Architecture
Image Studies

Vol.6, Issue 3, pp.1700-1709, 2025
DOI: https://doi.org/10.62754/ais.v6i3.509

https://journals.ap2.pt/index.php/ais/index

Compatible and Incompatible Uses of Mixed Land Use within the Framework of Achieving Urban Resilience: A Case Study of Al-Yarmouk District in Baghdad

Ruqaya Jawad Khamat[1], Ihsan Sabah Hadi[2]

Abstract

Urban resilience is an essential tool for addressing the challenges of urban growth and land use diversity in cities, as it aims to enhance the ability of urban areas to adapt to environmental, social, and economic changes. This study focuses on compatible and incompatible mixed land uses in the Yarmouk area of Baghdad, with the aim of analyzing the impact of land use distribution on urban resilience and resident satisfaction. The research used a descriptive analytical approach, employing field surveys, direct observation, and secondary data to classify uses and determine levels of compatibility and incompatibility. The results showed that residential, service, educational, health, and recreational uses are largely compatible, which enhances the functional integration of the area and increases the ability of its residents to adapt to urban changes. In contrast, industrial uses showed clear incompatibility with housing and education, requiring planning to locate them away from residential areas to reduce functional conflicts. The survey also indicated residents' satisfaction with the proximity of markets and educational services, while noting their discomfort with the presence of some incompatible activities such as hospitals next to their homes, and the need to enhance green spaces. The study emphasizes that achieving urban flexibility depends on managing compatible uses and reducing functional incompatibility, using tools such as compatibility and incompatibility matrices to guide urban planning. The recommendations point to the importance of smart planning for mixed-use areas, increasing recreational spaces, and community participation in decision-making to ensure an integrated and sustainable urban environment.

Keywords: *Urban flexibility, mixed land uses, compatible uses, incompatible uses, sustainable urban planning.*

Introduction

Mixed land use is one of the most prominent modern concepts in urban planning, as it allows for functional diversity in cities, which contributes to improving their sustainability and enhancing their urban attractiveness. However, this diversity does not always have positive effects, as different uses can give rise to compatible relationships that enhance urban resilience or incompatible relationships that lead to difficulties in managing urban growth and achieving a balance between urban functions.

Urban resilience focuses on the ability of cities to adapt to economic, social, and environmental changes, which is directly influenced by the pattern and harmony of urban land use distribution. While compatible uses contribute to positive interactions between different activities and facilitate access to services, incompatible uses can lead to functional imbalances andincreased planning costs and negatively impact the quality of urban life.

Despite the growing prevalence of the idea of mixed land uses in urban planning, there is a clear lack of understanding of the relationship between these uses and the ability of cities to achieve urban resilience. While some studies indicate that compatible uses contribute to enhancing functional balance and improving adaptation to economic and social changes, other studies indicate that incompatible uses can lead to difficulties in managing urban growth, increased planning costs, and a decline in the quality of the urban environment.

[1] Center for Urban and Regional Planning, University of Baghdad, Iraq. roqia.jawad2200m@iurp.uobaghdad.edu.iq (corresponding author).
[2] Center for Urban and Regional Planning, University of Baghdad, Iraq. dr.ehsan@iurp.uobaghdad.edu.iq

The main problem lies in the absence of a clear conceptual framework that defines how to classify mixed uses as compatible or incompatible, and the impact of each type on enhancing or weakening urban resilience.

This research aims to study the classification of mixed land uses into compatible and incompatible and analyze the characteristics of each type and its impact on urban resilience.

The research used a comparative approach to study the comparisons between compatible and incompatible mixed land uses, in addition to analyzing the theoretical frameworks of urban resilience. It also relied on a review of recent scientific literature and sources related to mixed uses and the classification of uses into compatible and incompatible according to planning criteria..

The first axis: compatible land uses

"Compatible land uses" is one of the basic concepts in sustainable urban planning, referring to the integrated organization of land uses in urban or rural areas in a way that ensures harmony and consistency between different activities in the same place. This idea is based on the premise that different land uses—such as housing, commerce, industry, public services, agriculture, and recreation—can share the same space, provided that their coexistence does not lead to a deterioration in quality of life or functional conflict between those uses.

It combines different land uses and organizes them in a desirable pattern. Urban compatibility can be applied for the following reasons: (Janan Marzouk Flih, 2013, p. 24)

a. Land can be used for several purposes

b. Land is a limited resource in specific areas

c. There is competition between mixed uses

Inappropriate uses are as follows. (T,williom, 1979, p. 61)

1. Inappropriate uses contain appropriate buildings
2. Compatible uses containing incompatible structures.
3. Inappropriate uses containing appropriate buildings.

The essence of this concept lies in providing a flexible urban environment that combines diverse functions in a way that contributes to reducing the need for long commutes, improving land use efficiency, and providing basic services close to places of residence and work, which has a positive impact on society, the economy, and the environment.

Table (1) Examples of compatible land uses

Main type of use	Compatible uses	Benefits
Residential	Light commercial (shops, cafes, services)	Easy access to services and reduced need for transportation
Residential	Schools, parks, community facilities	Supporting family stability and promoting social life
Commercial	Parking, public transportation, service facilities	Supporting commercial activity and increasing demand
Light industrial	Residential, commercial (within specified ranges)	Create local jobs and reduce commuting
Agricultural	Eco-tourism, rural housing	Supporting the local economy and preserving the environment

First: Characteristics of compatible land uses:

- Reducing visual and noise pollution.
- Supporting environmental and economic sustainability.
- Increasing infrastructure efficiency.
- Improving the quality of life for residents.
- Creating interconnected and functionally integrated communities.

Second: The importance of compatible land uses in urban planning:

1. Achieving functional integration
2. Promoting environmental sustainability
3. Supporting local economic activity
4. Increasing infrastructure efficiency

The second axis: incompatible land uses

Conflicting land uses are defined as activities or uses that, when adjacent or overlapping within the urban environment, give rise to functional, environmental, visual, or even social conflicts, negatively affecting the quality of life in the city. These conflicts often arise as a result of the absence or weakness of land use regulation in structural and detailed plans, or due to unplanned and random expansion. The most prominent examples of this are the presence of heavy industrial facilities alongside residential or commercial areas, or noisy recreational activities near educational or health facilities (Al-Maliki, 2007, p. 12).

First: The negative effects of incompatible land uses

The overlap of incompatible land uses results in many negative effects, most notably environmental pollution (both air and noise), declining property values, deterioration of public health, weakened functional efficiency of urban areas, and complicated traffic and mobility patterns. These uses can also lead to social problems, including internal migration or displacement of residents from affected areas. These effects have become particularly noticeable in many Iraqi cities, such as Baghdad and Basra. (Mahdi and Nasr, 2020, p. 43)

Inappropriate uses reduce land value, disrupt residents' comfort, and affect the environment of the area where these uses are located, as well as the architectural fabric of the entire city. (David Massey, p. 48).

In residential areas, there are some inappropriate uses, such as craft shops and some commercial shops that are not closely related to the area. They are located in residential areas but cause serious harm to the residents of those areas, such as environmental pollution (air and noise), as well as the loading and unloading of goods in stores and warehouses located near main streets, which causes traffic congestion on those streets, especially in areas close to the city center. There is also a mix of inappropriate uses in buildings originally intended for residential purposes, such as offices and workshops, as one floor of a building is used for a different purpose than the floor above it, such as shops of various kinds, casinos, car repair shops, and blacksmith workshops. on the ground floor of the building and, in some cases, the first floor of some buildings is occupied by small factories, workshops, and commercial offices, while the other floors are occupied by medical clinics or offices for lawyers, engineers, and commercial offices, and the other floors are occupied by residential apartments. (Haider Abdul Razzaq Kamouna, 1996, p. 125)

Second: Mixed-use land use standards

The concept of mixed land use has undergone remarkable development in recent decades as one of the modern planning trends aimed at enhancing the effectiveness of the urban system and achieving a balance between the different functions of the city. This type of use comes as a response to the challenges posed by traditional patterns based on strict separation between uses, which often result in problems related to traffic congestion, poor quality of life, and a lack of economic and social efficiency in urban areas (Jacobs, 1961, p143.).

Achieving successful and effective mixed use does not happen randomly, but requires the adoption of a set of planning criteria that ensure integration between urban functions and efficient land use, while preserving urban identity and social and environmental harmony. These standards serve as a reference tool for planners and those involved in urban development to ensure that the integration of different uses is based on sound scientific principles, rather than merely a temporary response to market shifts or development pressures (Talen, 2012, p89.).

Hence the importance of defining mixed-use land use criteria, which include various dimensions such as density, functional integration, accessibility, design flexibility, environmental compatibility, and others, as fundamental pillars that guide the planning process and support the ability of cities to

transform and adapt to future changes, thereby enhancing their urban resilience and sustainability (UN-Habitat, 2020, p57.). As shown in Figure 1, the criteria for mixed land use

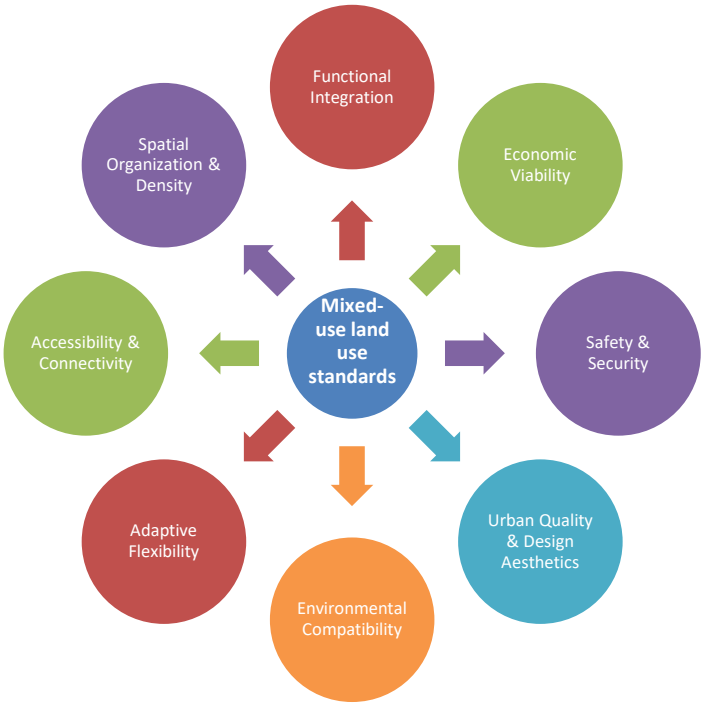

Figure (1) illustrates the criteria for mixed land use

Criterion 1: Functional Integration

Functional integration is one of the most important pillars of contemporary urban planning. It refers to the organization and distribution of various urban activities—residential, commercial, service, cultural, and recreational—in a single urban space in a harmonious and interconnected manner, allowing them to overlap and interact to achieve efficiency and sustainability. This integration does not only mean the physical proximity of functions, but also refers to the existence of dynamic functional relationships that lead to the formation of vibrant, multi-use urban environments (Calthorpe, 1993, p. 56).

Criterion 2: Spatial Organization & Density

Spatial organization is one of the most important criteria determining the quality and efficiency of mixed-use land, as it refers to the thoughtful distribution of different functions and activities within a given area so that harmony between different uses is achieved and conflicts or incompatibilities between them are reduced. Good spatial organization helps improve access to services and facilities and contributes to enhancing urban sustainability through better land use and reduced land loss (Saleh et al., 2017, p. 45).

Criterion 3: Accessibility and Connectivity

Accessibility and connectivity are fundamental pillars that determine the effectiveness and sustainability of mixed-use land in urban environments. This criterion refers to the ability of individuals to easily access and move around to various activities and services, whether by walking, using public transportation, or private transportation. Where , interconnected and diverse transportation networks contribute to reducing travel time, enhancing quality of life, and reducing emissions from transportation (Litman, 2017, p. 45)

Criterion 4: Adaptive Flexibility

Adaptive flexibility is a core concept in modern urban planning, referring to the ability of urban areas to adapt to economic, social, environmental, and technological changes without losing their functional efficiency or urban quality (Ahern, 2016, p. 115). This capacity is evident in the design of flexible urban spaces that allow for rapid and effective changes in use, reducing the need for comprehensive replanning or major structural modifications (Meerow et al., 2016, p. 42).

Criterion 5: Environmental Compatibility

Environmental compatibility is a key criterion in the assessment of mixed-use land, as it focuses on the extent to which urban activities can coexist with the natural environment without causing significant environmental damage. This criterion includes consideration of reducing harmful emissions, managing natural resources efficiently, preserving biodiversity, and improving air and water quality (Beatley, 2016, p. 150).

Criterion 6: Urban Quality & Design Aesthetics

Urban quality and design aesthetics are vital criteria in the development of mixed-use land, as they directly affect the comfort of residents and enhance the identity and attractiveness of the place. Urban quality encompasses multiple elements such as the design of public spaces, the balance of buildings and green spaces, the quality of infrastructure, and the integration of visual and functional elements that create a comfortable and attractive urban environment (Montgomery, 2016, p. 134).

Criterion 7: Safety and Security

Safety and security are fundamental criteria in the design of mixed-use developments, as they play a vital role in ensuring a stable and attractive living environment for residents and visitors. This criterion includes reducing the risks associated with crime, traffic accidents, and natural disasters, while providing environments that encourage social and economic activity (Newman, 2016, p. 142).

Criterion 8: Economic Viability

Economic viability is a decisive factor in the success of mixed-use land, as it focuses on the urban project's ability to generate sustainable financial returns that support continuity and the development of infrastructure and services. Economic viability depends on an in-depth study of development costs versus the economic benefits resulting from diversity of uses and increased economic activity within the area (Bullen & Love, 2017, p. 210).

Third: Methods for achieving mixed land use

Achieving mixed land use requires the adoption of a set of planning and organizational methods that integrate residential, commercial, recreational, and institutional uses within an integrated urban environment. The following are the most prominent of these methods:

1. **Residential-commercial:**

This type of mixed use refers to buildings consisting of two to three floors, where the upper floors are reserved for residential units, while the ground floor is used for commercial purposes. These buildings often overlook main streets, making them easily accessible to pedestrians and promoting urban interaction.

2. **Urban residential-commercial buildings (multi-story buildings)**

These buildings are primarily residential, but include active commercial or civic uses on the lower floors, especially the ground floor. This type of high-density urban development is an effective way to support commercial activities such as retail, while providing attractive storefronts for pedestrians.

3. **Live-work:**

This type of vertically mixed use involves allowing residents to run small businesses or offices within the same building in which they live, usually on the ground floor. This model aims to reduce the need for commuting by combining living and working spaces, as well as providing local services and goods to the building's residents themselves.

4. **Light industry:**

This type of development allows for the creation of small workshops within the residential building itself, either vertically (using different floors) or horizontally (by allocating part of the building to workshops). This strategy contributes to supporting small businesses and reducing living costs by combining housing and work in one place.

5. **Separate area with an independent shopping center:**

This model is based on grouping commercial uses within a separate neighborhood that contains an independent shopping center, and its success depends on the presence of a large number of

residential units that support this center. This model provides access to goods and services on foot for a number of residents, and enables a larger number of them to access it by bicycle

. (Mixed-Use High-Rise Buildings 2019, p. 23)

Figure 2 illustrates the methods that achieve mixed land use.

Figure 2 illustrates the methods used to achieve mixed land use

Chapter Three: Case Study of the Yarmouk Area – Baghdad

Description of the study area

The Yarmouk area is located on the western side of Baghdad within the Karkh administrative district. It is characterized as a relatively modern residential area with diverse land uses, including:

- **Residential**: apartment buildings and detached houses.
- **Commercial**: small shops and central markets.
- **Services, education, and health**: schools, health centers, and public parks.

Data collection tools

- **Field survey**: A survey targeting residents of different age groups and professions, with questions about their satisfaction with the various land uses.
- **Field observation**: To determine actual land uses and compatible and incompatible areas.

Statistical model

- **Independent variable**: Mixed land uses (compatible – incompatible)
- **Dependent Variable**: Urban resilience in the Yarmouk area.
- **Methods of analysis**:
    1. Descriptive statistics to show the proportions of different uses.
    2. Correlation coefficient to measure the strength of the relationship between compatibility/incompatibility and resilience.

Table (2) Land use ratios in the Yarmouk area

Type of Use	Area (hectares)	Percentage
Residential	12	50
Commercial	40	16.7
Service	25	10.4
Educational	15	6.3
Health	10	4.2
Entertainment/Parks	20	8.3
Industrial/Other	10	4.2
Total	240	10

Figure (3) Land use ratios in the Yarmouk area

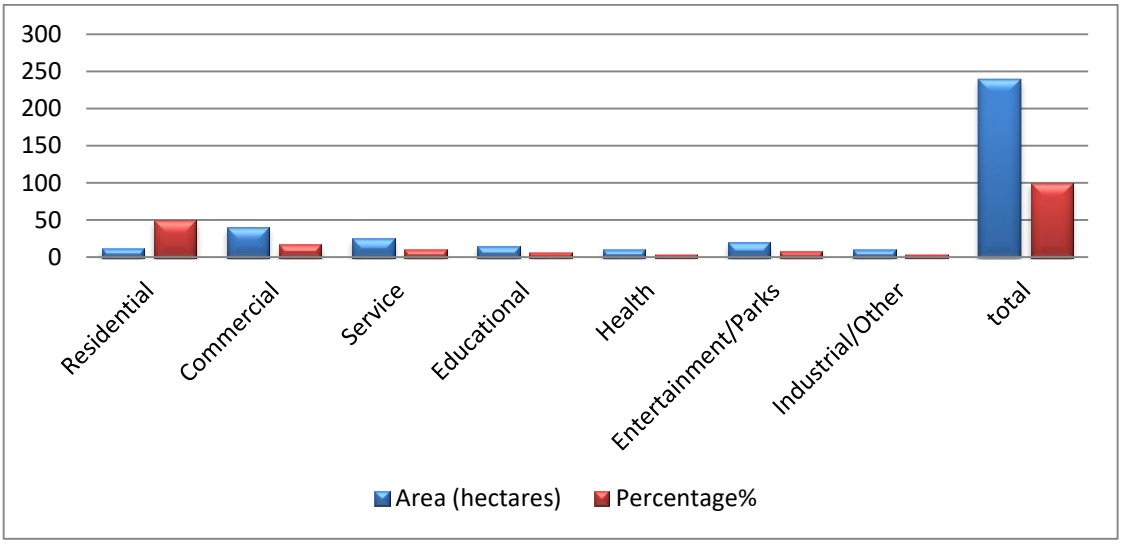

Table (2) and Figure (3) show the distribution of land use in the Yarmouk area. Residential use clearly dominates the area, occupying 50% of the total area, equivalent to 120 hectares, reflecting the primarily residential nature of the area. This is followed by commercial use at 16.7%, indicating significant economic activity on the main streets and markets, while service use accounts for 10.4% of the area, reflecting the availability of some basic facilities for the area's residents. Educational uses account for 6.3% and health uses for 4.2%, indicating a limited number of schools and health centers within the urban fabric. Recreational areas and parks occupy 8.3%, contributing to the improvement of the quality of life and the urban environment, while industrial and other uses account for 4.2%, reflecting the limited industrial activity within Yarmouk. This analysis shows that the distribution of uses reflects a relatively balanced pattern between different functions, with a predominance of residential uses, which reinforces the idea of urban flexibility if the overlaps between uses are dealt with in a well-thought-out planning manner.

Table 3: Matrix of compatibility and incompatibility between uses

Uses	Residential	Commercial	Service	Educational	Health	Entertainment	Industrial
Residential	✓	△	✓	✓	✓	✓	✕
Commercial	△	✓	✓	△	✓	✓	✕
Service	✓	✓	✓	✓	✓	✓	△
Educational	✓	△	✓	✓	✓	✓	✕
Health	✓	✓	✓	✓	✓	✓	△

Recreational	✓	✓	✓	✓	✓	✓	△
Industrial	✕	✕	△	✕	△	△	✓

✓△ : Partially incompatible:✕ : Incompatible

The table shows the compatibility and incompatibility matrix between uses in the Yarmouk area, as well as the functional relationships between different types of land uses. It can be observed that residential uses are compatible with most uses, such as service, educational, health, and recreational, indicating the possibility of integrating them into the urban fabric in a way that promotes urban flexibility. However, there is a clear incompatibility between residential and industrial uses (✕), reflecting that the presence of industrial activity near residential areas may lead to environmental problems, congestion, and noise or air pollution. Commercial use is compatible with most service and recreational activities, but shows partial incompatibility with residential and educational uses, indicating that the intensity of commercial activity may affect residents' comfort or interfere with school use. Service, educational, health, and recreational uses show great compatibility with each other, reflecting the integration of urban functions within the area. Industrial use is the most incompatible, being completely incompatible with residential and educational uses and partially incompatible with service, health, and recreational uses, but compatible with itself. This suggests that industrial areas should be defined and separated from residential and educational areas to ensure urban flexibility and reduce functional conflicts.

Overall, the matrix reflects that urban flexibility in Yarmouk can be enhanced by focusing on compatible uses and reducing points of incompatibility, especially between residential and industrial uses, and by planning commercial activities in a manner that takes into account population density and nearby services.

Table 4: Results of the resident survey

Question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Having commercial markets close to home is convenient	45	35	10	7	3
Educational services are adequate and appropriate	50	30	10	7	3
The presence of hospitals next to residential areas causes disturbance	10	15	20	3	20
Sufficient parks and green spaces	20	25	15	25	15

Figure (4) Results of the population survey

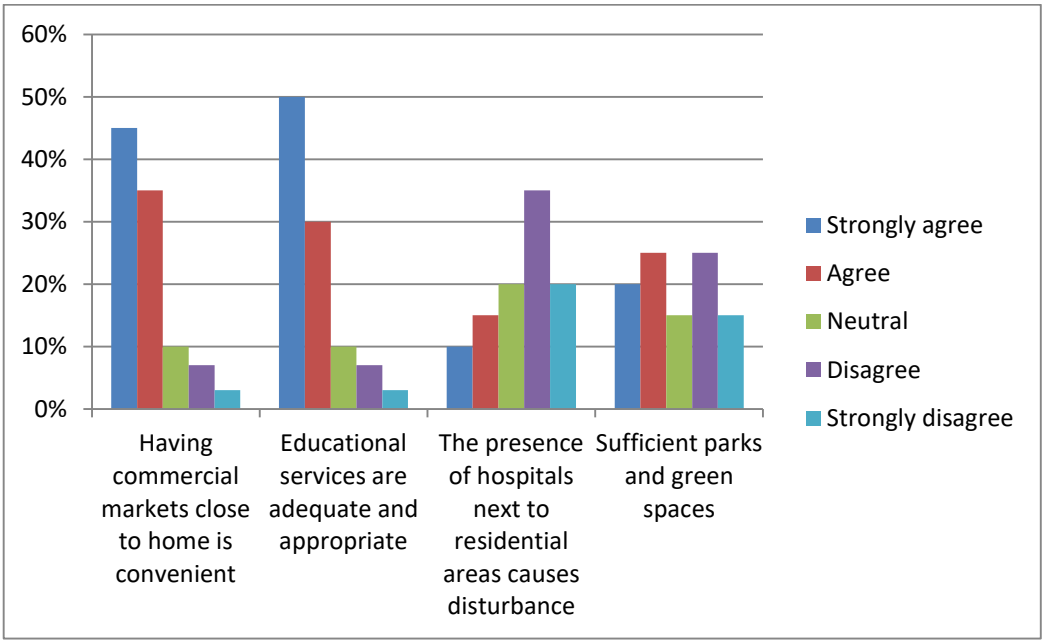

Table (3) and Figure (2) show the results of the population survey on the Yarmouk area, reflecting residents' opinions on the quality of different land uses. First, it is clear that the presence of commercial markets near residential areas is convenient for residents, with 45% expressing strong agreement and 35% agreeing, indicating the importance of proximity between commercial and residential activities to easily meet the daily needs of residents. Second, the survey results showed that educational services are adequate and appropriate, with 50% strongly agreeing and 30% agreeing, reflecting residents' satisfaction with the availability of schools and educational services in the area.

On the other hand, there is concern about the presence of hospitals next to residential areas, with 35% expressing disagreement and 20% strongly disagreeing, indicating that some residents feel disturbed by the movement of patients, ambulances, or noise. As for parks and green spaces, residents expressed mixed opinions, with 45% agreeing (20% strongly agree and 25% agree) that they are sufficient, while 40% (25% disagree and 15% strongly disagree) felt that the spaces were insufficient, indicating a need to improve green infrastructure to enhance quality of life and increase urban resilience in the area.

Overall, the survey results reflect that residents value uses that are compatible with their daily lives, such as markets and educational services, while the incompatibility between some uses, such as housing and hospitals, poses a challenge that must be addressed in urban planning to achieve urban resilience.

Conclusion

The study shows that urban resilience in the Yarmouk area is greatly influenced by the distribution of land uses and the level of compatibility between them. Compatible uses, such as housing with educational, health, and recreational services, contribute to social and functional integration, while incompatible uses, especially industrial uses near residential areas, lead to reduced urban performance efficiency and increased pressure on infrastructure. The survey also showed that residents of the area appreciate the proximity to markets and essential services, but are bothered by some incompatible uses, highlighting the importance of smart planning and thoughtful distribution of activities. The study's findings reflect the importance of using compatibility and incompatibility matrices in urban design to enhance urban resilience and improve the quality of life for residents.

Results

1. Residential use dominates half of the Yarmouk area (50%), confirming the primarily residential nature of the area, while commercial, service, educational, health, and recreational uses make up the remainder, reflecting relative diversity in land functions.
2. The compatibility and incompatibility matrix showed that residential, service, educational, health, and recreational uses are largely compatible, which enhances functional integration and contributes to increased urban resilience.
3. Industrial activity is the most incompatible use, especially with housing and education, requiring planning to locate it away from residential areas to ensure minimal functional conflicts.
4. The survey showed residents' satisfaction with the proximity of markets and educational services, while they expressed their discomfort with the presence of hospitals near their homes and emphasized the need to enhance green spaces and parks.
5. The relationship between functional compatibility between uses and community satisfaction indicates that urban flexibility in the area depends on planning uses in a way that ensures reduced conflict and increased integration between different functions.

Recommendations

1. Develop clear urban policies to locate industrial activities away from residential and educational areas.
2. Support positive overlaps between housing, educational, health, and recreational services to provide a flexible urban environment.
3. Increase recreational spaces and public parks to enhance quality of life and reduce pressure on infrastructure.
4. Use compatibility and incompatibility matrices and urban resilience indicators as tools to guide future urban planning.

5. Involve residents in planning and decision-making to ensure that uses are compatible with their daily needs.

References

1. Al-Maliki, Khawla Gharib Faraj. (2007) Urban land uses in Sadr City and their alternatives – a study in urban geography. Master's thesis, University of Baghdad, Faculty of Arts.
2. Dr. Haider Abdul Razzaq Kamouna. (1996). "The Environment and Land Use in Iraqi Cities." Environment and Development Magazine, Iraqi Society for the Protection and Improvement of the Environment, Issue 1, Year 1, p. 125.
3. Jinan Marzouq Faleh. (2013). The Social and Urban Impacts of the Shift from Residential to Commercial Land Use. Diploma thesis submitted to the Center for Urban and Regional Planning, p. 24.
4. Mahdi, Murtaza Majid & Nasr, Amer Rajeh. (2020). "Assessment of the reality of urban land use and its spatial trends in the city of Madhatia." Babylon University Journal of Humanities, Vol. 28, No. 2, pp. 43–61.
5. Saleh, Ahmed, et al. (2017). "The Impact of Spatial Organization on Land Use Quality in Urban Areas." Journal of Urban Studies, Vol. 15, No. 3, pp. 40-55.
6. Ahern, J. (2016). "Urban Landscape Sustainability and Resilience: The Promise and Challenges of Integrating Ecology with Urban Planning." Landscape Ecology, 31(9), 112-125.
7. Beatley, T. (2016). Green Urbanism: Learning from European Cities. Island Press.
8. Bullen, P. A., & Love, P. E. D. (2017). "Adaptive Reuse of Heritage Buildings." Structural Survey, 35(3), 204-220.
9. Calthorpe, P. (1993). The Next American Metropolis: Ecology, Community, and the American Dream. Princeton Architectural Press.
10. David Massey. (n.d.). "Property Rights vs. Development Control." Town Planning Review, Liverpool University Press, quarterly vol. 58, p 48.
11. Jacobs, J. (1961). The Death and Life of Great American Cities. Random House.
12. Litman, T. (2017). Evaluating Transportation Land Use Impacts. Victoria Transport Policy Institute.
13. Montgomery, J. (2016). Happy City: Transforming Our Lives Through Urban Design. Farrar, Straus and Giroux.
14. Newman, O. (2016). Defensible Space: Crime Prevention Through Urban Design. Macmillan.
15. Talen, E. (2012). City Rules: How Regulations Affect Urban Form. Island Press.
16. UN-Habitat. (2020). Planning for Urban Resilience. Nairobi: United Nations Human Settlements Programme, p. 83.