

## EXPLORING THE POTENTIAL OF VERTICAL LIVING FOR SUSTAINABLE URBANIZATION IN LAHORE, PAKISTAN

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### ABSTRACT

This study aimed to examine the potential of vertical living for sustainable urbanization in Lahore, Pakistan. Through a cross-sectional survey of 400 residents using a structured questionnaire with Likert scale items and demographic questions, valuable insights are gathered from the city's diverse population, particularly those in congested areas experiencing urbanization implications. The demographic data reveals a balanced representation of gender, age, marital status, and education among the respondents. The findings highlight the positive perception of vertical living in addressing the increasing demand for housing in Lahore, with 60% of respondents agreeing it can meet this need. Additionally, 70% of respondents believe vertical living can promote efficient land use and reduce urban sprawl, while 83% see it as a means to conserve green spaces and protect natural habitats. Furthermore, 76% agree that vertical living can contribute to a more sustainable and balanced urban development in Lahore. Moreover, 64% of respondents find vertical living as a solution for affordable housing options and 69% believe it can improve transportation efficiency by reducing the need for long commutes. The study concludes that a significant portion of respondents have a positive view of vertical living's potential benefits in Lahore. However, it also reveals concerns and neutral views, indicating the necessity for further research and increased awareness to better understand the concept of vertical living and its relevance in the context of Lahore's urban development. This research can assist in making informed decisions about sustainable urban planning and housing initiatives in Lahore and potentially in other similar urban settings.

**Keywords:** Vertical Living, Sustainable Urbanization, Lahore Pakistan, Sustainable Urban Development, Urban Planning, Housing Demand

## INTRODUCTION

### Urbanization

Urbanization refers to the process by which an increasing proportion of a country's population moves from rural areas to urban areas, leading to the growth and expansion of cities and towns (Gallagher, 2015). It involves the transformation of agricultural and rural landscapes into urban centres characterized by a higher concentration of people, infrastructure, and economic activities. This process is often

driven by various factors, including industrialization, economic development, and population growth (Encyclopaedia Britannica, 2021; UNDP 2018).

### Factors Behind Urbanization

There are many factors that contribute to urbanization, including economic opportunities, access to education and healthcare, and the search for a better quality of life. As people move to cities, they bring with them their cultures, traditions, and values. This can lead to a mixing of cultures

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and the creation of new urban identities. Urbanization has both positive and negative consequences. On the one hand, it can lead to economic growth, improved infrastructure, and access to services. On the other hand, it can also lead to social problems such as poverty, crime, and pollution. The future of urbanization is uncertain. Some experts believe that the trend will continue, leading to even larger and more populous cities. Others believe that urbanization will eventually plateau, as people become more aware of the challenges of living in cities (World Bank, 2020; UNDP, 2018; WHO, 2010).

### Urbanization in Pakistan

Pakistan, a developing nation in South Asia, has experienced rapid urbanization, surpassing other countries in the region. Factors like internal and external insurgencies, economic opportunities, and high population growth have led to increased migration to cities for security and livelihoods (Kugelman, 2013). Projections indicate that half of the country's population will be living in urban areas by 2025, with a significant portion being under the age of 30. This rapid urbanization has resulted in challenges, including a severe housing shortage, with an estimated backlog of approximately 10 million housing units needed. As the urban population continues to grow, addressing this housing demand becomes crucial for sustainable and balanced urban development in Pakistan (UNDP, 2019).

### Urbanization in Lahore

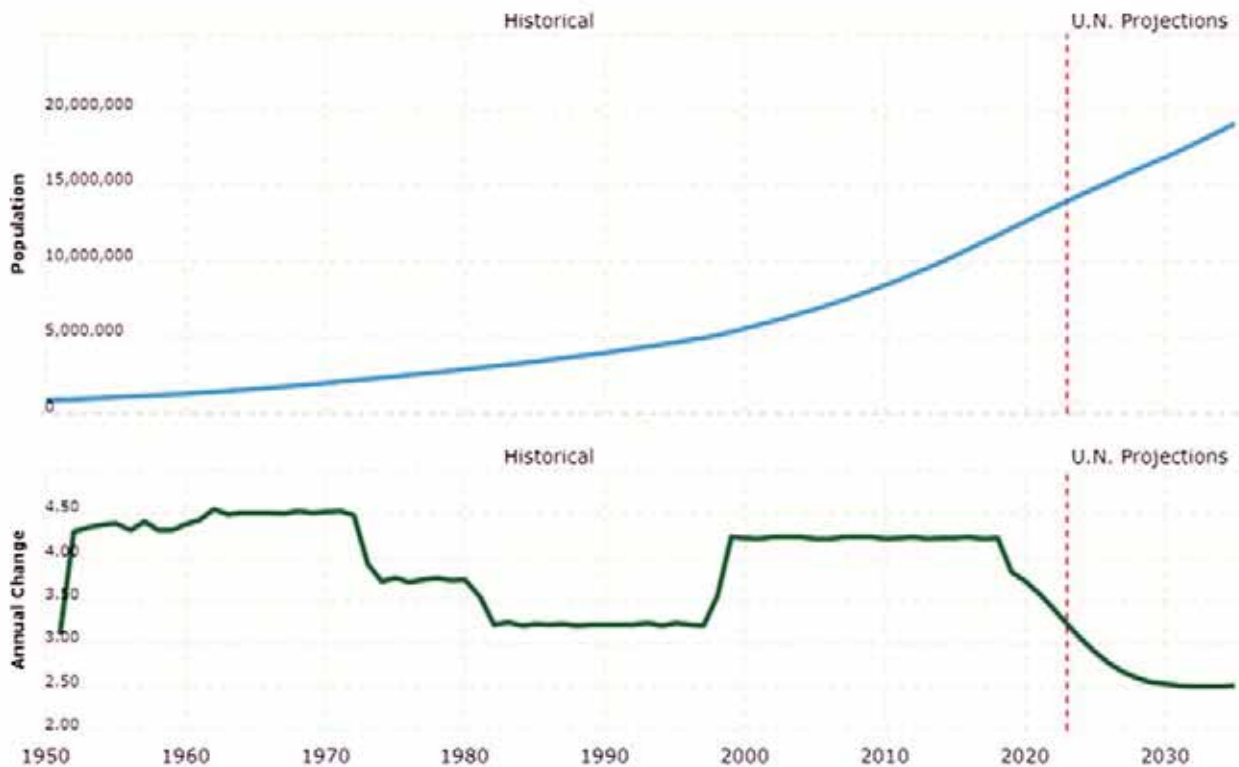
Lahore, the capital city of the Punjab province in Pakistan, is one of the country's most populous cities. With a rich cultural heritage, historical landmarks, and economic significance, Lahore has experienced rapid population growth over the years. As of March 2023, Lahore's population was estimated to be over 13.5 million, making it one of the most densely populated cities in Pakistan (Macrotrends, 2023). The city's population has been steadily increasing due to natural growth and rural-to-urban migration, driven by the search for better economic prospects and improved living standards.

Lahore, like many other major cities in Pakistan, faces a severe housing problem. The rapidly growing population has led to an increasing demand for housing, surpassing the available supply. This has resulted in various housing challenges, including:

- **Housing Shortage:** The demand for affordable and adequate housing far exceeds the supply, leading to a shortage of affordable homes for the city's growing population.
- **Informal Settlements:** The lack of affordable housing options has resulted in the growth of informal settlements, often referred to as slums or *Katchi Abadis*. These settlements lack proper infrastructure, sanitation, and access to basic services.
- **Urban Sprawl:** The demand for housing has led to urban sprawl as the city expands horizontally into its surrounding areas. This expansion can put additional pressure on agricultural land and natural resources.
- **Housing Affordability:** Many residents find it difficult to afford housing in the formal market due to high property prices and limited access to mortgage financing.
- **Housing Quality:** While there are some high-end housing projects, there is also a lack of quality housing options for middle and lower-income groups.
- **Infrastructure Strain:** The rapid increase in the population has put a strain on existing infrastructure and utilities, including water supply, sanitation, and transportation.
- **Land Use and Zoning Issues:** Inefficient land use and zoning practices may contribute to the misallocation of land resources and the lack of suitable areas for housing development (Malik et al 2019; Kugelman, 2013; Fatima et al., 2021; Nadeem et al., 2021).

### VERTICAL LIVING

Vertical living refers to residential buildings that are designed and constructed with multiple floors or stories. Instead of spreading horizontally across a large area, vertical living utilizes the vertical space by stacking residential units on top of each other within a single building. These buildings often have elevators and staircases to facilitate access to different floors (Khan and Tariq, 2019). The concept of vertical living has gained popularity in urban areas with limited available land for horizontal expansion. It allows for increased housing density, which is particularly important



**Figure-1:** Population Trends of Pakistan.  
**Source:** World Population Prospects, UNDP

in densely populated cities to accommodate a growing population while conserving land and promoting sustainable urbanization. Vertical living can take various forms, such as: high-rise apartments, skyscrapers, condominiums and mixed-use developments. Vertical living offers several potential benefits, including: Efficient land use, access to amenities and reduced commute sustainability (Sadiq et al., 2019, Ahmad and Naseer, 2019; Khan and Tariq, 2019).

### VERTICAL LIVING IN LAHORE

Choosing Lahore for this study is ideal due to its rapid urbanization and population growth, presenting a relevant case for exploring sustainable housing solutions. With a rising demand for housing, vertical living offers a compact and eco-friendly option (The Business Year, 2020). Limited land availability in Lahore underscores the need for efficient land use through vertical living. Addressing sustainability concerns, this study aids policymakers in formulating effective urban planning. Conducting this research fills a gap in vertical living studies specific to Lahore, offering valuable insights for future urban projects. Lahore's socioeconomic

diversity enables a comprehensive understanding of vertical living feasibility and acceptance. Lessons learned can have broader applications for other urban centres facing similar challenges (Fatima et al., 2021; Nadeem et al., 2021).

### PROBLEM STATEMENT

The increasing demand for housing in Lahore presents a pressing urbanization challenge. To address this, exploring the potential of vertical living is crucial. This study aims to investigate the perceptions and opinions of residents regarding vertical living's ability to cater to housing demands, promote efficient land use, conserve green spaces, and contribute to a more sustainable and balanced urban development. Additionally, the study aims to assess vertical living's potential as a solution for affordable housing options and its impact on reducing long commutes and improving transportation efficiency. Understanding residents' willingness to consider living in vertical housing will provide valuable insights for sustainable urban planning in Lahore.

- To evaluate residents' perceptions and opinions on the potential of vertical living in addressing the increasing demand for housing in Lahore.
- To examine the impact of vertical living on promoting efficient land use and reducing urban sprawl in Lahore.
- To investigate residents' views on the role of vertical living in conserving green spaces and protecting natural habitats, contributing to a more sustainable and balanced urban development in Lahore.

By achieving these research objectives, the study aims to contribute valuable insights to inform urban planning, housing policies, and sustainable development strategies in Lahore.

### Significance of Research

This research holds significant implications for sustainable urban development and housing planning in Lahore. By exploring the perceptions and opinions of residents on vertical living, the study addresses key aspects that can shape the city's future such as meeting housing demand, efficient land use, conservation of green spaces, sustainable urban development, affordable housing solutions, transportation efficiency and resident perception. This research contributes to evidence-based decision-making for urban planning and policymaking in Lahore. The findings can guide the city's authorities and developers in creating a more sustainable, liveable, and inclusive urban environment that meets the evolving needs of its residents. Moreover, the study's insights can have broader implications for other cities facing similar challenges, paving the way for innovative and sustainable housing solutions on a global scale.

### Review of the Significant Literature

The study by Nadeem et al. (2021) focuses on scaling the potential of compact city development in Lahore, Pakistan. It explores how compact city planning can address urbanization challenges, promote sustainability, and improve urban livability. The research examines the impact of compact city development on land use efficiency, transportation, infrastructure, and environmental sustainability in Lahore. By analysing the case of Lahore, the study provides insights into the opportunities and challenges of implementing compact city strategies in rapidly growing cities.

The results of 2017 Pakistan Census showed that the total population of Pakistan was 207.8 million, positioning it as the fifth most populous country globally and it highlighted the significant housing shortage in the country, particularly in urban areas. According to the census, there were 32.2 million households in Pakistan, an increase of 32.2% from the previous census in 1998 (Tariq et al., 2018). Urbanization has led to a rapid increase in the population of cities like Lahore, leading to the demand for more housing and infrastructure (Hassan and Khan, 2014).

However, limited land availability, due to urban sprawl and land-use regulations, has resulted in a shortage of affordable housing in many cities worldwide, including Lahore (Jabeen et al., 2015). Consequently, informal settlements have become widespread, lacking basic facilities like water, electricity, and sanitation. UI Hussnain, et. al., (2020) emphasized that the lack of community and stakeholder participation has been a significant obstacle in the success of past urban plans. The inclusion of stakeholders is crucial for achieving social sustainability within the community (Kohon, 2018). Recognizing this finding, it becomes imperative to acknowledge that the key stakeholders in any urban plan are the citizens who will be directly impacted by the planning decisions on a daily basis. Their active involvement in the planning process is essential for ensuring sustainable urban development (Lindenau and Bohler-Baedeker, 2014).

Notably, young people, although they may not have decision-making power in choosing their residence, are profoundly influenced by their environment, which significantly impacts their socialization (Osborne et al., 2017). Therefore, fostering meaningful engagement and representation of stakeholders, including young people, can contribute to more effective and socially sustainable urban planning and development.

Bharti and Mehrotra (2020) discusses Ahmedabad's urban development approach using contiguous replication of town planning schemes for coherent and organized growth. It explores benefits, challenges, and lessons for urban planners and policymakers in other cities facing similar urbanization issues, emphasizing sustainable practices. Kaczorowska (2020) examined the urban transformation and implementation of green development strategies in the city of Gothenburg. The prime focus was on analysing the city's efforts to adopt and execute sustainable development practices.

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The research, Bibri et al. (2020) explored various practices and strategies to promote the compact city concept, focusing on urban sustainability. The study examined the implications of compact city planning on land use, transportation, infrastructure, and environmental aspects. The findings offer valuable guidance for urban planners and policymakers seeking to adopt sustainable urban development practices in the context of increasing urbanization and environmental challenges. Malik et al. (2019) examine the lack of tenure security, poor housing conditions, and limited access to water, sanitation, and healthcare. The research sheds light on the vulnerability of these marginalized communities to evictions, displacement, and environmental hazards.

While Jucu and Voiculescu (2020) investigate abandoned places and urban marginalized sites in Lugoj municipality, Romania, three decades after the socialist-state collapsed. The research explores the impact of the collapse on urban development, resulting in neglected and abandoned areas within the city. The study examines the social, economic, and environmental implications of these abandoned sites. It aims to shed light on the challenges faced by Lugoj municipality in revitalizing and integrating these marginalized areas into the urban fabric. Bhagwat and Devdas (2020), explore the concept of compact city development and its potential to address urban sustainability challenges. It examines strategies and approaches for achieving a sustainable compact city, focusing on land use efficiency, transportation, infrastructure, and environmental considerations. The study provides a roadmap for urban planners and policymakers to promote sustainable urban development and create more liveable and resilient compact cities.

Liaqat et al. (2017) explore urban sustainability in Lahore using the compact city approach. The study focuses on evaluating the city's sustainability by assessing its compactness and efficiency in land use, transportation, and infrastructure. The research investigates how compact city planning can lead to sustainable development, reduced urban sprawl, and improved accessibility. Jim (2013) highlights the importance of urban greening in promoting environmental sustainability, improving quality of life, and addressing urban challenges in densely populated areas. The research examines various green infrastructure practices, such as urban parks, green roofs, vertical gardens, and urban forests, and their potential benefits for compact cities.

The study by Tariq et al., (2018), highlights how built houses can control residential land speculation in Bahria Town, Lahore. It explores their impact on real estate dynamics, regulatory implications, urban development, and liability. The findings emphasize the potential role of built houses in sustainable urban planning, offering valuable lessons for managing urban growth, land speculation, and ensuring affordable housing options in rapidly growing cities.

Maloutas et al. (2023) explore how different social groups tend to concentrate on specific floors or sections of the buildings. Factors influencing residential preferences, social interactions, and community dynamics are analysed. The research highlights the implications for urban planning and design to create more inclusive and cohesive neighbourhoods in high-rise developments. Understanding the phenomenon of vertical segregation is essential for promoting social diversity and building sustainable and harmonious living environments in apartment buildings in cities.

Horizontal planning, which involves the development of low-rise buildings and single-family homes, has been the traditional approach to urban development in many cities, including Lahore. However, this approach is not sufficient to meet the housing needs of the growing urban population, particularly low to middle income families (Latif and Tao Fang 2020). Limited land availability, coupled with increasing demand for housing, has resulted in rising housing costs, making it difficult for low to middle income families to afford decent housing (World Economic Forum, 2019).

Vertical planning, such as high-rise apartment buildings, provides a potential solution to the issue of limited land availability and increasing demand for affordable housing (Hanif et al., 2015). High-rise buildings can increase the density of urban areas, reducing the need for new land development and preserving open spaces. Furthermore, high-rise buildings can provide more affordable housing options for low to middle income families, as they can be constructed on a smaller land area than low-rise buildings, reducing land costs. However, vertical planning also has its drawbacks. High-rise buildings require higher initial costs and may have higher maintenance costs than low-rise buildings, making them less accessible to low-income families. Additionally, high-rise buildings may have limited

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privacy and can be more vulnerable to noise and other disturbances, affecting the liveability of the building (Fatima et al., 2021).

Similarly, a study found that vertical accommodation can provide a solution to the housing affordability and availability challenges in Lahore. The study highlighted that affordable housings can be developed in areas that are close to employment centres, public transportation, and other amenities, which can help reduce transportation costs and improve access to job opportunities for low to middle income families (Tariq et al., 2018). However, the literature also highlights some of the challenges associated with vertical living. Building safety and accessibility are major concerns in the development of high-rise buildings in Pakistan. The study suggests that building codes and safety standards must be enforced to ensure that high-rise buildings are safe and structurally sound (Hasan, 2021).

## RESEARCH METHODOLOGY

### Research Design

The research will adopt a cross-sectional survey design to gather data from respondents in Lahore. This design allows the researchers to collect information at a specific point in time, providing insights into the participants' perceptions and opinions about vertical living and its role in sustainable urbanization. The survey questionnaire is used to assess the respondents' attitudes towards vertical living, addressing various aspects such as its ability to address the growing housing demand, promote efficient land use, conserve green spaces, and contribute to sustainable urban development.

**Population:** Lahore is a vibrant and diverse city in Pakistan, making it an excellent choice as a survey population. With a population of around 13.5 million (Macrotrends, 2023), the city offers a wide range of socio-economic backgrounds and housing conditions. Conducting a survey in Lahore can provide valuable insights into various urbanization challenges and opportunities, including affordable housing, sustainable urban development, and the potential of vertical housing solutions. The findings from such a survey in Lahore can have broader implications for urban planning and development in other rapidly growing cities facing similar issues.

**Sampling:** Considering the constraints of limited financial resources, human resources, and time, the current study opts for a convenient sampling method. This method involves selecting participants who are readily available and accessible for data collection. The selection criteria focus on residents living in areas of Lahore characterized by congestion and high population density. These individuals are considered the best respondents for this survey because they directly experience the challenges and implications of urbanization and housing demand in their daily lives.

**Sample Size:** To calculate the sample size using Taro Yamane's (1967) formula on 13.5 million population of Lahore, a desired level of precision ( $e$ ) of 5% is taken, which can be expressed as 0.05.

### Using the Formula

$$n = 1 + N(e^2)N$$

$$n = 13,500,000 + 13,500,000(0.0025)n = 1 + 13,500,000(0.025)13,500,000 \quad n = 13,500,000 + 33,750n = 1 + 33,75013,500,000$$

$$n = 400.035$$

Therefore, the estimated sample size required for the population of Lahore with a desired precision of 5% is approximately 400.

### DATA COLLECTION

Data for this study is collected through a structured questionnaire designed to assess respondents' perceptions and opinions regarding the potential of vertical living for sustainable urbanization in Lahore. The questionnaire comprises 7 Likert scale items, which allow participants to express their level of agreement or disagreement with specific statements related to vertical living. Additionally, the questionnaire includes 4 demographic questions to gather information about respondents' gender, age, marital status, and education level. The data collection process involves distributing the questionnaire in-person to the selected participants. This approach enables the researchers to directly engage with the respondents, ensuring a higher response rate and the opportunity to clarify any questions or concerns the participants may have.

**Table-1:** Demographic Statistic

| <b>Gender of the Respondents</b> |        |           |         |                    |
|----------------------------------|--------|-----------|---------|--------------------|
|                                  |        | Frequency | Percent | Cumulative Percent |
| Valid                            | Male   | 240       | 60.0    | 60.0               |
|                                  | Female | 160       | 40.0    | 100.0              |
|                                  | Total  | 400       | 100.0   |                    |

| <b>Age of the Respondents</b> |             |           |         |                    |
|-------------------------------|-------------|-----------|---------|--------------------|
|                               |             | Frequency | Percent | Cumulative Percent |
| Valid                         | 18-25       | 8         | 2.0     | 2.0                |
|                               | 26-35       | 16        | 4.0     | 6.0                |
|                               | 36-45       | 104       | 26.0    | 32.0               |
|                               | 46-55       | 184       | 46.0    | 78.0               |
|                               | 56 or Above | 88        | 22.0    | 100.0              |
|                               | Total       | 400       | 100.0   |                    |

| <b>Marital Status of the Respondents</b> |                   |           |         |                    |
|------------------------------------------|-------------------|-----------|---------|--------------------|
|                                          |                   | Frequency | Percent | Cumulative Percent |
| Valid                                    | Single            | 48        | 12.0    | 12.0               |
|                                          | Married           | 320       | 80.0    | 92.0               |
|                                          | Divorced/Seprated | 16        | 4.0     | 96.0               |
|                                          | Window            | 16        | 4.0     | 100.0              |
|                                          | Total             | 400       | 100.0   |                    |

| <b>Education of the Respondents</b> |                      |           |         |                    |
|-------------------------------------|----------------------|-----------|---------|--------------------|
|                                     |                      | Frequency | Percent | Cumulative Percent |
| Valid                               | Primary Education    | 8         | 2.0     | 2.0                |
|                                     | Secondary Education  | 56        | 14.0    | 16.0               |
|                                     | Higher Sec.Education | 184       | 46.0    | 62.0               |
|                                     | Masters Degree       | 104       | 26.0    | 88.0               |
|                                     | Bachelors Degree     | 40        | 10.0    | 98.0               |
|                                     | Doctors Degree       | 8         | 2.0     | 100.0              |
|                                     | Total                | 400       | 100.0   |                    |

### Data Analysis

In this study, descriptive statistics will be employed to analyse the demographic data of the respondents. The survey questionnaire data will be analysed using SPSS version 26, a statistical software package commonly used for data analysis in research. This statistical analysis to provide a clear understanding of the participants' characteristics and perceptions regarding vertical living, enabling meaningful interpretations and conclusions from the collected data.

### Data Analysis and Interpretation

Data analysis and interpretation are essential steps in any research study, including the current investigation on the potential of vertical living for sustainable urbanization in Lahore. After collecting the data through the survey

questionnaire, the next phase involves processing and analysing the responses using appropriate statistical methods.

Table 01 presents demographic statistics from a survey conducted with 400 respondents. The respondents were categorized based on gender, age, marital status, and education level.

### Demographic Profiles of the Respondents

#### Gender of the Respondents

- 60% of the respondents were male (240 out of 400).
- 40% of the respondents were female (160 out of 400).

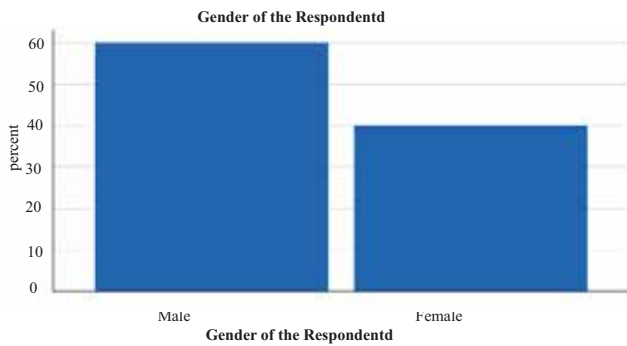


Figure-2: Gender of the Respondents

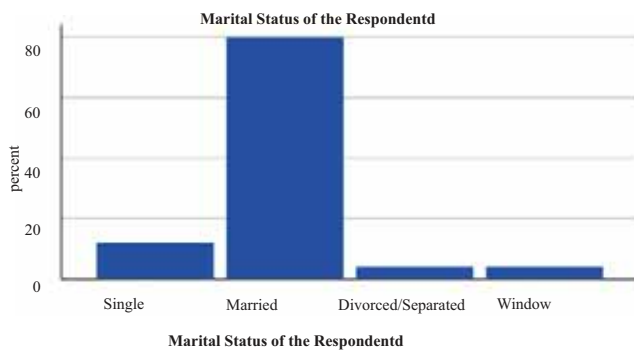


Figure-4: Marital Status of the Respondents

### Age of the Respondents

- 2% of the respondents were aged 18 to 25 (8 out of 400).
- 4% of the respondents were aged 26 to 35 (16 out of 400).
- 26% of the respondents were aged 36 to 45 (104 out of 400).
- 46% of the respondents were aged 46 to 55 (184 out of 400).
- 22% of the respondents were aged 56 or above (88 out of 400).
- 40% of the respondents were female (160 out of 400).

### Marital Status of the Respondents

- 12% of the respondents were single (48 out of 400).
- 80% of the respondents were married (320 out of 400).

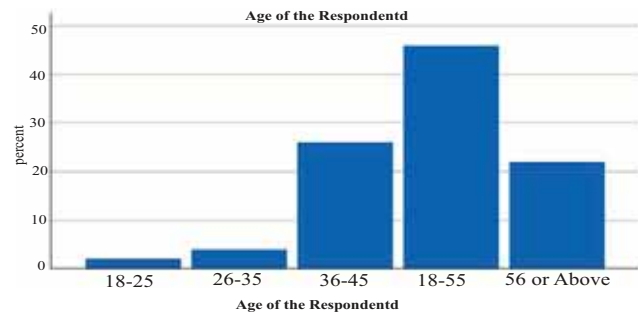


Figure-3: Age of the Respondents

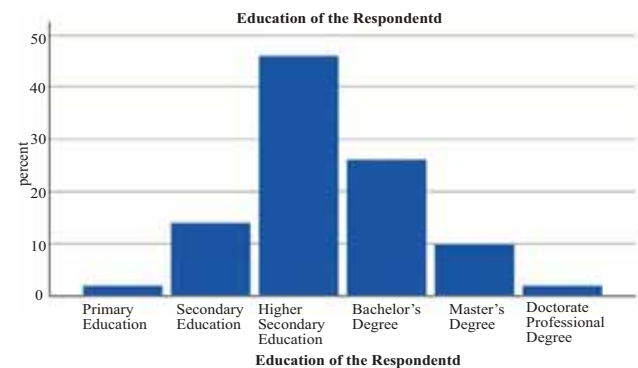


Figure-5: Education of the Respondents

- 4% of the respondents were divorced/separated (16 out of 400).
- 4% of the respondents were widowed (16 out of 400).

### Education of the Respondents

- 2% of the respondents had primary education (8 out of 400).
- 14% of the respondents had secondary education (56 out of 400).
- 46% of the respondents had higher secondary education (184 out of 400).
- 26% of the respondents had a Bachelor's degree (104 out of 400).
- 10% of the respondents had a Master's degree (40 out of 400).
- 2% of the respondents had a Doctorate or Professional degree (8 out of 400).



**Table-2:** Responses About Potential of Vertical Living in Lahore.

| <b>1-Vertical living can help Address the Increasing Demand for Housing in Lahore</b>            |                   |           |         |               |                    |
|--------------------------------------------------------------------------------------------------|-------------------|-----------|---------|---------------|--------------------|
|                                                                                                  |                   | Frequency | Percent | Vaild Percent | Cumulative Percent |
| Valid                                                                                            | Strongly Disagree | 16        | 4.0     | 4.0           | 4.0                |
|                                                                                                  | Disagree          | 32        | 8.0     | 8.0           | 12.0               |
|                                                                                                  | Neutral           | 24        | 6.0     | 6.0           | 18.0               |
|                                                                                                  | Agree             | 160       | 40.0    | 40.0          | 58.0               |
|                                                                                                  | Strongly Agree    | 168       | 42.0    | 42.0          | 100.0              |
|                                                                                                  | Total             | 400       | 100.0   | 100.0         |                    |
| <b>2-Vertical Living can Promote Efficient Land Use and Reduce Urban Sprawl.</b>                 |                   |           |         |               |                    |
|                                                                                                  |                   | Frequency | Percent | Vaild Percent | Cumulative Percent |
| Valid                                                                                            | Strongly Disagree | 36        | 9.0     | 9.0           | 9.0                |
|                                                                                                  | Disagree          | 44        | 11.0    | 11.0          | 20.0               |
|                                                                                                  | Neutral           | 40        | 10.0    | 10.0          | 30.0               |
|                                                                                                  | Agree             | 172       | 43.0    | 43.0          | 73.0               |
|                                                                                                  | Strongly Agree    | 108       | 27.0    | 27.0          | 100.0              |
|                                                                                                  | Total             | 400       | 100     | 100.0         |                    |
| <b>3-Vertical Living can Help Conserve Green Spaces and Protect Natural Habitats.</b>            |                   |           |         |               |                    |
|                                                                                                  |                   | Frequency | Percent | Vaild Percent | Cumulative Percent |
| Valid                                                                                            | Strongly Disagree | 20        | 5.0     | 5.0           | 5.0                |
|                                                                                                  | Disagree          | 16        | 4.0     | 4.0           | 9.0                |
|                                                                                                  | Neutral           | 32        | 8.0     | 8.0           | 17.0               |
|                                                                                                  | Agree             | 220       | 55.0    | 55.0          | 72.0               |
|                                                                                                  | Strongly Agree    | 112       | 28.0    | 28.0          | 100.0              |
|                                                                                                  | Total             | 400       | 100     | 100           |                    |
| <b>4-Vertical Living can Promote a more Sustainable and Balanced Urban Development in Lahore</b> |                   |           |         |               |                    |
|                                                                                                  |                   | Frequency | Percent | Vaild Percent | Cumulative Percent |
| Valid                                                                                            | Strongly Disagree | 32        | 8.0     | 8.0           | 8.0                |
|                                                                                                  | Disagree          | 24        | 6.0     | 6.0           | 14.0               |
|                                                                                                  | Neutral           | 40        | 10.0    | 10.0          | 24.0               |
|                                                                                                  | Agree             | 184       | 46.0    | 46.0          | 70.0               |
|                                                                                                  | Strongly Agree    | 120       | 30.0    | 30.0          | 100.0              |
|                                                                                                  | Total             | 400       | 100     | 100.0         |                    |
| <b>5-Vertical Living can Provide a Solution for Affordable Housing Options in Lahore.</b>        |                   |           |         |               |                    |
|                                                                                                  |                   | Frequency | Percent | Vaild Percent | Cumulative Percent |
| Valid                                                                                            | Strongly Disagree | 56        | 14.0    | 14.0          | 14.0               |
|                                                                                                  | Disagree          | 40        | 10.0    | 10.0          | 24.0               |
|                                                                                                  | Neutral           | 48        | 12.0    | 12.0          | 36.0               |
|                                                                                                  | Agree             | 176       | 44.0    | 44.0          | 80.0               |
|                                                                                                  | Strongly Agree    | 80        | 20.0    | 20.0          | 100.0              |
|                                                                                                  | Total             | 400       | 100     | 100.0         |                    |

**6- Vertical Living can Reduce the need for Long Commutes and Improve Transportation Efficiency.**

|       |                   | Frequency | Percent | Vaild Percent | Cumulative Percent |
|-------|-------------------|-----------|---------|---------------|--------------------|
| Valid | Strongly Disagree | 36        | 9.00    | 9.00          | 9.0                |
|       | Disagree          | 40        | 10.0    | 10.0          | 19.0               |
|       | Neutral           | 48        | 12.0    | 12.0          | 31.0               |
|       | Agree             | 192       | 48.0    | 48.0          | 79.0               |
|       | Strongly Argee    | 84        | 21.0    | 21.0          | 100                |
|       | Total             | 400       | 100     | 100.0         |                    |

**7- I Would be Willing to Consider Living in a Vertical Housing Structure in Lahore.**

|       |                   | Frequency | Percent | Vaild Percent | Cumulative Percent |
|-------|-------------------|-----------|---------|---------------|--------------------|
| Valid | Strongly Disagree | 28        | 7.0     | 7.0           | 7.0                |
|       | Disagree          | 44        | 11.0    | 11.0          | 18.0               |
|       | Neutral           | 72        | 18.0    | 18.0          | 36.0               |
|       | Agree             | 176       | 44.0    | 44.0          | 80.0               |
|       | Strongly Argee    | 80        | 20.0    | 20.0          | 100.0              |
|       | Total             | 400       | 100     | 100.0         |                    |

Overall, the table provides a useful overview of the demographic characteristics of the respondents. This information can be used to understand the population of Lahore and to make informed decisions about marketing, product development, and other business initiatives.

**Frequency Distribution of Survey Responses**

Table 2 presents the results of a survey conducted to explore the perceptions and opinions of residents in Lahore regarding the potential of vertical living as a sustainable housing option.

The Table 02 presents survey responses on seven statements related to the potential of vertical living in Lahore. Each statement was rated on a scale from "Strongly Disagree" to "Strongly Agree." The table provides a breakdown of the frequency and percentage of respondents for each response category.

Vertical living can help address the increasing demand for housing in Lahore: 60% of respondents "Agree" or "Strongly Agree" that vertical living can address housing demand. Vertical living can promote efficient land use and reduce urban sprawl: 70% of respondents "Agree" or "Strongly Agree" that vertical living can promote efficient land use.

Vertical living can help conserve green spaces and protect

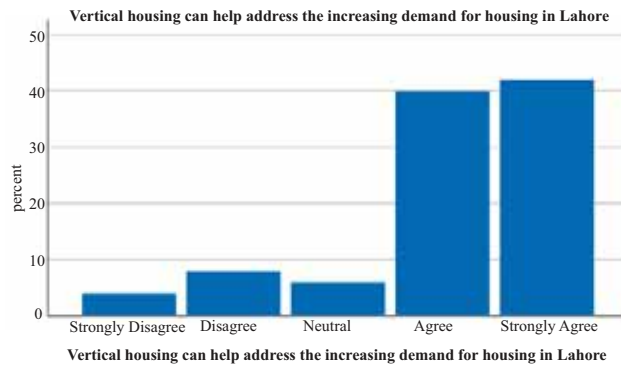
natural habitats: 83% of respondents "Agree" or "Strongly Agree" that vertical living can conserve green spaces.

Vertical living can promote a more sustainable and balanced urban development in Lahore: 76% of respondents "Agree" or "Strongly Agree" that vertical living can promote sustainable urban development.

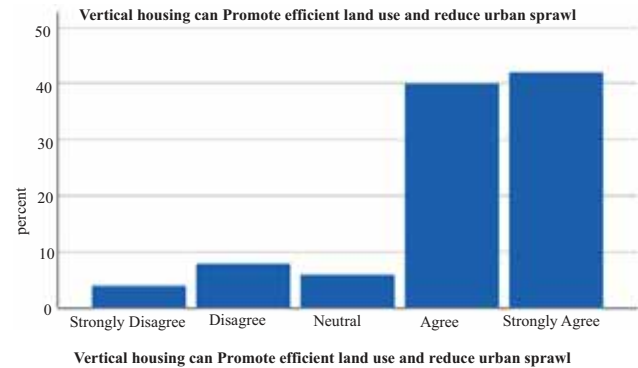
Vertical living can provide a solution for affordable housing options in Lahore: 64% of respondents "Agree" or "Strongly Agree" that vertical living can offer affordable options. Vertical living can reduce the need for long commutes and improve transportation efficiency: 69% of respondents "Agree" or "Strongly Agree" that vertical housing can improve transportation efficiency.

I would be willing to consider living in a vertical housing structure in Lahore: 64% of respondents "Agree" or "Strongly Agree" that they would consider living in vertical housing.

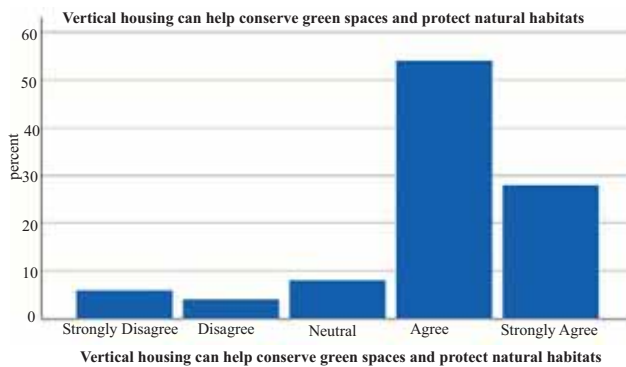
Overall, the responses indicate a positive perception of vertical living's potential benefits in Lahore. A significant portion of respondents agreed that vertical living can address housing demand, promote sustainability, and provide feasible solutions for affordable living. However, some respondents also expressed concerns or neutral views, emphasizing the need for further research and awareness on the concept of vertical living in the context of Lahore's urban development.



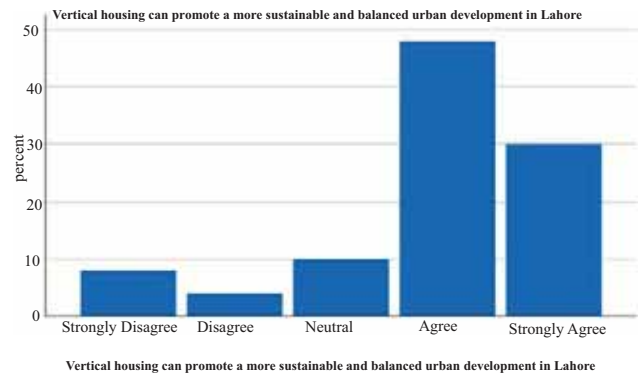
**Figure-6:** Vertical living can help address the increasing demand for housing in Lahore



**Figure-7:** Vertical housing can promote efficient land use and reduce urban sprawl



**Figure-8:** Vertical housing can help conserve green spaces and protect natural habitats



**Figure-9:** Vertical housing can promote a more sustainable and balanced urban development in Lahore

## DISCUSSION CONCLUSION AND IMPLICATIONS OF THE RESEARCH

The discussion, conclusion, and implications of the research are essential components that follow the data analysis and interpretation phase.

### Discussion on the Key Findings

The survey results on the potential of vertical living for sustainable urbanization in Lahore reveal a generally positive outlook among respondents. The majority "Agree" or "Strongly Agree" that vertical living can address the increasing demand for housing, promote efficient land use, conserve green spaces, and contribute to sustainable urban development. This indicates that the concept of vertical living is perceived as a viable solution to the city's housing challenges and environmental concerns.

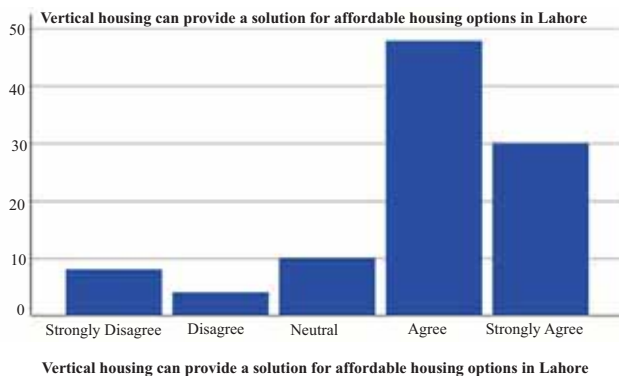
The positive attitudes towards vertical living align with the research topic of exploring its potential for sustainable

urbanization in Lahore. The findings suggest that vertical living can play a crucial role in meeting the city's housing needs while ensuring efficient land use and preservation of green spaces. Additionally, the survey results highlight the importance of considering affordability, accessibility, and transportation efficiency when implementing vertical living initiatives.

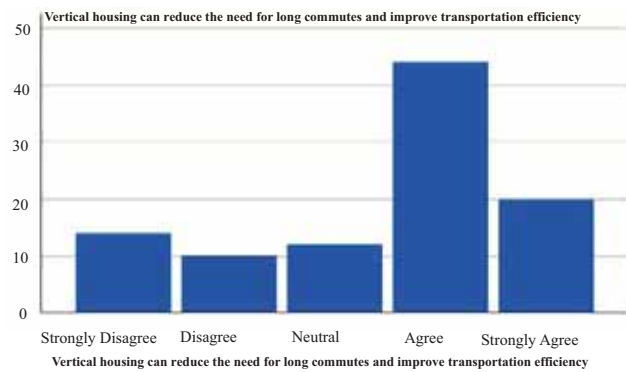
These results are aligned with the previous studies (Khan and Tariq, 2019; Sadiq et al., 2019; Ahmad and Naseer, 2017; Malik and Tariq 2020; World Economic Forum, 2019) while findings contradicted with (Hanif et al., 2015; King et al., 2017; Tariq et al., 2018).

## CONCLUSION

The survey results on vertical living's potential for sustainable urbanization in Lahore demonstrate a positive reception among respondents. The majority agree that vertical living can address housing demand, promote efficient land use, conserve green spaces, and contribute to sustainable urban



**Figure-10:** Vertical housing can provide a solution for affordable housing options in Lahore

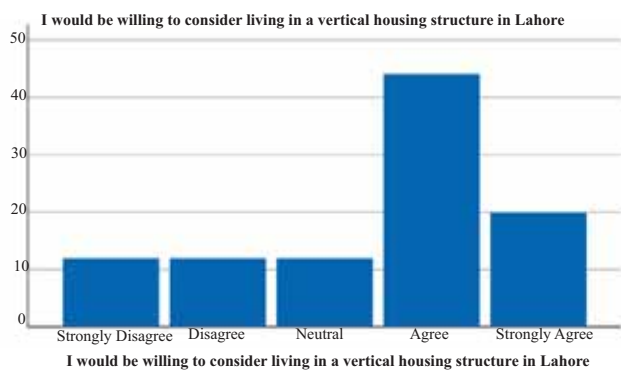


**Figure-11:** Vertical housing can reduce the need for long commutes and improve transportation efficiency

development. This highlights its viability as a solution to the city's housing challenges and environmental concerns. Policymakers can use the findings to design strategies that meet housing needs while ensuring sustainable development. Incorporating vertical living into Lahore's plans could lead to a more balanced and eco-friendly urban landscape, addressing the housing crisis and promoting sustainability. However, challenges such as potential resistance and accessibility for people with disabilities should be addressed proactively to create an inclusive and sustainable environment. Overall, the positive perceptions offer valuable insights and opportunities for Lahore's sustainable urbanization journey. The findings serve as a foundation for informed decision-making, fostering a resilient, livable, and environmentally conscious city. By embracing vertical living, Lahore can embrace sustainable urban development and improve its residents' quality of life.

### Research Implications

The research on the potential of vertical living for sustainable urbanization in Lahore has several implications for stakeholders. Urban planners and policymakers can use the positive reception of vertical living to prioritize and strategize its development, focusing on creating policies that encourage sustainable options and address concerns related to affordability and accessibility. Real estate developers can invest in vertical housing projects with energy-efficient design practices to meet the increasing housing demand.



**Figure-12:** I would be willing to consider living in a vertical housing structure in Lahore

Engaging residents in the planning process can foster community support, and policymakers can advocate for green building regulations. Embracing vertical living can lead to a more sustainable and efficient urban development, promoting resource utilization and infrastructure efficiency. The findings provide a foundation for future research on social impacts, economic feasibility, and sustainable design, supporting Lahore's journey towards a more liveable and eco-friendly urban environment. Overall, the research showcases vertical living as a viable solution for Lahore's housing and urbanization challenges, with potential benefits for various aspects of sustainable development.

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