

Resilience and sustainability analysis of urban residential redevelopment projects: Al-Kadhimiya as a case study

Raed Fawzi Mohammed Ameen¹, Ali Raoof Hussain^{2*}, Kadhim Mohsin Ibrahim³

^{1,2,3}Department of Architecture, College of Engineering, University of Kerbala, Iraq

¹BRE Institute of Sustainable Engineering, Cardiff University, School of Engineering, Cardiff, United Kingdom

*Corresponding author E-mail: ali.raoof@uokerbala.edu.iq

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Abstract

Despite the rich heritage of Iraqi local architecture, there is a loss of architectural regional character of existing cities' urban design. Key research issues include employing this local architectural heritage in developing resilient and sustainable urban design. Many urban architectural attempts have emerged in the last decades to achieve the integration of modernity in urban development. It represents the gap between theoretical and practical application in this field, the loss and marginalization of this cultural and historical heritage can be traced back to the lack of clear strategies for urban development processes in the old cities such as Al-Kadhimiya, one of the important traditional and religious cities in Iraq. As well as the absence of an effective role for the decision-makers, architectural departments and bodies working in the urban development process. The Key indicators of urban resilience and sustainability were identified through an extensive review of the related studies. Followed by conducting a comprehensive questionnaire by selecting different segments of society (157 respondents). The questionnaire contains 15 indicators organized with questions. Respondents' perspectives were collected according to the 5-level Likert scale and demographic information. The analysis of the main component was used to organize the indicators according to comprehensive main groups, and three main components were identified: "urban structure and environment", "strategy and leadership" and the "social aspect". The results showed that security indicator is the most important among the indicators of resilience and urban sustainability, followed by the diversity indicator and the cultural creativity index respectively, while the social capital indicator received the least important indicators. The "contemporary scene" represents a confusing and unregulated phenomenon that is far from local or global.

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1. Introduction

Nowadays, due to the significant growth of urban areas compared to rural areas, many societies are facing crucial problems on a social, economic, as well as urban scale [1]. The steady increase in the urban population,

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which represented 10% of the world's population in 1900 A.D has continued [2]. Since 1950, with a higher level of urbanization, lack of resources, food insecurity, and other issues, the population percentage increased to reach 2.5 billion. The world population today is 8 billion, and it is expected that the proportion of those living in urban areas will rise to 68% by 2050 [3]. The importance of urbanization is highlighted by the significant effects on societies and economic and environmental issues, as it is directly related to economic development, improving infrastructure and services, as well as increasing job opportunities and health [4]. However, there are challenges and negative roles played by the rapid urbanization phenomenon, causing overpopulation, environmental pollution, and the possibility of the emergence of slums [5]. Urban areas continue to face current challenges such as increasing employment opportunities, food security, environmental challenges, climate change, and infrastructure services [6]. If addressed with appropriate tools, these challenges can lead to accumulations that are directly reflected in society. Therefore, the goals should be linked to the current conditions to prevent the accumulation of urban problems, leading to the achievement of a resilient and sustainable urban system capable of facing challenges more efficiently [7]. The expected effects of natural disasters, along with the impacts of urbanization and other influences on the city, can pose a major challenge to cities, primarily putting pressure on their core dimensions. Hence, cities must become smarter in dealing with such challenges, as resilience may be the best solution for improving the urban environment to face such disasters [8].

Resilience and urban sustainability, as concepts that emerged in the seventies of the last century in scientific research, are linked to ecosystems by [9], which is the continuation of ecosystems amidst changes and their ability to absorb change without radical transformation while maintaining the same relationships between populations or the state variables. That is, the ability of the system to absorb turbulence and undergo change while maintaining the same function and infrastructure of the system without crossing the threshold of a different system, i.e., staying on the system but with a different identity [10]. Resilience and urban sustainability require identifying probabilistic indicators of threats and disruptions that are likely to threaten the urban environment of historic centers [11], as well as the frequency and severity of such disruptions, while examining how the historic center can build and strengthen the ability to adapt and respond to such disruptions so that it remains within an effective and practical state [12].

Urban resilience and sustainability in front of two options, namely restoring the historical center to its previous state or following the best option, which is to reach a state of balance, where the center tries and in a state of balance to reach the natural situation through the resilience and sustainability of its structure, which works to accommodate the disasters it was exposed to [13], whether those natural or man-made disasters, where urban resilience adopts methods that would lead to reducing the vulnerability to injury or vulnerability by increasing the means of prevention, safety and the ability to Adaptation to disorders [14]. The rest of the research is organized as follows. A description of the study area (Kadhimiya) and a review of its urban development, followed by a review of the most important concepts in this paper, which are resilience, urban sustainability and access to commonalities between them, after that the strategies for urban development are reviewed depending on the previous two concepts and extract their common indicators, followed by the research methodology and review of the stages of the questionnaire and the analysis of the answers of community samples in a special program for this purpose, in addition to that, the main components were analyzed to control more on the indicators to finally reach the discussions and results to come up with the most important Conclusions of the paper.

2. Description of the study area

The city of Kadhimiya is located in the capital Baghdad, on the western part of the Tigris River as it is surrounded by a curvature on its eastern end when it enters the capital, which gives its location a good fertility and climate. As shown in Figure 1, the old city of Kadhimiya settles in an area that was surrounded by orchards on most of its sides, which is close to the Tigris River, and if fertile soil its general form is closer to the ring with a radius ranging from 350 to 500 meters, and it consists of shops (Dabbaghana, Tal Al-Qattana and Al-Shuyoukh), while the modern Kadhimiya, in addition to the traditional part, includes other larger shops. The

area is surrounded to the north by the Baghdad Gate, to the east by the Tigris River, to the west by the Baghdad-Mosul Railway, and to the south by Sheikh Junaid Street [15]. Al-Kadhimiya has four main entrances in four directions, as well as a network of roads and streets established to facilitate the movement of residents, visitors and expatriates, which are currently insufficient to increase the number of visitors during religious occasions and throughout the year. Those coming from the northern and southern governorates can enter the Kadhimiya area through the north gate of Baghdad, from the west through Al-Adl Street, Aden Square and Al-Shula Road, and from the south through the Karkh area, while those coming from the east pass through the Al-Adhamiya area through the bridges of Al-Sarafiyah, Adhamiya and Al-Ayima [16]. The area around the Holy Shrine consists of an architectural urban fabric containing models of old Baghdadi houses and buildings with narrow alleys and the style of their roofed markets. Due to the significant increase in visitor numbers, especially in recent decades, a plan was proposed to develop the urban area surrounding the shrines, which was implemented in phases starting in 2011. The development plan included the expansion of the pedestrian plaza surrounding the shrines as well as the surrounding area [17].

The development of the urban fabric surrounding the shrines went through three phases, the first phase included the near part of the shrines and the form of a complete ring surrounding them. This ring included what remained of the traditional urban fabric after large parts of it had been demolished to open additional streets to suit the new events outside this ring. The second phase involved the area after the first ring and also in a ring form. It contains a modern residential area and a number of craft and industrial activities interspersed with main streets that open towards the shrine for the movement of cars. As for the third and final phase, it came after the second ring, which is the farthest compared to its distance from the shrines, consisting of horizontal and vertical residential areas that pass through its new axis cars coming from the rest of Baghdad. During the development, not all users and their activities were taken into account, as the effectiveness of the visit was considered the main pillar of the development of Kadhimiya, this led to the lack of flexibility and urban sustainability for the local population and their homes [18].



Figure 1. (A) Planning the old city of Al-Kadhimiya, (B) Planning the old city of Al-Kadhimiya after development

3. Urban resilience and sustainability

Cities were governed by traditional regulation, represented by building codes and zoning legislation, often implemented and enforced by governments first by city governments, then by national governments. This approach has reasonably worked to ensure a safe and healthy built environment, but not so much to address climate change mitigation (urban sustainability) and adaptation (urban resilience) at the city level [19]. The Cities are also considered unsustainable sources of resource consumption and waste production, including greenhouse gases, and major contributors to climate change. At the same time, cities are highly vulnerable to climate change risks, such as extreme weather events. Traditional solutions are often unable to address these risks, taking time to develop, implement and achieve their impacts. Governments around the world have been experimenting with new regulatory and governance tools for urban sustainability and resilience [20]. Reference [21] considers that urbanization and urban areas have profoundly changed the relationship between society and

the environment, affecting the sustainability and resilience of cities in complex ways at alarming rates. Over the past decades, sustainability and resilience have become key concepts aimed at understanding current urban dynamics and responding to the challenges of creating a livable urban future. As part of their natural growth and development, cities face many changes in their urban fabric over time, both from their visible aspects represented by external forces, which include the influences that form the shape of the building in the urban fabric without the will of society) and their invisible aspects represented by internal forces, which include (way of life and social structure.... etc.). The city is also believed to be a living organism founded on two levels: the first, the natural form of the urban fabric, which constitutes the city's identity, history and record of civilization, and the second, it represents the intervention of architects over time, as he referred to in his theory, "The city is a giant organism made by man [22].

According to that the idea of change in the historical urban fabric can be dealt with by understanding the term (permanence or perseverance) that has been used in urban design directly, theories refer to the role of permanent structures and elements in determining the identity of the region or city, despite the amount of changes that occur in the fabric of the city, there are still some architectural styles and elements that are looking to present possibilities in the future because they "are the creative and vital forces behind the construction of the city"[23]. The traditional areas in city centers are the complex system with the most integrated relationships between all its parts, components and elements, which have faced many aspects of transformation over time [24], Returned the reason to the existence of the property of resilience that extends in all parts of the traditional urban system at several levels, that is, resilience systems are those that absorb all disturbances by transforming or redefining themselves structurally and maintaining all values, relationships and meanings, and this proves that all city centers, it is based on building blocks which in turn have allowed cities to operate through time despite all the circumstances and changes [25].

The main goals of resilience are to reduce the effects of disruptions and traumas, a characteristic at the core of an urban system, yet all the differences in its definitions lie in actions and disturbances, that is, if the system can endure, maintain, support, persevere, resist, assimilate, survive, reorganize, adapt, recover, respond, transform, and confront system disruptions that cause disturbances that affect the functioning of the system [26].

4. Overview of sustainable and resilient urban development strategies

Government institutions and urban communities with the right vision, strategies and plans to mitigate threats and enhance the resilience and sustainability of their urban structure are able to adapt to future threats and risks at the lowest cost. therefore, after an intensive review of previous studies, 15 common indicators between resilience and sustainability were selected to identify how to enhance the concept within the urban structure, as shown in Table 1.

Table 1. Common indicators between resilience and urban sustainability based on extensive reviews of literature review

Indicators	Scope and limits of influence in urban design
Diversity	Functional diversity [27]. Diversity of sizes and patterns of land plots, diversity of social services, diversity of land tenure [28].
How difficult it is to change land use?	Balanced distribution of services and infrastructure [29]. Sustainable development in the development of the urban system must take into account past land-use patterns [30].
Multiple Modular Event Centers	Stereotyped multi-center urban structure [31]. Multi-center urban form [32].
Percentage of residents in the city Centre	High population density, prevalence and urban growth [32]. Population-cantered urban planning in the city center promotes social cohesion [33].
Percentage of public places	The presence of public places improves the quality of life [34]. Green spaces help reduce pollution and improve air quality [35].

Indicators	Scope and limits of influence in urban design
Multifunctional land use	Reduce the need for mobility [35]. Providing local services in residential areas [36].
Pedestrian markets	Provide spaces for social and cultural interaction [37]. Preserving the cultural and historical identity of the city [38].
Preservation of historic buildings	The preservation of historic buildings enhances the attractiveness of the city to tourists [39]. Integrating heritage with urban development strategies enhances the resilience and sustainability of cities [40].
Environmentally friendly transportation	Reduce gas emissions and improve air quality in urban areas [35]. Reduce traffic congestion in crowded city centers [41].
Urban Green Spaces	Promote social cohesion [42]. Improving adaptability to climate change [34].
Emergency Response	Improve the capacity to deal with health crises and reduce their impact on the population [43]. Spatial distribution of infrastructure [44].
Big Data Collection	Data analysis to understand population behavior patterns and needs [45].
Social Capital	Building more cohesive and collaborative societies [46]. Small places with defined boundaries [47].
Cultural Creativity	Preserving the cultural and architectural heritage of cities [47]. Provide platforms for interaction and communication between different segments of society [48].
Security	The impact of societal behaviors [49]. Combating crime and security threats [49].

5. Research methodology

After collecting indicators from the literature review, a questionnaire containing 15 items was conducted, to study the real indicators affecting making urban design sustainable and resilient. A comprehensive survey of the study area was conducted, because the questionnaire represents one of the best ways to collect data and give an accurate perception of the spread of variables [50], Statistical analysis of the data was used to take the perceptions of the relevant authorities in the study area in order to prove the reliability of the survey data.

5.1. Phases of the questionnaire

Phase I: 15 indicators shared between sustainability and resilience in urban development strategies were identified, based on extensive literature reviews. The review is particularly aimed at the challenges faced by the historic centers of the ancient Arab city.

Phase 2: One of the researchers visited the study area, as well as communicating with the relevant authorities from official institutions such as municipalities and investment, as well as communicating via mobile phone, social networks and development files of the designed company, and meeting with stakeholders in the study area.

Phase 3: From the previous two phases, a draft questionnaire was prepared in Arabic based on the above indicators, and the draft was presented to specialists to determine the comprehensiveness of the indicators as well as the correlation of the questionnaire questions with each other and the length of the questionnaire. After careful review, a sample of 165 person was selected, represented by engineers, city planners, university professors and concerned citizens.

Phase 4: After preparing the questionnaire in its final form, including 15 questions, the questionnaire was distributed manually by one of the researchers, and each research sample was interviewed face to face, as this process allows clarifying the points of the questionnaire more to the recipient. The research used a 5-point Likert scale (5 unimportant – 4 little – 3 somewhat important – 2 important – 1 very important) to assess the perceptions

of the study sample in relation to the questionnaire questions. Personal information of samples, their ages, educational qualifications and places of work was included.

5.2. Survey participants

The sample of the participants in the survey was elected from various fields interested in the development of the study area, the area surrounding the Holy shrines was chosen in the center of the old city in Kadhimiya, citizens were informed of the participants in the questionnaire that the condition has completed 18 years of age and that their personal information will remain confidential.

5.3. Data analysis

The data taken from the questionnaire was placed in SPSS 26 on Windows 11 to analysis statistical data, as the descriptive statistics of indicators were calculated as well as scale frequencies, response ratios and standard deviations (SD). The Cronbach alpha coefficient (α) was used to assess the reliability of internal consistency and mean correlation of questionnaire items. Many studies have shown that ($\alpha = 0.7$ is the acceptable reliability threshold [51], to ensure the adequacy of the size of the selected sample, it was confirmed using the Kaiser-mylar scale (KMO).

5.4. Demographics of respondents

A total of 165 questionnaire forms were distributed, and personal interviews were conducted with each participant. Out of these, 157 valid responses were received, while 8 questionnaires were excluded for not meeting the required conditions. The demographic summary of the participants revealed that 72.0% were male and 28.0% were female. In terms of age, the largest group, making up 36.9% of respondents, was between 25 and 30 years old, as shown in Figure 2, which depicts the highest participation rate. Conversely, the age group of 51-55 years old had the lowest participation rate at just 4.5%.

The descriptive analysis of sustainability and resilience indicators is presented in Table 2. This table shows the response ratio for each indicator based on the questionnaire responses using a 5-point Likert scale. The mean, mode, and standard deviations for each indicator were calculated, and they are listed in ascending order by mean. The questionnaire included indicators related to mixed land use and the percentage of residents living in the city center. These questions were designed to compare urban standards with the opinions of respondents from various segments of the population.

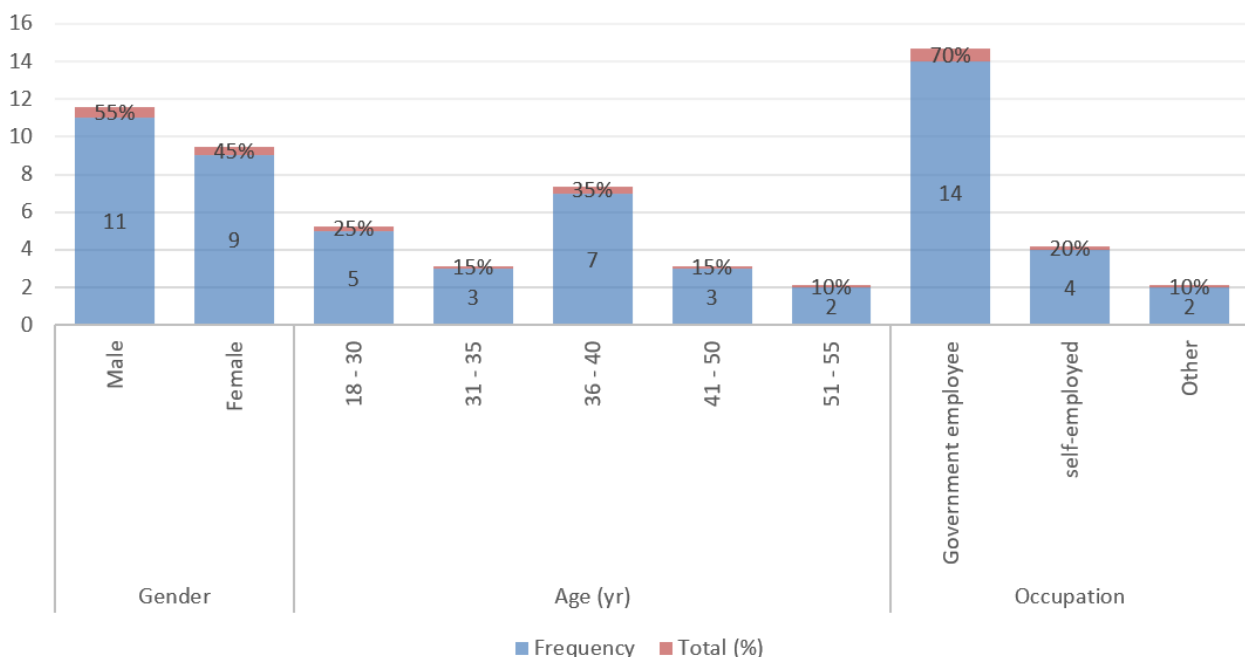


Figure 2. Background factors of the respondents

Table 2. Descriptive analysis of the survey items

Items	Response %					Mean	Mode	S.D
	1	2	3	4	5			
Security	59.2	22.3	12.7	3.2	2.5	1.68	1	0.989
Diversity	58.9	30.3	7.5	2.2	1.3	1.71	1	0.809
Cultural creativity	39.2	36.3	20.7	2.5	1.3	1.91	1	0.901
Emergency response	51.3	24.8	6.7	14.7	2.5	1.92	2	0.768
Mixed land use	52.5	23.8	14.1	6.4	3.2	1.96	2	0.865
Big data collection	38.9	32.5	17.8	3.7	7.1	2.14	2	1.129
Green spaces	65.6	12.1	12.1	3.8	6.4	2.27	2	0.95
Presence of pedestrian markets	40.1	32.5	14.6	7.6	5.1	2.69	2	0.985
Preservation of historical buildings	45.8	28.1	10.8	12.7	2.5	2.82	3	1.028
Land use change	23.6	19.8	11.5	14.6	30.4	2.94	4	1.367
Presence of public spaces	33.1	10.2	16.4	26.1	14.2	3.04	3	1.29
Multiple centers with organized activities	45.6	22.7	6.8	17.8	7.1	3.09	3	1.028
Percentage of residents in the city center > 5%	5.7	30.6	32.5	23.6	7.6	3.11	3	1.035
Environmentally friendly transportation	44.6	22.3	26.1	2.5	4.5	3.26	4	0.942
Social capital	42.7	22.2	2.5	5.1	27.4	3.68	3	1.014

Notes: *Reverse encoding was used to analyses data logically and consistently.

*Response scales are as follows:

5. Unimportant; 4. Of little importance; 3. Moderately important; 2. Important; 1. Very important

*1 to 2.5: represents a high significance or agreement.

2.6 to 3.5: Represents neutrality.

3.6 to 5: Represents lack of importance or weak agreement.

5.5. Principal component analysis (PCA)

It is a mathematical technique used to determine the basic structure that characterizes a set of related variables [52]. The analysis of the main components was carried out on 15 items as shown in Table 2. After that, the orthogonal (Varimax) analysis was perpendicular to extract, where three basic components were extracted that include 15 items of the questionnaire: urban and environmental structure, strategy and leadership, and the social aspect. An initial analysis was performed to obtain the eigenvalues of each component according to the Kaiser criterion with a value greater than 1. as shown in Table 3, The eigenvalues of the three components ranged from 8,121 with 1,898 for the second component and 1,634 for the third component, which is the lowest value. The loading amount of the elements, the percentage of variation and the amount of eigenvalue for each indicator were also determined. The adequacy of sampling was also verified by the Kaiser scale, as the scale was achieved with a magnitude of 0.846, indicating that the resolution variables are suitable for analysis. The total variance of the three components (56,647) was extracted. The first component included 10 indicators with a contrast ratio of (22,115), the second component included 2 indicators, represented by a contrast ratio of (17,812), and the last component included 3 indicators with a contrast ratio of (16,720).

Table 3. Rotated component matrix of the survey items

Items	Component		
	Urban structure & environment	Strategy & leadership	Social aspect
Diversity	0.796	*	*
Land use change	0.712	*	*
Percentage of residents in the city center > 5%	0.805	*	*
Multiple centres with organized activities	0.645	*	*
Mixed land use	0.865	*	*
Presence of public spaces	0.708	*	*
Presence of pedestrian markets	0.827	*	*
Preservation of historical buildings	0.768	*	*
Environmentally friendly transportation	0.789	*	*

Items	Component		
	Urban structure & environment	Strategy & leadership	Social aspect
Green spaces	0.641	*	*
Emergency response	*	0.662	*
Big data collection	*	0.647	*
Social capital	*	*	0.607
Cultural creativity	*	*	0.756
Security	*	*	0.611
Cronbach's alpha coefficient	0.769		
Eigenvalues	8.121	1.898	1.634
Percentage of explained variance (56.647)	22.115	17.812	16.72

5.5.1. Urban and environmental structure

Healthy urban systems are systems that create functional diversity within their urban structure, this diversity is essential rather than forced because unregulated land-use change leads to a major disruption of the urban system, due to current and potential future reactions to some threats, and [29], as well as the difficulty of changing the urban system is incorrect, because both are required and essential to achieving sustainable and resilient conditions. Therefore, it is necessary to move to another solution through which the urban system can be preserved from collapse when part of it is exposed to direct threats, which is to create multiple typical centers for events within urban agglomerations [31]. Each center has a degree of internal cohesion and poor communication with other centers to ensure that they do not affect each other in a way that leads to their complete collapse [32]. Which affects the percentage of residents and gradually collapses because their presence ensures a healthy biocenter on which the rest of the daily activities, whether service or cultural activities, depend. On the other hand, public spaces play an important role in social communication between people, as they have special features that show that they are a common area for many people. The existence of multifunctional land use is necessary and economical; it determines the integration of urban activities with each other and is an indicator of the transition of urban structure to a resilient and sustainable structure [35].

The presence of pedestrian markets is often associated with a significant reduction in noise, pollution and accidents with an increase in retail sales and an increase in local property values [37]. As it is considered one of the events within the city's historical fabric, in conjunction with historic buildings that express the memory of the place and that must be preserved because it has the cultural value that gives resilience and sustainability to the urban structure. Reducing the number of cars and relying on environmentally friendly means of transportation is critical to improving air quality, health and vitality of life at the same time. while enhancing urban green spaces in this aspect in addition to its other function in the possibility of adapting them to be places for social interaction and adapting them to support a healthy, sustainable and resilient future.

5.5.2. Strategy and leadership

Disaster management planning represents an important stage for the transformation of the urban environment into a resilient environment, as it significantly and directly affects the way an emergency situation is managed, and emergency response is one of the pillars of future development in sustainable societies [53], and is a critical part of the disaster management process that includes frequent assessment, planning and periodic review. It directly relies on big data aggregation processes to respond immediately to future problems [54], as this process enables the extraction of good insights that allow those responsible to make decisions and better manage performance.

5.5.3. Social aspect

Social capital based on trust and norms is an important element for building resilient systems [55]. As civil society institutions are able to promote cooperation in society, which in turn leads to greater trust among its members to reach greater justice and resilience. According to the National Research Council's Disaster Research

Committee, Social capital is an essential element of society's resilience to effectively cope with disasters and reduce conflict. Cultural creativity shapes people's behaviors and interactions [56], and provides a complex framework of practices at the level of individuals and groups, which in turn support the sustainability and resilience of society. The availability of security and safety for communities is also essential for sustainable systems to reduce current and future risks to the urban system [49].

6. Results and discussions

Specialists and residents of the Kadhimiya area are the closest to the problems of the urban fabric after development, and their perceptions and opinions about the area are reflected more credibly due to their direct or indirect contact with its daily activities. In this paper, 15 indicators affecting the sustainability and resilience of urban systems were studied. The importance of these indicators was ranked according to the mean value of the few scores for each indicator, which mean from 1.68 to 3.68 on 5 degrees inverted of the Likert scale. Among the sustainable and resilient urban indicators as shown in Figure 3, the "security" means "1.68" was ranked as the most important indicator of the sustainability and resilience of the urban environment. Followed by "diversity" mean "1.71" While the "Cultural Creativity" indicator came in third place with mean "1.91" and in fourth place came the "Emergency Response" indicator with mean "1.92". On the other hand, the "Social Capital" indicator obtained mean "3.68" as the least important among the value of the indicators analysis, including the indicators of "percentage of residents in the city center" mean "3.11" and "environmentally friendly transportation" mean "3.26" ranked second and third in the least important indicators for the results.

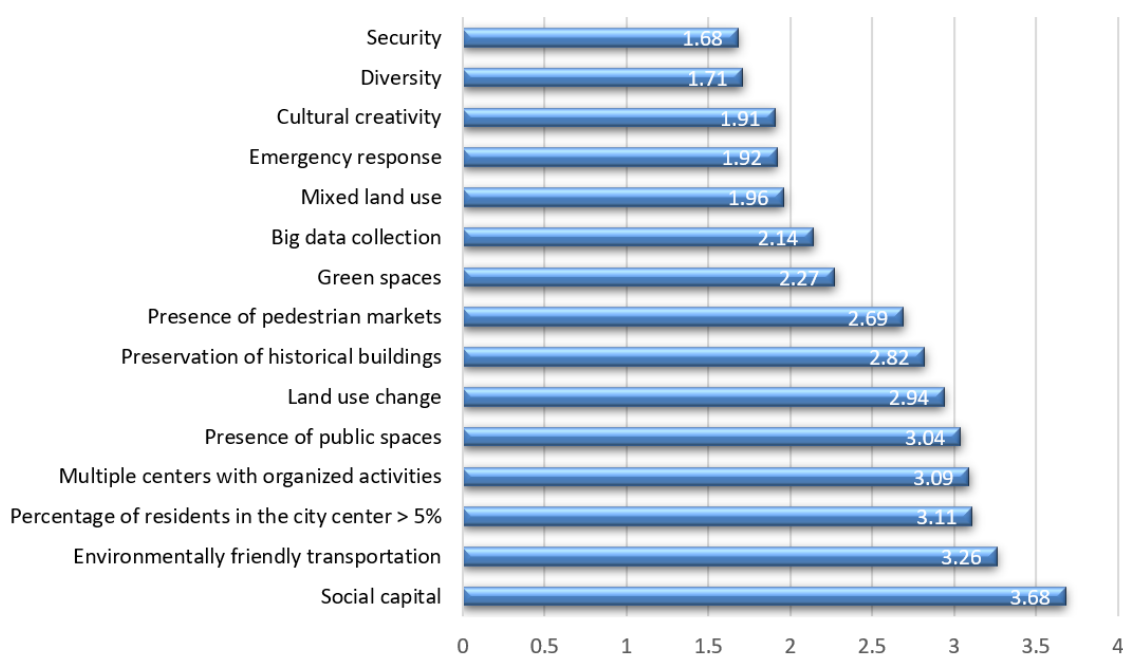


Figure 3. (Mean) The importance of indicators according to respondents (ascending order)

The results indicate that the people of the Kadhimiya area and specialists in studying its urban environment have an increasing concern about many indicators that have not been achieved in their urban environment after development, such as security, diversity at its levels, cultural creativity, emergency response, as well as mixed land use, in addition to other indicators. These findings coincided with the results of previous studies and research papers reviewed on resilient and sustainable urban development strategies. The results showed the urban threats to the residents of the region after development, as there is a need for security at all levels. It is important to rely on all measures that preserve people and property, such as explosive detectors, inspection vehicles, control points and continuous control rooms, and to harness all capabilities to establish security in the area without affecting other functions in the region. At the same time, the diversity of systems in cities and historic areas is important because with increasing diversity comes the increasing ability to thrive, survive and

bounce back from external shocks and pressures. The diversity of systems reduces the potential negative impact of the city from the failure of any specific system within it [57].

Therefore, specialists and residents in the region identified the need for diversity of systems within the city of Kadhimiya, as the results of the questionnaire showed awareness of the importance of diversity at all levels, which the region loses due to neglect by those in charge. Equally important, cultural creativity contributes to the cohesion of society by strengthening the cultural identity represented by preserving historical buildings and providing artistic events to serve as platforms for communication between all members of society [56]. It also contributes to the development of creative solutions to urban challenges that can design a resilient and sustainable area that can adapt to changes [58].

In the city of Kadhimiya, cultural creativity is one of the threats facing society. According to respondents, the new development of the area did not take into account the presence of places for cultural and artistic events, so residents of the area had to go outside the city to participate in such events after they existed in the area. These activities must be taken into account in development strategies in order for the region to have sustainable and resilient dimensions. It is worth noting that the other indicators that have been extracted from the previous literature review are as important as these indicators, with 14 out of 15 indicators of high importance for respondents and considering them to be non-existent in urban development or present but insufficient. These responses confirm that the urban development process that took place in the city of Kadhimiya followed incorrect strategies, as the contemporary landscape of the region represents a confusing and unorganized phenomenon that is far from local or global, and cannot be described as architectural.

7. Conclusions and recommendations

The study showed that the relationship between resilience and urban sustainability is a positive step towards reaching designs that are able to withstand current and future challenges with the least damage. The study showed that "security" is the most influential indicator of the rest of the indicators, which may result due to the terrorist attacks that the region was exposed to in addition to the lack of a sufficient number of checkpoints in the vicinity of the area. On the other hand, the research showed sustainable and resilient indicators to develop a comprehensive framework for urban development processes in historic centers.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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Ethical approval statement

Our institution does not require research ethics approval for reporting individual cases or case series.

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