

## Evaluation of the residents' satisfaction with high rise housing in new Eskin/Erbil-Iraq as a gated community



Zhyar Abdalla Hussein<sup>1</sup>, Kozan Uzunoğlu<sup>2,\*</sup>

<sup>1</sup>Faculty of Engineering, Tishk International University, Erbil, Iraq

<sup>2</sup>Faculty of Engineering and Architecture, Bahçeşehir Cyprus University, Nicosia, Cyprus

### ARTICLE INFO

#### Article history:

Received 23 February 2020

Received in revised form

12 June 2020

Accepted 27 June 2020

#### Keywords:

POE (Post-occupation evaluation)

Gated-community

Housing standards

Housing in North Iraq

### ABSTRACT

High rise apartment blocks are the appropriate solution found in many countries in the world to solve the problem of lack of residential space, after the large increase in the population on earth. After the fall of the Baath party in 2003, a large number of high rise apartments were also built in Northern Iraq. The main objective of this research is to examine the user's satisfaction in housing settlements via POE (Post Occupation Evaluation) approach in Northern Iraq/Erbil. For this study, the New Eskin housing settlement in Erbil was selected as a case study. The primary source of data for this study was collected through a questionnaire. Fifty residents of New Eskin volunteered for the questionnaire survey; they were asked about their needs and problems, and the data collected were statistically analyzed. The questionnaire is structured on the physical, spatial, and functional properties of the building system. According to the participants' answers, some problems were also identified as environmentally, socially, and economically. Indoor and outdoor space standards were evaluated. As a result of this study, "safety and security" has been found to be the main reason for life preference in the gated community of New Eskin settlement. In addition, the users identified a lack of sufficient green areas and common areas as the main deficiency. Respondents' satisfaction on physical, spatial, and functional features of flats and near environment showed variations depending on the flats' orientation and respondents' education level. Short term, medium-term, and long term recommendations for better living in New Eskin settlement have been put forward.

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### 1. Introduction

After the fall of Saddam Hussain in 2003, particularly in Northern Iraq, there has been a remarkable development in terms of construction. The population has increased significantly, and because of the limited space and the high price of land, the government has encouraged high-rise housing projects which were not experienced much before by the Iraqi people. Studies based on post-occupation evaluation (POE) of high rise housings in Iraq are very few. The purpose of this study is to evaluate the New Eskin settlement, which is a high-rise gated community project. The study concerns a post-occupation study approach based on the user's

satisfaction related to user requirements. The number of high-rise gated community projects is increasing in Erbil/Iraq from day to day, and POE based studies and researches need to be more. Therefore, it is believed that this study will make a contribution to the field.

Due to the large population density in the world, there were also many problems in terms of housing. A number of solutions have been applied; one of these solutions was the construction of residential apartments. The characteristics of residential apartments are that in a small area, a large number of residents live, and to a certain extent, this solves the problems of lack of space and lack of housing for a large number of people. With today's developments, the increasing sophistication of contemporary technology, and the design and construction of apartments have also had a great development. However, there are many problems and needs that have not been addressed, so the right solutions must be found. After the increasing number of apartments, another problem emerged as

\* Corresponding Author.

Email Address: [kozan.uzunoglu@baucyprus.edu.tr](mailto:kozan.uzunoglu@baucyprus.edu.tr) (K. Uzunoğlu)

<https://doi.org/10.21833/ijaas.2020.11.003>

Corresponding author's ORCID profile:

<https://orcid.org/0000-0002-7891-1205>

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the performance of residential buildings in housing estates in which the POE plays an important role, and in relation to this, user satisfaction is a measure of the performance of the buildings.

Bordass and Leaman (2005), in their studies, "Making feedback and post-occupancy evaluation routine 1: A portfolio of feedback techniques," explained how feedback, follow-through from design and construction into occupancy, and post-occupancy evaluation could become a natural part of project delivery, and how this could improve the quality and sustainability of our buildings. Five years later, Stevenson and Leaman (2010) considered POE in their studies, tried to find out an answer to a question in common: How can occupancy feedback as a multidisciplinary practice, addressing climate change, help to produce better housing? They explored the developing understanding of housing occupancy feedback in terms of occupants' expectations, perceptions, experiences, and subsequent behavior, particularly concerned with the research, policy, and management implications of housing occupancy feedback. Ibem et al. (2013) conducted a survey of 452 households in nine public housing estates in Nigeria. They used a questionnaire survey and observation as a method of research. According to the results of the survey, the occupants were generally satisfied with the performance of the buildings. Especially the satisfaction levels of the users were generally higher with privacy and the areas of living and sleeping spaces. The availability of water and electricity in the buildings, the type, location, and aesthetic appearance of the buildings as well as the size of main activity areas were the most predominant factors that determined satisfaction at the end of the survey. Researchers draw attention to the critical areas in order to improve the performance of residential buildings and users' satisfaction with public housing projects in Nigeria. Another research on housing conducted in Iran, the study of Ghasrodashti et al. (2017) was about residential satisfaction in public housing through assessment of the Mehr housing scheme in the new town of Sadra. MHS is a significant project of the Iranian government's current development plans. During the survey, data were collected through a sample of residents. Physical characteristics of housing units, public facilities and services, and also the social participation and cohesion among residents were examined in order to explore the residents' satisfaction. The results of the survey demonstrated that only 32.5% of the residents were satisfied with living in MHS.

Myers (1988) said, "quality of life" is a powerful expression for defining citizen satisfaction in different locations. He also says, standard indicators of quality of life do not include only wealth and employment, but there are also many indicators like the state of the built environment, physical and mental health, education, recreation, leisure, and social belonging. He emphasizes that quality of life changes all the time with technological

developments. Therefore people's expectations must be measured in parallel to these developments. He recommends five basic stages for measuring the quality of life, which are "review literature," "interview group leaders," "profile of objective trend indicators," "survey of citizen perceptions/preferences," and "issue reports for public discussion." Du et al. (2017) specified five factors for residents' satisfaction, which are travel, accessibility, social interaction, safety, and overall residential environment. According to Moser (2009), "people-environment congruity" was a must factor, especially in residences for an acceptable level of satisfaction. All these approaches reveal strongly that POE (Post Occupation Evaluation) studies measuring residents' satisfaction, which are based on user's needs, can provide continuous data and feedback for planning purposes of a built environment.

In literature, some researchers conducted surveys via POE for measuring the users' satisfaction in buildings in Iraq. These buildings are generally non-residential buildings like university buildings.

In this research, the New Eskin housing gated community settlement has been chosen as a case study. It includes 16 blocks built on a total area of 26000m<sup>2</sup>. Each block has 17 floors and a basement. Detailed information about the site and high rise blocks can be seen in Table 1.

### 1.1. The history of residential housing in Iraq

The Iraq Housing Market Study (IHMS) was a key component of the UN-trust fund strengthening the capacity of the housing sector project implemented by UN-HABITAT. The study was intended to provide an up-to-date analysis of the housing sector and real estate markets representing the housing sector in the North, Center, and South of Iraq in six selected cities; Sulaimaniya, Mosul, Baghdad, Hilla, Najaf, and Basrah. According to the study, considering the housing production history, government-built housing met only 15 percent of the housing needs in Iraq, most of the constructions occurred in 1960 and 1970s. These were multi-story public housings built by the government and some staff housings built by ministries, universities, and state-owned construction companies. Since the early 1980s, the private sector has been providing 80-90 percent of housing in Iraq. This sector includes small-scale private contractors working for individual landowners.




### 1.2. Housing policy in Northern Iraq

The government didn't have a master plan regarding the housing sector prior to 2012 in Iraq. First, the housing projects were proposed to the BOI (Board of Investment) by the investors. Then, they would send the project to the Ministry of Housing and Reconstruction just for a technical inspection. Consequently, during this procedure, the number of the projects and housing units in the projects, the

price of the housing units were not examined according to an existing plan considering the needs and necessities of the people. All of these influential factors were determined primarily by the developers

who generally care about the size of their capital rather than providing requirements and necessities of people.

**Table 1:** General layouts of the high-rise housing in New Eskin as gated community settlement in Erbil

Table 21 General layout of the high-rise housing in New Eskin as gated community settlement in Erbil		Site layout
Project name	New Eskin	
Location	North Iraq-Erbil	
Architecture	Mimar Company	
Number of blocks	16 blocks	
Level of each block	17 Floors+basement	
Total Area	26000 M <sup>2</sup>	
Total Building Area	10720 M <sup>2</sup>	
Car Parking ground area	5000G+15000B M <sup>2</sup>	
Green Area in the master plan	10000 M <sup>2</sup> (But in reality, less than 1000 M <sup>2</sup> )	
Block Layout		
Block Base Area	670 M <sup>2</sup>	
Number of floors	17 Floors+basement	
Number of flats on each floor	4	
The total area of flats in each floor	150 * 4=600 M <sup>2</sup>	
Circulation and service spaces area	70 M <sup>2</sup> (for each floor)	
Number of stairs	2	
Number of elevators	3	
Number of natural ventilation ducts	2	
Garbage chute	2	
Electric panels	2	
Flat Layout		
Area of Flat	150 M <sup>2</sup>	
Entrance corridor	2.4*1.8=4.32 M <sup>2</sup>	
Guest room	5*3.8=19 M <sup>2</sup>	
WC	1.5*1.8=2.7 M <sup>2</sup>	
Living room	3.5*4.7=16.45 M <sup>2</sup>	
Kitchen	3.5*4.5=17.6 M <sup>2</sup>	
Master Bedroom	4.5*3.8=17.1 M <sup>2</sup>	
Bedroom	3*4.5=13.5 M <sup>2</sup>	
Bath and W.C.	2.8*1.8=5 M <sup>2</sup>	
Corridor	1.6*4.8=7.7 M <sup>2</sup>	
Balcony	3.5*1=3.5 M <sup>2</sup>	

This lack of a master plan for housing renewal for Erbil created chaos in the housing sector, resulting in almost 80 projects and more than 68000 housing units being commissioned. The cost was about 13 billion dollars and a work force more than Erbil can provide between 2006 and 2012. By a presidential decision, all the permits for housing developments in Erbil had been stopped in order to control this situation. In 2012, the Kurdistan Regional Government with the coordination of HABITAT and foreign experts devised a housing plan for Erbil. In this plan many socioeconomic aspects of Erbil were considered which were neglected in housing developments. But the political and security conditions in the region become a handicap in front of this strategy to be executed.

Ministry of Housing and Reconstruction has yearly plans for housing units for the low-income citizens. The houses are constructed with the

minimal standards. In this way, the highest number of units can be constructed with the budget assigned for housing. But last year's Kurdistan Regional Government is in a financial crisis and this situation affected the yearly plan that produced almost 5000 housing units for the low-income families in Erbil governorate. In addition to that, even the housing projects that target the very low and low-income groups are occasionally misused through second hand sales and their market price becomes much more than the original price specified by the authorities. So there must be legislations that prohibit such actions that damage and distort the whole process of providing housing for the low income people (Baker and Hamilton, 2006). Another problem is generated from the lack of a master plan for housing prior to the emergence of the housing complexes in Erbil. These housing complexes are targeting mostly the high income group citizens. It is



true that each housing unit participates in a way to solve the housing problem in Erbil but the households that can afford to buy houses at prices that mostly exceed 300,000 dollars are households that didn't have a housing problem already, as for the very low and low income groups' whom average annual income is about 6000 dollars (Majury, 2013).

There were two projects for the construction of apartments in the city of Erbil and Sulaymaniyah. The projects were named Eshan and Kareza wshk. Later after the fall of Saddam Hussain in 2003, in Northern Iraq in particular, there has been a remarkable development in terms of architecture; the population has increased significantly, and because of the limited space and the high price of land, the government applied the method of building the apartments, but unlike the apartments in the other countries, in the city of Erbil a large number of apartments are empty and there is no life in them.

### 1.3. Development of gated communities in Erbil

The adjustments in Iraq after 2003, political monetary and social advancements overwhelmed the Northern Iraqi urban communities and Erbil turned into the focal point of this real move. The per capita has expanded by 9 times in only a couple of years, this advance changed how individuals live and stay. Notwithstanding that, from the expanding quantities of vagrants from rustic zones to urban

areas in Kurdistan locale, Erbil had the lion offer and this had driven the legislature to not be able to supply the request in the market of lodging division, which made ready for private segment/land designers to create lodging. This circumstance has set off the rise of high number of gated groups that were working inside the only a couple of years. A number of these gated communities consist of apartments, it solves the problem of lack of area and a large number of people, by increasing the number of dwelling units vertically (Demir and Mukhlis, 2017). For exploring and exemplifying the gated community phenomenon in Erbil, a new Eshan Project has been chosen, which is in the center of Erbil City and it acts as a model for most of the gated communities in Erbil in terms of design, form, function and economic problems.

### 1.4. Post occupancy evaluation (POE)

Stevenson (2008) described the POE as: "Systematic collection and evaluation of information about the performance of a building in use." In other words, are people happy and did the building meet the expectations? POE is also used as a broad term which comprises project delivery process review and functional and technical performance review of buildings during occupation (Preiser et al., 2015). Short term, medium term, long term benefits of POE are described in Table 2.

**Table 2:** Short term-medium term-long term benefits of POE (Preiser et al., 2015)

Short term benefits of POE	Identify and provide solution to building problems.
	Attends to the needs of the users.
Medium term benefits of POE	It enhances space utilization based on the provided feedback
	It tries to understand the effects of whether change of on buildings, context of work and budgeting Supply decision making
Long term benefits of POE	Construct capacity for building to get use to the growth and changes in organization.
	Identifies further application of buildings.
Stages of review	Accounts performance of buildings by designers.
	Building performances is improved to the long-term scale.
POE address a number of questions:	Design quality improvement.
	Review of strategies.
	Is the building performance as intended?
	Is there a change in the needs of the users?
	Are there problems needed to be addressed quickly?
	What was the efficiency of the method from onset to completion?
	What are the knowledge gained for future works?

There are three process stages of review: They include Operational Review performed after 3-6 months' post occupation, a Project Review performed after 12-18 months' post occupation, and a Strategic Review performed after 3-5 years post occupation. Two to three months later when the users have knowledge about the building, questions might be raised from Operational Review pertaining working adequacy and if there are urgent problems requiring solution. The subsequent response stage is the Project Review, performed somewhat a year later of occupation by the time there is settlement in the building's systems and a full seasonal cycle has been achieved. This provides an insight of the performance of the building under various conditions. Furthermore, the users get the chance to figure out what the building lacks for long term

needs. The Strategic Review is the third stage that happens years later from initial occupation during which the needs of the organization might have changed and the building is lacking that (Krada et al., 2014).

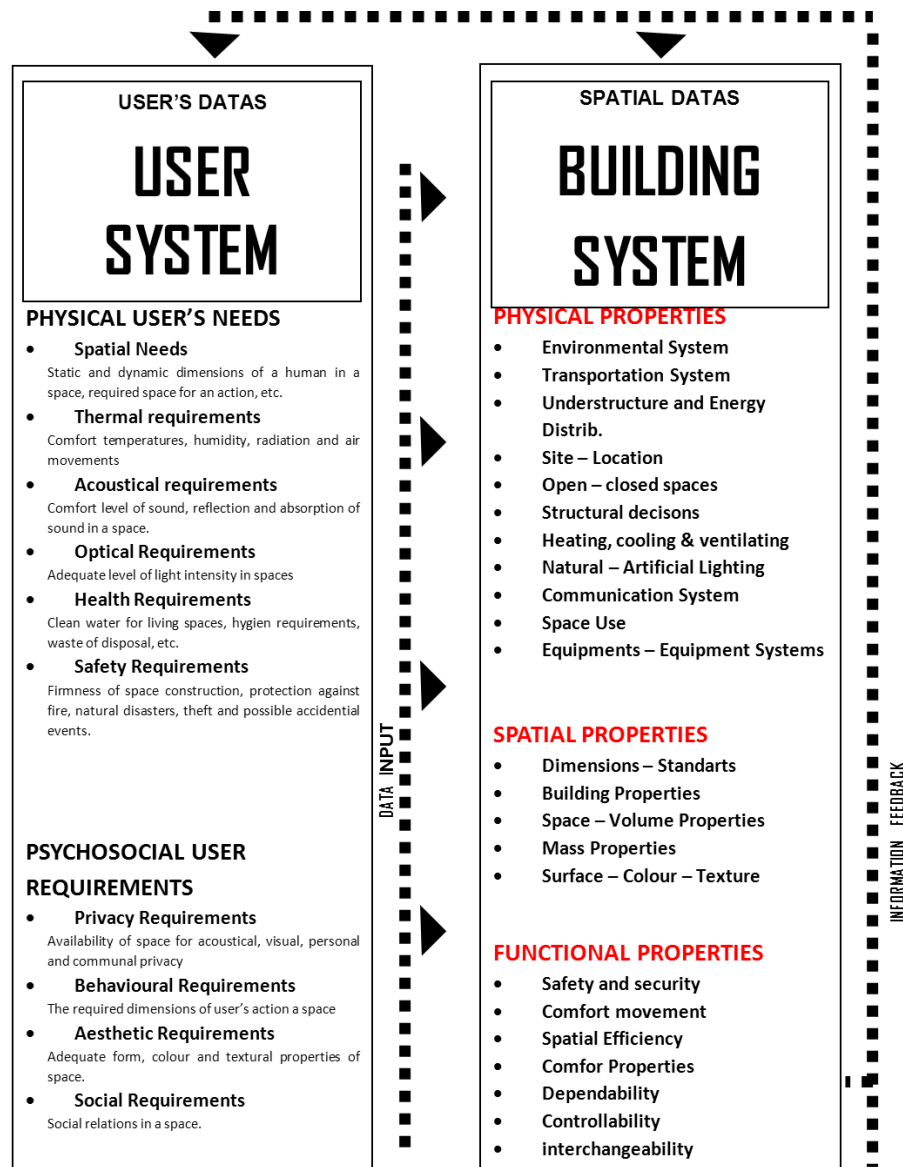
### 1.5. User needs in housing

User needs can be examined under two headings: Physical and psycho-social needs. Physical user needs mean providing appropriate physical conditions for the environment in which the users perform their actions. These physical conditions can be determined according to the number of users, the properties of the activities and the properties of the equipment elements used depending on the location. These properties are the dimensions of the space

required depending on the user's anthropometric, sensory, and perceptual dimensions, number and equipment. In addition, the requirements for security (structural stability, fire, natural disasters, and measures against the thief) must be addressed in these circumstances. Physical user requirements are examined in six sub-sections: Spatial needs, thermal, acoustical, optical, health and safety requirements (Table 3).

Psycho-social user requirements are the conditions that can prevent any psychological discomfort when a user action occurs. These are the characteristics of auditory, visual privacy and the features of social environment related to human

behavior and the aesthetic features of the space such as form, color and texture. Psycho-social needs are the characteristics depending on the individual's wishes and desires which vary according to the culture and environment. Psycho-social needs can be studied in four subgroups: Privacy behavioral, aesthetic and social requirements (Fig. 1). Establishing spatial evaluation criteria based on user requirements emerges as the most appropriate method for comparing and overlapping spatial features and human needs. Integration of user requirements with environmental features also constitutes the building system (Uzunoğlu and Özer, 2014).



**Fig. 1:** The NTIS (The national technical information service-an agency within the U.S. department of commerce) operating scheme transmits information to the building system by processing the information received from the user system (Uzunoğlu and Özer, 2014)

## 2. Research methodology

In this research, quantitative method is used. The primary source of data for this study was collected through a self-administered questionnaire. The questionnaire has been distributed to more than 100 flats but only 50 of flat residents volunteered to

participate in the survey. The questionnaire consisted of basically two parts. The first part measures the demographic characteristics of the participants and the second part measures their satisfaction based on user needs. The questions on user's satisfaction are related with the user's system requirement as shown in Table 3. Residents were

asked about their needs and what are their problems. The answers were collected from the questionnaire and these data are used to get a result. The frequency scale was prepared in a way to be scored between 1 and 5 from the negative to positive in accordance with the Likert scale. Prepared as "not satisfied", "very poorly satisfied", "poorly satisfied", "strongly satisfied" and "very strongly satisfied". The data of the research were evaluated with a statistical analysis program and frequency and percentage distributions were determined regarding the attitudes of the respondents.

The questionnaire items can well be related with the building system components that are physical, spatial and functional properties. This relationship is shown in Table 4. Thus, the answers to the questions developed on the basis of user requirements can be transferred to evaluate the physical, spatial and functional data that make up the building systems.

### 3. Findings

According to the results of the survey, the distribution of participants according to their age, gender, flat orientation and floor level is given in Table 5.

The average age of respondents is 36.22 years. The marital status of 14% of the respondents are single, 86% of the respondents are married. The educational level is divided into five levels as; high school, diploma, bachelor, master and Ph.D. of those fifty New Eskan residents, 12% have high school degree, 16% diploma degree, 66% bachelor's degree, 4% master's degree and 2% have PhD degree. Mean of educational level is 2.68. Standard deviation is 0.819. According to answers to the questionnaire, 34% are the owner of the flat, and 66% are tenants. The residency periods of the participants in the New Eskan was asked. The percentages were: 22% resided for less than six months, 54% resided between six months to one year and 24% resided

between one to two years. Mean is 2.02 and standard deviation is 0.685.

**Table 3:** Questionnaire layout and user system requirements relationship

Questionnaire Layout (Questions on user's satisfaction)	User System Requirements (Answers transfers information to user's system)
• Quality Of Services	➔ • Health Requirement
• Sun Orientation of Flats	➔ • Thermal Requirement
• Natural Ventilation Of Flats	➔ • Thermal Requirement
• Access Opportunities To City Center	➔ • Social Requirement
• Plan Layout Of Flats	➔ • Spatial, Behavioural, Privacy Requirements
• Efficiency Of Heating–Cooling Systems	➔ • Thermal Requirement
• Heat Insulation Performance	➔ • Thermal Requirement
• Sound Insulation Performance	➔ • Acoustical Requirement
• Daylight Efficiency	➔ • Optical Requirement
• Water Quality	➔ • Health Requirement
• Finish Materials	➔ • Aesthetic and Safety Requirements
• Health Services	➔ • Health, Social and Safety Requirements
• Exterior Design	➔ • Aesthetic Requirement
• Cultural Environment	➔ • Social Requirement
• Social Environment	➔ • Social Requirement
• Use Of Outdoor Spaces	➔ • Spatial, Social and Aesthetic Requirements
• Protection Against Hazards	➔ • Health Requirement
• Green Areas	➔ • Aesthetic and Social Requirements
• Car Parking	➔ • Spatial Requirements
• Fire Safety	➔ • Safety Requirements
• Earthquake Safety	➔ • Safety Requirements

During the survey, the residents were asked how much they were satisfied with the price of services (cleaning, water supply and rubbish). In Table 6 the percentages are shown. The result shows that the overall population of New Eskan is not satisfied with the price of services.

**Table 4:** Questionnaire items and building system relationship (Uzunoğlu and Özer, 2014)

Questionnaire Items (Form-Function-Construction Properties In Architectural Design)	BUILDING SYSTEM
1-Topography of the area to be designed-Site features	Physical Properties
2-The orientation of the building	Physical Properties
3-Compatibility with climate-wind-direction factors	Physical Properties
4-Architectural texture features around the area to be designed	Physical Properties
5-Cultural characteristics-Characteristics of the society	Physical Properties
6-Building regulations and characteristics of the area to be designed	Physical Properties
7-Form of building-Aesthetics	Spatial Properties
8-Surface features-color-texture	Spatial Properties
9-Building function-User requirements and building program	Functional Properties
10-Construction technique and construction features	Physical Properties
11-Heating-cooling systems	Physical Properties
12-Heat-sound insulation properties	Physical Properties
13-Natural-artificial lighting	Physical Properties
14-Spatial features- Spatial standards	Spatial Properties
15-Static properties-Durability features	Functional Properties
16-Security-fire, natural disasters, etc. Features	Functional Properties
17-Flexible use - Interchangeability – Renewability	Functional Properties
18-Use of renewable energy-Green energy	Functional Properties
19-Use of ecological materials	Functional Properties
20-Budget-Initial construction and cost of maintenance	Functional Properties

**Table 5:** The distribution of number of respondents according to their age, gender, orientation of their flat and floor level

Age of Respondents	Number of Respondents	Percentage (%)
18-30 years	13	26.0
31-40 years	25	50.0
41-55 years	10	20.0
Upper 50 years	2	4.0
Total	50	100.0 %
Gender	Number of Respondents	Percentage (%)
Male	30	60.0
Female	20	40.0
Total	50	100.0 %
Orientation of Flats	Number of Respondents	Percentage (%)
NW	11	22.0
NE	11	22.0
SE	13	26.0
SW	15	30.0
Total	50	100.0 %
Floor Level	Number of Respondents	Percentage (%)
Ground floor	11	22.0
1 <sup>st</sup> floor	3	6.0
2 <sup>nd</sup> floor	3	6.0
3 <sup>rd</sup> floor	2	4.0
4 <sup>th</sup> floor	3	6.0
5 <sup>th</sup> floor	1	2.0
6 <sup>th</sup> floor	4	8.0
8 <sup>th</sup> floor	4	8.0
9 <sup>th</sup> floor	2	4.0
10 <sup>th</sup> floor	1	2.0
11 <sup>th</sup> floor	3	6.0
13 <sup>th</sup> floor	6	12.0
14 <sup>th</sup> floor	2	4.0
15 <sup>th</sup> floor	2	4.0
16 <sup>th</sup> floor	3	6.0
Total	50	100.0 %

The participants were asked about how much they are satisfied with their flat's orientation; their

answers are presented in Table 7. These apartments are divided into four sections (A-NW, B-NE, C-SE and D-SW). All participants of section A and B were more satisfied with their flat orientation and the views of flats were also better than those in section C and D.

**Table 6:** Satisfaction of New Eskan residents with the price of services (cleaning, water supply and rubbish)

Options	Num. of respondents	Percent.(%)	Mean	Std. Deviation(5)
Not satisfied	29	58.0		
Very poor	18	36.0	1.48	0.614
Poor	3	6.0		
Total	50	100.0 %		

**Table 7:** Satisfaction about the orientation of the apartment flats

Options	Num. of respondents	Percent.(%)	Mean	Std. Deviation(5)
Very poor	5	10.0		
Poor	20	40.0		
Strong	18	36.0	3.54	0.862
Very Strong	7	14.0		
Total	50	100.0 %		

Residents were asked if they were satisfied with the natural ventilation in their flats. The answers came out as shown in Table 8. It should be noted that those flats which were in upper floors are very well ventilated. However, the lower flats, particularly those in the ground floor were badly ventilated.

**Table 8:** Satisfaction of New Eskan residents with the ventilation in the flats

Options	Num. of respondents	Percent. (%)	Mean	Std. Deviation
Not satisfied	2	4.0		
Very poor	12	24.0		
Poor	17	34.0		
Strong	17	34.0		
Very Strong	2	4.0		
Total	50	100.0 %		
Mean of satisfaction for ventilation			3.10	0.953

The satisfaction rate of New Eskan residents in getting their daily needs like food and other needs were also asked. The result came out such that large extent of the residents were satisfied. 56% were strongly and 44% were very strongly satisfied. This is because, geographical location of the New Eskan project is almost in the city center of Erbil and it is close to the markets and other public places. Mean satisfaction was 4.44 which is a very good ratio and the Standard deviation was 0.501.

Another question was about the most important reason for choosing to live in the apartment, and the answers are displayed in Table 9. As expected, most

of them preferred to live there because of "better safety and security". Apart from the options in questionnaire, 36% of the respondents mentioned other reasons which are worth mentioning. "Other reasons" focus on three issues: The first one is the power cuts, which are frequent across the country and these are not experienced much in gated community projects built by the private sector. The second one is the heating-cooling system that is not found in many detached houses of the country, and the third is the search for a more privileged environment like gated communities.

**Table 9:** The three most important reasons for New Eskan residents choosing to live in apartment

Options	Num. of respondents	Percentage (%)
Better safety and security	21	42.0
Close to schools, university	4	8.0
Good design of apartment	2	4.0
Didn't have a choice	2	4.0
Change from renter to owner or owner to renter	2	4.0
Change in family structure (child birth, divorce, marriage, etc.)	1	2.0
Other (Please specify)	18	36.0
Total	50	100.0 %

The residents were asked how much they were satisfied with the plan of apartment flats. 82% mentioned that they were satisfied with the plan of their flats and 18% said they were dissatisfied with plan layouts. Among the dissatisfied residents 12% were not satisfied with the kitchen and 6% were not satisfied with bath and W. C. The residents were also asked what type of energy they use for heating and cooling purposes. According to the results; 74% use electricity, 20% use gas and 6% use kerosene. The residents were asked if there is any heat insulation in their flat. The answers were as follows; 96% said "yes" and 4% said "no idea". Then the residents who responded as "yes" were asked how much they are satisfied with heat insulation. The distribution of

answers were; 10% very poor, 30% poor, 52% strong, 8% very strong.

Another question was about the existence of sound insulation in the flats; 96% said "yes" and 4% said "no." Then the residents who said "yes" were asked; how much they were satisfied with the sound insulation: 26% of the respondents said very poor, 30% poor, 26% strong and 2% very strong.

The residents were asked about natural lighting in their flats. The answers were; 2% not satisfied, 22% very poor, 22% poor, 32% strong and 22% very strong. Mean is 3.5 and standard deviation is 1.129. In [Table 10](#), the relationship between flat's orientation and residents' satisfaction on the benefit of natural lighting are shown.

**Table 10:** The relationship between flat's orientation and residents' satisfaction on the benefit of natural lighting

Orientation of flat	To what extent are you satisfied with the natural lighting in the flats?	Mean	Std. Deviation	N
NW	Not satisfied	43.00	.	1
	Very poor	20.40	10.691	5
	Poor	27.00	8.631	5
	Total	25.45	10.967	11
NE	Very poor	26.67	15.397	6
	Poor	25.00	18.601	5
	Total	25.91	16.053	11
	Poor	34.00	.	1
SE	Strong	27.78	13.917	9
	Very Strong	5.33	2.517	3
	Total	23.08	15.343	13
	Strong	29.00	16.543	7
SW	Very Strong	25.88	16.907	8
	Total	27.33	16.211	15
	Not satisfied	43.00	.	1
	Very poor	23.82	13.227	11
Total	Poor	26.73	13.229	11
	Strong	28.31	14.600	16
	Very Strong	20.27	17.129	11
	Total	25.50	14.577	50

Residents of New Eskan who lived in flats on the northwest and the northeast of blocks were not satisfied with natural lighting. But residents who lived on the southeast and the southwest of blocks were very satisfied with natural lighting. Participants were also asked; how much they were

satisfied with the quality of their flats, the answers were as follows: 22% very poor, 68% poor and 10% strong. Mean is 2.88 ([Table 11](#)). It can be deducted that the materials used in New Eskan are not good quality and are more commercial. Standard deviation is 0.558.

**Table 11:** Distribution of participants' (according to their education levels) answers related with their satisfaction on the quality of flats that they are living.

Education level	To what extent are you satisfied with the quality of the flat	Num. of respondents	Percentage (%)
High School	Strong	4	8
	poor	2	4
	Total	6	12.0
technical	poor	7	14
	Strong	1	2
	Total	8	16.0
bachelor	Very poor	10	20
	poor	23	46
	Total	35	66.0
Master	Very poor	1	2
	poor	1	2
	Total	2	4.0
PHD	poor	1	2
	Total	1	2.0
	Totally	50	100.0 %

The residents were asked about water in New Eskan in terms of quality and quantity. The answers were as follows: 36% poor, 60% strong and 4% very strong. Mean is 3.68 and standard deviation is 0.551. This ratio shows that most of the people were

satisfied with the water quality and quantity. According to the results of the questionnaire, all the respondents agreed that there are no emergency health services like clinics and pharmacies in New Eskan settlement. From the aesthetic point of view,



residents were asked how much they were satisfied with the exterior design of their building. The responses are presented as follows: 34% poor, 64% strong, 2% very strong, mean is 3.68, which means New Eskin residents are satisfied with the aesthetics of building facades. Standard deviation is 0.513.

The residents were asked if living in flats was in accordance with local customs and traditions. Answers were as follows: 2% unsuitable, 36% very poor and 62% poor. Mean is 2.60 and standard deviation is 0.535. These are low percentages and it reflects that this can be one of the reasons why Northern Iraq people do not prefer to live in apartment flats.

The residents of New Eskin were asked to what extent they were socially comfortable with living in flats. The responses were as follows: 40% not comfortable, 52% very poor, 42% poor and 2% strong. Mean is 2.42. This is a very small percentage, and this is another problem of living in the apartment. Standard deviation is 0.609.

Residents were asked about the degree of the social relationship with neighbors in the apartments.

The answers were as follows: 66% said neighbors' social relationship was absent and 34% said it was very poor. This is a very high percentage. The responses reflect that, the lack of social relationship with the neighbors can be another reason for the lack of desire to live in the apartments. However, it's well-known that in general, culturally, the residents of Northern Iraq have warm relations with their neighbors. Mean is 1.34 and the standard deviation is 0.479.

The residents were asked about their satisfaction with the spatial quality of common spaces in New Eskin. The answers were as follows: 82% not satisfied and 18% mentioned that it was very poor. These are very high percentages, meaning there is no common space in New Eskin. This is a big problem for the residences. The mean is 1.18 and standard deviation is 0.388.

Residents were asked if the following environmental/public health hazards were seen in New Eskin housing settlement. The results are in [Table 12](#).

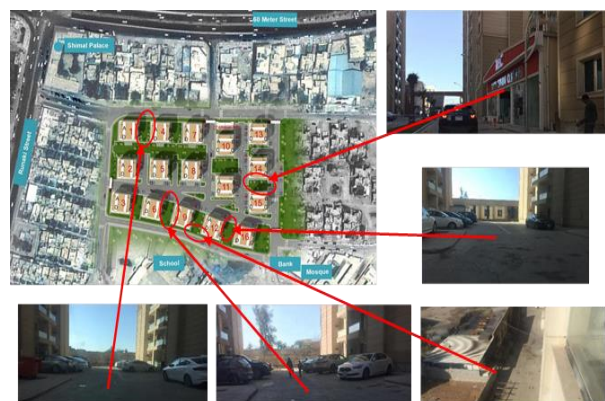
**Table 12:** Questionnaire findings about environmental/public health hazards

Health threats	Are there any threats?	Num. of respondents	Percentage (%)	Mean	St.Dev.
Abandoned buildings	Yes	1	2.0	2.00	0.202
	No	48	96.0		
	Unknown	1	2.0		
Business, factory or other entity that produces an excessive amount of noise	Yes	36	72.0	1.40	0.700
	No	8	16.0		
	Unknown	6	12.0		
Contaminated drinking water	Yes	21	42.0	2.58	0.499
	No	29	58.0		
	Unknown	0	0		
Excessive amount of traffic noise	Yes	36	72.0	1.28	0.454
	No	14	28.0		
	Unknown	0	0		
Smoke stack or other entity that is discharging smoke and/or pollutants	Yes	33	66.0	1.44	0.675
	No	12	24.0		
	Unknown	5	10.0		
Toxic materials	Yes	19	38.0	2.62	0.490
	No	31	62.0		
	Unknown	0	0		

Another question was about satisfaction with the green area of the New Eskin project. The answers were as follows: 84% not satisfied, 14% very poor and 2% poor. Mean is 1.18 which is small ratio, this means that there is no green area in New Eskin and this is the problem of the entire residences in New Eskin. This is because, although in the design phase small percentage of green area had been included on site plan developments, at the time of the implementation of the project it was not done ([Fig. 2](#)). In general, there is no green area, and this is a major problem for the population of Northern Iraq. Geographically, Northern Iraq is a mountainous region with a population that loves green areas. However, in the apartment life they do not have much green area and this makes them uncomfortable and unhappy. Standard deviation is 0.438.

Respondents were also asked about their satisfaction with the use of car parking spaces. Distribution of answers were; 2% very poor, 4%

poor, 74% strong and 20% very strong. This is a very high percentage. According to this questionnaire, the residents of New Eskin are very satisfied with the car parking area. The green area that was shown in the original project is also used as car parking area. The standard deviation is 0.558.



**Fig. 2:** Although green area organization is seen in master plan project, it's not applied in reality

Participants were asked how they feel about safety factors in case of fire. The answers were as follows: 16% poor, 76% strong, 8% very strong, and mean is 3.92. This is a high ratio. It means that to a large extent, the residents in New Esku are satisfied with safety factors in case of fire. Standard deviation is 0.48.

Participants were asked how much they were satisfied with the safety factors in case of earthquake. The distribution of answers are as follows; 58% poor, 38% strong and 4% very strong. This means that the residents in New Esku are confident in their apartment in terms of earthquake safety factors. Standard deviation is 0.579.

#### 4. Conclusion

This study is about the residential building in North Iraq and the reason why despite the presence of a large number of apartments, a large proportion of them remain empty. As described before, there is a relationship between user needs and the building system approach (Table 3). The questionnaire conducted on the New Esku settlement also fits these systems. The outcomes of the questionnaire are reflected in Table 13 along with their evaluation. The results were good in terms of the indoor dimensional standards for flats as referenced to urban housing standards of Iraq, UK and USA (RIMCH, 2010; Council, 2012; Ranson, 2002; Littlefield, 2012). On the other hand, the outdoor spaces standards were very weak, such as the lack of green area and no common space for people to meet. However, the New Esku residents were very satisfied with security.

Table 13 describes the New Esku housing settlement evaluations as a building system approach. In this study, the findings are based on the answers given to a prepared list of questions. According to the responses to the questions; the average age of residents in the apartments is 36.22, where 14% of the people were single and 66% of them were married. In terms of ownership of flats, 34% of the respondents were owners of their flats, whereas 66% of them were renting. They were satisfied with the floor on which the flat was located, and were satisfied with the heating and cooling systems.

One of the questions was "to what extent are you satisfied with the quality of the flat", and they replied that they were dissatisfied with the quality of the building due to the use of substandard materials and poor implementation of the project. By comparing the respondents' education level and the answers to "to what extent are you satisfied with the quality of the flat", it was concluded that those educated at a higher level were more dissatisfied with the quality of buildings compared to those with lower education levels. In answer to the question "to what extent do you feel safe in terms of security at New Esku", the residents were largely satisfied.

The results of the questionnaire can also be categorized as environmental (orientation, green area, ventilation, natural lighting and sound insulation, etc.), social (lack of public space, appropriate plan schemes for family life, etc.) and economical (flexible use, use of renewable energy, initial budget, etc.), as mentioned above.

The flat apartment units that are located in the northeast and northwest have very poor natural lighting due to their lacking natural lighting and the residents were therefore not satisfied. However, residents in flats located in southeast and southwest were satisfied with natural lighting to a large extent.

According to results of the questionnaire, it is clear that there are no green areas in New Esku and this is another reason for the dissatisfaction of the residents. As Northern Iraq is mountainous and there are generally many green areas in the region, the residents demand a certain amount of green space and this was not provided in the residential buildings. In terms of ventilation, the residents on the lower floors of the apartments (ground, first, second, third floors) were largely dissatisfied with the ventilation of their flats. In the flats on the lower floors, the air in the apartment is not easily changed, and the smell of the bathroom and kitchen as well as garbage from the upper floors can cause discomfort for residents in the lower floors.

In terms of sound, residents on the lower floors of the apartments (ground, first, second, third floors) were largely dissatisfied with the sound insulation of their flats. These flats that are on the lower floors have more load thus leading increased levels of noise. Furthermore, the sound isolation used in the apartments is not sufficient for the lower floors.

There are also social reasons why people in Northern Iraq do not like living in apartments. Social statistics indicate that the social relations are very weak in the apartments, and this does not correspond with the social life in Northern Iraq. Furthermore, there are either very limited or non-existent common spaces in the projects such as New Esku. This is a reason why social relations should be strengthened among the population in these settlements.

In many Northern Iraq settlement projects, common spaces are included in the original master plans, but at the time of implementation, they are either disregarded or the space is less than originally planned.

There are also economic reasons why people in northern Iraq do not prefer to live in apartments. The prices are generally very high and buying or renting an apartment is not very affordable, where the prices of a flat can sometimes be double of a detached house. This is the opposite of many countries around the world. Therefore, in this study it can also be deducted that "safety and security" is the main preference of choosing life in a gated community of Esku settlement.

**Table 13:** New eskan housing project description according to building system

1. The topography of the area to be designed site features,	In general, Erbil is a flat area with no slopes and the New Eskan project is in a flat location, with no slope.
2. The orientation of the building,	There is no specific orientation. Flats are oriented in different directions.
3. Compatibility with climate-wind-direction factors,	New Eskan settlement was designed as high rise buildings. Upper floors are ventilated better than lower floors.
4. Architectural texture features around the area to be designed,	The housing project is compatible with the buildings around it, and the materials used are not very different from the materials used in the neighboring buildings.
5. Cultural characteristics-characteristics of the society,	Plan schemes reflects the cultural features.
6. Building regulation and characteristics of the area to be designed	The residents need more green areas
7. A form of building aesthetics	High-rise building area as a rectangular prism.
8. Surface feature-color-texture,	All surfaces are as plaster colored
9. Building function-user requirements and building program,	Some of the New Eskan residents do not like the kitchen and bathroom facilities
10. Construction technique and construction features	Not satisfactory
11. Heating-cooling systems	Good but expensive to use
12. Heat-sound insulation properties,	Satisfaction in terms of thermal and acoustic comfort varies according to both the story level and orientation of the flat. New Eskan residents living on northeast and northwest side of the blocks are not satisfied with natural lighting, but residents living on the southeast and southwest of blocks are very satisfied with the natural lighting.
13. Natural-artificial lighting	Satisfactory.
14. Spatial feature-spatial standard	Satisfactory
15. Static properties- durability features	Satisfactory
16. Security fire, natural disasters, etc... features	Fire exits not acceptable
17. Flexible use-interchangeability-renewability	Some spaces has flexible use
18. Use of renewable energy-green energy	Some of the blocks are using renewable energy (solar cells).
19. Use of ecological materials	Generally, they used cement originated material or ceramics.
20. Budget initial construction and cost of maintenance	Two times more expensive than a detached house

## 5. Recommendations

Short-term recommendations: According to the answers given by the residents of New Eskan, they experience various problems such as lack of green areas, common spaces, ventilation, sound insulation, and orientation. To solve the problem of lacking green areas, it is recommended that the municipality implement regulations stipulating the required amount of green area according to the number of residents in the apartments and according to the international specifications for green areas, common areas and parking areas. This is necessary because contractors generally utilize the maximum area of the plot in order to increase their profits.

The municipality should follow up projects in detail at the time of implementation, so as to ensure that the green area and the common area specified in the residential projects are applied, because this is another problem in Northern Iraq in that the projects are not implemented according to the specifications of the master plan.

Medium-term recommendations: In the light of the answers given by the New Eskan residents, it is clear that there are some problems, such as poor sound isolation and ventilation. The system that is used to isolate sound is not adequate. It is recommended to improve and use other subjects for easy ventilation and the extraction of odor. Furthermore, there is a high level of dissatisfaction regarding the prices of electricity and services in

terms of electricity. It is recommended that solar energy should be used due to the large amount of energy consumption. By this way, dissatisfied residents of the apartments can be reduced. It is also recommended that used water can be recycled, which can produce large volumes of water at a low price.

Long-term recommendation: According to the answers given by the New Eskan residents, flats oriented to northeast and northwest are not getting natural daylight satisfactorily. In order to solve this problem, it is recommended that the municipality should establish regulations for the high-rise housings that are built. The regulation should stipulate that in the future, the design of the flats should be such that, each living space must be located in such an orientation that sufficient amount of sunlight must be provided. In terms of the quality of the building, the residents are generally dissatisfied. It is therefore recommended that the municipality monitor construction of buildings to ensure that they are constructed with good quality.

This study is limited with a POE survey only in New Eskan settlement in Erbil. However, it is also recommended that further research can be carried out on larger number of residential projects in a number of different cities in Northern Iraq. The questionnaire can be conducted with a larger number of apartment dwellers and other citizens who do not live in high rise apartments, to make comparison between the results that the most appropriate solution to these problems can be

reached. As a result of the study, this paper highlighted the important points where attention is needed in order to improve the performance of residential buildings and improve users' satisfaction with public housing projects in Iraq.

### Compliance with ethical standards

### Conflict of interest

The authors declare that they have no conflict of interest.

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