292101\\_alt.pdf](https://sustainabledevelopment.un.org/content/documents/11292101_alt.pdf)
-

---

United Nations, 2016, “Sustainable Development Goals. Goal 11: Make Cities Inclusive, Safe, Resilient and Sustainable,” viewed 14-8-2020, from <https://www.un.org/sustainabledevelopment/cities/>

United Nations, 2020, “Meetings Coverages and Press Releases,” Affordable Housing, Inclusive Economic Policies Key to Ending Homelessness, Speakers Say as Social Development Commission Begins Annual Session, viewed 12-12-2020, from <https://www.un.org/press/en/2020/soc4884.doc.htm>

United Nations New York, 2020, “World Economic Situation and Prospects as of mid-2020,” viewed 14-12-2020, from [https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/publication/WESP2020\\_MYU\\_Report.pdf](https://www.un.org/development/desa/dpad/wpcontent/uploads/sites/45/publication/WESP2020_MYU_Report.pdf)

UNDESA, 2020, “Challenges and Way Forward in the Urban Sector Sustainable Development in the 21st century (SD21),” viewed 12-12-2020, from [https://sdgs.un.org/sites/default/files/publications/challenges\\_and\\_way\\_forward\\_in\\_the\\_urban\\_sector\\_web.pdf](https://sdgs.un.org/sites/default/files/publications/challenges_and_way_forward_in_the_urban_sector_web.pdf)

Viola, S. and Diano, D., 2019, “Repurposing the Built Environment: Emerging Challenges and Key Entry Points for Future Research,” *Sustainability*, 11(4669): 1-19.

World Bank, 2020, “Projected poverty impacts of COVID-19 (coronavirus),” viewed 6-4-2021, from <https://www.worldbank.org/en/topic/poverty/brief/projected-poverty-impacts-of-COVID-19.ein>

World Health Organisation, 2020, “Emergency, Coronavirus Disease (COVID-19) Pandemic,” viewed 3-11-2020, from <https://www.who.int>.

World Health Organisation (WHO), 2007, “The World Health Organisation approach to Housing and Health,” viewed 3-6-2021, from [http://www.euro.who.int/Housing/Activities/20041012\\_1](http://www.euro.who.int/Housing/Activities/20041012_1)

Wallace, P., Allake, T., 2019, “Lagos Building Luxury Homes in Face of Affordable Housing Crisis, Bloomberg Economics,” viewed 8-4-2021, from <https://www.bloomberg.com/news/articles/2019-12-20/lagos-building-luxury-homes-in-face-of-affordable-housing-crisis>

Wahab, B., 2020, “Abandoned Federal Govt Buildings in Lagos are Now Homes to Miscreants and Robbers,” viewed 20-12-2020, from <https://www.pulse.ng/news/local/abandoned-federal-govt-buildings-in-lagos-are-now-homes-to-miscreants-and-robbers/33e14hx>

Wang, J. and Maduako, I. N. 2018, “Spatio-Temporal Urban Growth Dynamics of Lagos Metropolitan Region of Nigeria based on Hybrid methods for LULC Modeling and Prediction,” *European Journal of Remote Sensing*, 51(1): 251–265.

Yakubu P., 2019, “Affordable Housing Within Abandoned Buildings in Lagos,” *The Guardian*, viewed 10-12-2020, from <https://guardian.ng/opinion/affordable-housing-within-abandoned-buildings-in-lagos/>

Yeboah, I.E.A., 2005, “Housing the Urban Poor in Twenty-First Century Sub-Saharan Africa: Policy Mismatch and a Way Forward for Ghana,” *Geo Journal*, 62: 147–161.

## REPRESENTATION OF WATER IN MUGHAL ARCHITECTURE: A CONTEXTUAL ANALYSIS OF SHALIMAR GARDENS, LAHORE FORT GARDENS AND WAH GARDENS

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### ABSTRACT

Mughals demonstrated their extraordinary talent for fusing local culture with Islamic thinking. In Asian culture and architectural design, water has long been a key element. Both the Mughal gardens and historic buildings make extensive use of water as an architectural element. On a scorching summer day, water not only provides aesthetic pleasure but also provides isolated cooling. This paper focuses on water as a design element used not merely to make the gardens along the famed Grand Truck Road in Lahore more beautiful, but also to analyse the technological benefits of water. According to design research methods, the water analysis of gardens combines fundamental and applied methodologies. The study in this investigation demonstrate that Mughals used water as a famous representation of their unwavering power to control the temperature as well as for aesthetic purposes by creating lakes, canals, springs, fountains and pools.

**Keywords:** Shalimar Gardens, Lahore Fort Gardens, Wah Gardens, Water, Mughal Architecture

## INTRODUCTION

The Mughal gardens initiated by the Mughal sovereign Babur were created until the late Mughal period. Their structural highlights discovered reverberation during the Sikh ruling period, turning into a part of metropolitan culture, and the convention proceeded in the parks of all little and huge Pakistani towns. These gardens were planned as architectural chefs-d'oeuvre design, yet additionally facilitated

exercises that changed the way of life of urban communities across time. In that regard the Grand Trunk (GT) Road assumed a critical role (Wescoat, et. al., 1996). The GT Road extends among Bengal and Kabul, and despite the fact that it has lived in various shapes since vestige, the forerunner to the cutting-edge road was first spread out by the Afghan clan leader Sher Shah Suri in the sixteenth century. It was rebuilt several times by Suri and was extended later on in the time of Mughal and British era along a partly



similar route. It begins in Kabul and goes through the Jalalabad and Khyber Passes, before arriving at Peshawar (present Khyber Pakhtunkhwa) (Rehman and Akhtar 2012). Moving south, it crosses the river Indus close to Attock and, going through Rawalpindi and Rohtas, it arrives at Gujrat subsequent to intersection the river Jhelum close to Sarai Alamgir. From Lahore, this magnificent interstate highway enters India, and after contacting Sirhind, it arrives at Delhi and proceeds towards Agra and beyond.

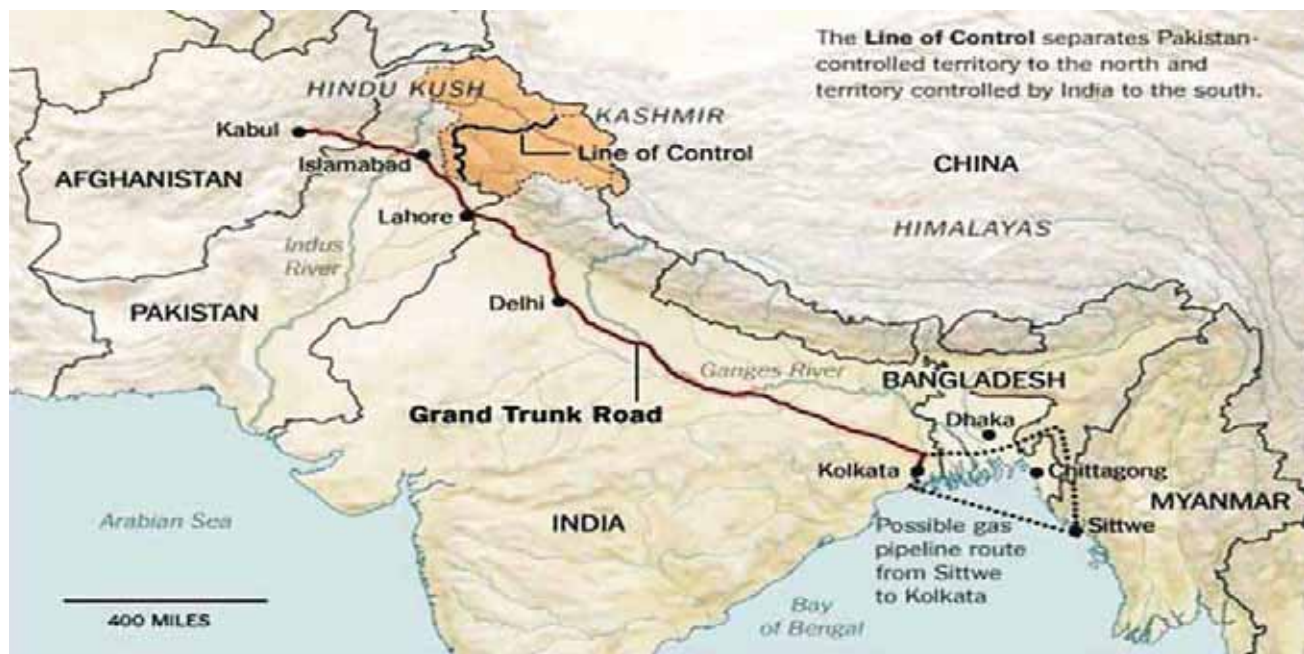
The Mughal emperors passed along it often, and every single one of them improved it by building public structures distinguished from one another at commodious distances. Nevertheless, giving a way to individuals and products/goods, the G.T road served paths for correspondence and transmission of thoughts, starting with one area then onto the next. Its whole length goes through an assortment of atmospheres, landforms, and topographical highlights. It navigates mountains, valleys, fields, and levels with assorted water highlights. Consequently, the presence of wells, normal springs, streams, and waterways gave significant component to the choice of garden destinations, just as a wellspring of life for them (Fatma, 2012) (Figure 1).

## LITERATURE REVIEW

Landscape architects and microclimate control specialists, use water features such as water channels and fountains to a control in interior climates. The air temperature in the

microclimate is moderated and regulated by water. Water not only adds an aesthetic element, it also passively cools interiors on a hot summer day. Evaporating water, cools the surrounding air, enhancing physical comfort. The precise zoning of the covered spaces, which enables strategically placed strips of water to circle the structure, and the area of water in contact with the air limits the rate of heat loss from moving air (Mittal 2012).

Air travelling over water generates evaporation, which results in heat being absorbed and the air being cooled, raising air humidity. Water features in courtyard, absorb solar energy and lessen summertime heat (Samadi, 2014). The idea is to direct winds away from the water pools and toward the building. Before it reaches the buildings, the breeze is channelled through the water in the fountains, where it picks up heat. Maximum-sized water feature in courtyards stores energy and lessens summertime heat. Additionally, water on a building exteriors has a propensity to evaporate. About 2500 joule of heat energy is lost for every gram of water that evaporates. Water evaporating from fountains in front of buildings dampens the surfaces and dissipates the heat from the sun. Beyond its psychological effects, the sound of water is calming and relaxing and its ability to balance and lower surrounding temperature is significant for human comfort (Fernandes and Correia-da-Silva 2007). Due to its stagnancy, a pool's water also mirrors the sky. Water not only has an impact on a person's psyche or aesthetic sense,



**Figure-1:** Grand Trunk Road.  
Source: Khanna, 2014.

but it also has a notable impact on the hearing and visual sense. Other advantageous and useful elements of pools are their acoustic and aquatic properties. Water is a fluid that can considerably reduce the sonic energy in its variations. The water in a pool serves as a covert barrier that prevents sound from entering the building from the outside. A fountain in front of buildings not merely sets the temperature at a comfortable level and create wind low, but also aids in preserving a tranquil aesthetic and emotional atmosphere. Due to the position between wind directions, these provide their inhabitants with a peaceful and cool environment (Shokouhian, Soflaee and Nikkah, 2007).

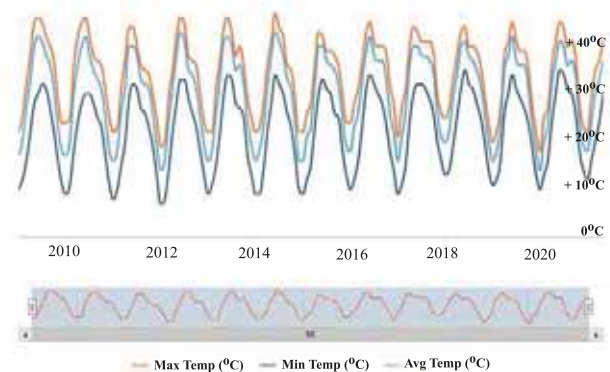
## METHODOLOGY

The selection of waterworks in the Mughal gardens depends on the past literature on the kinds of Charbagh under various Mughal rulers from the fifteenth to the seventeenth century. The data was assembled through a qualitative research approach and contained literary and visual investigation that enhanced the momentum of research work. The information was gathered utilizing a few field perceptions and condition evaluation studies of the Shalimar Gardens, Lahore Fort Gardens and Wah Gardens of the Mughal period. Qualitative meetings with the administration, experts and caretakers of the monuments were directed in relation to the set of experiences and past protection subtleties by the Department of Archaeology. The information was arranged through books, articles, websites and journals to fortify it further. Guidelines were taken from international charters and contextual analyses to detail an investigation of the chosen sites.

## CLIMATE

Lahore has a semi dry climate with infrequent rainy disturbance, with hazy winters (30 November- 15 February). There is also a spell of monsoon in the summers. June is the hottest month, with typical highs that often reach above 40 °C (104.0 °F). The wettest month is July, which experiences heavy rainstorms in the evenings with a probability of downpours. January is the coolest month because of the heavy mist. On June 5, 2003, the city experienced its highest temperature on record, which was 52.8C (127.1F) (PMD., 2018) (Table 1).

Over the years the region of Lahore has also experienced changes in its weather and climatic conditions (World Weather Online, 2020). Figure 2 demonstrates the change in temperature during the years 2010-2020.



**Figure-2:** Temperature Graph for the Lahore City.  
**Source:** Weather, 2021

**Table-1:** Climate data for Lahore (1961-1990), Extremes (1931-2018)  
**Source:** NOAA, 2013

| Month                           | Jan            | Feb            | Mar             | Apr             | May             | Jun             | Jul             | Aug             | Sep             | Oct             | Nov            | Dec            | Year             |
|---------------------------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|------------------|
| Record high<br>°C (°F)          | 27.8<br>(82.0) | 33.3<br>(91.9) | 37.8<br>(100.0) | 46.1<br>(115.0) | 48.3<br>(118.9) | 47.2<br>(117.0) | 46.1<br>(115.0) | 42.8<br>(109.0) | 41.7<br>(107.1) | 40.6<br>(105.1) | 35.0<br>(95.0) | 30.0<br>(86.0) | 48.3<br>(118.9)  |
| Average high<br>°C (°F)         | 19.8<br>(67.6) | 22.0<br>(71.6) | 27.1<br>(80.8)  | 33.9<br>(93.0)  | 38.6<br>(101.5) | 40.4<br>(104.7) | 36.1<br>(97.0)  | 35.0<br>(95.0)  | 35.0<br>(95.0)  | 32.9<br>(91.2)  | 27.4<br>(81.3) | 21.6<br>(70.9) | 30.8<br>(87.4)   |
| Daily mean<br>°C (°F)           | 12.8<br>(55.5) | 15.4<br>(59.7) | 20.5<br>(68.9)  | 26.8<br>(80.2)  | 31.2<br>(88.2)  | 33.9<br>(93.0)  | 31.5<br>(88.7)  | 30.7<br>(87.3)  | 29.7<br>(85.5)  | 25.6<br>(78.1)  | 19.5<br>(67.1) | 14.2<br>(57.6) | 24.3<br>(75.8)   |
| Average low<br>°C (°F)          | 5.9<br>(42.6)  | 8.9<br>(48.0)  | 14.0<br>(57.2)  | 19.6<br>(67.3)  | 23.7<br>(74.7)  | 27.4<br>(81.3)  | 26.9<br>(80.4)  | 26.4<br>(79.5)  | 24.4<br>(75.9)  | 18.2<br>(64.8)  | 11.6<br>(52.9) | 6.8<br>(44.2)  | 17.8<br>(64.0)   |
| Record low<br>°C (°F)           | -2.2<br>(28.0) | 0.0<br>(32.0)  | 2.8<br>(37.0)   | 10.0<br>(50.0)  | 14.0<br>(57.2)  | 18.0<br>(64.4)  | 20.0<br>(68.0)  | 19.0<br>(66.2)  | 16.7<br>(62.1)  | 8.3<br>(46.9)   | 1.7<br>(35.1)  | -1.1<br>(30.0) | -2.2<br>(28.0)   |
| Average rainfall<br>mm (inches) | 23.0<br>(0.91) | 28.6<br>(1.13) | 41.2<br>(1.62)  | 19.7<br>(0.78)  | 22.4<br>(0.88)  | 36.3<br>(1.43)  | 202.1<br>(7.96) | 163.9<br>(6.45) | 61.1<br>(2.41)  | 12.4<br>(0.49)  | 4.2<br>(0.17)  | 13.9<br>(0.55) | 628.8<br>(24.78) |
| Mean monthly<br>sunshine hours  | 218.8          | 215.0          | 245.8           | 276.6           | 308.3           | 269.0           | 227.5           | 234.9           | 265.6           | 290.0           | 259.6          | 222.9          | 3,034            |

Wah Gardens are located on the main GT Road, 50 kilometres to the northwest of Islamabad. Islamabad experiences four distinct seasons, including a lovely spring from March to April, from May to August is scorching summer, from September to October is autumn, and from November to February is winter. The hottest month is June, with average highs often topping 100.4 °F (38 °C). The wettest month is July, with a lot of rain and potential downpour-inducing night-time thunderstorms. With regional variations in temperature, January is the coldest month. Temperatures in Islamabad range from frigid to mild, frequently falling below zero. Snowfall on the hills is sparse. The temperature ranges are from 6.0 °C (21.2 °F) in January to 46.1 °C (115.0 °F) in June. June's average low and high temperatures are 2 °C (35.6 °F) and 38.1 °C (100.6 °F), respectively (NOAA, 2001) (Table 2).

The region of Wah has also experienced changes in its weather and climatic conditions (World Weather Online, 2020). Figure 3 demonstrates the change in temperature during the years 2010-2020.

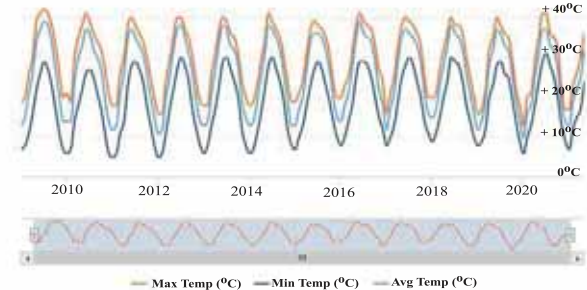
## SHALIMAR GARDENS

In 1641 AD, the Persian legislative leader of Punjab and canal engineer Ali Mardan Khan, conceived Lahore as a project and Shahjahan gave the go-ahead to create it. One of his initiatives was the construction of the Shalimar Garden, which was overseen by Khalilullah Khan, a prominent member of the court of the fifth Mughal emperor Shahjahan, in conjunction with Iranian architect Mulla Alaaul Maulk Tuni and other notable individuals of the period. The Shalimar Gardens' location is around three miles higher east of the central Lahore city, next to Baghbanpura hamlet along the

G.T road. The task was completed in a short span of one year, five months and four days by 1642. After the Taj Mahal, Shalimar Garden is recognised as one of Shahjahan's greatest achievements. It has served as a milestone through the development of Mughal garden design. According to several historians, Shalimar Garden is one of the most exquisite achievements of Mughal civilization (Nath, 1994).

## Architecture Design and Layout of Shalimar Gardens

The Shalimar Gardens are a sprawling oval parallelogram surrounded by a high brick wall that is praised for its intricate fretwork. The design of this garden was inspired by *char-bagh* (four gardens). The gardens are around 16 hectares in area and stretch for 658 metres north to south and 258 metres east to west. Each terrace level is about 13 to 15 feet higher than the one before it. In accordance with the UNESCO Convention for the protection of the world's natural and cultural heritage sites in 1972, Shalimar Gardens and the Lahore Fort were combined as a UNESCO World Heritage Site in 1981 (Figure 4).

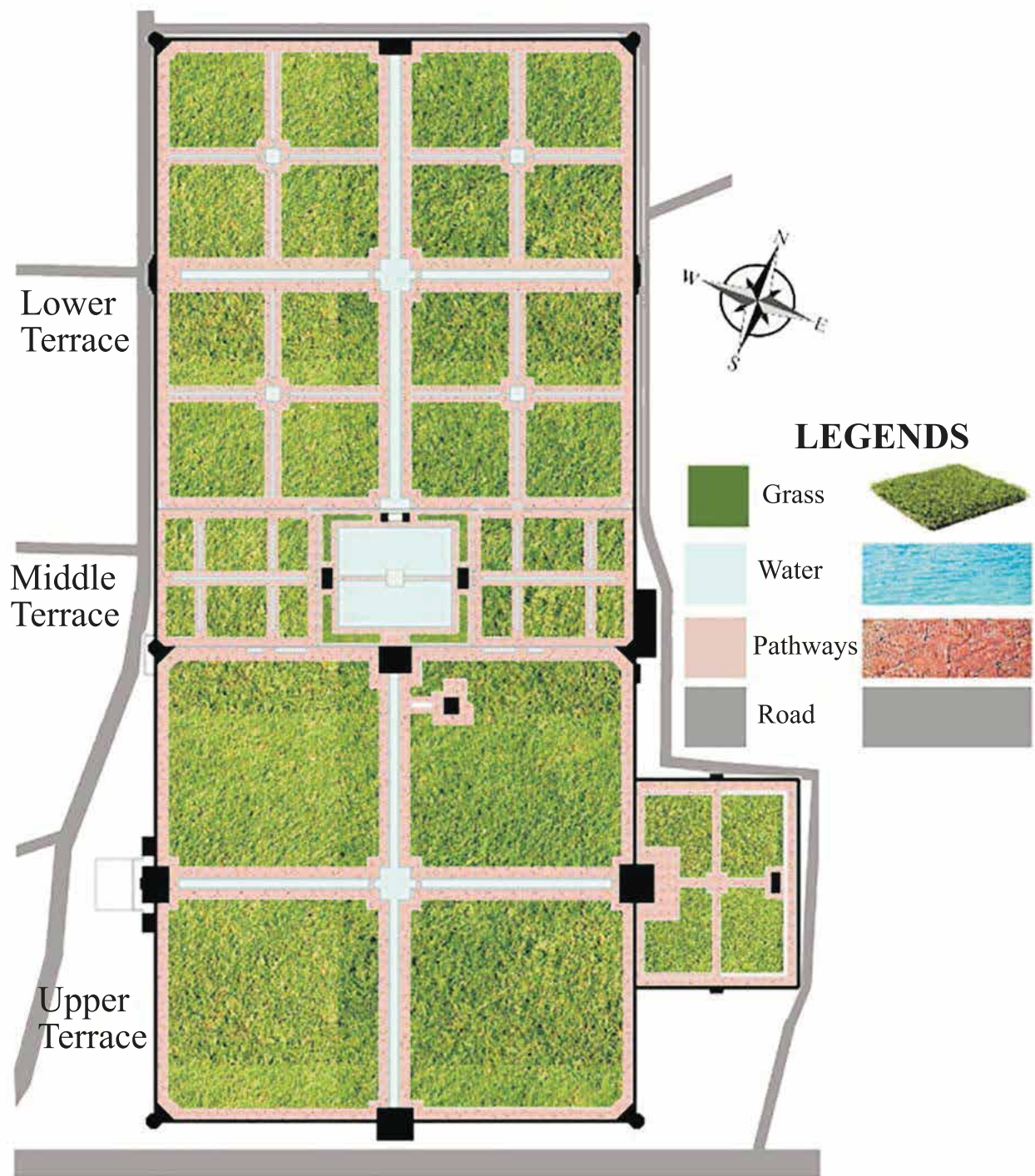


**Figure-3:** Temperature Graph for the Wah Area.  
**Source:** Weather, 2021

**Table-2:** Climate data for Islamabad (1961-1990), Extremes (1931-2018)  
**Source:** PMD, 2015

| Month                                   | Jan            | Feb            | Mar            | Apr             | May             | Jun             | Jul              | Aug              | Sep             | Oct             | Nov            | Dec            | Year               |
|---|----------------|----------------|----------------|-----------------|-----------------|-----------------|------------------|------------------|-----------------|-----------------|----------------|----------------|--------------------|
| Record high<br>°C (°F)                  | 30.1<br>(86.2) | 30.0<br>(86.0) | 34.4<br>(93.9) | 40.6<br>(105.1) | 45.6<br>(114.1) | 46.6<br>(115.9) | 45.0<br>(113.0)  | 42.0<br>(107.6)  | 38.1<br>(100.6) | 37.8<br>(100.0) | 32.2<br>(90.0) | 28.3<br>(82.9) | 46.6<br>(115.9)    |
| Average high<br>°C (°F)                 | 17.7<br>(63.9) | 19.1<br>(66.4) | 23.9<br>(75.0) | 30.1<br>(86.2)  | 35.3<br>(95.5)  | 38.7<br>(101.7) | 35.0<br>(95.0)   | 33.4<br>(92.1)   | 33.5<br>(92.3)  | 30.9<br>(87.6)  | 25.4<br>(77.7) | 19.7<br>(67.5) | 28.6<br>(83.5)     |
| Daily mean<br>°C (°F)                   | 10.1<br>(50.2) | 12.1<br>(53.8) | 16.9<br>(62.4) | 22.6<br>(72.7)  | 27.5<br>(81.5)  | 31.2<br>(88.2)  | 29.7<br>(85.5)   | 28.5<br>(83.3)   | 27.0<br>(80.6)  | 22.4<br>(72.3)  | 16.5<br>(61.7) | 11.6<br>(52.9) | 21.3<br>(70.3)     |
| Average low<br>°C (°F)                  | 2.6<br>(36.7)  | 5.1<br>(41.2)  | 9.9<br>(49.8)  | 15.0<br>(59.0)  | 19.7<br>(67.5)  | 23.7<br>(74.7)  | 24.3<br>(75.7)   | 23.5<br>(74.3)   | 20.6<br>(69.1)  | 13.9<br>(57.0)  | 7.5<br>(45.5)  | 3.4<br>(38.1)  | 14.1<br>(57.4)     |
| Record low<br>°C (°F)                   | -6.1<br>(21.0) | -2.2<br>(28.0) | -0.3<br>(31.5) | 5.1<br>(41.2)   | 10.5<br>(50.9)  | 15.0<br>(59.0)  | 17.8<br>(64.0)   | 17.0<br>(62.6)   | 13.3<br>(55.9)  | 5.7<br>(42.3)   | -0.6<br>(30.9) | -4.1<br>(24.6) | -6.1<br>(21.0)     |
| Average<br>precipitation<br>mm (inches) | 56.1<br>(2.21) | 73.5<br>(2.89) | 89.8<br>(3.54) | 61.8<br>(2.43)  | 39.2<br>(1.54)  | 62.2<br>(2.45)  | 368.0<br>(14.49) | 334.5<br>(13.17) | 122.2<br>(4.81) | 29.3<br>(1.15)  | 17.8<br>(0.70) | 37.3<br>(1.47) | 1,291.1<br>(50.85) |
| Mean monthly<br>sunshine hours          | 195.7          | 187.1          | 202.3          | 252.4           | 311.9           | 300.1           | 264.4            | 250.7            | 265.6           | 2275.5          | 247.9          | 195.6          | 2,945.8            |





**Figure-4:** Master Plan of Shalimar Gardens, Lahore, Pakistan.  
**Source:** Author



### Three Terraces of Shalimar Garden

The Gardens are divided into three terraces that drop from south to north and are elevated by 4-5 metres from one another (Figure 5).

### Detail of lower Terrace with the help of Plan view

There are four structures on lower terrace of Shalimar Garden (Figure 6).



Lower Terrace

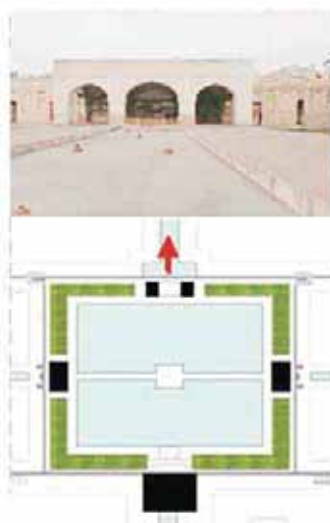


Middle Terrace

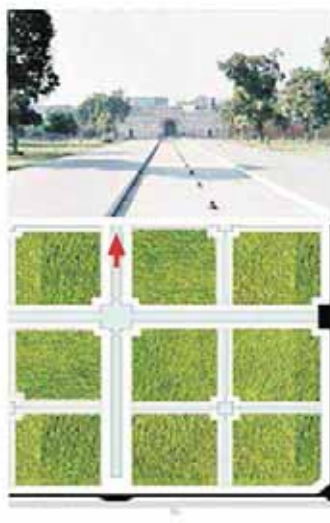


Upper Terrace

**Figure-5:** Aerial View of Three Terraces of Shalimar Gardens, Lahore.



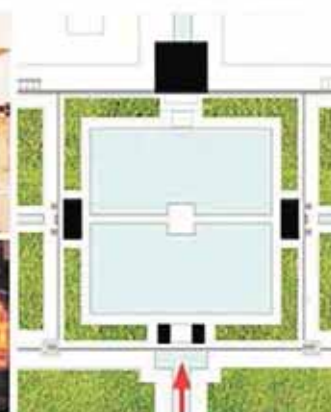
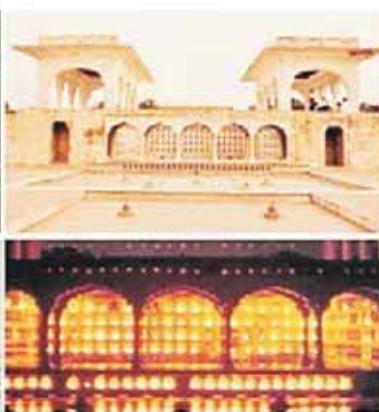
Location of North Gate



Location of West Gate



Location of East (Delhi) Gate



Location and views of Chini khana from different angles in the middle of Monsoon Pavilions

**Figure-6:** Perspective View of Buildings at Lower Terrace.

The various structures which are part of the overall composition of the garden are describe here.

**1 Chini Khana:** This is an elegant structure in the Shalimar Gardens, which was used by the emperors and the harem to enjoy the view from the monsoon pavilions. At nighttime it was lit in the traditional way. The position of Chini khana is in the middle of *Sawan Bhadon*, which has an entrance from the lower terrace.

#### Middle Terrace

**2 Red stone Pavilions:** Two red stone pavilions parallel to the *Mehtabi* (stage) were used by musicians at that time.

**3 Throne:** This was the royal marble throne of the emperor of that time, who used to sit and enjoy the dance performenes on the *mehtabi* (stage) infront of the throne.

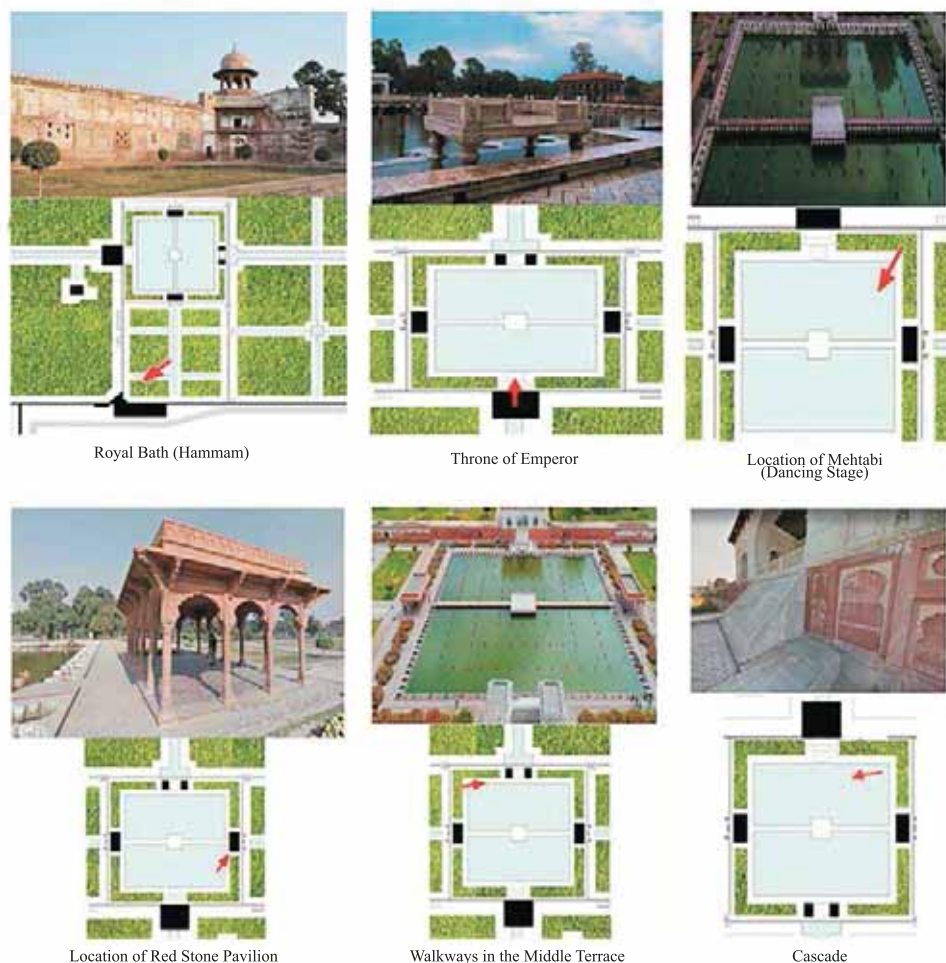
**4 Walkways:** The square design-shaped terraces were both partitioned into four identical modest squares, using long fountains flanked by brick/walkways intended to raise the access and to give better views of the garden.

**5 Cascade/Waterfall:** This design element was cast on a marble path in what is called a *chadar* or "curtain" on the central terrace. The water gathered into a huge pool, known as a *haûz* in local language, over which a seating was designed red stone under a pavilion (Figure 7).

#### Upper Terrace

**6 Aiwan:** *Aiwan* is a private audience hall for meetings with special audience the emperor of that time.

**7 Daulat Khana-i-Khas:** The place where emperor of that time used to meet with special audiences.



**Figure-7:** Perspective view of buildings at middle terrace.



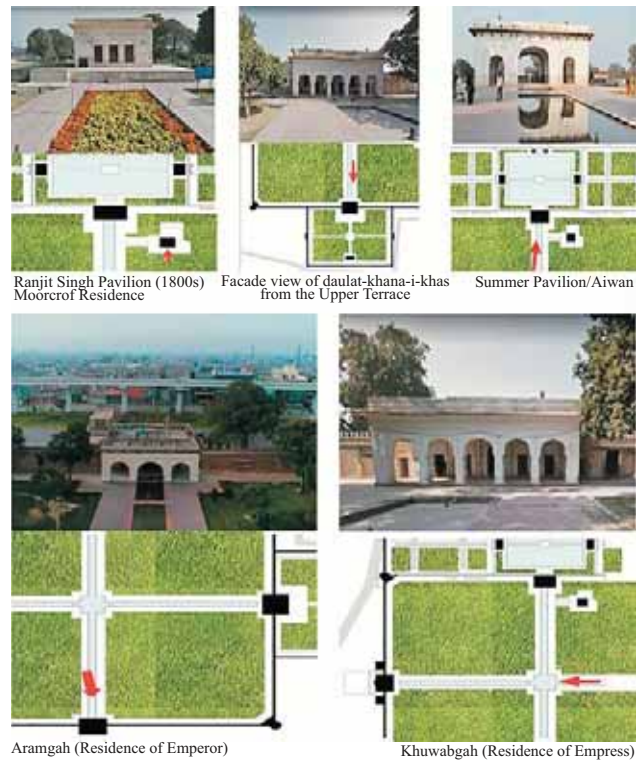
**8 Moorcrof pavilion:** This pavilion also has underground residence. It was built by Ranjit Singh for the guest Moorcrof, he introduced himself as a medical doctor, but according to many historian she was spy (Figure 8).

## IRRIGATION OF MUGHAL GARDENS

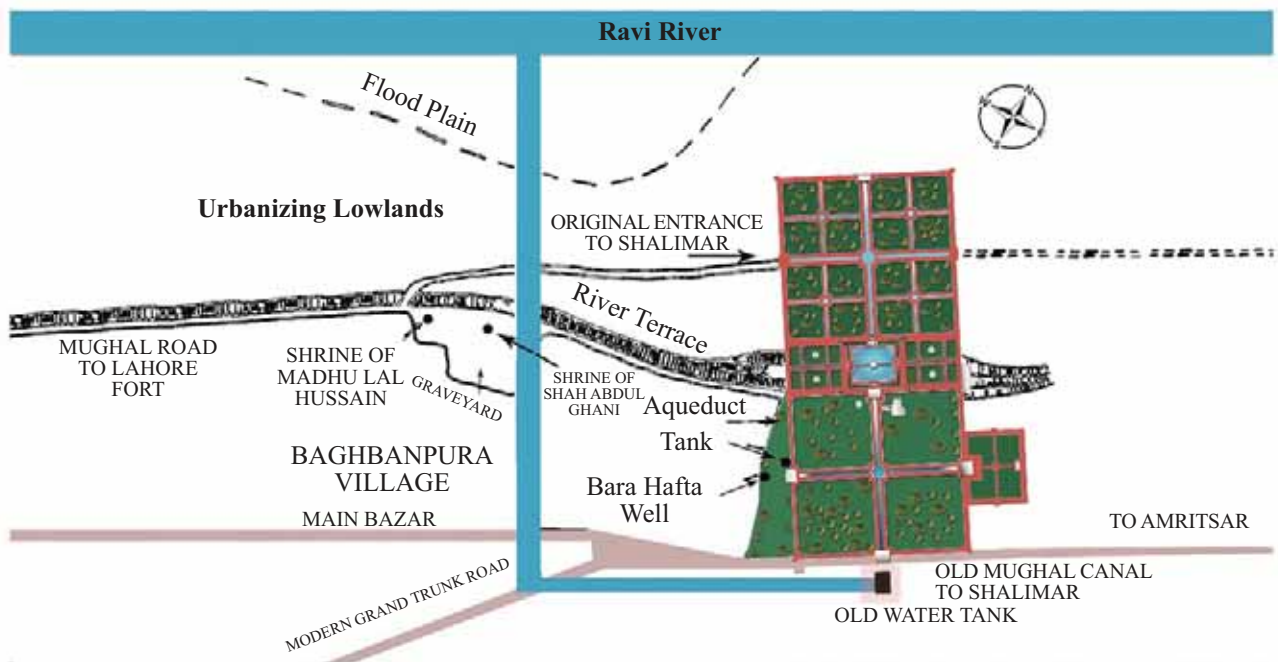
### Irrigation of Shalimar Gardens

The water supply for the Shalimar Garden was designed by point architect engineer of the garden Ali Mardan Khan. He was the person who proposed to the emperor that water from Ravi river ought to be brought from Rajput (presently Madhpur in India) for the gardens. Within two years, a water canal named Shah Nahar (Royal Canal) stretching over 150 miles (242 km) was finished (Wahi, 2013) (Figure 9).

The middle terrace's enormous marble pool is where the canal, which cut through the gardens, was discharged. In addition, the hydraulic tank system was completed in 1644. The Shalimar Gardens in Lahore are specifically designed to serve as an example of how the Mughals constructed their buildings and gardens close to waterways or water sources and were subsequently prepared to draw both water and cooling benefits from an intentional hydraulic tank and irrigation system. This system, incorporated the use of



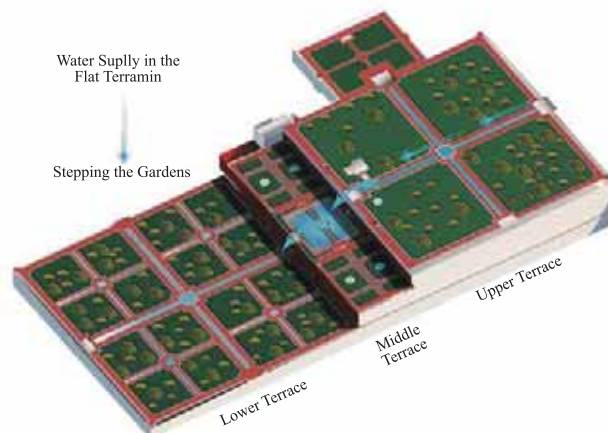
**Figure-8:** Perspective view of buildings at upper terrace.



**Figure-9:** Water Canal from River Ravi for Irrigate to Shalimar Garden.

gravity and lifted the water through numerous dispersion mechanisms (Figure 10).

This system provided for the water arrangements in stepwells and reservoir conduits. For instance, at the Shalimar Gardens in Lahore, where the *baoli* (stepwell) is located, it works as the primary supply of water. The water level was raised from one level to multiple additional levels or tiers. According to Fraenkel (1986), the mechanism for raising water is based on the development of the water wheel, also known as the Persian rehan system (Fraenkel 1986). Wheels with shafts that were propelled by either people or camels were found inside the *baolis*. Thus, up until the next stage of the waterworks, these wheels pivot the poles that drive a belt of clay pots that are filled with water (Fraenkel, 1986) (Figure 11).



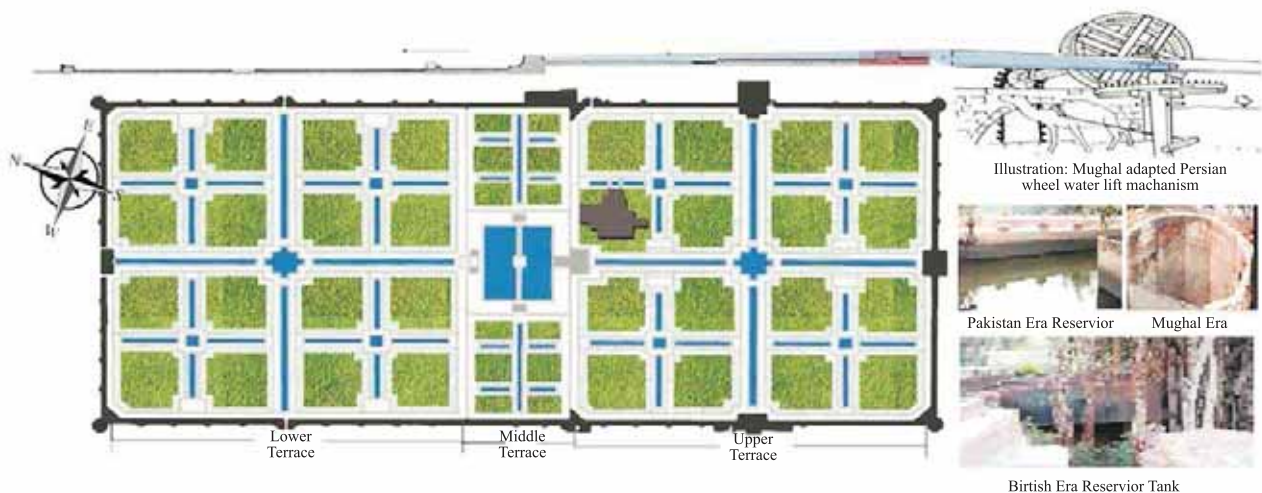
**Figure-10:** Stepping of Water in Shalimar Gardens Via Hydraulic Tank.

The Mughals adopted the Persian wheel mechanism for lifting water from the well which had a source connected with river Ravi. Later on, the British made revit reservoir tank and after 1947 when Pakistan came on the map of world, concrete tanks were built at the same place. None of these exist today. They were existing till 2010. These time periods are mentioned in figure 12.

For agricultural and water-based cultural and economy, the Mughal gardens water supply systems have been referred to as the "aesthetic distillate" of the ancient Mughal civilization (Petrucchioli, 1998: 351). These have evolved into several kinds of octagonal pools and gardens within squares and patios of urban buildings.



**Figure-11:** Aqueducts and Water System Raising Mechanism at Shalimar Gardens Lahore.



**Figure-12:** Irrigation System of Shalimar Gardens During Three Periods.

The original Persian *charbagh* is where such water frameworks originated. Figure 13 depicts the urban water to ground components of several Mughal gardens inside a defined limit. Its water to ground ratio is calculated, while expressing the amount of exposed water and ground zone that are located inside a specific boundary. Although the spatial morphology can be open or enclosed, its ratio is theoretically related to the solace level attained, which was

dependent on the size of its water pools. This was placed within an enclosed boundary with less exposure to solar radiation facing high wind speed, especially during the summer. According to the investigation, the water-to-ground ratio in the courtyard of Shish Mahal is believed to be around 1:6, but it is predicted to be around 1:4 in the patio of Shalimar Gardens.

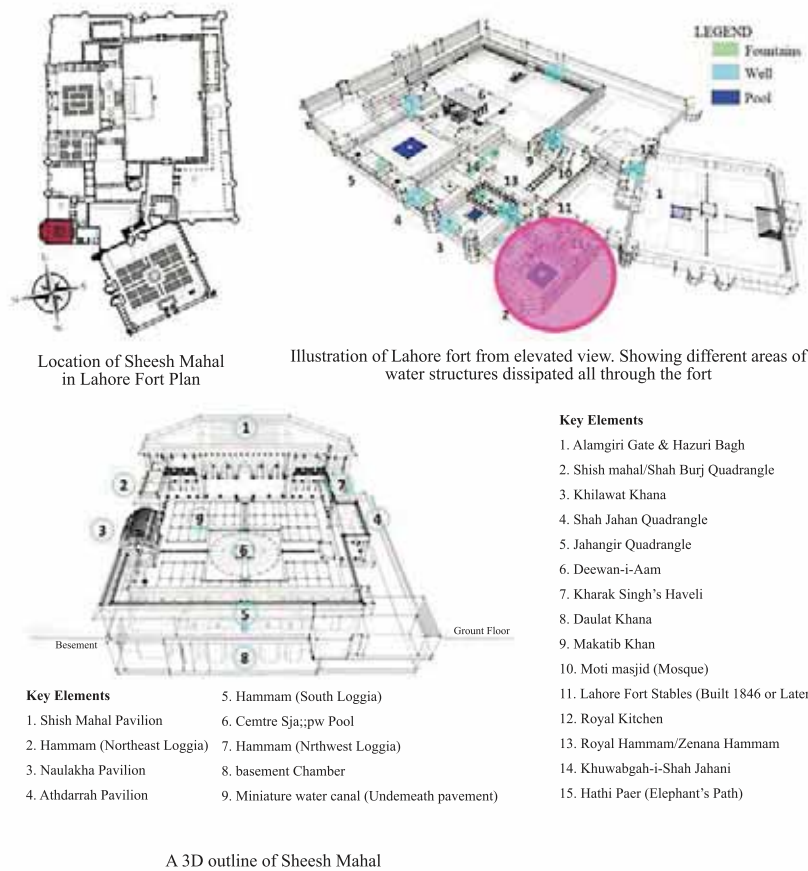


Open Garden ratio 1:4  
(Shalimar Gardens)



Enclosed Garden ratio 1:6  
(Sheesh Mahal)

**Figure-13:** Morphology Configurations Charbagh (Gardens) and its Water to Ground Ratio.



**Figure-14:** Water Flow Representation in Lahore Fort.



## Sheesh Mahal, Lahore Fort-Pakistan

### Variant Names

The Sheesh Mahal, commonly known as the "Mirror Palace," within the Lahore Fort was officially approved by Emperor Shah Jahan in 1631 and completed in 1632 under the direction of Asif Khan (Kamran, 2016).

Like all quadrangle designs, so frequently planned with a central pool at the centre, the shallow round pool of the Sheesh Mahal courtyard stands in contrast to others. The pool has a depth of 15cm and a width of 16m by 16m with a central decorated platform (called *mehtabi*) in the middle. It is decorated with pietra-dura using semi-precious stones, such as jade, agate, lapis lazuli, carnelian and chalcedony. Pietra dura or Pietre Dure is known as *parchin kari* in the Indian subcontinent. is a term for the inlay technique of using fitted, highly polished colored stones to create images.

It is an ornamental art. The patio is developed into four quadrants of four narrow water channels where the southern channel is used as the sole inventory of water for the central shallow pool. The living rooms are cooled by means of *chadar* (water wall).

Structures at the Lahore Fort are arranged around an open forecourt that is covered by a variety of marble types. The courtyard previously boasted a sophisticated drainage system with water channels on each of its four sides and fountains that fed into a small circular pool of water in the middle. The marble *mehtabi* (stage), located on the middle terrace, is in the center of the swimming pool. A circular area in the middle of the patio is filled with water from a cascade (*chadar/abshar*) carved into the south wall. A sizable subterranean area beneath the quadrangle functioned as the Empress's summer residence (Figure 14 and 15).

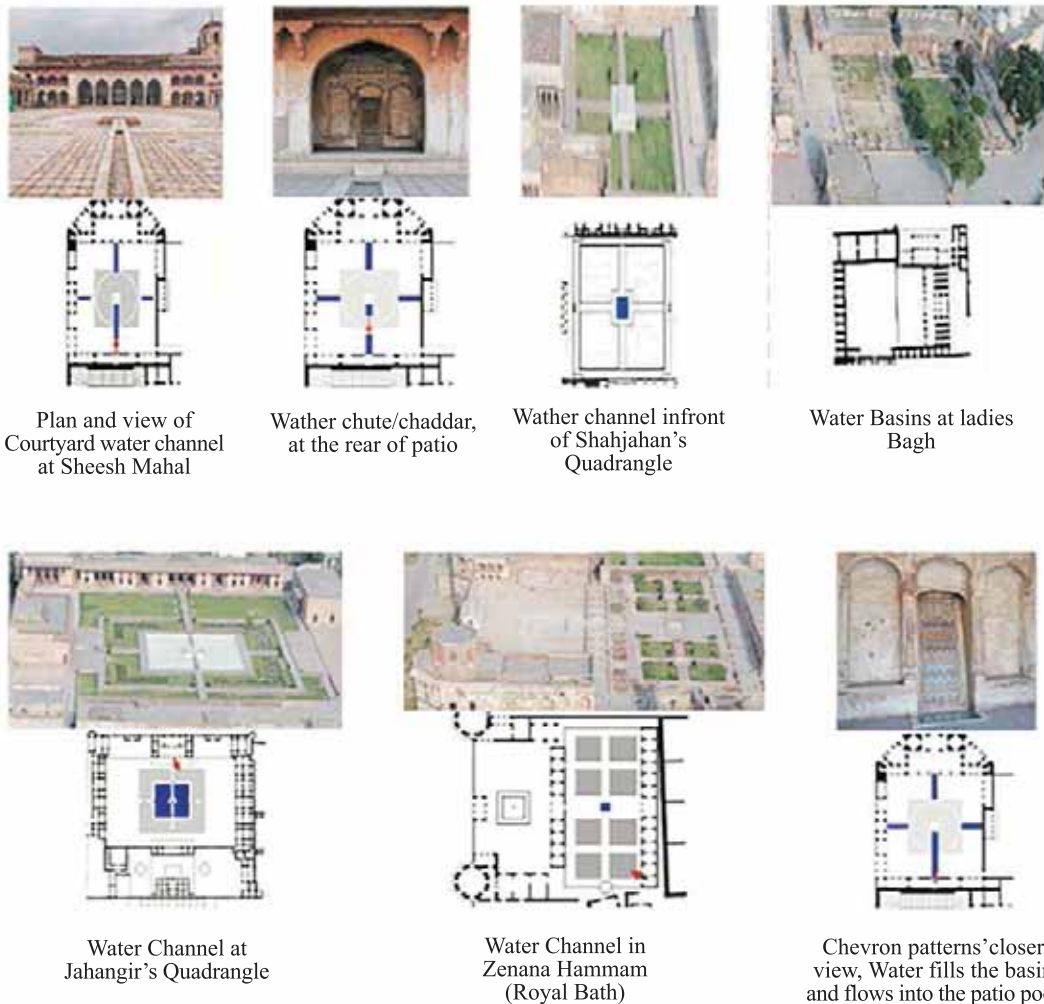


Figure-15: Water Channels in Lahore Fort.

The *salsabils* of the summer palace (the basement of the Sheesh Mahal) are fed water through the fountain that is located on the patio above, in contrast to the traditional *chadars* or water chute or *salsabils* (a water distribution kiosk), where the pressure of the water is created by the marble slab and fed into a central fountain. A *salsabil* (or *salasabil*, also known as a *shadirwan*, is a type of fountain that maximizes the surface area of the water. It is used for evaporative cooling of buildings, cooling and aeration of drinking water and ornament (it has also been used to prevent eavesdropping. The water may flow in a thin sheet or thin

streams, often over a wavy surface with many little waterfalls. Its use extends from southern Spain through North Africa and the Middle East to Northern India. The *salsabil* was connected to the fountain of the patio of Sheesh Mahal through a water spout that opened up in a nook of the summer palace and allowed the water to stream over the marble slab. The fountain of the Patio of the Shish Mahal kept the rooftop cool. By making the dry air come through the *mashrabiya*s more humid, water from the *salsabils* cooled the interior of the summer palace (Figure 16).

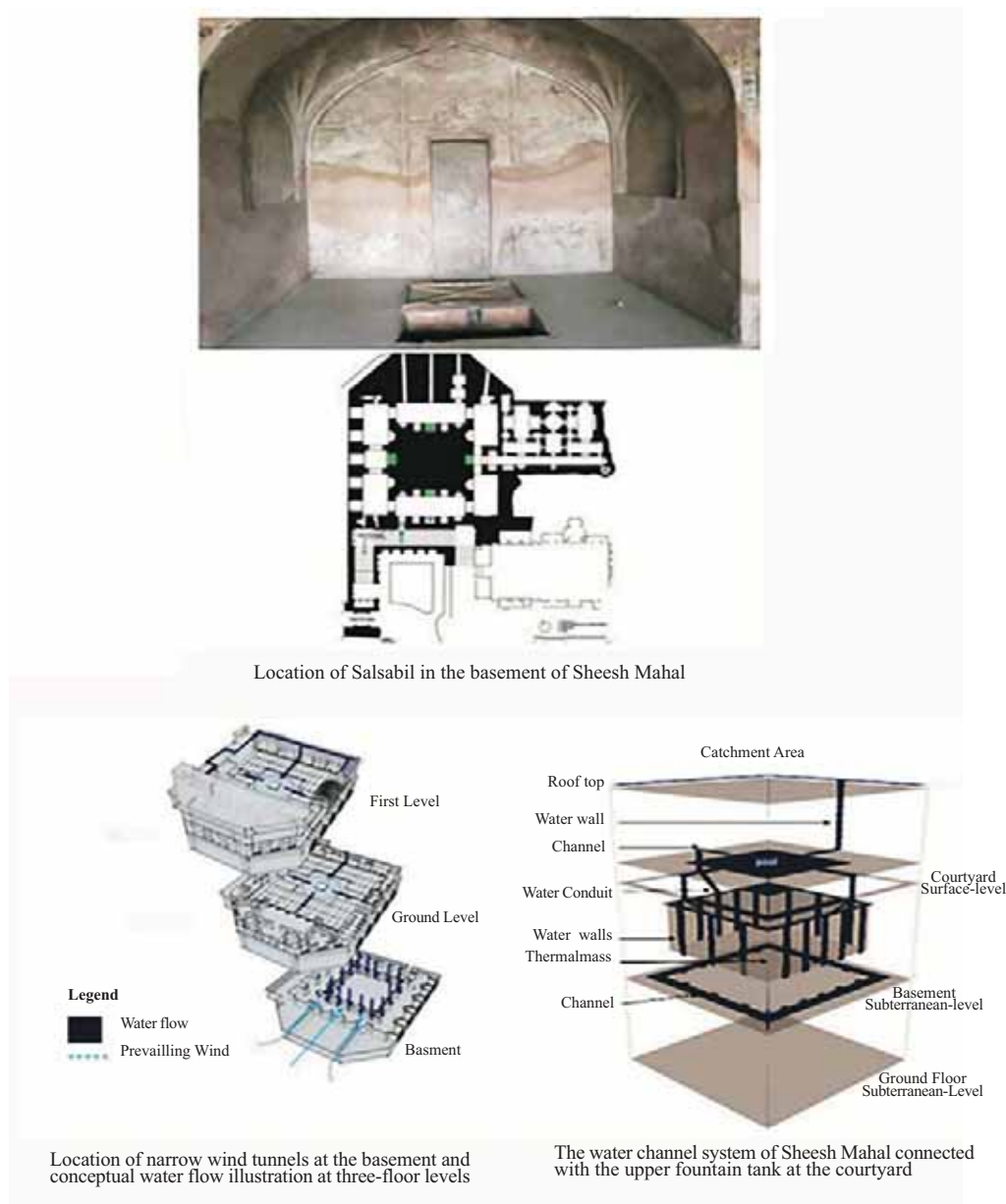


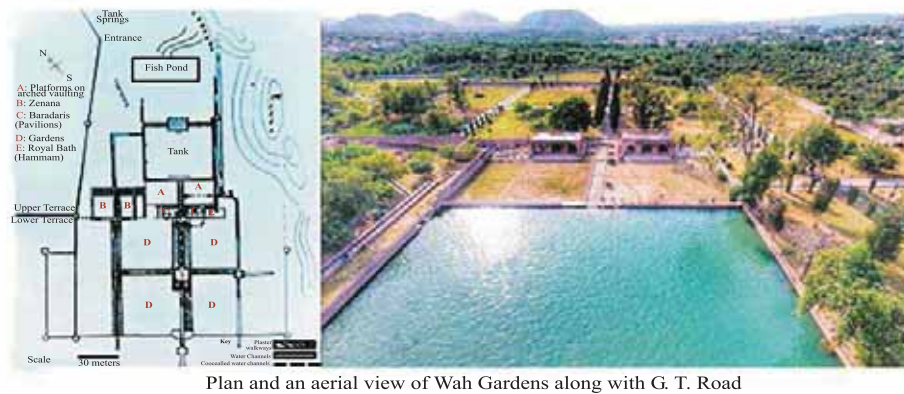
Figure-16: Water Channel in Sheesh Mahal Building.

## Wah Gardens

As one continues on the GT Road west of Lahore, past Islamabad one arrives at another Mughal garden close to the town of Hasan Abdal, at "Wah," which can be translated as "Wow/Amazing." After observing the crystal-clear rivers and picturesque surroundings, the third emperor of the Mughal empire is thought to have given the name "Wah" to this place. Even though Hasan Abdal's springs and sites of devotion have a considerably longer history, the location and its gardens are primarily documented in detail by the fourth Mughal emperor, Jahangir. Aurangzeb, the sixth king, ruled the region for more than a year.

Clear, chilly springs that collect water in a sizable square tank on its upper terrace take care of the Wah gardens. The

water initially flowed down a sloping cascade/chaddar that was decorated with a typical Mughal dark-and-yellow marble chevron pattern, past two flanking pavilion constructions, one of which housed elaborate shower rooms (*hammam*). The water moved through a pivot in the garden that was lined with cypress trees, a middle water tank and stage, and finally reached the main entrance of the garden. Part of the garden was discovered and rebuilt by the Department of Archaeology, and analysts have described its experiences, spatial layout, and highlights (Rajput, 1996). Due to its location on a major route and its similar spring-fed, terraced architecture, Kausar (1990) suggests it may be an example of modern Mughal garden design in Kashmir (Indian Occupied Jammu and Kashmir) (Figure 17).



Golden Cascades in the middle of two pavilions (Upper Terrace)



A central tank of Wah Gardens in front of pavilions (Upper Terrace)



Water channel at Wah gardens (Lower Terrace)



Water flow in Wah gardens



Sitting spot for rulers over the water channels



Natural lake source from spring water. The lake is the house to fish that are plentiful in the streams of the neighborhood

**Figure-17:** Water Representation of Wah Gardens, Hasan Abdal , Pakistan.



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## Conclusion

Human life depends on water in many ways. It serves as a skeleton that is important in many communities and schools of thought. Water occupies a special place in architectural engineering from both a logical and expert standpoint. According to the exploration's findings of this research, water features like fountains and water channels were included in the case studies to maintain a comfortable interior temperature. Water absorbs the warm radiation as air flows over the water bodies. Along with its greatness, water also

possesses a mysterious ability to reveal itself through sight and sound. It has a good impact on human audio and visual characteristics in addition to psychology and aesthetic sense. As a result, the Mughals exploited water not just to improve the area's beauty but also to deal with its climate. Therefore, the Mughals' use of water in their gardens is still a striking example of their unwavering architectural ability in maintaining and regulating the temperature as well as beautifying the area through lakes, fountains, canal water channels and pools.

## REFERENCES

- Fatma, S. and Fatima, S., 2012, "Waterworks in Mughal Gardens" *In Proceedings of the Indian History Congress*, Indian History Congress, Vol 73:1268-1278.
- Fernandes, J. and Correia-da-Silva, J., 2007, "Passive Cooling in Évora's Traditional Architecture", *2nd PALENC Conference and 28th AIVC Conference on Building Low Energy Cooling and Advanced Ventilation Technologies in the 21st Century*, editado por M. Santamouris e P. Wouters.
- Fraenkel, A., 1986, "FAO Irrigation and Drainage Paper 43: Water Lifting", Food and Agriculture Organization of the United Nations, Rome.
- Kamran, M. A., 2016, "History of Conservation of Sheesh Mahal in Lahore, Pakistan", Lahore.
- Kausar, S. B., 1990, "Shalamar Garden, Lahore: Landscape, Form and Meaning (No. 1)", Department of Archaeology and Museums, Ministry of Culture, Pakistan.
- Khanna, P., 2014, "Permeable Lines on the Grand Trunk Road", *The New York Time*, viewed 20-1-22, from <https://www.nytimes.com/roomfordebate/2014/07/03/where-do-borders-need-to-be-redrawn/permeable-lines-on-the-grand-trunk-road>
- Mittal, N., 2012, "Heritage Buildings an Inspiration for Energy Efficient Modern Buildings", CSIR-Central Building Research Institute, Roorkee.
- Nath, R., 1994, "History of Mughal Architecture: The Transitional Phase of Colour and Design", Jehângîr, 1605-1627 AD, New Delhi: Abhinav Publication.
- Petrucchioli, A., 1998, "Rethinking the Islamic Garden. Transformation of Middle Eastern Natural Environment: Legacies and Lessons", Coppock, J. and A. Miller, J., (eds), *New Haven*, PP. 349-363.
- PMD, 2015, "Extremes of Islamabad", Pakistan Meteorological Department, viewed 18-1-22, from <http://www.pmd.gov.pk/cdpc/extrems/lahore.htm>.
- PMD, 2018, "Pakistan Meteorological Department: Lahore (During 1931-2018)", viewed 22-1-22 from <http://www.pmd.gov.pk/cdpc/extrems/lahore.htm>.
- Rajput, S., 1996, "The Mughal Garden "Wah" Near Hasan Abdal: Source Material, Report of Excavations of 1993-94 and New Discoveries", *The Mughal Garden: Interpretation, Conservation and Implications*, City, PP. 73-87.
- Rehman, A. and Akhtar, M., 2012, *The Mughal Gardens along the Grand Trunk Road in Pakistan and Afghanistan*.
- Samadi, J., 2014, "Utilizing the Central Courtyard of Traditional Architecture in Modern Architecture", *Research Journal of Environmental and Earth Sciences* 6(3): 161-167.

---

Shokouhian, M., Soflaee, F. and Nikkhah, F., 2007, "Environmental Effect of Courtyard in Sustainable Architecture of Iran (Cold regions)", *2nd PALENC Conference and 28th AIVC Conference on Building Low Energy Cooling and Advanced Ventilation Technologies in the 21st Century*.

Wahi, T., 2013, Shah Nahr: its History, Technology and Socio-Political Implications, in Proceedings of the Indian History Congress.

Weather, 2021, *Weather of Wah Region*, Viewed 6-2-22, from <https://www.worldweatheronline.com/laure-weather-averages/punjab/pk.aspx>.

Wescoat, J. L.-B., Wolschke-Bulmahn, J., 1996, *Mughal Gardens: Sources, Places, Representations, and Prospects* (Vol. 16), Washington DC, Dumbarton Oaks.

## UNDERSTANDING THE SPATIAL CONFIGURATION OF HOUSING LAYOUTS THROUGH SPACE SYNTAX: CASES FROM PAKISTAN

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### ABSTRACT

Our lifestyle has its effects on the design and layout of house which also in turn affects the housing market. The function of the space is one important factor affecting interactions. In the last few decades, an important change has occurred in the layout of houses in terms of designation of spaces for specific functions as seen, in Pakistan. This study analyzed 15 different cases of house layouts from three major cities of Pakistan. Space syntax was used to quantify the layouts of these houses using DepthmapX software. The measure of integration, space-link ratios and difference factors were calculated for each case in the sample. The average integration and difference factor of the sample range from 0.62-1.02 and 0.52-0.81 with average value of 0.88 and 0.73 respectively. The results showed that underneath the apparent different layouts, there resides a consistent spatial pattern in the order of spatial arrangements of different layouts. The spatial pattern showed Living room as the most integrated space of the layout this found in 14 out 16 cases. The second most integrated space was kitchen reported in 9 out of 15 cases. The third integrated place was bedroom 9 out of 15 cases. The results of this study may provide insights into the future development of housing layouts based on the existing pattern of use.

**Keywords:** House Layouts; House Design in Pakistan; Space Syntax; Spatial Configuration

### INTRODUCTION

A house represents our position in a competitive status order (Conviser 1986). The function of the space is one of the important factors affecting interactions (Laing et al 2011; Peponis 2012; Sailer, 2011). The real estate agencies provide house based on personal characteristics, such as the professional status and income level of the buyer (Smith et al 2021). Physical and socio-cultural components of a house are linked with lifestyle, function of space and the period of stay which affect the user's spatial behavior. The built environment is also affected by family structure, household composition and lifestyle (Altman & Chemers, 1980). House

plan and its spatial configuration reflect the social and family structure of the residents. The changes in the morphology, use of dwelling and the furnishing are associated with variations in the social meaning and household life (Lawrence, 1989). The ordering of space in buildings is about the ordering of relations between people (Motamed 2016). In the last few decades, an important change occurred in house layouts is the designation of spaces for a specific function, in Pakistan. In traditional house layout, spaces were designed to be multifunctional (Petherbridge 1978). Rooms were used interchangeably for different activities which was important for joint family system (Pramar 2005). This also encouraged maximum space utilization. Buildings

create and order the empty volumes of space as a result of a specific pattern (Hillier & Hanson 1989). This ordering of space is known as function or the purpose of building. This theory was first introduced by Hillier and Hanson in 1984, as a means of which the relationship between space and its use was formalized by means of topological graphs (Dawson 2008). Space syntax is a theory and set of techniques used for the quantification, representation, and interpretation of spatial configuration of buildings and settlements (Hillier et al 1987). Configuration can be defined as the relation between two spaces in house layout considering at least a third space (Hillier et al 1987). It describes spatial models for layouts in a numerical as well as graphical form, thus provide basis for scientific interpretations. It merges science-based knowledge into design, which constitutes the core of “evidence-based design”.

This study explored the relationship between architectural layouts and the functional systems of housing layout in Pakistan. The research points towards the fact that the relations between the spaces in domestic layout have an important role on the nature of spatial configuration. In addition, the location or placement of the internal spaces also affect spatial configuration, which in turn affect the functional efficiency of these spaces in a layout.

## RESEARCH METHODOLOGY

In this study, fifteen houses from three major cities i.e., Islamabad, Peshawar, and Lahore in Pakistan were analyzed. Floor plans were the basic source of information, as it is an abstraction of architecture that captures essential characteristics of the interior space. All the plans were analyzed through Agraph and DepthmapX softwares developed by Alasdair Turner at University College of London (UCL). space syntax indices of integration, difference factor and space-link ratios were calculated.

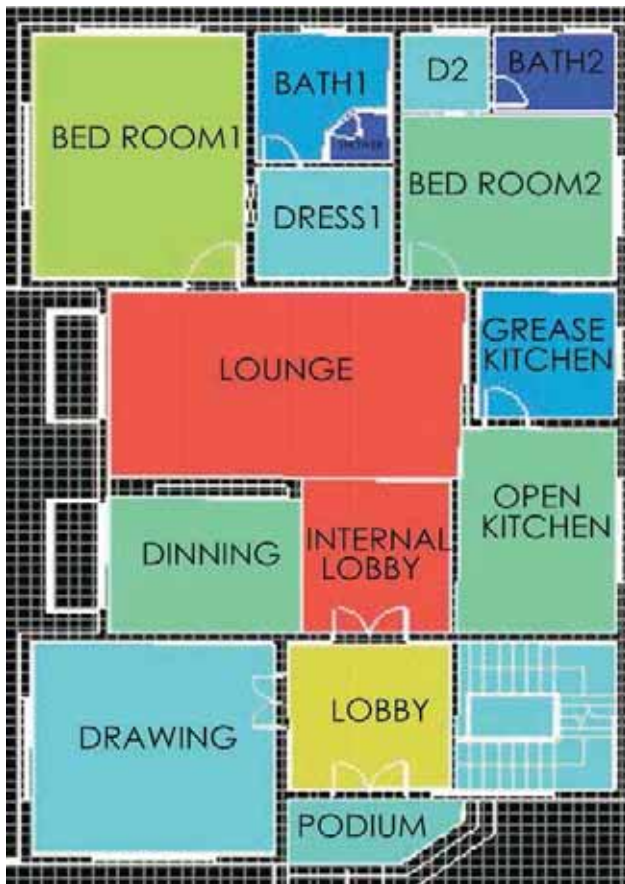
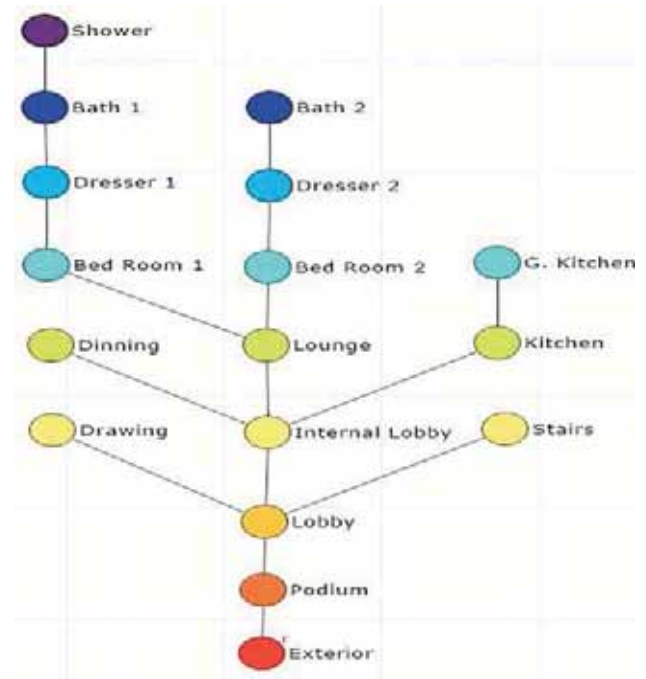
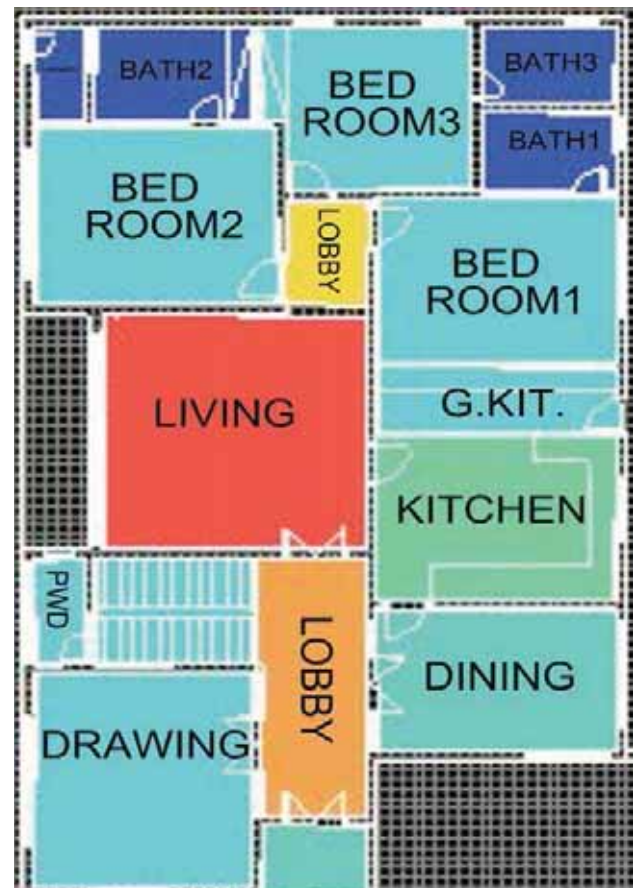


Figure-1A: Covex Map of Case-1.



Figure-1B: Covex Map of Case-2.





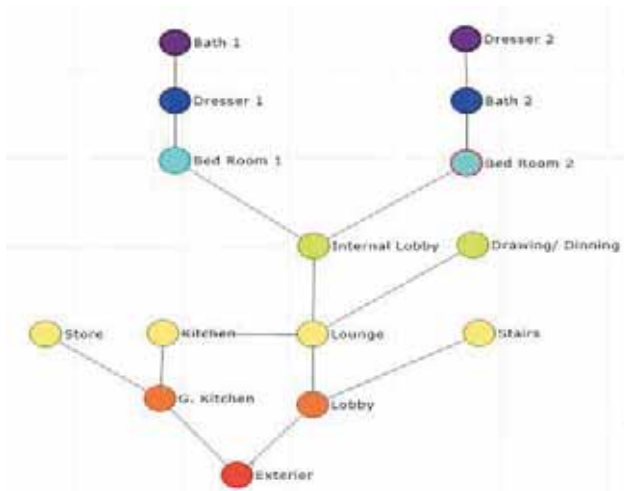


Figure-2B: Justified Permeability Graphs of Case-2.

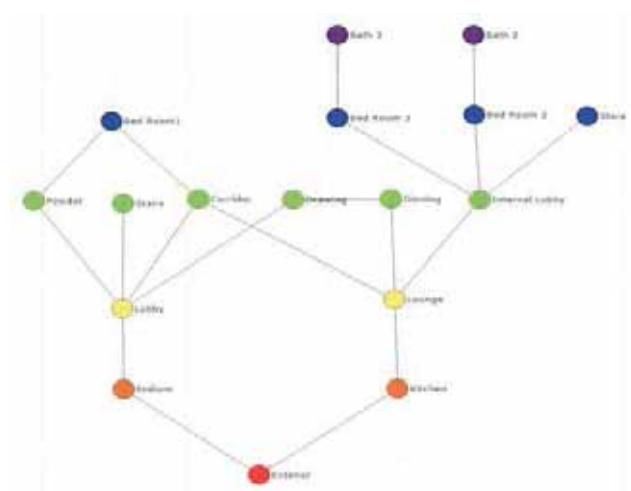


Figure-2C: Justified Permeability Graphs of Case-3.

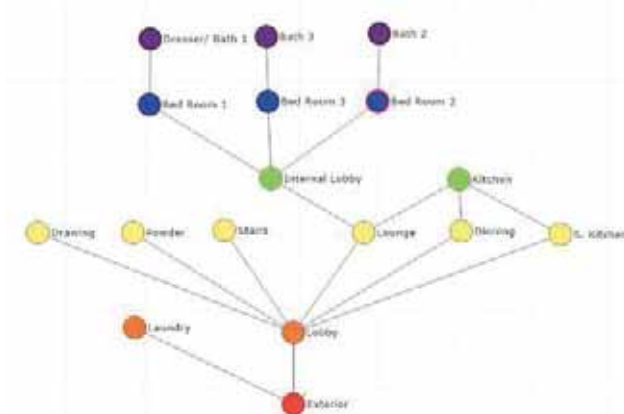


Figure-2D: Justified Permeability Graphs of Case-4.

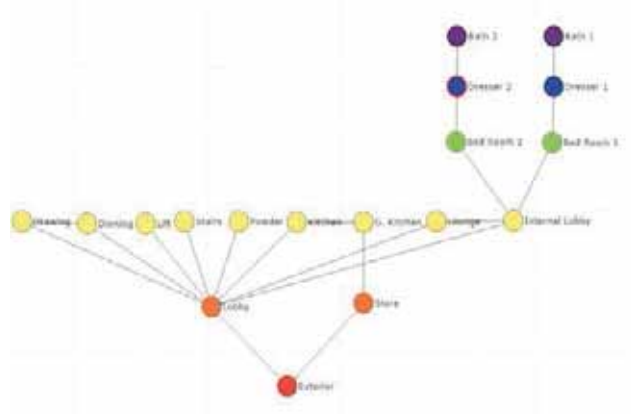


Figure-2E: Justified Permeability Graphs of Case-5.



Figure-3A: Convex Map of Case-6.

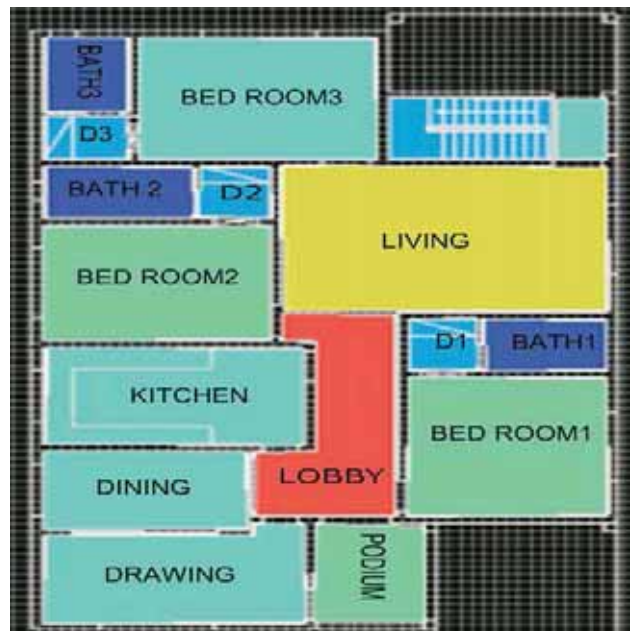


Figure-3B: Convex Map of Case-7.



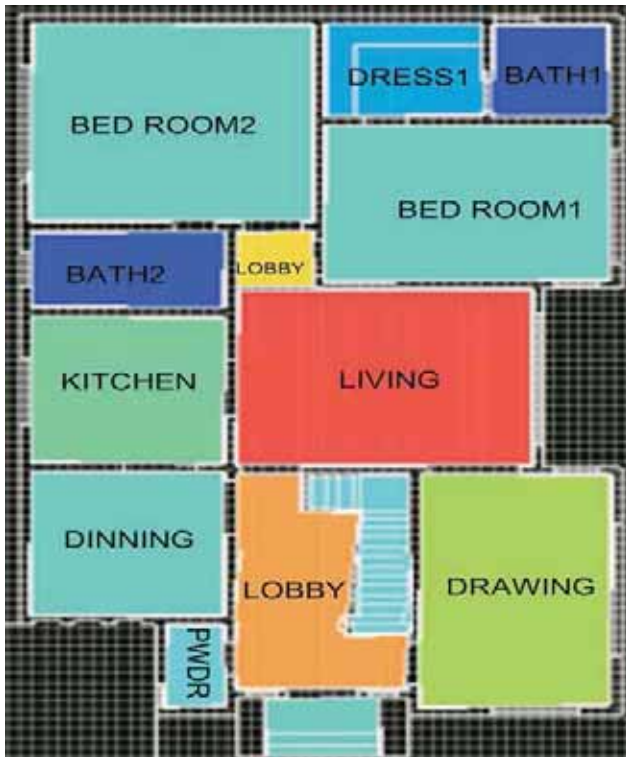


Figure-3C: Convex Map of Case-8.



Figure-3D: Convex Map of Case-9.



Figure-3E: Convex Map of Case-10.



Figure-4A: Justified Permeability Graphs of Case-6.

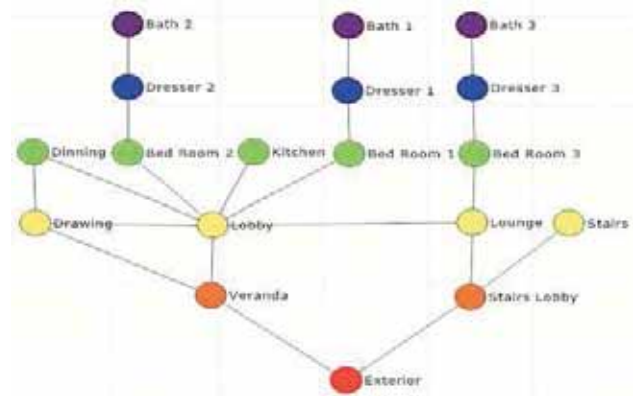


Figure-4B: Justified Permeability Graphs of Case-7.



Figure-4C: Justified Permeability Graphs of Case-8.

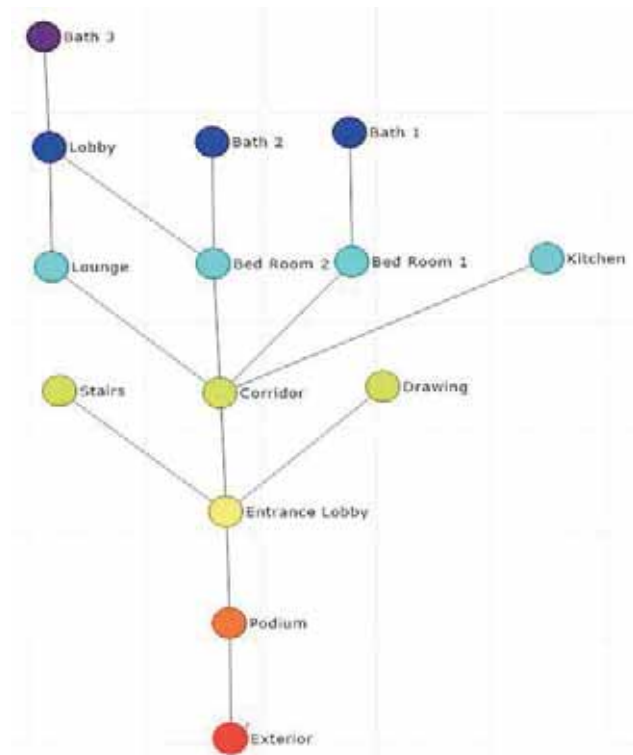


Figure-4D: Justified Permeability Graphs of Case-9.

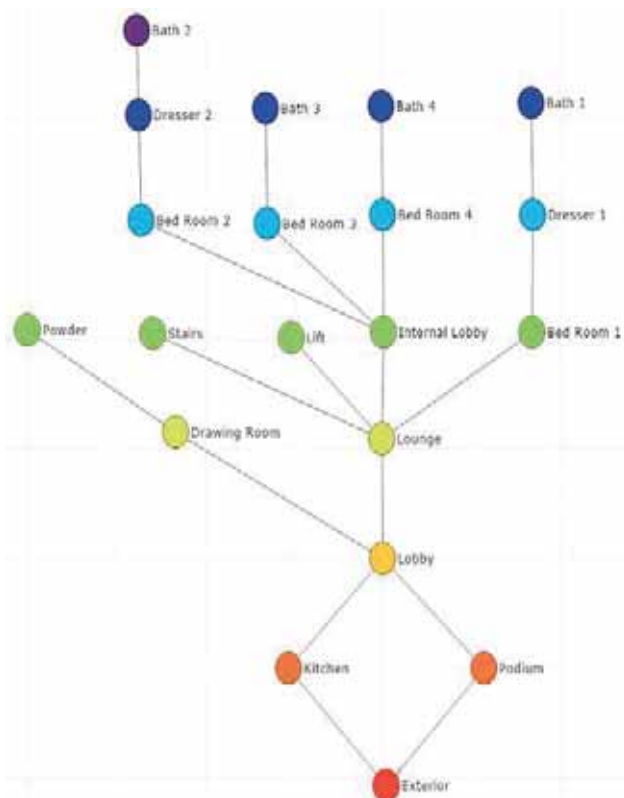


Figure-4E: Justified Permeability Graphs of Case-10.

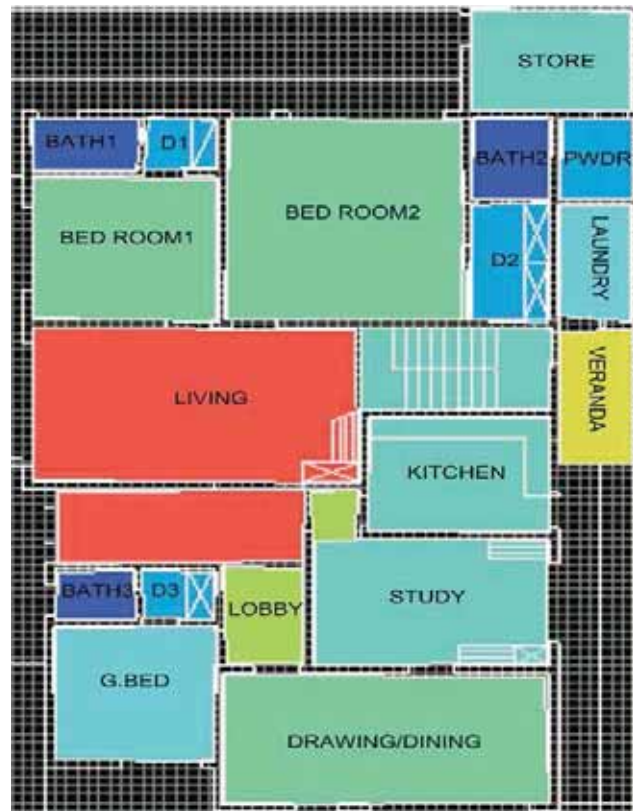


Figure-5A: Convex Map of Case-11.



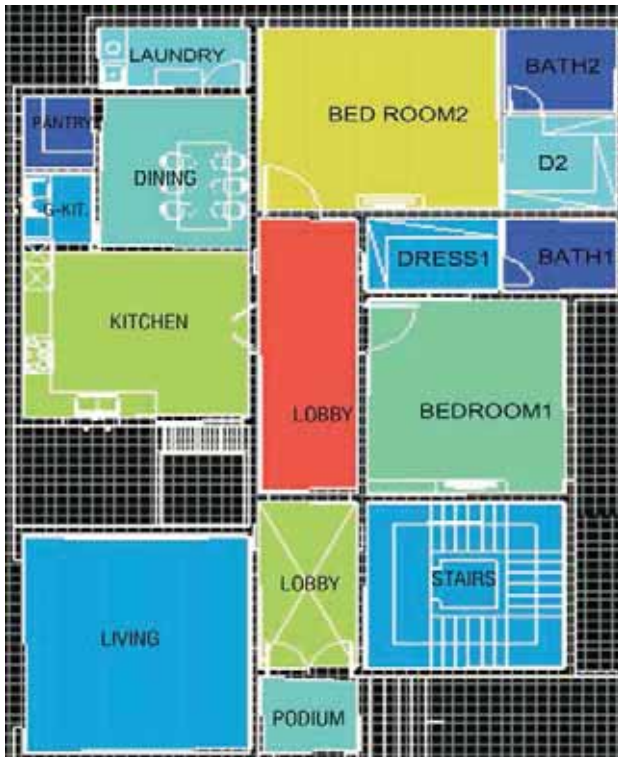


Figure-5B: Convex Map of Case-12.



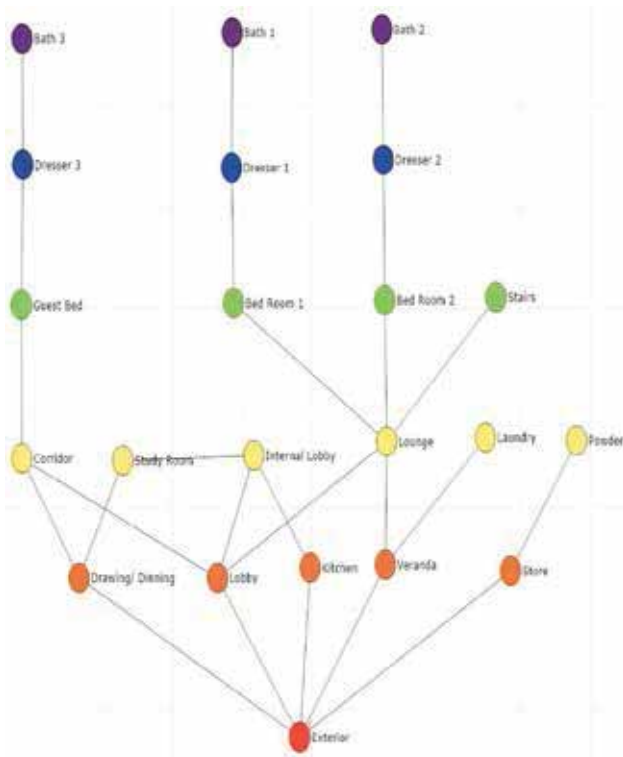
Figure-5C: Convex Map of Case-13.



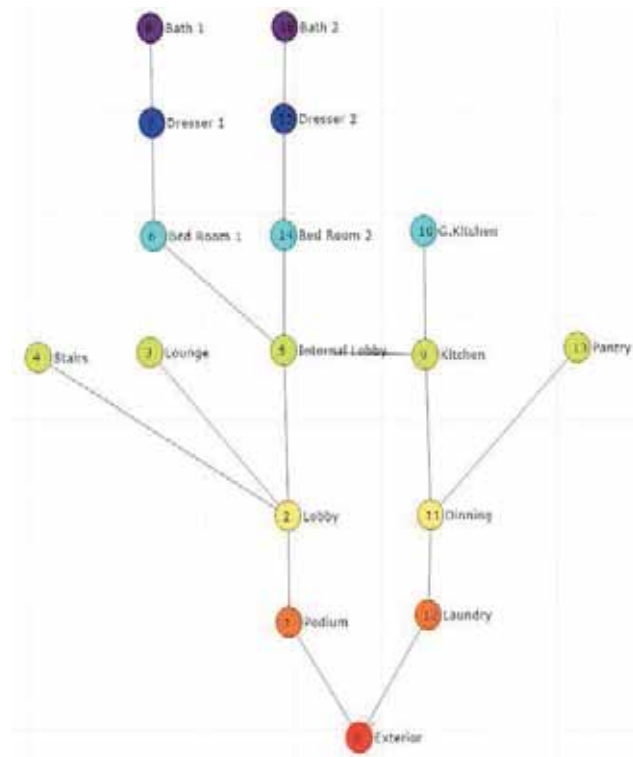
Figure-5D: Convex Map of Case-14.



Figure-5E: Convex Map of Case-15.



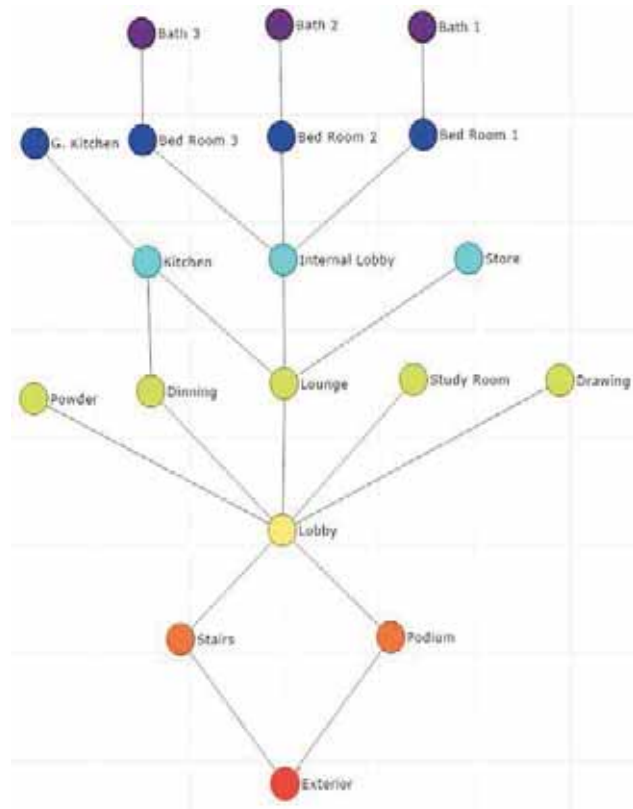
**Figure-6A:** Justified Permeability Graphs of Case-11.



**Figure-6B:** Justified Permeability Graphs of Case-12.



**Figure-6C:** Justified Permeability Graphs of Case-13.



**Figure-6D:** Justified Permeability Graphs of Case-14.

The reasons for using this methodology are as follows:

- Space syntax methodology combines physical and social parameters to explain the morphology and to identify differences and similarities in a configuration. This help in detecting the functional strengths and weaknesses in each layout.
- It uses the syntactic measures for the interpretation of different spatial structures.

- This, in turn, facilitates the process of analyzing, evaluating, and comparing these various systems.
- This methodology describes and models formal and spatial systems, thus establishing research credibility.

### Limitations

This research is limited to the spatial configurations and functional efficiency of house layouts only. Other aspects like style, aesthetics, climatic considerations, 3-dimensional design of house are not covered in this research. Furthermore, the houses selected for this study belong to upper middle class within formally planned urban areas in primary cities of Pakistan. Thus the results are not applicable for low income households.

### RESULTS

Table 1 shows mean integration of the sample ranges from 0.62-1.02 with an average of 0.88 and the difference factor of the sample ranges from 0.52-0.81 with average of 0.73. The space link ratios show that there are few rings in the spatial configurations which can also be seen in justified permeability graphs. Table 2 show that, the order of integration of the layouts follows a consistent pattern, where in 14 out of 15 cases, the most integrated space is living

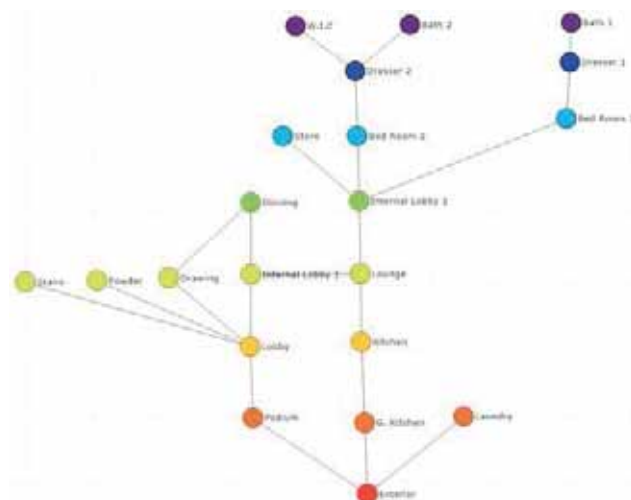


Figure-6E: Justified Permeability Graphs of Case-15.

Table-1: Space Syntax Indices of Space-Link Ratio, Integration and Difference Factor.

| Case No. | Location    | No. of Spaces | Space Link Ratio | Integration |      |         |      |
|----------|-------------|---------------|------------------|-------------|------|---------|------|
|          |             |               |                  | Minimum     | Mean | Maximum | D.F  |
| 1        | Lahore      | 17            | 1.0              | 0.41        | 0.75 | 1.33    | 0.74 |
| 2        | Peshawar    | 15            | 1.07             | 0.46        | 0.80 | 1.38    | 0.77 |
| 3        | Peshawar    | 17            | 1.12             | 0.58        | 0.97 | 1.72    | 0.77 |
| 4        | Peshawar    | 17            | 1.12             | 0.60        | 0.96 | 1.72    | 0.78 |
| 5        | Islamabad   | 18            | 1.15             | 0.55        | 0.62 | 2.30    | 0.52 |
| 6        | Islamabad   | 16            | 1.06             | 0.57        | 0.91 | 1.64    | 0.78 |
| 7        | Islamabad   | 18            | 1.17             | 0.51        | 0.98 | 2.02    | 0.65 |
| 8        | Islamabad   | 15            | 1.13             | 0.46        | 0.89 | 1.56    | 0.73 |
| 9        | Peshawar    | 14            | 1.07             | 0.58        | 0.99 | 2.08    | 0.67 |
| 10       | Lahore      | 20            | 1.05             | 0.53        | 0.94 | 1.74    | 0.73 |
| 11       | Lahore      | 22            | 1.18             | 0.48        | 0.91 | 1.61    | 0.73 |
| 12       | Islamabad   | 17            | 1.06             | 0.53        | 0.87 | 1.60    | 0.76 |
| 13       | Lahore      | 18            | 1.11             | 0.53        | 0.88 | 1.53    | 0.78 |
| 14       | Lahore      | 19            | 1.11             | 0.65        | 1.02 | 1.86    | 0.78 |
| 15       | Lahore      | 21            | 1.10             | 0.49        | 0.78 | 1.30    | 0.81 |
|          | Sample Mean | 17.6          | 1.10             | 0.53        | 0.88 | 1.69    | 0.73 |

**Table-2:** Order of Integration First Five Values of Integration for Each Case.

| Case No. | Order of Integration First to Fifth Value |         |         |         |                |                |
|----------|---|---------|---------|---------|----------------|----------------|
| 1        | Living                                    | Kitchen | Bed     | Dining  | Bed            | Grease Kitchen |
| 2        | Living                                    | Kitchen | Bed     | Bed     | Dining         | Drawing        |
| 3        | Living                                    | Dining  | Kitchen | Drawing | Bed            | Grease Kitchen |
| 4        | Living                                    | Kitchen | Dining  | Bed     | Grease Kitchen | Drawing        |
| 5        | Living                                    | Kitchen | Bed     | Drawing | Dining         | Store          |
| 6        | Living                                    | Kitchen | Bed     | Dining  | Drawing        | Store          |
| 7        | Living                                    | Kitchen | Drawing | Bed     | Bed            | Dining         |
| 8        | Living                                    | Drawing | Kitchen | Bed     | Dining         | Store          |
| 9        | Living                                    | Bed     | Bed     | Kitchen | Drawing        | Bed            |
| 10       | Living                                    | Bed     | Kitchen | Bed     | Dining         | Store          |
| 11       | Living                                    | Drawing | Bed     | Bed     | Store          | Kitchen        |
| 12       | Bed                                       | Kitchen | Bed     | Dining  | Store          | Laundry        |
| 13       | Living                                    | Kitchen | Bed     | Bed     | Store          | Dining         |
| 14       | Living                                    | Kitchen | Dining  | Bed     | Drawing        | Grease Kitchen |
| 15       | Living                                    | Kitchen | Bed     | Bed     | Store          | Dining         |

room. The second most integrated space is kitchen which occurs in 12 out of 15 cases. The third most integrating space is dining room which occurs in 11 cases out of 15. It mostly occurs at third or fourth place. While in two cases each it occupies second and fifth place of integration value.

## CONCLUSION

The result of this study shows that different layouts of houses in Pakistan follows a consistent spatial pattern in their configuration. This consistency means a regular pattern of use across a specific social and cultural community. With very little inconsistency in few instances, the overall sample shows that housing layouts in Pakistan are arranged around living room as the overall integrating space of the house. This implies that family gathering is an important consideration in the design of houses in Pakistan. The second most integrating space is kitchen. As opposed to the trend of last century where kitchen was segregated from the main functional areas of the house, kitchen is again gaining its

traditional key position in house layout as an important space. Dining and drawing rooms are the third and fourth integrating spaces in the layouts carrying second to fifth place of integration value. This developing consistency in the housing layout shows, that a specific lifestyle is persistent in the major cities of Pakistan. This study will help to determine the overall layout consistency for future house planning in Pakistan. Conclusively, this study helps to desipramine a base line methodology for the objective evaluation of functional efficiencies in different building program. The methodological contribution of this research is useful as it relies on an objective evolution, based on space syntax tools and techniques, and not on subjective evaluations.

## Acknowledgements

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## REFERENCES

- Altman, I. and Chemers, M.M., 1980. 'Cultural Aspects of Environment-Behavior Relationships', in *Handbook of cross-cultural psychology*, 5, pp.355-395
- Conviser, R., 1986. 'Cosmology, Economy and Ecology: Appropriate Housing, Past, Present and Future', in *Architecture in Cultural Change: Essays in Built Form and Cultural Research*, University of Kansas School of Architecture and Urban Design, pp.135-146.
- Dawson, P.C., 2008. 'Unfriendly Architecture: Using Observations of Inuit Spatial Behavior to Design Culturally Sustaining Houses in Arctic Canada', in *Housing Studies*, 23(1), pp.111-128.
- Hillier, B. and Hanson, J., 1989. *The Social Logic of Space*, Cambridge University Press.
- Hillier, B., et al., 1987. 'Ideas are in Things: An Application of the Space Syntax Method to Discovering House Genotypes', *Environment and Planning B: Planning and Design*, 14(4), pp.363-385.
- Lawrence, R., 1989. 'Translating Anthropological Concepts into Architectural Practices', in S. Low, E. Chambers (Eds.), *Housing, Culture and Design: A Comparative Perspective*.
- Laing, A., et al., 2011. *High-performance Office Space*, Harvard Business Review, 89(9), pp.32-33.
- Motamed, M., 2016. Role of Visual Affordance of a Spatial Layout on Human Interactions at a Work Environment, Doctoral dissertation, University of Minnesota.
- Peponis, J., 2012. 'Building Layouts as Cognitive Data: Purview and Purview Interface', in *Cognitive Critique*, 6, pp.11-50.
- Petherbridge, G.T., 1978. 'The House and Society', in G. Mitchel (ed.), in *Architecture of the Islamic World*.
- Pramar, V.S., 2005. *A Social History of Indian architecture*, Oxford University Press, USA.
- Sailer, K., 2011. Creativity as Social and Spatial Process, Facilities.
- Smith, T.R., et al., 2021. 'Information provision: An Analysis of Newspaper Real Estate Advertisements', In *Modelling Housing Market Search*, (pp. 160-186). Routledge.

## COVID-19 AND PUBLIC SPACES: IMPROVING QUALITY AND FLEXIBILITY FOR INTERACTIVE PLACES THROUGH DESIGN

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### ABSTRACT

Cities are shaped and formed through urban settings and there are many factors which give it a final built form. Corona Virus Disease (COVID-19) has changed many life patterns and has adversely affected livability of urban public spaces. Social distancing and masks have reduced the opportunities for people to interact with each other. Social life has also diminished to a great extent. This research aims to bring interventions in the design of urban open spaces to make it more flexible and healthier under the current pandemic situation. Thus, a qualitative study is conducted to cover all the aspects related to the pandemic, its history and how it has effected urban livability. Such design interventions in the urban built environment support the continuation of public life with the possibilities of healthier and pandemic resilient spaces. It brings forward strategies for better understanding of the situation and to provide awareness in general public. The research can be helpful for architects, designers and urban planners for making pandemic resilient urban spaces in the future.

**Keywords:** Livability, Public spaces, Flexibility, Interactive places.

## INTRODUCTION AND LITERATURE REVIEW

Cities are innovative centers and places for economic growth and are sources of generating livable urban spaces. The crisis of COVID-19 has affected livability and connectivity of urban spaces, as people in cities are at greater risk of spreading the disease. Under COVID-19, the quality of living in cities has been questioned and altered. The overall system has seen a great shift in the role of the home and the neighborhood. Change is also seen in the role of transportation and information and communications technology (ICT) (Mouratidis, 2021a). Since the beginning of the pandemic, different professionals have been involved in understanding the virus and designing policies to control it. However, the role of an urban planner for developing pandemic resilient

urban strategies to mitigate the risk of spread can be very significant. UN-Habitat also emphasizes that COVID-19 pandemic has brought to light a number of public space deficiencies that require immediate, medium-term and long-term attention. These deficiencies include several gaps related to accessibility, flexibility, design, management and maintenance, connectivity and equitable distribution in designing urban space network (UN-Habitat, 2020).

Other than the catastrophic influences of COVID-19, the need for innovative ideas to address the vulnerability regarding public urban spaces was also invoked. A need was felt for alternate design solutions and to think beyond the bounds of set urban principles (Jasiński, 2020).

Public urban spaces not only play a significant role to achieve better communities by imparting public amenities, but also maintain ecological balance by generating breathing spaces in high density areas. No matter how big or small these spaces are, they are a source of several planned or spontaneous activities (Gehl, 2011). These spaces include city squares, public parks, open recreational spaces, streets and walkways and are designed to enhance the meaningful and healthy urban environment in communities. The relationship of people with public spaces however has changed since the COVID-19 pandemic. Under severe constraint on movement, the public spaces, streets, squares and parks were avoided initially by people. The impression given by this pandemic was that these public spaces were a source of spreading the virus thus they should be avoided. Later on however, the need for understanding and purposeful designing of these public spaces was felt as a means to bring together the community again (Stevens, Tavares and Salmon, 2021).

Urban open spaces are the platform for diverse social interactions. Researchers have over time proved the importance of such spaces for healthy development of human minds. The open spaces with green areas are the best locale for releasing stress. Nature has positive distractions and an ability to reduce stress (Shawket and El Khateeb, 2020). The distractions it provides through different buildings, green spaces, views of nature, water bodies, art and music, have a positive impact on human behavior. Research has proven that outdoor nature helps in quick recovery in patients suffering from stress and anxiety (Uwajeh and Ezennia, 2019). Overall and in this extended phase of the pandemic, the constraint to stay at home along with the deflation in economy has created circumstances to induce involuntary jobs and impacted a great majority by loss in income (Dong and Bouey, 2020). The need is to sustain public life in urban open spaces while preventing the spread of the virus. The new design solutions should prioritize design concepts acknowledging the current phase of the pandemic (Couling, 2014).

Internationally, researchers are responding to the need of COVID-19 via responsive design by incorporating social and ecological determinants, for creating an environment where people could have the freedom of physical activities, social health, mental progression and overall satisfaction (Morales-Rodríguez et al., 2021). Planners and practitioners should be able to intervene and enhance quality of life on various spatial scales. The systematic knowledge and in depth understanding of various ways that land use, transportation systems, urban design and housing may contribute to improve the subjective well-being of cities,

can be a key to achieve quality cities (Mouratidis, 2021b).

The paper is a synthesis of available knowledge and offers a framework for future research. Potential ramifications for urban design and policy in the face of COVID-19 and upcoming pandemics are suggested in light of the literature review. The conceptual framework and literature evaluation in this paper aims to provide a fresh framework that might direct future investigations into cities and quality of life under COVID-19. Different case studies have been taken into consideration in the local area for indepth research and analysis.

## METHODOLOGY

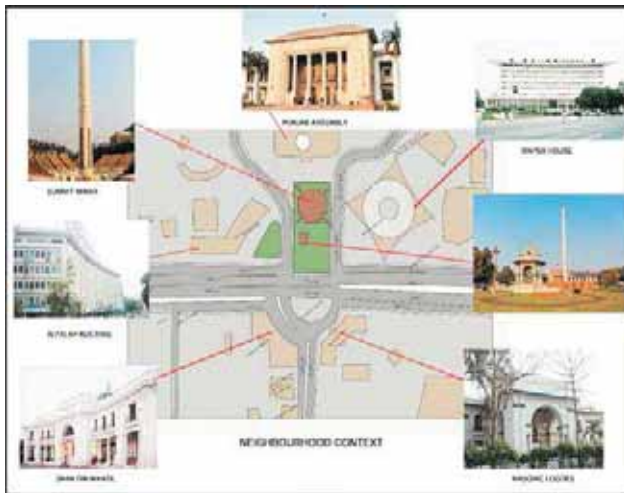
A qualitative research has been conducted to develop an understanding of different environmental, social and economic effects of this pandemic on people through a questionnaire survey. The horizon of the survey was extended from local stake holders, to experts and policy makers for better understanding of different perspectives for the same. Considering all the possible facts, design strategies have been suggested to make such spaces healthier and flexible for public use. Stepwise framework of the research has been formulated in Figure 1.

### Selection of Case Study

The selection of case study was very difficult because the concept of public square was totally different in the Indian subcontinent before the British rule. So for this type of study within the current built environment that has undergone different architectural styles was a difficult task. The local vocabulary of Indo Pak public squares starts from the walled city of Lahore. This has limited usage with a limited number of people as a reflection of social and cultural norms. While the concept of public squares introduced in British rule was the amalgamation of western and eastern influences so for this reason, case selection for proper representation of the objective was a challenge. Keeping in mind the study aim of the research the following three areas were included for detailed analysis, from which the Charing Cross was selected based on literature studied with identified factors. This case



**Figure-1:** Methodology Framework for the Study.



**Figure-2:** Charing Cross Square with its Neighboring Context.



**Figure-3:** Existing Land Use of the Site and its Surrounding Areas.



**Figure-4a:** View Charing Cross.  
**Source:** Google Images, Accessed on 1-12-21.



**Figure-4b:** Charing Cross Square.  
**Source:** Google Images, Accessed on 1-12-21.

study was identified to be the most representative of the urban public squares of Pakistan (Figures 2 and 3).

- Liberty Roundabout Chowk
- Kalma Chowk
- Charing Cross

The historical analysis of the three selected areas projected the characteristics of the public squares and their historical importance within the built environment. The Liberty roundabout has undergone various design changes and after this new identity, it is now serving the same purpose as Charing Cross by becoming a major icon of built environment of the area. Whereas Kalma Chowk, which was initially designed on the same ideology has lost its identity with the passage of time due to metro train project. The selected site of Charing Cross is representative of the urban public squares of Pakistan. The Charing Cross is an urban square located on the Mall road, the oldest and busiest road in Lahore.

Charing Cross is a representation of the colonial era architectural heritage of the city. The square represents the historic glory of the city and was the new urban center of colonial era. A prime area was selected by the British for their imperial army and officers and a new network of roads linking all the prime locations was laid. The Mall road was the outcome of this vision and with the passage of time it became the focal point of many dignified private and public buildings (Aslam, 2019). Initially it was a triangular open space, but in 1913 M. Sullivan improved its visual appearance by aligning the roads and relocating its axis. His geometrical alignment of roads and relocation of Queens's canopy gave a new shape to the space and created a meaningful square (Figure 4b).

The dome shaped British pavilion, with the statue of Queen Victoria inside, increased the architectural significance of the square. The addition of Shah Din Building (1914) and Masonic Lodges (1917) added a new character to the urban environment. These buildings are identical to each other





**Figure-5:** View of the Charing Cross Square During a Protest.

and are located on the opposite side of British pavilion. The overall character of the space was changed by giving it a feeling of enclosure (Imtiaz and Mustafa, 2018). More grandeur was added with the construction of the Punjab Assembly building in 1935, which had a Neo Classical style of imperial architecture and was designed by M. Sullivan. The elite of that time preferred to spend their quality time here. The quality of space and the environment it created had a great impact on people. It was a space providing a platform for people to interact with each other, keeping the factor of livability as its prime focus.

With time, further growth took place and the Alfalah building (1962) with its counterpart, the WAPDA house (1963) enhanced the spatial arrangement and defined the geometrical enclosure. The Square gained new focus with the construction of Summit minar in 1977. The Turkish architect designed the vertical Minar of one hundred and seventy feet height rising from a water pool as a symbol of unity and brotherhood among Muslim states. This urban space transformed many times over the course of its history and became an urban node with a new name, the Faisal Square. The Square at all times had its own significance and remained a multicultural asset of Lahore's history. Today, the square is basically used as a platform of protests and rallies (Figures 5 and 6). Commercialization and increased economic development however results in traffic congestion at the junction. Nonetheless, this space has gained an important status over the years as after Prime Minister Zulfiqar Ali Bhutto the Square was frequently used as the place of protests and anti-government rallies (Naz and Ashraf, 2008).

### POST-COVID-19 SCENARIO

COVID-19 has imposed many limitations on the activities of public spaces. The post COVID effect was observed on Charing Cross also. The Square previously contributed in



**Figure-6:** View of the Charing Cross During and Protest.

providing a platform for social interaction, supporting a healthy and strong community and acting as part of a safe and connected network of urban spaces. Interestingly in this case study, it was seen that with the advent of COVID-19 some of the activities that were performed in the Square changed overtime where as some remained unchanged. However, a general deterioration of the urban space was witnessed.

### Functions disturbed after COVID-19

A functional square is one with active participation of people in that space. The impact of this pandemic has not totally removed the public from the Square but has reduced the need of the space. Previously people used to come from neighboring shops, offices and institutes during their free time. The survey confirmed the absence of these activities and participation of the people in the Square post COVID-19. The absence of physical objects like benches, chairs, steps and plants is also responsible for reducing the number of people visiting the Square. Majority of the area is restricted from usage due to the presence of Punjab Assembly building at the rear end and the green area around the canopy cannot be accessed by public. The remaining area is not enough to hold big gatherings as social distance is to be maintained. Flexibility of space is also compromised due to absence of surfaces for sitting. The elements that make the public square more vital are not arranged and planned for. The pavements and sidewalks are not accessible for pedestrians. Furthermore, trees and shades are not enough for people to rest when required.

Previously, due to the prime location and presence of the Assembly building, this Square was the focal point of public gatherings and protests. People from various walks of life would gather here to raise their voices. Though there was no planned space and sitting areas to accommodate all the



**Figures-7, 8 and 9:** Different Views of the Charing Cross Square During the Pandemic.

people participating in the protests, but people gathered on the main road and blocked the traffic. Post COVID-19 pandemic, the restriction on public protests and the measures for maintaining social distance has brought this activity to an end. Today, the semicircular space opposite the marble pavilion created by M. Sullivan is used as a refuge space by few protestors. However, the space is quite minimal and cannot accommodate few people maintaining social distancing. The sidewalks are not accessible and the roads on both sides of the park holding the marble canopy are blocked due to security reasons, leaving little space for people to carry on social interactions (Figures 7, 8 and 9).









Thus, to facilitate public gatherings and interactions the adequate presence of street furniture is essential. Unfortunately, the Square does not hold these amenities to provide space for gatherings. The streetscape enhancement and openness is also an essential feature to be incorporated in the existing fabric, considering the recent pandemic situation in mind.

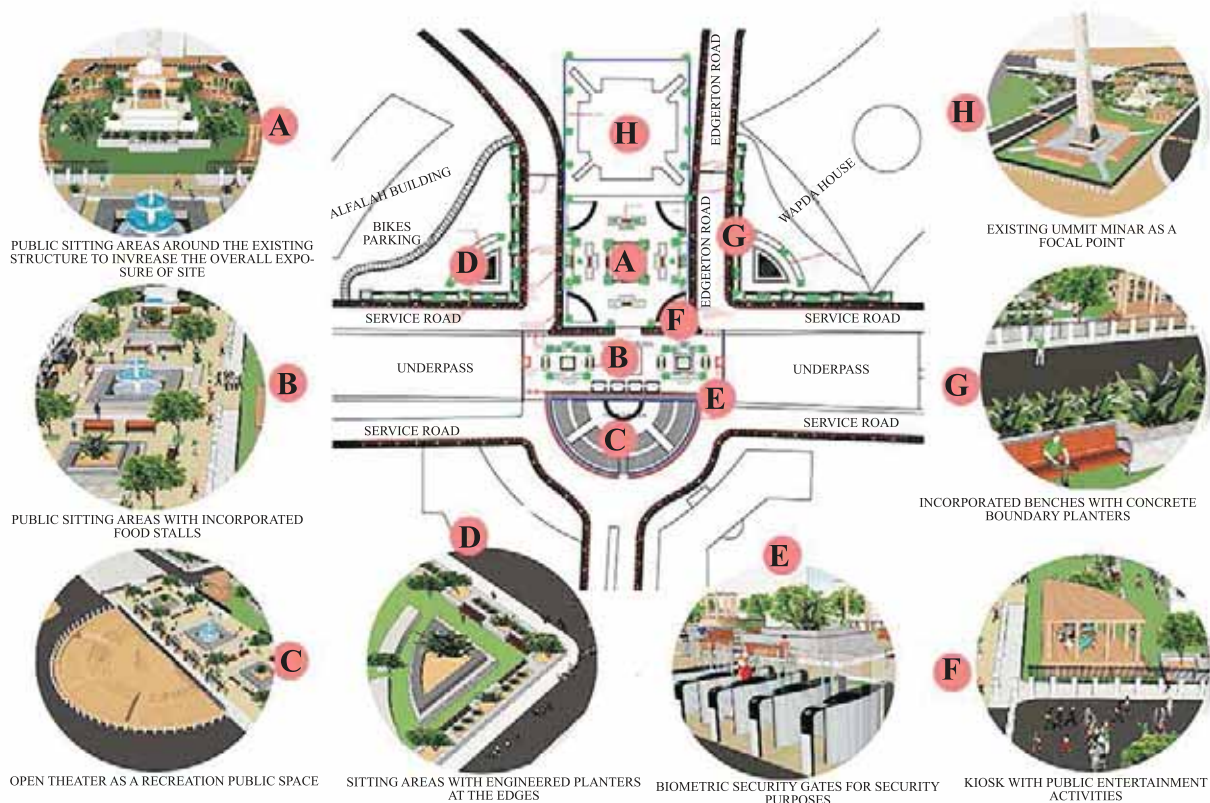
The study revealed that due to the strong character of the place, some of the features and characteristics were not disturbed. As mentioned previously, some of the road networks were already blocked due to security reason, after the pandemic people had further restrictions and faced problems due to blocked linkages. The functions related to the design were not supportive of the overall needs. Thus, safe and easy access to different public squares is very important along with maintaining social distance. Furthermore public amenities are absent from the square as there is no structure to be used in case of severe weather conditions. Also, the restrictions in pandemic have further limited the diversity of square. The overall environment is not friendly and welcoming. According to the current situation, there is need of improved planning and addition of infrastructure in the existing fabric, as evident through analysis present in Table 1, in order to make it a resilient space for public use.

Since the outbreak of the pandemic till date, no improvement has been made in the design of the square and no measures have been taken to improve its vitality. Some functions like public interaction with nature, the environment of the square, livable surroundings, local character and visual quality are still present, but many other factors related to social interaction have been lost. In addition, now people cannot find a defined place for protests and due to the fear of spread of virus, there is no planned way to carry on the activities.



**Table-1:** Assessment of Existing Situation of During Pandemic.

| Overall Relationship of Characters of Urban Squares After COVID-19 |   | Response           |                   |                       | Images of Site  |
|--|---|--------------------|-------------------|-----------------------|---|
|  |   | Strong Relation    | Moderate Relation | Relation Lost         |   |
| <b>Qualities of Public Square</b>                                  | Image Enclosure<br>Linkages<br>Connectivity<br>Human Scale<br>Legibility<br>Coherence   | ✓✓                 | ✓<br>✓<br>✓<br>✓  | X<br>X                |    |
| <b>Design Elements</b>   | Public Amenities<br>Sensory Experience<br>Protection from Climate<br>Local Character<br>Maximum Diversity<br>Public Friendly Design         |                    | ✓                 | X<br>X<br>X<br>X<br>X |    |
| <b>Role of Stakeholders for Regulating the Space</b>               | Maintaining Design<br>Maintaining Utilities<br>Improvement in Design  |                    | ✓✓                | X                     |    |
| <b>Physical Comfort</b>  | Public Amenities<br>Street Furniture<br>Visual Quality<br>Active and Passive Social Network   |                    | ✓                 | X<br>X<br>X           |   |
| <b>Safety Factor</b>   | Implementation of Rules<br>Sense of Belonging<br>Climate Protection Measures<br>Measure for COVID-19 Spread                                 |                    | ✓✓                | X<br>X                |  |
| <b>Activities and Experiences</b>                                  | Social Interaction<br>Walkability<br>Easy Accessibility<br>Community and Civic Gatherings<br>Public Protests                                |                    | ✓                 | X<br>X<br>X           |  |
| <b>Urban Environment</b>   | Public Interaction with Each Other<br>Public Connection with Nature<br>Safe and Comfortable Environment<br>Healthy and Livable Surroundings |                    | ✓<br>✓<br>✓       | X                     |  |
| <b>New Design Measures</b>   | Maintaining Social Distance<br>Street Furniture Incorporation<br>Marking Spaces for Sit ins<br>Allocating Space for Protests                |                    |                   | X<br>X<br>X<br>X      |  |
| Strong Relation<br>✓ ✓   | Moderate Relation<br>✓  | Relation Lost<br>X |                   |                       |   |



**Figure-10:** Views Outs of Proposed Design Layouts of the Square.

## STRATEGIES FOR MAKING URBAN SPACES RESILIENT

### Avoiding Dense Concentration of Public

Recent pandemic suggests change in design of public spaces. Previous design consideration for public square was based on public togetherness. For this purpose, the sitting areas and benches were planned around a focal point. The new design paradigm needs flexibility in design with a focus on scattered spaces. Thus, different platforms should be created and dispersed throughout the space to maintain social distance. This will help to prevent the spread of virus and people could get the chance to remove masks and enjoy the environment. Figure 10 shows how to achieve dispersed activities throughout the square, taking the case of Charing Cross, while avoiding dense concentration in one place.

### Change in Design Strategies

In public squares, the change in design strategies should be pandemic resilient along with supporting their overall purpose. Scattered stalls and urban retreats focusing on small groups and allowing activities for individual use could be

very helpful. Furthermore, different platforms with marked grids on ground to maintain social distancing is required. Along with creating social distance and scattered public platforms, the overall comfort of public is a priority and should be managed through design. With the incorporation of retreat spaces, the success of the space totally depends on environmental comfort and success of the space itself. The design should also ensure that the entry and exit spaces are wide enough to avoid crowding. The sidewalks and pavements should be widened. In addition, the planned system needs to provide choice in paths for safely circulating through spaces. While designing the spaces, another important consideration is maintaining safe distance throughout. The design should permit minimum physical distance between people and also between people surrounding structures. A proposed plan of the existing square and shows how to change the planning framework to achieve the desired results (Figure 10).

### Separation and Segregation through Planning

The new system of separation is a big shift in design of public spaces. Public spaces which offer separation and



**Table-2:** Summary of Recommendations.

|   |   |
|---|---|
| Avoiding Dense Concentration of Public      | <ul style="list-style-type: none"><li>• By Practicing Social Distancing</li><li>• Reminding by Sign Boards of “Social Distance” inscription</li><li>• Marking Ground or Paths by Chalks for Maintaining Distance</li></ul>  |
| Change in Design Strategies                 | <ul style="list-style-type: none"><li>• Individually Focused Urban Retreats</li><li>• Environmental Comfort</li><li>• Avoiding Crowd at Entrances and Exits</li><li>• Widened Sidewalks and Pavements</li><li>• Well-Spaced Built Structures</li></ul>  |
| Separation and Segregation Through Planning | <ul style="list-style-type: none"><li>• Scattered Sitting Places</li><li>• Small and Scattered Water Bodies Instead of One in Center</li><li>• Scattered Platforms for Activities</li><li>• Scattered Stalls with Marked Grids</li><li>• Placing and Planning Soft Landscape to Maintain Distance</li></ul> |
| Integration of Physical Objects             | <ul style="list-style-type: none"><li>• Incorporating Physical Barriers and Buffers</li><li>• Use of Railings and Balustrades</li><li>• Separation Through Lighting</li></ul>   |

segregation underpins the shifting paradigm in public space design. This shift in design will bring more sense of security in public as it will ensure less spread of disease. The idea of separation is kept flexible with an inclusive design approach. This can be achieved through designing scattered sitting places and water bodies (Figure 10, images A and B). Scattered food stalls and activity places can also be used for the overall design (Figure 10, image F). Adding soft landscaping and dispersed planters can play significant role to control the spread of disease. The placement of urban design elements according to proper planning can help in segregation of people and to achieve proper social distancing. Placing plants and soft landscape will enhance the visual experience along with providing buffers and separating spaces for users while maintaining social distance.

### Integration of Physical Objects

The new norms of design of public spaces requires users and community to accept and incorporate new design parameters. Integrating different physical objects is a way to achieve the desired purpose. It allows more flexible spaces and prevents high risks of virus spread. Planned placement of planters, hedges, street furniture, lighting fixtures and sculptures can play significant role to maintain proper social distance and at the same time it can enhance the beauty of any public space. Figure 10 with images C, D, G and F illustrateS how planning and installing sitting space, planters, street furniture and different sculptures can help to make spaces pandemic resilient, without compromising the quality of space. The aim is to provide opportunities for people to come together in public spaces while keeping them a safe distance apart at the same time.

Table 2 summarizes a few recommendations towards this end.

### CONCLUSIONS

The paper concludes with the finding that in the challenging times of COVID-19, the character and design of public space needs to be redefined. The designers can play a significant role in shaping the structure of urban spaces. As the image of a city is mainly dependent on the quality of its urban spaces, thus the success of these spaces is dependent on community participation and their connectedness. Public spaces create a network which strengthens the overall city’s connections. Public spaces are the platforms for social interactions, exchange of ideas and facilities for political mobilization. Strong and healthy connection of a city’s streets, squares and other public spaces are key consideration for a city’s identity.

The results of this research show that public squares are not playing their role in the current context of Lahore and people are restricted to use such spaces due to fear of virus spread. People cannot gather for social interactions and protests which used to occur frequently at the Charing Cross previously. Lack of planning, street furniture and restricted zones do not allow public mobility. The public accessibility is further restricted by barriers.

To make public spaces lively and interactive, there is a need to design and plan these spaces considering the impact of a pandemic like COVID-19. The users of these spaces desire for areas to be healthy and of good quality. So the responsibilities of urban planners and designers towards spaces is remarkably increased.

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## REFERENCES

- Aslam, S., 2019, "Exploring The Colonial Era Developments of The Mall Road, Lahore," *Journal of Art Architecture and Built Environment*, 2(1): 30–46.
- Couling, N., 2014, "Spaces and Flows: An International Journal of Urban and Extra Urban Studies", *Space and Flows*, 4(1): 26-38.
- Dong, L. and Bouey, J., 2020, Public Mental Health Crisis during COVID-19 Pandemic", *Emerging Infectious Diseases*, China, 26(7): 1616–1618.
- Gehl, J., 2011, *Life Between Buildings*, Washington, DC, Island Press.
- Imtiaz, H. and Mustafa, M., 2018, "The Charing Cross: Unfolding a Genius Loci in Lahore, Pakistan," *An International Journal on Urban Environments*, 3(1): 1-10.
- Jasiński, A., 2020, "Public Space or Safe Space – Remarks During the COVID-19 Pandemic," *Technical Transactions*, 1–10.
- Morales-Rodríguez, F. M. et al., 2021, "Stress, Coping, and Resilience Before and After COVID-19: A Predictive Model Based on Artificial Intelligence in the University Environment," *Frontiers in Psychology*, 12(May): 1–15.
- Mouratidis, K., 2021a, "How COVID-19 Reshaped Quality of Life in Cities: A Synthesis and Implications for Urban Planning," *Land Use Policy*, 111: 105772-105780.
- Mouratidis, K., 2021b, "Urban Planning and Quality of Life: A Review of Pathways Linking the Built Environment to Subjective Well-being," *Cities*, 115: 1-2.
- Naz, N. and Ashraf, Z., 2008, "Transformation of Urban Open Spaces of Lahore: From Charing Cross to Faisal Square," *Pak. J. Engg. & Appl. Sci*, 2: 65-78.
- Shawket, I. M. and El Khateeb, S., 2020, "Redefining Urban Public Space's Characters after COVID-19: Empirical Study on Egyptian Residential Spaces," *Proceedings of the International Conference on Information Visualisation*, 2020-Sept (IV): 614–619.
- Stevens, N. J., Tavares, S. G. and Salmon, P. M., 2021, "The Adaptive Capacity of Public Space Under COVID-19: Exploring Urban Design Interventions Through a Sociotechnical Systems Approach," *Human Factors and Ergonomics in Manufacturing*, 31(4): 333–348.
- UN-Habitat, 2020, "Guidance on COVID-19 and Public Space," viewed 20-6-2021, from [https://unhabitat.org/sites/default/files/2020/06/un-habitat\\_guidance\\_on\\_covid-19\\_and\\_public\\_space.pdf](https://unhabitat.org/sites/default/files/2020/06/un-habitat_guidance_on_covid-19_and_public_space.pdf).
- Uwajeh, P. and Ezennia, I., 2019, "Evaluating Staff Perceptions of Supportive Healing Environment in Healthcare Facilities," *Journal of Contemporary Urban Affairs*, 3(1): 13-25.

## SPATIAL DESIGN EVALUATION OF ACCIDENT AND EMERGENCY DEPARTMENT OPTIMIZATION: A CASE OF CAPITAL HOSPITAL G-6, ISLAMABAD

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### ABSTRACT

Sustainable usage and optimal performance of Accident and Emergency (A & E) department of any hospital is one of the most critical need of healthcare infrastructure in times of trauma, catastrophes and emergencies. Exploration with respect to A&E optimization is missing in the context of Pakistan. A study was undertaken with the focus on A&E Department at Capital hospital, Islamabad. Based on standards of A&E design optimization, a checklist based observational study was followed using the data obtained from the respondents from medical, paramedic, support and administrative staff along with patients and their attendants. It was concluded that the existing facility fails to fulfill the requirements for a standardized A&E Department for targeted number of beds and hence needs design interventions. The researchers with the help of A&E lead and chief medical officer devised a facility brief and later proposed a whole new design facility in the current context for sustainable usage in the future.

**Keywords:** Healthcare design, Environmental design, Accident and emergency, Architectural intervention, Sustainable usage

## INTRODUCTION

Healthcare is considered one of the pivotal measure of any society towards achieving sustainability (Afzal and Yusuf, 2013). Within a hospital, Accident and Emergency (A&E)

Department acts as the main frontline support mechanism for medication. Thus, an optimal functionality of A&E Department is of higher significance to the wellbeing of the society, especially, in times of emergency, trauma and uncertainty.

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The A&E Department of public hospitals in Pakistan need to be optimized towards functionality and sustainable usage for current and future needs (Afzal and Yusuf, 2013). It is necessary to evaluate the existing facilities within A&E Department in relation to its optimum performance, issues and procedures and engaging end users towards developing solutions (Verbeek-Van Noord, et. al., 2014). This research paper presents the findings of an evaluation on the optimum performance of A&E Department of Capital Hospital in Sector G-6 in Islamabad.

A&E Department is an integral part of any hospital. It is commonly considered to be a microcosm of the hospital as a whole (Gupta, et. al., 2007). Being the front door of the hospital, it becomes the critical entry point with highest influx of critical patients around the clock. (Puvanachandra, Razzak and Hyder, 2015).

Historically A&E Departments have played a vital role in dealing with any epidemic spread through recording, highlighting, reporting and identification of new disease spread and patterns in population (Noreen et al., 2020). Here the role of information and analysis through data gathered from A&E Department becomes vital towards breaking down the epidemic, endemic or pandemic nature of the disease (Rose, Shufflebarger, and Walter, 2021). Pakistan has gone through recent epidemic history of cholera, malaria and dengue fever in the last decade (Siraj and Khan, 2020). Thus, the role of A&E Departments and their design and spatial configuration are of utmost importance in managing the disease through curbing it down to avoid any further spread and risk of contamination to others, including healthcare facility support personnel (Nasir, Rehman and Omair, 2021). Healthcare design integration of epidemic consideration acts as the lifeline for those who suffer from these large scale disease spread with higher RO (transfer rate from one patient to another) value towards spreading and causing panic and fear in public (Haroon, et. al., 2021).

The research was divided into five major phases with an introduction to the highlighted research gap followed by a review of relevant literature of the existing body of knowledge. That helped in defining the research methodology. An observational study, site documentation, development of data collection questionnaire and respondent's data collection was done. The comparison of data generated helped identify the major issues. This were later reported through findings and conclusions. To address the gaps, design interventions were proposed at the end of the research.

## BACKGROUND

Healthcare facilities in Islamabad need to expand and upgrade with the rise in population and with the high influx rate of patients (Mehmood, Khan and Khursheed, 2012). Capital Hospital, Islamabad, was incorporated in the Capital Development Authority (CDA) as a small day care medical centre providing preventive and curative medical facilities to outpatients and residents of Islamabad.

The need for in-patient care necessitated the conversion of this day care centre into a hospital facility. In March 1981, a sixty bedded hospital was started comprising medical and pediatric wards, coronary care unit, X-ray department, pathology laboratory, dental clinic, dermatology department and mother and child health centre. In the second phase the surgical block was completed and started functioning in September 1992, with the department of general surgery, orthopedics, urology, gynae and obstetrics, neonatology, eye and ent, post-operative intensive care and A&E Department. Thus, the facility developed into a 250 bedded hospital equipped with the latest equipment and providing modern medical and surgical facilities to the patients in emergency, out-patients and patients in various wards. In 1999, a new block to house outpatients and a laboratory were also commissioned.

According to the literature review, following major issues have been observed with regard to hospital facilities in Islamabad in general (Mehmood, Khan and Khursheed, 2012)

- 1) Shortage of water for emergency department.
- 2) High influx of patients who are not CDA employees.
- 3) Shortage of medicines.
- 4) Shortage of paramedic staff.
- 5) Scale of A&E is generally small as compared to the patient influx.

Hence it was concluded that an exploration is necessary to find the current context towards better future prediction and optimum utilization for the benefit of the society and the public at large. Thus the following major objectives of the research were set forth using a case study methodology

- To evaluate A&E Department's spatial functionality in the CDA Hospital



- To evaluate existing healthcare spatial design services, with the objective of achieving patient and service provider satisfaction and
- To design interventions to improve the spatial design and facility for A&E Department.

## RESEARCH METHODOLOGY

Following were the major steps taken as part of the research methodology based on the qualitative aspects of research (Figure 1). Based on literature review and selected standards (American Disability Act Standards for Accessible Design, 2010; Standards for Emergency Department Design and Specification for Ireland, 2007; Guidelines for A&E department state of Haryana; Minimum Service Delivery Standards for Primary and Secondary Health Care in Punjab) existing functional and spatial planning aspects were analyzed. A checklist was prepared in the light of the standards studied and their modules and selected parameters were highlighted which helped the researchers to define aspects which needed to be analyzed for the efficient delivery of healthcare facilities within the A&E Departments. The A&E Department at Capital Hospital was visited, documented through photographs. Drawings were developed of the existing facility. The reason for selecting this case study was that since it initially targeted the CDA employees and

was later opened for general public use, thus the question of sustainable use arose. This was further reviewed with the lens of design evolution and adaptive measures. The recent changes in the department were documented to arrive at an understanding of the current scenario of the facility and how it serves the two major end users i.e. medical teams and the patients (Figure 1). The existing hospital map with major buildings and their areas was prepared (Figure 2). The location of A&E is shown in Figure 3 and the existing A&E Department plan is shown in Figure 4.

The primary data was gathered via a questionnaire from forty respondents and observational sheets. The collected data included recent reports and research articles and standards of A&E department. The objective was to develop a baseline parameter to evaluate and identify the current A&E facility. Data collection tools mainly included qualitative interviews, discussion with end users, documentation checklist for researcher, photographs and previously developed drawings from CDA. The gathered data was then analyzed in the context of initial analysis via comparison of existing facility with selected standards of A&E Department design to identify the current issues which the end users face while trying to either avail or use the A&E Department. A comparative analysis was later done, based on identified issues in the observation study and using primary data from all major respondent categories. This analysis is shown in Table 1. A visual documentation of some of the major issues observed is shown in Figure 5 to Figure 8.

## LITERATURE REVIEW

Healthcare is considered the most critical of all primary rights of any human in a society (Akbari et al., 2009). A society which is unable to provide healthcare to its inhabitants has failed to survive and sustain itself in the history of mankind. Either in the days of peace or war, in times of natural calamity and disasters, epidemics, healthcare acts as a backbone towards enabling a society to survive and sustain core health of inhabitants (Bache, 2005). In order to achieve the targeted aim, hospitals and their core departments role becomes pivotal towards helping the society (Akbari et al., 2009). Amongst these departments, the emergency department acts as one of the most critical department which becomes the entrance door and welcome mat for people requiring immediate medical care and treatment. A&E department works round the clock, seven days a week and offers front face of any healthcare facility (Letvak & Rhew, 2015) and its smooth functioning enables people to get relief from pain and misery in critical health conditions.

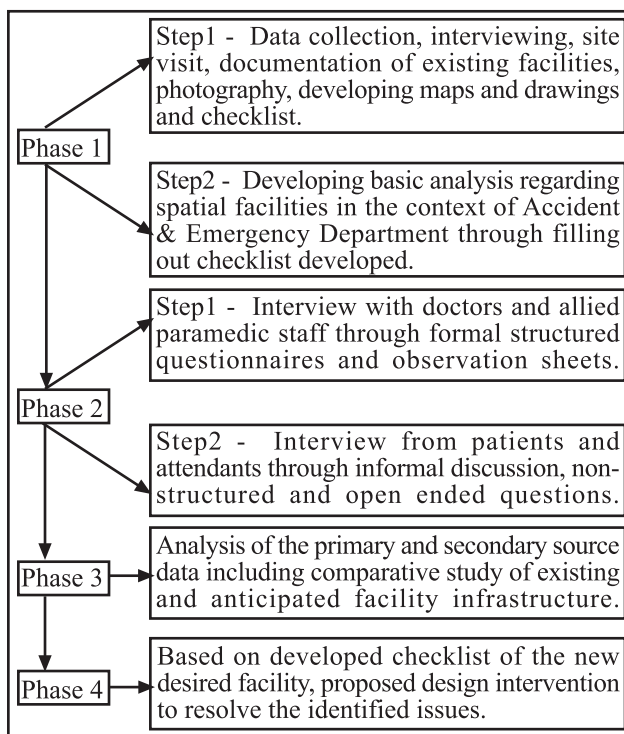


Figure-1: Flow Chart Diagram.

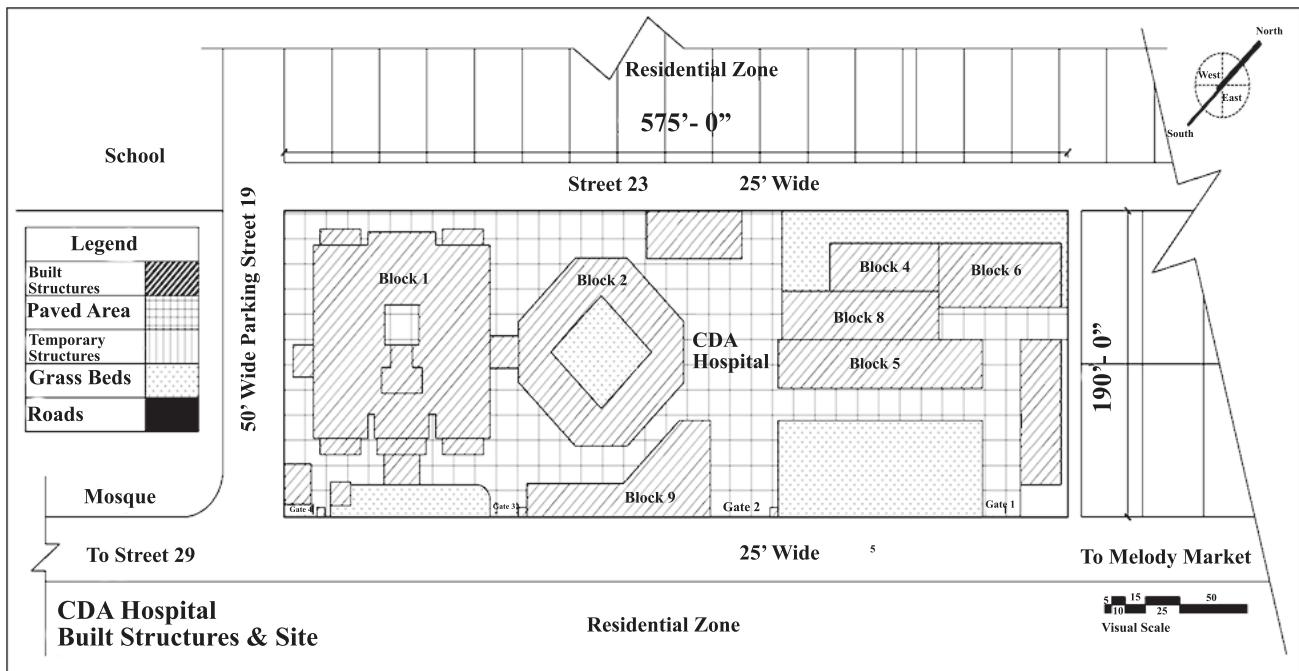


Figure-2: Plan of the Capital Hospital, Islamabad.

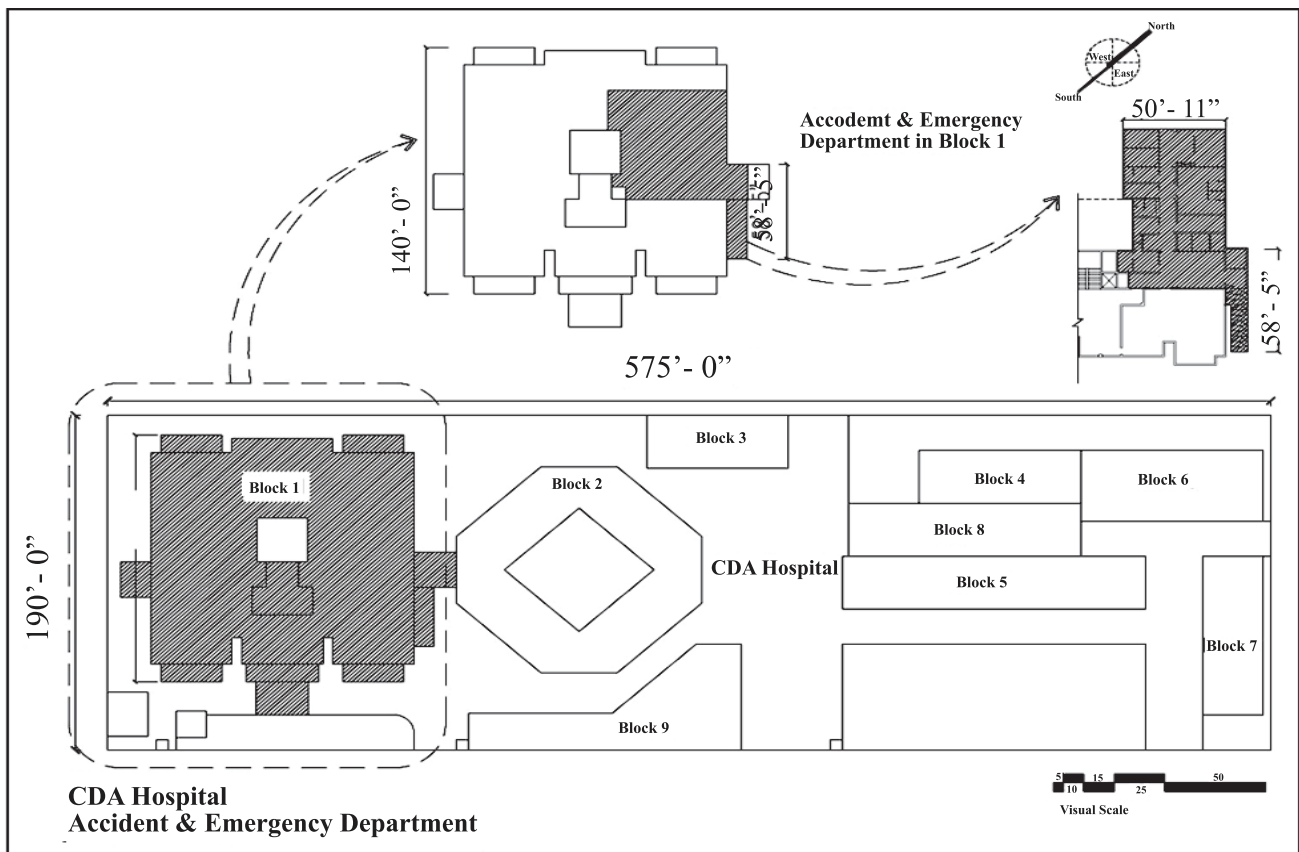


Figure-3: Location Map of A&E in Capital Hospital (commonly known as CDA Hospital).

The A&E Department is a comparatively modern department as compared to in-patient and out-patient departments, since it came into existence in mid-twentieth century when National Health Service (NHS) opted to reform the casualty departments in 1972. Sir Henry Osmond-Clarke in 1961, 1962 and 1970, Sir Harry Platt in 1962, Sir John Bruce in 1971, and Walpole Lewin in 1978 recommended that 'casualty' should be replaced by 'accident and emergency department'. Bruce's report of 1971 was particularly instrumental in recommending the introduction of the A&E department (Joint Consultants Committee, 1971).

Thirty-two consultants in A&E medicine were appointed in 1972. The majority had a surgical rather than medical background. These pioneers were able to offer both clinical experience and leadership in the evolving specialty of A&E medicine. The experiment was judged a success and more consultant posts were introduced. In 1977, the first senior registrars in A&E medicine were appointed, with the development of formal training programs, and by the early 1980s posts at this level had been established throughout UK. Thus by the mid or late 1980s, most hospitals had an A&E department under the managerial control of one or two consultants in A&E medicine. Regional training schemes had been established so that senior registrars could

supplement the consultant numbers (Bache, 2005).

During the 1980s and 1990s, journals were established, an examination structure was developed, academic posts were created in A&E medicine, and the number of consultant posts and senior registrar posts continued to increase. Another development during the 1990s was the introduction of emergency nurse practitioners. Thus, just as in the late 1980s various factors combined to necessitate an increased interest in the management of major trauma, and by late 1990s it was becoming apparent that many patients received a raw deal in the A&E department.

In order to create a baseline understanding of A&E department of a hospital, the book "Modern trends in Planning & Design of Hospitals: Principles & Practice" became a major single reference (Gupta, et. al., 2007). It has been extensively referred to throughout the literature review of this paper as well.

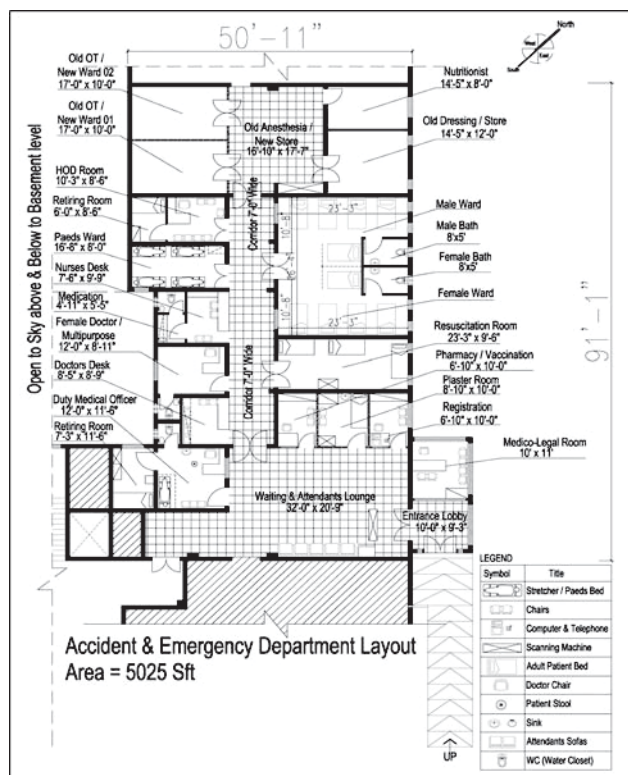


Figure-4: Plan of A&E Department, Capital Hospital.



Figure-5: Existing Condition of Beds Shortage Forced Administration to Display this Notice.



Figure-6: Poor Lighting and Cross Ventilation in Wards.





**Figure-7:** Lack of Signage on Main Access Road.

The A&E department is key facilitation factor towards stabilizing the poor or critical conditions of the people and patients brought in (Gonzalo et al., 2014). With increasing rate of uncertainty and accident within cities and urban centers, A&E departments face tremendous pressure to cater for the high influx of patients and to ensure treatment and diagnosis. Though however, it is also the least earning department of the hospital as compared to out patient department, diagnostics unit and in-patient departments etc(Kellermann & Weinick, 2012). This makes it a high end tough job for the administrators and managers at A&E department (Gupta et al., 2007).

## DISCUSSION AND ANALYSIS

It was evidently visible that the issues identified by the researchers have been the source of major hurdles towards ability of the department to be a sustainable facility. The analysis showed that the existing facility of A&E department at CDA Hospital had short falls and was unable to provide basic emergency services to the patients including that of trauma, surgery and pediatric emergency. Influx of patients had increased tremendously over the last few years curtailing more burden on the department to provide quality services.

Some of the major issues included the limited numbers of doctors and paramedic staff as well as camped spaces designated for them. The numbers of beds available for patients was comparatively less as compared to patient influx. It is proposed that the existing facility should be used as private wards for the CDA employees while a new A&E Department building should be developed in the premises of the Hospital. The new proposed building needs to facilitate higher influx of patients. The building program



**Figure-8:** Lack of Shade and Poor Lighting on the Main Access of the A&E Department.

of the new built structure needs to be in consensus with the doctors and staff recommendations to facilitate provision of optimum healthcare services through incorporating the spatial aspects missing in the existing design of the A&E Department. The objective behind these recommendation is to increase the number of beds to cater to higher influx of patients.

Furthermore, it was noticed that the signage of the existing facility was poorly planned and was not visible along the path leading to the Hospital. The location of the hospital was not appropriate either as it was not directly accessible by any public transport route. The patients and attendants were bound to use ambulances, private vehicles and personal transport to reach the Hospital. Incase of un-peaceful conditions in the city, the main access road was usually blocked by the city administration posing access burden on the medical team. The location of the A&E Department was also not planned as per the need of the hour. It had been placed in the building which is farthest from the main access road and thus poses issues of timely medical treatment. The absence of a shaded drop off point for emergency patients also caused issues during rain and hot season. Furthermore, lack of parking facilities for attendants forced them to park vehicles outside the Hospital, posing a risk of theft and inconvenience to patients and the general public. In addition, the internal spatial planning of the A&E Department was found to be poor and not inline with the national / international standards. This caused time delays in the safe access for patients to reach the doctor to initiate the process of medical treatment. It also caused lack of satisfaction and higher stress in the medical team, patients and their attendants. Lastly, the lack of surgical facility and post-trauma unit and lack of basic facilities of the A&E Department also led to further



**Table-1:** Data Verification of Documentation (Phase1) Against Data Collection from Primary Resources (Phase2).

| Major Issues Identified as per Phase 1 |  | Verification of Identified Issues Through Phase 2 |                 |               |          |            |
|--|--|---|-----------------|---------------|----------|------------|
| S. #                                   | Issues   | Doctors   | Paramedic Staff | Support Staff | Patients | Attendants |
| 1                                      | Non availability of local transport  | -   | Yes             | Yes           | Yes      | Yes        |
| 2                                      | Location of hospital   | -   | -               | -             | Yes      | Yes        |
| 3                                      | Poor signage towards location of hospital  | -   | -               | -             | Yes      | Yes        |
| 4                                      | Poor transport system / access   | Yes   | Yes             | Yes           | Yes      | Yes        |
| 5                                      | Lack of parking  | Yes   | Yes             | -             | Yes      | Yes        |
| 6                                      | Lack of shaded patient drop point  | -   | Yes             | -             | Yes      | Yes        |
| 7                                      | Lack of shaded passage to A&E Department   | Yes   | Yes             | Yes           | Yes      | -          |
| 8                                      | Poor signage of department entrance / access   | -   | -               | -             | Yes      | Yes        |
| 9                                      | Distant and small registration desk  | -   | -               | -             | Yes      | Yes        |
| 10                                     | Insufficient waiting facility  | Yes   | Yes             | Yes           | Yes      | Yes        |
| 11                                     | Lack of triage facility  | Yes   | Yes             | -             | -        | Yes        |
| 12                                     | Lack of toilets for attendants   | -   | -               | -             | Yes      | Yes        |
| 13                                     | Lack of tuck-shop/pharmacy inside department   | Yes   | Yes             | Yes           | Yes      | Yes        |
| 14                                     | Poor facilities and less beds in resuscitation room  | Yes   | Yes             | -             | Yes      | Yes        |
| 15                                     | Less number of beds in wards   | Yes   | Yes             | Yes           | Yes      | Yes        |
| 16                                     | Too small pediatric unit   | Yes   | Yes             | -             | Yes      | Yes        |
| 17                                     | Non availability of surgical facilities  | Yes   | Yes             | Yes           | Yes      | Yes        |
| 18                                     | Lack of isolation rooms  | Yes   | Yes             | -             | Yes      | -          |
| 19                                     | Lack of post resuscitation unit for high dependency patients                                 | Yes   | Yes             | -             | Yes      | Yes        |
| 20                                     | Inappropriate location of nurse's station in wards corridor                                  | Yes   | Yes             | Yes           | -        | Yes        |
| 21                                     | Lack of beds in plaster room   | -   | Yes             | Yes           | Yes      | Yes        |
| 22                                     | Fresh air, cross ventilation and natural light aspects in different spaces of A&E Department | Yes   | Yes             | -             | Yes      | Yes        |
| 23                                     | Lack of in-house lab based diagnostics facility  | Yes   | Yes             | -             | Yes      | Yes        |
| 24                                     | Lack of CT Scan facility in close vicinity   | Yes   | Yes             | Yes           | -        | Yes        |
| 25                                     | Overall poor planning of the facility  | Yes   | Yes             | -             | Yes      | Yes        |

difficulties. This posed serious threats to critical care patients. In addition to this, the non availability of lab based tests within A&E Department was another hurdle for the patients and the attendants. In addition the attendants had to carry the sample themselves or request the paramedic staff for the missing facility. With only three to four beds available for

the pediatric patients, the high influx of these patients had to be referred to other hospitals. Apart from their major issues, other problems faced by the A&E Department were poor lighting, poor indoor air quality and lack of trained staff. There was also lack of privacy for female patients and there was lack of coordination between A&E Department

**Table-2:** Spatial Requirements for New A&E Department and Old Department Comparison.

| S. # | Spaces Required   | Existing | Proposed   | Defference |
|------|---|----------|------------|------------|
| 1    | Separate gates for entrance of walking and vehicular based patients | No       | Yes        |            |
| 2    | Guard room  | Yes      | Yes        |            |
| 3    | Ambulance drop point covered  | No       | Yes        | +1         |
| 4    | Ambulance shed with staff area and allied facilities                | No       | Yes        |            |
| 5    | Stretcher / wheel chair bay / store                                 | Yes      | Yes        |            |
| 6    | Reception / Registration counter                                    | Yes      | Yes        |            |
| 7    | Triage with CMO (Causality Medical Officer) room                    | No       | Yes        | +1         |
| 8    | Medico-Legal room   | Yes      | Yes        |            |
| 9    | Duty doctor room  | Yes      | Yes        |            |
| 10   | Waiting lounge with toilets   | No       | Yes        |            |
| 11   | Public drinking water facility                                      | No       | Yes        |            |
| 12   | Examination room with multiple couches                              | No       | Yes        |            |
| 13   | Observation wards   | 1        | 6          |            |
| 14   | ECG room  | Yes      | Yes        |            |
| 15   | Nursing station/s   | Yes (1)  | Yes (4)    |            |
| 16   | Minor surgical room   | No       | Yes        |            |
| 17   | Plaster / dressing room   | Yes      | Yes        |            |
| 18   | Resuscitation room  | Yes      | Yes        |            |
| 19   | Clean linen store   | Yes (1)  | Yes (2)    |            |
| 20   | Dirty utility / store   | Yes (1)  | Yes (2)    |            |
| 21   | Internal Pharmacy   | Yes      | Yes        |            |
| 22   | Multiple storage spaces   | No       | Yes        |            |
| 23   | Diagnostics of X-ray and Ultrasound                                 | Yes      | Yes        |            |
| 24   | Internal ramp and lift facility                                     | No       | Yes (Lift) |            |
| 25   | Separate toilets for staff, paramedics, doctors (M/F)               | Yes      | Yes        |            |
| 26   | Changing room facility separate                                     | Yes      | Yes        |            |
| 27   | Decontamination room  | No       | Yes (2)    |            |
| 28   | Isolation room  | No       | Yes        |            |
| 29   | Lockers facility  | No       | Yes        |            |
| 30   | Announcement system room  | No       | Yes        |            |
| 31   | Cardiac observation room  | No       | Yes        |            |
| 32   | Pediatric Observation room  | No       | Yes (5)    |            |
| 33   | Gynecological observation room                                      | No       | Yes        |            |
| 34   | Critical ER room  | No       | Yes        |            |
| 35   | Conference / meeting room   | No       | Yes        |            |

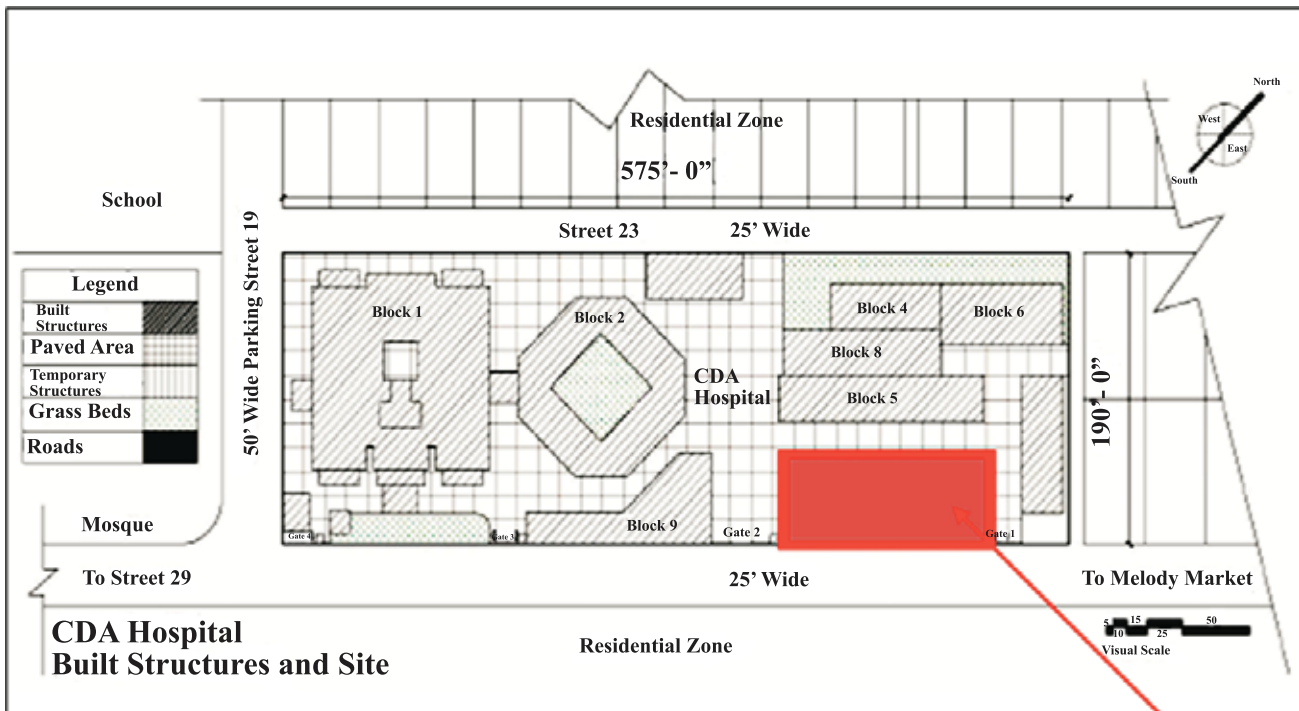


Figure-9: Proposed Location for New A&E Block.

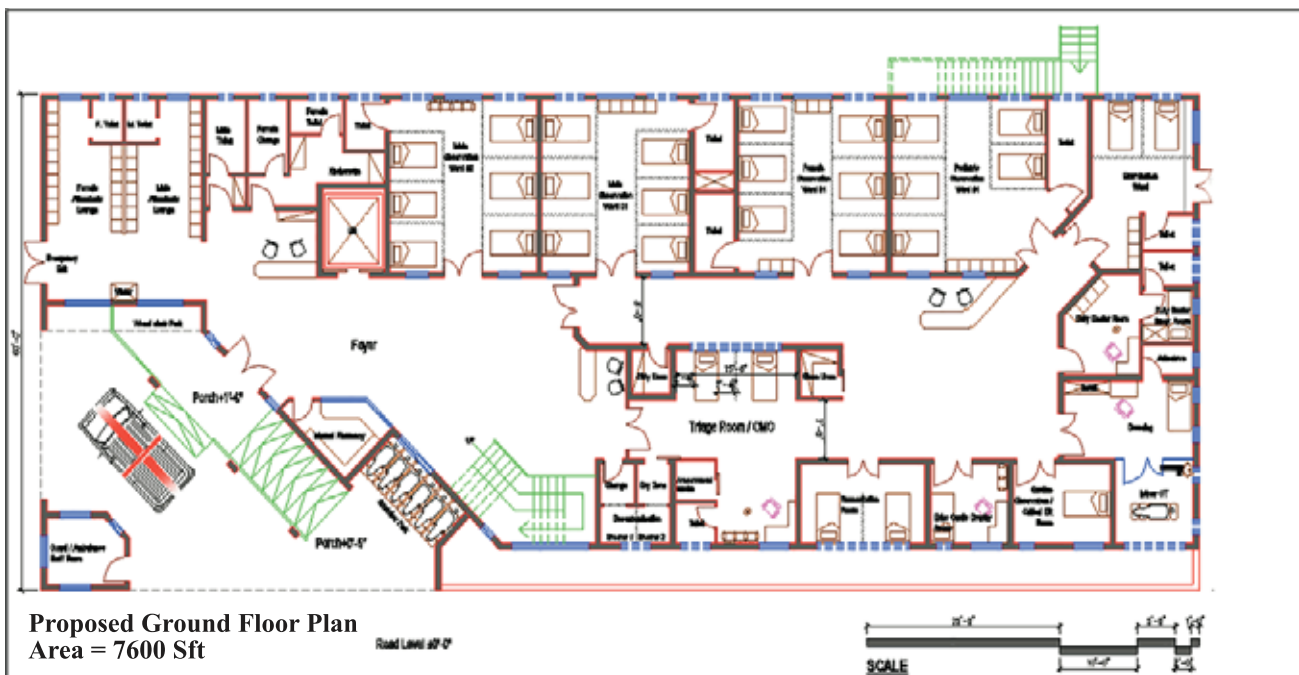


Figure-10: Proposed Ground Floor Plan.



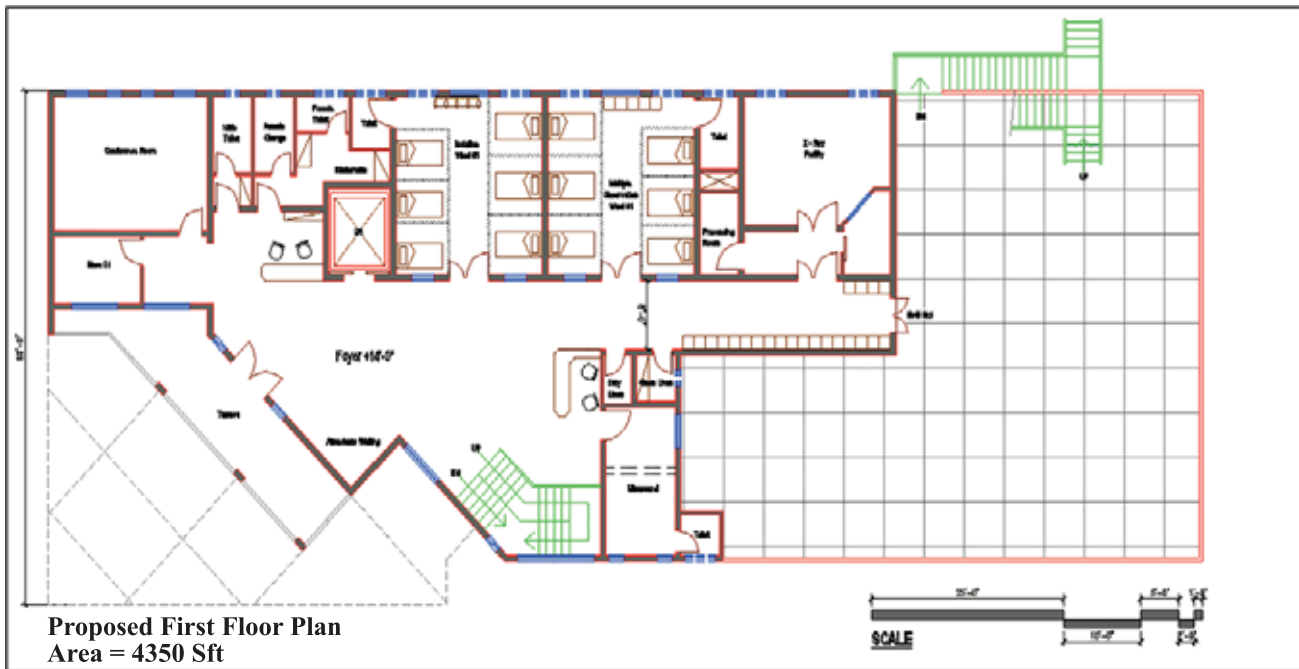


Figure-11: Proposed First Floor Plan.

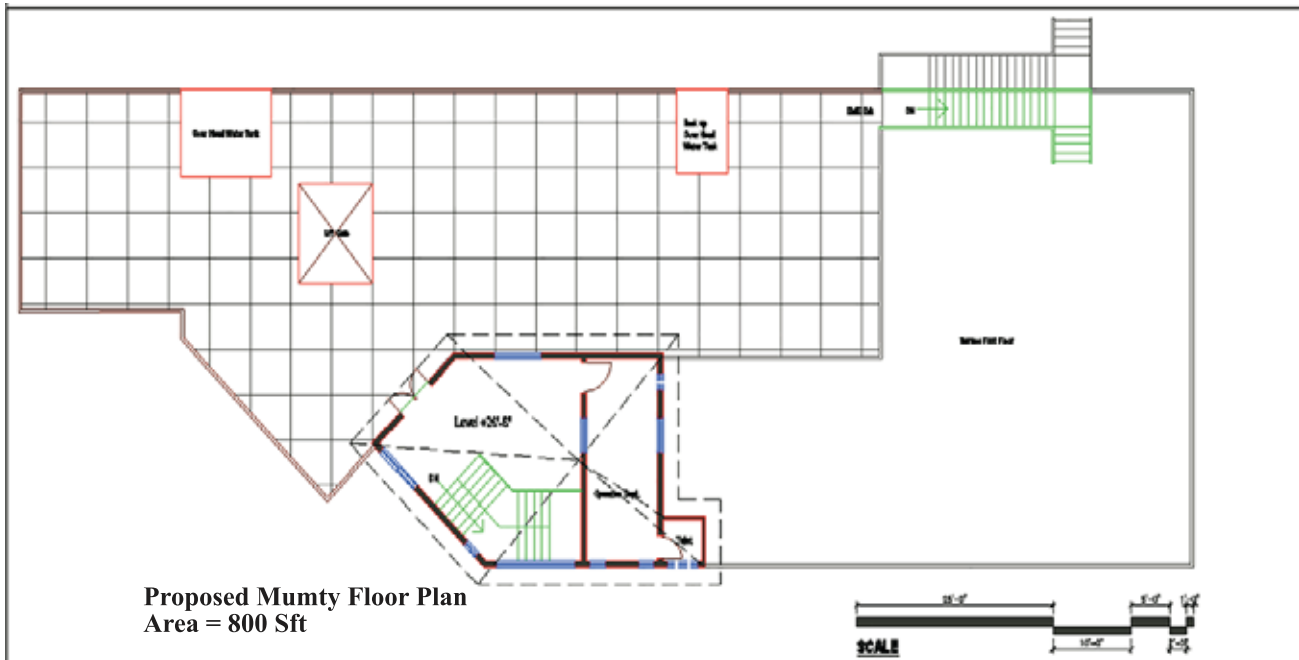


Figure-12: Proposed Mumty Floor Plan.

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and other departments creating critical issues for the patients. Furthermore, the seating space for the attendants was insufficient forcing the attendants to wait in uncomfortable areas.

Conclusively, along with the existing built structure and planning, a triage would not be feasible as the current facility is a very small area and further congestion would result in additional complexity of the space. This would not be helpful for patients and the medical team. It was also evident that extensive spill out spaces were occupied by attendants and other allied end users could not be adjusted in the existing facility. Thus, the A&E Department either needs to be expanded within the existing premises, or should be relocated to a new area. Another preferred choice was to design a new unit of A&E Department in the open area available in the CDA Hospital, basing it on the future and current needs.

It was concluded that a new building program needs to be devised for the A&E Department based on the feedback provided by the major stakeholders of the department and its lead team. The new building program should focus on the sustainable future usage of the facility through a new proposed facility for the extensive and optimum service delivery. The new proposed program is shown in Table 2. It was proposed that the preferred location of the new unit should be nearer the entrance to the hospital. The existing open space next to first entrance gate of the hospital seemed the most appropriate location, as discussed with the end

users from the Department (Figure 9). The proposed facility design was based on the given brief and focused on the missing gaps from the existing facility. The proposed ground floor plan (Figure 10), proposed first floor plan (Figure 11) and proposed mumty floor plan (Figure 12) are shown.

## CONCLUSION

Recent COVID-19 pandemic highlighted some of the major gaps in the existing design and integration of the A&E Department design with respect to epidemic considerations at all major health care facilities across the nation (Bhatti and Ghufuran, 2020). It was evident that such high influx jolted the national level healthcare infrastructure and hence highlighted some critical issues to be considered as part of the futuristic A&E Department design with provisions to manage such epidemic influx of patients (Khalid and Ali, 2020). Some of the aspects included flexible design to incorporate provision for bifurcation and isolation towards managing the patients either in the quarantine or in isolation, through enabling spaces for purposeful segregation. The need for the spaces to be in coordination with the central communication, healthcare safety, central diagnostics, monitoring and reporting was also highlighted. Furthermore the overall administrative management of the patient influx, specially in the case of epidemics through space segregation, designation and implementation of protocols for isolation and quarantine, was also needed.

## REFERENCES

- Afzal, U. and Yusuf, A., 2013, "The State of Health in Pakistan: An Overview", *The Lahore Journal of Economics*, 18 (special edition), 233-244.
- Akbari, A. H., Rankaduwa, W., and Kiani, A. K., 2009, "Demand for Public Health Care in Pakistan," *The Pakistan Development Review*, 48(2):141-153.
- Bache, J., 2005, "Emergency Medicine: Past, Present and Future. Journal of the Royal Society of Medicine," 98(6): 255-258.
- Bhatti, O. S., and Ghufuran, A., 2020, "Pakistan Healthcare Infrastructure and Covid-19?: A Case For Isolation and Quarantine Facilities Optimization In The Context Of Pakistan", *Journal of Research in Architecture and Planning*, 29, 36-45.
- Gonzalo, J. D., Yang, J. J., Stuckey, H. L., Fischer, C. M., Sanchez, L. D. and Herzig, S. J., 2014, "Patient Care Transitions from the Emergency Department to the Medicine Ward: Evaluation of a Standardized Electronic Signout Tool," *International Journal of quality in Health Care*, 26: 23-39.
- Gupta, K., Gupta, S. K., Kant, S., Chandrashekhar, R. and Satpathy, S., 2007, *Modern Trends in Planning and Designing of Hospitals: Principles and Practice*, New Delhi, Jaypee Brothers Publishers.

---

Haroon, N., Owais, S. S., Khan, A. S. and Amin, J., 2021, "Prevalence, Risk Factors and Sources of Anxiety among Emergency Department Healthcare workers in Pakistan during COVID-19 Pandemic: A Single Center Survey", *Experimental Results*, 2: 1–13.

Joint Consultants Committee (Chairman: Sir John Bruce), 1971, "Report of a Joint Working Party," London: BMA.

Kellermann, A. L. and Weinick, R. M., 2012, "Emergency Departments, Medicaid Costs and Access to Primary Care: Understanding the Link," *New England Journal of Medicine*, 366(23): 2141-2143.

Khalid, A. and Ali, S., 2020, "COVID-19 and its Challenges for the Healthcare System in Pakistan", *Asian Bioethics Review*, 12(4): 551–564.

Letvak, S. and Rhew, D., 2015, "Assuring Quality Health Care in the Emergency Department," *Healthcare (Basel)*, 3(3):726-32.

Mehmood, A., Khan, B. A. and Khursheed, M., 2012, "Overcrowded Emergency Departments: A problem looking for solution", *Journal of Pakistan Medical Association*, 62(6): 529-530.

Nasir, N., Rehman, F. and Omair, S. F., 2021, "Risk Factors for Bacterial Infections in Patients with Moderate to Severe COVID-19: A Case-Control Study", *Journal of Medical Virology*, 93(7): 4564–4569.

Noreen, N., Dil, S., Niazi, S. U. K., Naveed, I., Khan, N. U., Khan, F. K. and Kumar, D., 2020, COVID-19 Pandemic and Pakistan; Limitations and Gaps, 1(4).

Puvanachandra, P., Razzak, J. A. and Hyder, A. A., 2015, "Establishing a National Emergency Department Surveillance: An Innovative Study from Pakistan", *BMC Emergency Medicine*, 15(Suppl 2), I1, DOI: <https://doi.org/10.1186/1471-227X-15-S2-11>.

Rose, A. L., Shuffle Parger, E. and Walter, L. A., 2021, "Impact of the COVID-19 Pandemic an Emergency Department Boarding" *Academic Emergency Medicine*, 28 (Suppl-I)

Siraj, A. and Khan, M. W., 2020, "Uncertainty in the Air: In the Emergency Room with COVID-19 in Pakistan", *International Journal of Medical Students*, 8(1): 54–55.

Verbeek-Van Noord, I., Wagner, C., Van Dyck, C., Twisk, J. W., and De Bruijne, M. C., 2014, "Is Culture Associated with Patient safety in the Emergency Department? A Study of Staff Perspectives", *International Journal for Quality in Health Care*, 26(1): 64-70.



## THE ARTS AND CRAFTS OF THE HUNZA VALLEY IN PAKISTAN-LIVING TRADITIONS

*Jurgen Wasim Frembgen, A Publication of OXFORD*

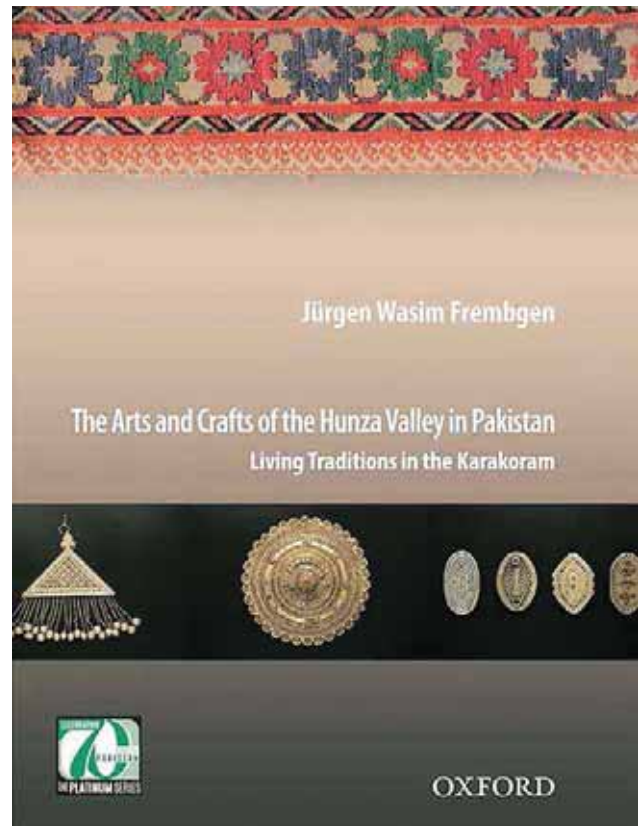
Reviewed by Madiha Salam\*

### BOOK REVIEW

Pakistan is enriched with various cultures and traditions; especially the northern areas of Pakistan flourish with breathtaking landscapes and diversified cultures and variety of attractive traditions. The Hunza and Nagar valleys in Gilgit Baltistan district are rich with traditions and carry a legacy of century old art and crafts, passed over generations. The book 'The Arts and Crafts of the Hunza Valley in Pakistan – Living traditions in the Karakoram' by Jurgen Wasim Frembgen depicts the beautiful arts and crafts from the valleys of Hunza and Nagar. This book is a field research done by ethnographer Jurgen Wasim Frembgen over a period of twenty years and is augmented by photographs of his choice. These visuals add a frame of reference to the wide assortment of arts, crafts and lifestyles that have been covered in this publication and that have flourished in the area for centuries.

Jurgen Wasim Frembgen has been an eminent professor of anthropology, Islamic studies and ethnography at various locations around the globe. He has been associated with various universities around the world including universities in Munich, Austria, Germany, USA and Pakistan. He has also worked as a curator at the Museum Fünf Kontinente in Munich. Dr. Fremgen has more than 130 books to his credit in both English and German language. Some of his celebrated readings include, The Aura of Alif: The Art of Writing in Islam; Journey to God: Sufis and Dervishes in Islam; Pigeon Fanciers and Kite Fliers. He has extensively written on cultures of the Muslim world, spanning from Iran to India with his major focus being on Pakistan. His books mainly focus on topics related to Islam, Sufi traditions, Muslim saints and their veneration, art, material, culture, anthropology and popular cultures.

He started this particular book with an ethnographic overview of Hunza and Nagar, explaining the origin of these valleys,



religious and cultural practices therein with a focus on the evolution of arts and crafts within the valleys. He then goes on to explain how the book was curated from field work, which was based on collection of the museum Funf Kontinente in Munich. The book is then divided into chapters about the material cultures of Hunza and Nagar and explains various rituals embedded within the cultural practices. The book also highlights in depth how various arts and crafts

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were prepared within the valleys by various crafters, along with the origin of the crafts and how they were used in the past and how they are used today. Concise, yet in depth explorations of fourteen crafts are included in the publication, ranging from luxury items for the elites like gold and silver jewelry; embroideries, silk production, weaving, architecture, carpentry, woodcarving, musical instruments, basketry, mat weaving, leather works, falconry accessories, stone vessels and calabashes. The author has also included interviews of master craftsmen and women from all walks of life to validate the reasons for diminishing crafts. Most of the crafts are mentioned using the regions' indigenous terminologies, which came into existence by the amalgamation of different cultures and routes from central Asia and Kashmir.

The author goes on to explain that this material culture of the valleys was the source of pride for the nobles and defined their status. The elite also took pride in showcasing various craft techniques derived borrowed from neighbouring, lands especially with which they had trade links. Artifacts like crowns, head gears, gilded throne like chairs, robes, precious jewelry and even the rugs and crockery were part of the extensive materiality swaggered by the elites. The craftsmen of these relics were meager peasants who were skillful and had to support their families in times of harsh weather which didn't allow any produce. These local farmers were dexterously self-sufficient with talents of producing ropes from goat hair, footwear made from leftover goat leather, stone pots, whetstones, sharp knives and axes.

The jewelry makers had origins from Kashmir. After partition many Kashmiri jewelers settled here and taught the craft to the local enthusiasts who still continue their legacy. These jewelers practice crafts in their workshops which are located near ancient royal palaces which were the abode of royalties for generations. These jewelry makers made jewelry not

only for men and women but also produced falcon accessories. This practice still continues in the region. The woodcarvers were skilled in making beautiful wooden boxes of different sizes that housed items from jewelry to cosmetics, and even clothing for the influential elites. They also mastered in making elaborate doors for the palaces, wooden partitions for rooms and ornate cradles for babies. Many beautiful wooden floral motifs can be found in the architecture of various mosques, palaces and shrines in the region that showcases the mastery of the locals.

The craftsmen of leatherworks are today, however, on the edge of extinction because of the tedious process of leather making and harsh climate of the region which does not support the process. Furthermore, the leather products have been replaced by other materials which are more accessible and easily available. Some of the products, however, which are still produced in leather, are raincoats, horsewhips, belts, protective gloves and small bags. Embroidery and weaving have also been the chief craft of Hunza valley; with intricate designs for bridal veils, jeweled caps for women, purses, bags, carpets and rugs. These products have special mentions in the book with examples of some finest pieces as pictures. The richness of articulation and uniqueness of diversification is manifest in these local crafts and many a times was acquainted from the neighboring lands through trades and marriage connections, especially from central Asian states like Afghanistan, Turkmenistan, Tajikistan, Yemen and neighborhoods of Kashmir and Gilgit.

Overall, this book is a good reference manuscript for those interested in indigenous arts, crafts, architecture and lifestyle of Hunza and Nagar regions. It explicitly gives the insight into the most uncommon and featured lifestyles of the regions and highlights how these crafts are an intrinsic part of the local economy and have a deep link with local tourism.



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## INVITATION FOR PAPER CONTRIBUTIONS

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**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.

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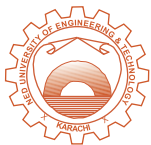
| FORMAT                    |  | Previous issues of JRAP have covered following topics:   |              |
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| <b>Article Size</b>       | 5000 words to 7000 words (please consult the journal office in case you wish to send a longer article)   | Townscapes   | Vol. 1, 2001 |
| <b>Page Size</b>          | A-4  | Townscapes II  | Vol. 1, 2002 |
| <b>Page Layout</b>        | Portrait   | Transportation in Architecture   | Vol. 2, 2003 |
| <b>Font Style</b>         | Times New Roman  | Conservation and Culture Heritage  | Vol. 3, 2004 |
| <b>Font Size</b>          | 10   | Form, Design and Details   | Vol. 4, 2005 |
| <b>Visuals</b>            | All visuals (photographs, direction maps, diagrams, Google maps etc.) shall 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. | Urban Design Case Based: Theory and Practice(I)  | Vol. 5, 2006 |
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| <b>Referencing System</b> | Harvard Style  | Architectural Practice   | Vol. 8, 2009 |
|                           |  | Architecture for Housing   | Vol. 9, 2010 |
|                           |  | <b>Later Biannual issues from 2011-2022 have covered varying topic range:</b>  |              |
|                           |  | <ul style="list-style-type: none"> <li>• Architectural philosophy</li> <li>• Building conservation</li> <li>• Building integrated renewable energy technologies</li> <li>• Conservation led urban regeneration</li> <li>• Eco-housing, Interactive architecture</li> <li>• Land use planning</li> <li>• Low carbon impact buildings</li> <li>• Secondary cities</li> <li>• Sustainable architecture</li> <li>• Urban ecology/ Urban renewal / Urban sprawl</li> <li>• Urban sustainability / Urban transportation</li> <li>• Urbanization</li> </ul> |              |

**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 architecture, planning and development.

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