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| RESEARCH ARTICLE

Post-Occupancy Evaluation of Apartment Housing in the Case of District 11, Kabul City

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| ABSTRACT
The construction method in developing countries is different from that in developed countries. Afghanistan, being a developing country, has faced enormous urban problems. This paper studies the prevalent construction methods in Kabul city. It explains how the apartment housing is built without the involvement of professionals. Additionally, it analyses the problems of apartment housing by using the post-occupancy evaluation methodology. The data collected from the interviews and questionnaire survey, as well as a survey of the physical measurement and observation of the houses, revealed that there was a high level of dissatisfaction with the typical houses built by the constructor.

| KEYWORDS
Kabul, Apartment Housing, Construction Methods, Professional, Post-occupancy Evaluation

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1. Introduction

Kabul is the capital and the largest city of Afghanistan. It was a beautiful city with valuable housing sufficient to the residence tradition and culture, but currently, it faces many huge urban problems, such as rapid development of informal settlements and construction of insufficient houses that are not meeting the needs of the residents in planned areas of the city. Like many Islamic cities, the new architectural style and urban development in Kabul are pursuing the modernist style of architecture that does not provide the charm of traditional Afghan places and lacks much regional fit (Kazimee and Najimi, 2017). The old city of Kabul, being the core part of the city, presents the rich vernacular architecture of the city residents because it is a product of centuries ago. However, after the rapid increase in population, the city expanded, and the government built a new style of housing, including apartments. Although these houses are built in the formal areas of the city, they face a lack of governmental control. On the other hand, in most developed countries, the construction industry is controlled, and agencies are registered in related organizations, but in developing countries, not only is the construction technology incomparable, but also the construction methods are different. Based on this, this paper studies contemporary apartment housing in Kabul city, particularly focusing on construction technology and methods. Thus, the aims of this paper are :

-To illustrate the prevalent construction technology and method of apartment housing in Kabul
-To reveal the level of satisfaction of houses built with less or even no involvement of architecture and engineering professionals.

For this purpose, the Khair Khana in the northern part of Kabul city is selected for this research.

2. Methodology

Based on the objectives of this study and an understanding of the situation of the Apartment buildings, a field survey was conducted in March of 2023 in Kabul, and the data was collected for analyses of the Apartment buildings. Thus, the methods which are applied to this paper are:

- Archival research; literature review which covers previous studies of Apartment buildings in Afghanistan and other countries.
- Post-occupancy evolution: During the survey conducted in March 2023, interviews with the residents of apartment buildings were done in order to ask for opinions about the buildings in use from the point of view of the people who use them.
- Physical measurement of Apartment building plots and buildings.
- Photography: Take photos of the apartment buildings to capture the current state of the buildings.

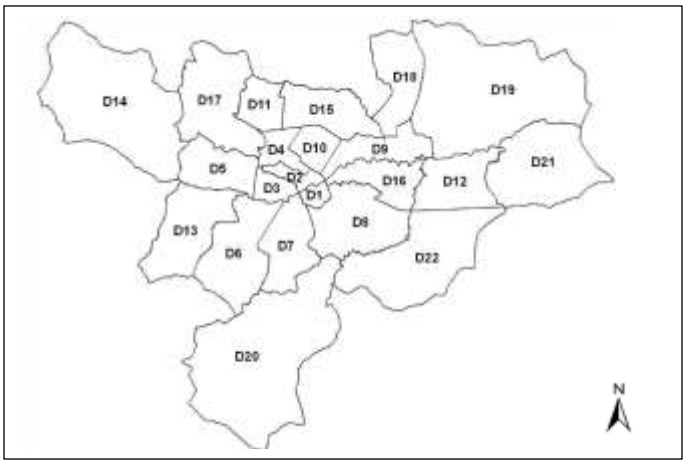

Fig.1. Kabul districts map

Fig.2. The study area. The highlighted plots are apartment housing

3. Apartment Housing

3.1 History

During the civil wars in Afghanistan, people migrated to many countries, mostly to neighbor countries such as Pakistan and Iran, where they worked as labors in construction industries and were equipped with construction skills. After the new regime took over and the people returned to their homeland, they used the construction skills they learned in the host countries to construct houses in the same way they had learned. Afghanistan has its own culture, and these types of houses lack much regional fit. These houses were constructed in many parts of the city, while the government, with its poor management in this sector, could not control the construction of these houses. In most cases, these houses were built with no observation by architects and engineers. These phenomena influenced majorly residential housing and also the apartment housing in the neighborhood.

3.2 The Study Area

Khair Khana is part of the suburban area extending from the city center toward the northwest with a distance of 8 km (Fig. 1), which is located mostly in District 11. The land area in Khair Khana was owned by the government and distributed to those who did not have a private house (Nabizada and Kita, 2012). Clusters of housing units are arranged within a square block, with deviations from the usual grid pattern apparent (Samizay, 1969). Khair Khan is divided into three parts: part-1, part-2, and part-3. The study area is located in part three — one hundred twenty-three houses along the newly paved street that connects the southern (Lab-Jar) to the northern (Panjsad Family) are studied (Fig 1).

Table.1. Typology of construction contract

Typology	Photograph	Tasks for Tikadar
Type A 4.8%		RC concrete Frame
Type B 16.2%		RC concrete Frame + Brick Masonry
Type C 25.2%		RC Concrete Frame + Brick Masonry + Plastering
Type D 8.9%		RC Concrete Frame + Brick Masonry + Plastering + Painting
Type E 17.8%		RC Concrete Frame + Brick Masonry + Plastering + Painting+ Plumbing
Type F 16.2%		RC Concrete Frame + Brick Masonry + Plastering + Painting+ Plumbing + Electrical
Type G 10.5%		RC Concrete Frame + Brick Masonry + Plastering + Painting+ Plumbing + Electrical + Carpentry

4. Construction Technology and Methods

4.1 The Builder

The lack of involvement of professionals and experts in the construction industry is one of the urban problems. Today, the construction of apartments is done by uneducated people with a lack of good control of the government. The common practice for the construction of apartment housing in Kabul is as follows. When they decide to build their house, the landowner selects the Tikadar, who is involved in the construction process and acts as general project manager. The Tikadar select the masons and other unskilled labor for construction. The landowner selects the Tikadar by asking those who have already built their houses. Even in some cases, the landowner selects a building to build a duplicate one for his own. The landowner and Tikadar, after agreement on the type of construction and cost, make a contract. The contract is based on the square meter of each floor area.

4.2 Typology of Construction Contract

The contract of construction and price is based on the typology of the contract. Different types of contracts are common among people in Kabul City; these are the most common ones. The Tikadar is responsible only for tasks that are categorized above and other activities, and the landowner will manage material supply. For instance, in Type B, Tikadar built the concrete structural frame of the building with brick masonry walls. In this case, the landowner will supply the construction material on the site, and the other activities such as plastering, painting, carpentry, installation of door and window frames, finishing (installing toilet tile, plastering the floors), plumbing and installing electrical parts are done after the frame stand. However, when the Tikadar is selected for a project, he starts to manage the project by paying other skilled labors as per his task, which is defined in the typology of construction. The skilled labors are selected from Chowk (a place in the bazaar where the workers stand in the early morning and look for work) or from those who have experience in other projects.

Table.2. Factor analysis of buildings

Building Analysis Attributes			
Comfort	Lighting	1	Quality of natural lighting in kitchen
		2	Quality of natural lighting in bedroom
		3	Quality of natural lighting in living room
		4	Quality of natural lighting in corridor
	Ventilation	5	Air Quality in Living room
		6	Air Quality in Kitchen
		7	Air Quality in Bedroom
		8	Air Quality in Corridor
	Size	9	Size of living and dinning space
		10	Size of bath and toilets
		11	Size of cooking and storage space
		12	size of bedrooms
	Location	13	Main door location
		14	Location of each apartment unit in the building
		15	Accessibility
	Design	16	Building design in relation to residents culture
		17	Bath and toilet facilities design
	Privacy	18	Privacy in the building
	Thermal	19	Thermal comfort in the building
	Sound	20	Protection against noise pollution in building
Safety	Structural safety	21	Structural design safety
	Fire	22	Fire safety and protection
Hygiene	Power	23	Power supply in the building
	Water	24	Water supply in the building

The contract between the owner of the house and the builder is based on the task for which the builder will be responsible, which is why this issue caused different typologies of contracts. For instance, Type-F is a contract between the owner and the builder and the builder is responsible for the following tasks: constructing a reinforced concrete frame of the building, construction of all brick masonry walls, applying plastering on the walls where required, applying layers of paint after plastering, all task related to the installing of mechanical instruments and finishing the electrical task for the building. Based on a survey that was done on the site, these are the most popular types of construction. It is worth mentioning that, at the first step of the project, the two parties undertake the covenant informally without any governmental registration of involvement. Based on the survey, it is found that

Type C, which has more than twenty-five percent of total built housing regarding informal construction contracts,s is the most prevalent type of construction contract. The tasks in this contract include the construction of RC concrete frames, brick masonry walls, and plastering. People who face financial problems usually prefer type C, as it has only a few tasks and usually costs less than other types, which have more tasks. The other benefit is that the owners who face financial problems can build their houses in piecemeal construction. The most common type after Type-C is Type-E, followed by Type-F, Type-B, Type-G, and Type-A, as listed in Table. 1.

5. Residents` Satisfaction

Poor housing environments can negatively affect a resident's overall lifestyle and also affect the health, productivity, and comfort of occupants (Silva et al. 2017). In order to find the main problems of apartment housing, which was built mostly by unprofessional builders, we did a post-occupancy evaluation. The post-occupancy evaluation is one of the important approaches toward solving the housing problems. Post-occupancy evaluation pays special attention to the actual usage of the built-environment and users` opinions and requirements (Yu et al. 2017).

The questionnaire has been prepared based on the post-occupancy evaluation. The main building analysis has been defined. Comfort, safety, and hygiene are the main analysis attributes. Then, the main attributes are divided into the sub-attributes. The lighting, ventilation, size, location, design, privacy, thermal and sound are the sub-attributes of comfort. Structural safety and fire are the sub-attributes of safety. Eventually, power and water are the sub-attributes of hygiene.

6. Results

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Series1	3.94	19.69	60.63	9.45	21.26	21.26	55.12	9.45	46.46	14.17	70.87	60.63	7.87	25.98	1.57	9.45	33.07	1.57	0.00	1.57	22.83	3.15	26.77	11.02
Series2	5.51	14.96	7.87	10.24	45.67	11.81	13.39	3.94	40.16	12.60	15.75	11.81	3.15	14.17	19.69	27.56	11.81	7.87	5.51	35.43	57.48	61.42	44.09	20.47
Series3	90.55	65.35	31.50	80.31	33.07	66.93	31.50	86.61	13.39	73.23	13.39	27.56	88.98	59.84	78.74	62.99	55.12	90.55	94.49	62.99	19.69	35.43	29.13	68.50

Fig.3. The apartment housing users' satisfaction. The number one to twenty-four referred to the table.2.

Based on the survey of post-occupancy evaluation in apartment housing in the study area, these issues are found as follows. Generally, it can be concluded that most of the users are dissatisfied with apartment buildings except for factors three (the quality of natural lighting in the living room), seven (air quality in the bedroom), eleven (size of cooking and storage space) and twelve (size of bedrooms. People are dissatisfied over fifty percent with fourteen factors among twenty-four. Among the fourteen, factor nineteen, which is thermal comfort, has the highest dissatisfaction rate, with almost ninety-five percent. The main reason is that these houses are usually built by non-professional builders, and they do not have knowledge of sun orientation. As Kabul is popular for its winter, it should well be considered in the design. Usually, the rooms are located in the wrong location.

Consequently, there are other factors which have over fifteen percent of dissatisfaction; factors eighteen (privacy in the building), one(quality of natural lighting in the kitchen), thirteen (main door location), eight (air quality in corridor), four (quality of natural

lighting in the corridor), fifteen (accessibility) ten (size of bath and toilets), twenty four (water supply in the building), six (air quality in the kitchen), two (quality of natural lighting in the bedroom), sixteen (building design in relation to residents culture), twenty (protection against noise pollution in building), fourteen (location of each apartment unit in the building) and seventeen (bath and toilet facilities design).

On the other hand, factor eleven, which is the size of the cooking and storage space, has the highest level of satisfaction, with almost seventy-one percent. Most people are satisfied with the size of spaces for different functions in these buildings. Subsequently, factors twelve and three, which are the size of bedrooms and quality of natural lighting in the living rooms, have a high amount of satisfaction in the chart.

In addition, some of the activities have neutral feedback, and the users of the apartment housing have a neutral thoughts about these factors. This is because they do not have enough knowledge about the matter or they have considered it simple. Factor twenty-two and twenty one has above fifty percent of the amount in the list.

Eventually, the survey, which was done in this area, found that most houses are faced with a lack of well-designed, good orientation, privacy, and accessibility. But the other factors such as the size of rooms and lighting of space are well considered.

7. Conclusion

Apartment housing is mostly built with a lack of professionals and experts. The unprofessional builder team, which is often led by a person called Tikadar, supervises the construction, and his tasks are defined as per the agreement with the landowner. There are different types of agreements between landowners and Tikadar. Nevertheless, the most common types are A, B, C, D, E, F, and G. Thus, the price and task amounts differ from type to type. Additionally, this research conducted the post-occupancy evaluation and found that most of the users are dissatisfied with most of the design factors of the houses. Among all the thermal comfort, privacy in the building, quality of natural lighting in the kitchen, door location, air quality in the corridor and accessibility have the highest level of dissatisfaction.

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References

[1] Bashir A. K, (2006). Sustainable Reconstruction And Planning Strategies For Afghan Cities: Conservation in Cultural And Environmental Heritage. WIT Transactions, 93, 49-59, 2006.
[2] Bashir. A.K. and Najimi, A.W. (2017). Analyses of Urban Regeneration and Architectural Heritage Saving in Kabul since 2001.*International Journal of Heritage Architecture*, 1, 4, 671-682
[3] Habib, J., (2011). Urban Cohesiveness in Kabul City: Challenges and Threats. *International Journal of Environmental Studies,* 68, 3, 363-371, 2011
[4] Hashemi, N.A. and Ogura, N. (2018). Development of Mixed-use Housing in Kabul City. AIJ, Kyushu Chapter Architectural Research Meeting. 57, 133-136
[5] Hashemi and Ogura, (2018). The Environmental Impact of Mixed-use Buildings -In the Case of Kabul, Afghanistan, IJTRA 6, 6, 1-5, 2018
[6] Hashemi and Ogura, (2018). Types of Commercial Activities and Their Impact on Mixed-use Housing: in the Case of Khair-khana Kabul City, Proceedings of the 12th ISAIA, 510-5013, 2018
[7] Japan International Cooperation Agency (JICA)., (2011) Draft of Kabul City Master Plan, RECS., 2011
[8] Kabila F H, (2017). Traditional Markets in Islamic Architecture: Successful Past Experience", WIT Transactions on the Built Environment, 171, 263-272, 2017.
[9] Marielle F S (2017). Post-occupancy evaluation of residential buildings in Luxembourg with centralized and decentralized ventilation systems, focusing on indoor air quality (IAQ). Assessment by questionnaires and physical measurements, Energy and Building 148 (2017) 119-127.
[10] Ministry of Urban Development Affair. (2015). State of Afghan Cities. Vol-1, 1-156
[11] Nazire and Kita, (2016). Specifying Characteristics of Informal Settlements by Comparing Four Areas from the Aspects of Houses, Land Tenure and Social Factors in Kabul Afghanistan, AIJ 81 728, 2197-2205, 2016.
[12] Nabizada and Kita, (2013). A Study on the Relationship between the Spatial Structure of Open Spaces and Outdoor Activities in the Typical Residential Areas in Kabul City, AIJ 78 686, 817-827, 2013.
[13] Nabizada and Kita, (2012). A study on The Process and Mechanism of Transformation in Settlements in Kabul city: The relationship between the typology of spatial structure and residents demands, AIJ 77 681, 2533-2543, 2012.
[14] Rafi S, M. (1974). Urban Growth and Residential Prototypes in Kabul, Afghanistan. MIT Massachusetts Institute of Technology, May 1974.
[15] Xiaoping Y. (2017). On a Post-Occupancy Evaluation Study of Effects of Occupant Behavior on Indoor Environment Quality in College Buildings in Chongqing, Procedia Engineering 205 (2017) 623-627.