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Urban Dynamics in Downtown Baghdad: Analyzing Syntactic Properties and Land Use Forms of AlShorja and Bab AlSharqi Areas

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ABSTRACT

The spatial arrangement in the urban area in which cities exist is very important because it directly influences how active or otherwise such an environment can be. This study explores how Baghdad's downtown area incorporates this spatial arrangement into land use patterns to support vitality. Particularly attention is given to AlShorja and Bab AlSharqi (two districts within Downtown Baghdad). The analysis of Space Syntax techniques and methods combined with GIS demonstrates that AlShorja does not only enjoy connectivity but also walking-oriented spaces while Bab AlSharqi has the opposite features with heavily structured road networks dedicated to vehicles. The compact, irregular streets in AlShorja support intense pedestrian movement and vibrant commercial activities, while the grid pattern in Bab AlSharqi enhances vehicular accessibility and accommodates a range of land uses, including commercial and administrative functions. The study concludes with recommendations for urban planners to improve connectivity and vitality through informed spatial planning, considering historical context integration with contemporary urban needs. These insights aim to guide future urban development to create livable and sustainable environments. Urban areas that are close to the downtown could be further studied using different analysis tools such as GIS or UNA. This could be expanded through the investigation of other forms of urban layers, such as economic and environmental aspects.

Keywords: Streets, Accessibility, Land use, Downtown.

1. INTRODUCTION

Urban space is a complex system where spatial configurations and land uses react together and define urban life and functionality. For this reason, understanding their interaction is the key to successful planning and urban design **(Kostof, 1991; Kropf, 2009; Russell, 2014, 2016)**. In this context, the paper focuses on Downtown Baghdad, particularly the AlShorja

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and Bab AlSharqi areas, to assess the relationship between spatial configurations with land use and the consequent impact upon the dynamics of the urban area, see **Fig. 1**. Using these two very different areas as examples, this paper seeks to bring forward how the forms of urban areas differ to affect patterns and quality of urban life. These conceptions can also be described by using the term spatial configuration, which involves the space arrangement in an urban environment, for example, street patterns, building layouts, and open spaces.

Syntactic properties provide a framework to analyze these spatial configurations in the definition of Space Syntax **(Hillier, 1993; Hillier and Iida, 2005)**. As developed by Hillier and Hanson in 1984, the Space Syntax techniques allow one to quantify some crucial aspects like connectivity and accessibility; two important syntactic properties, as proposed by Hillier and Hanson, are integration and choice. Integration considers the accessibility of space within the urban network, and it indicates an average measure of how quickly a space may be accessed from every other space **(Hillier and Hanson, 1984; Batty, 2022)**. Numerical measures which are higher values of integration have better accessibilities and centralities. Choice, on the other hand, measures the likelihood that space will be used as a route between different spaces, reflecting its strategic importance in the urban network **(Turner et al., 2005; Rashid and Alobaydi, 2015; van Nes, 2021)**. These metrics make it possible to appreciate spatial dynamics and patterns of movement within urban areas **(Rashid, 2017; Hillier, 1997, 2007; Mohammed and Alobaydi, 2020b)**.

Land use patterns may be defined as the distribution of different functions inside a metropolitan area; these could include residential, commercial, administrative, and recreational uses of land **(Lee et al., 2020; Garau and Yamu, 2024; Gu, 2024)**. The relationship between spatial configurations and land use is crucial in determining the vibrancy and functionality of urban spaces **(Al Hashimi and Alobaydi, 2023; Alsaffar and Alobaydi, 2023; Albabely and Alobaydi, 2024; Mohammed and Alobaydi, 2020a)**. Well-integrated spaces with high accessibility will likely attract commercial and public activities, while more segregated spaces might be suited for residential or specialized uses.

Al-Shorja is the historic core of Baghdad, characterized by its dense and irregular street patterns. The area has developed through a natural process of hundreds of years into a dense network of little, tortuous alleys. Such a pattern permits an intense level of pedestrian movement and social interaction. AlShorja's primary land use is purely commercial; its importance as a commercial hub is seen in the number of markets and traditional souqs there **(Awad, 1989; Alobaydi and Rashid, 2042; ALslik and Majeed, 2014; Al-Saffar, 2018; Alobaydi and Rashid, 2024a)**.

In contrast, Bab AlSharqi reflects an entirely different concept regarding modern urban planning principles. Developed in the mid-20th century, it boasts a highly structured grid pattern with wider streets to facilitate the influx of vehicular traffic. The designed layout increased navigability and accessibility in Bab AlSharqi, the most significant commercial and administrative area. Primarily, the land use of Bab AlSharqi is commercial and administrative, where significant developments and open spaces accommodate higher visual connectivity and spatial accessibility levels **(Pieri, 2008; Van de Ven, 2016; Alobaydi and Rashid, 2017; Alobaydi and Rashid, 2024b)**; see **Fig. 2**.

Examples of such landmarks include the Greek Agora and Roman Forum, which, in history, played a leading role in shaping the urban form. An Agora is an open quadrilateral enclosed by streets with colonnades on both sides, providing a multifunctional center of urban functions related to social, cultural, and economic activities **(Thompson, 1954; Gorski and Packer, 2015; Xiao, 2021)**. The Roman Forum, by way of illustration, constituted the

central area within the city where the principal urban functions of commercial activity, governance, and public life were carried out **(Perry, 2014; El-desokey and Yassin, 2023)**. Noteworthy, too, is visual permeability: how much or how little vision passes quickly through space. It impacts way-finding, safety, and the overall experience of being in an urban place. High visual permeability can often be achieved by having wide streets and open spaces to increase mobility. On the other hand, low visual permeability, characteristic of dense, winding street networks, will contribute to mystery and, therefore, discovery and uniqueness in urban experiences **(Ercetin et al., 2018; Alobaydi et al., 2020; Al-Saaidy and Alobaydi, 2021a; Al-Saaidy and Alobaydi, 2021b)**.

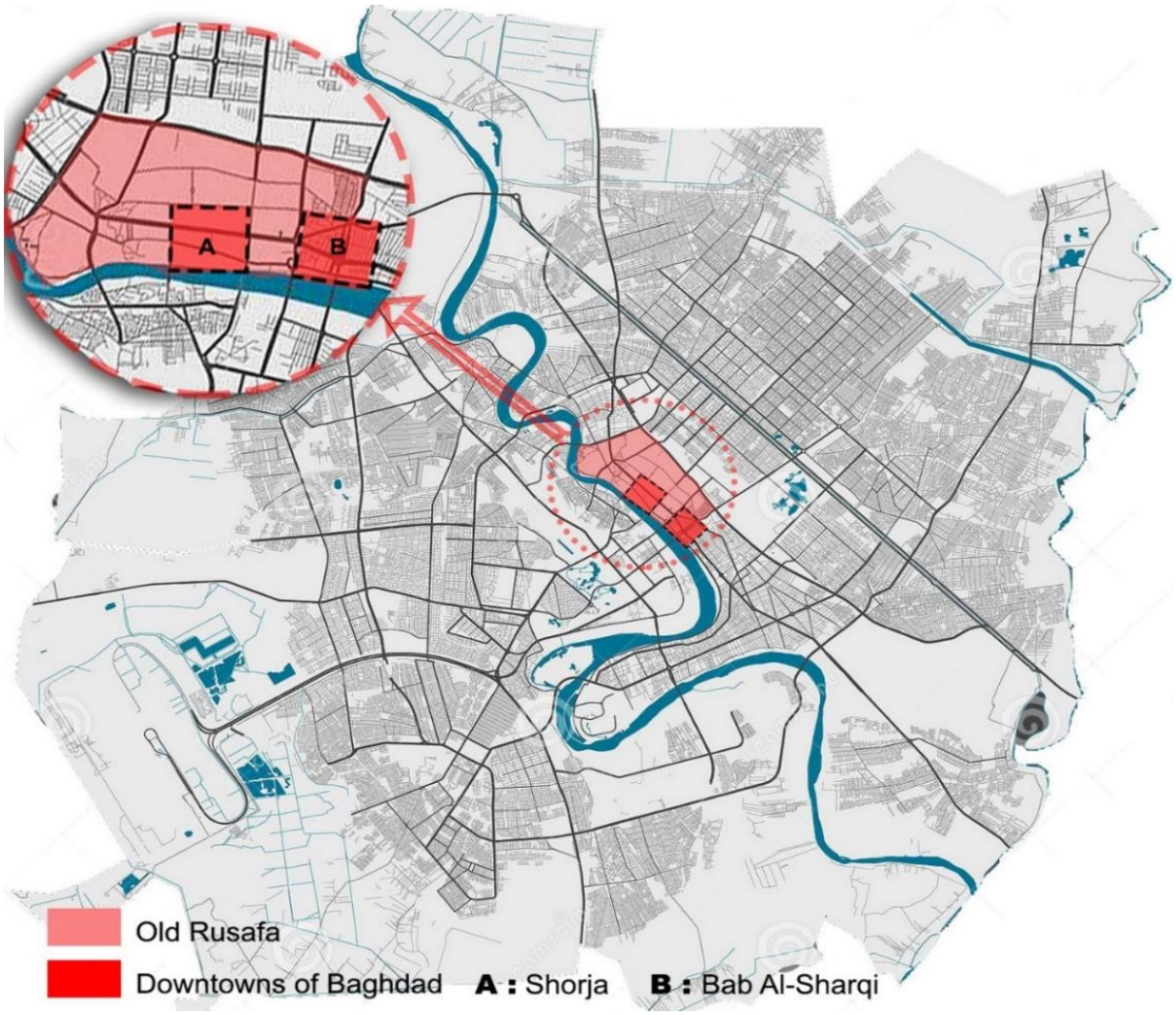


Figure 1. Shows Baghdad's Rusafa and its downtowns: AlShorja and Bab AlSharqi.

The significance of this study is to examine and find similarities and dissimilarities between the results obtained when analyzing the morphological characteristics of two downtowns, AlShorja and Bab AlSharqi. With the challenges that may come when establishing or designing these areas, urban developers and policy-makers can get useful information from these findings. On top of that, academic discourse on such matters is imperative as it is a way of dealing with global forces that are putting in danger the city's spatial culture and community identities.

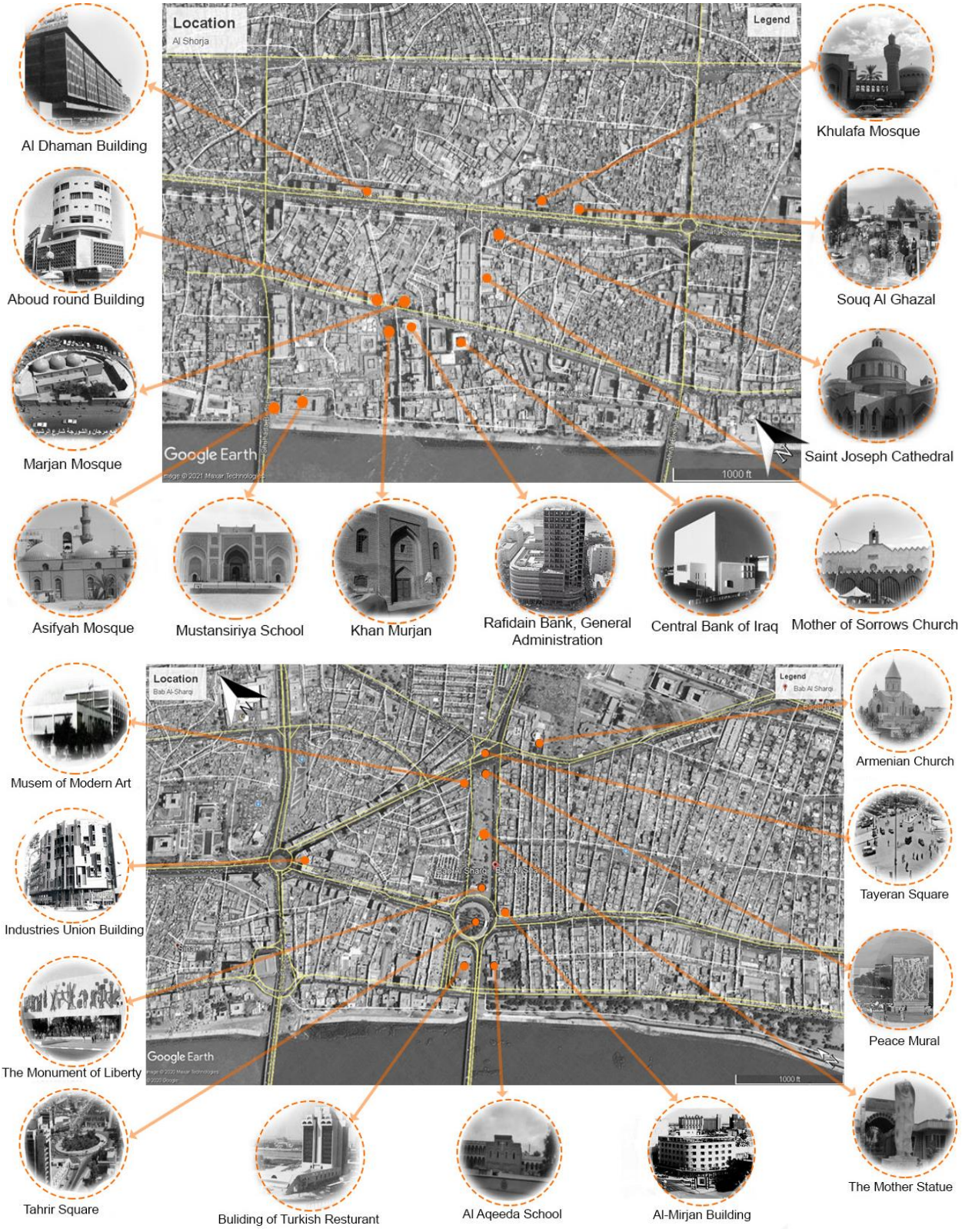


Figure 2. Shows the Landmarks located in AlShorja area (in the top) and in the Bab AlSharqi area (in the down) **(Al-Saffar, 2022)**.

This paper helps bridge the gap on how these spatial configurations and the land uses interact in shaping urban life in Downtown Baghdad. Through establishing an understanding of the effects that dissimilar urban forms may have on functionality, accessibility, and vitality by comparing the organic and historical formation of AlShorja with the planned one of Bab AlSharqi, this study will set its results at an essential role in urban planners and designers in formulating more livable and sustainable urban environments, which balance the needs of pedestrians and vehicles into a historical context.

2. METHODOLOGY

This research employs a mixed-method approach, integrating both qualitative and quantitative analyses to examine the spatial configurations, syntactic properties, and land uses in Downtown Baghdad, specifically in the AlShorja and Bab AlSharqi areas. The research methodology aims to show how different physical spatial arrangements affect how people use land and how they live in downtowns.

AlShorja is the ancient heart of Baghdad characterized by a compressed organic street network that has formed over time through spontaneity. It has narrow winding roads and a lot of walking activities around it. The use of land in this area is mainly commercial with many markets including traditional souqs which have been there since the past and presently this place possess active urban life. Bab AlSharqi, a 20th-century development, has a modern urban design that follows a regular grid system. Its wider roads are built for vehicle movement and help in the ease of movement as well as accessibility. Bab AlSharqi depends on service activities like administration and retailing for its functions and supports big built forms (megastructures) besides open spaces that promote visual connectivity, mobility, and vitality.

2.1 Data Collection

Field surveys were carried out on both AlShorja and Bab AlSharqi to collect data concerning street patterns, land uses, and pedestrian and vehicular flows. The field surveys involved taking photographs and making maps with detailed information about how urban areas are laid out.

Secondary data: local authorities who provided maps showing the history of both urban plans on which growth took place as well as archives where researchers found historical maps as well as some spatial data supplied by different organizations form part of secondary sources used here. They gave insight into such aspects as historical urban development within those districts and their land uses.

2.2 Data Digitization

The information that was collected underwent digitalization via GIS software. This event required the conception of perfect and elaborate basic maps for both AlShorja and Bab AlSharqi. Georeferencing historical maps to modern spatial information occurred to ensure it was possible to analyze anything consistently and correctly.

2.3 Space Syntax Analysis

The Space Syntax methods and techniques have been employed to study the spatial properties of streets in both AlShorja and Bab AlSharqi and how they function together

syntactically. As follows, calculations were made via the DepthmapX software program - integration values and choice values for each street network of the two examined areas:

- Integration Values measure how easily space is accessible within the whole spatial system of the town through one point or space. This means that spaces with higher integration will have better accessibilities thus making them centrally positioned.
- Choice Values mean that these spatial routes are often chosen as passages between different spaces of town due to their strategic importance of movement in any urban setting.

The study encompassed axial line analysis as well as segment analysis to cover a range of different spatial configurations.

2.4 Land Use Analysis

To investigate the relationship between the syntax of urban fabrics and land use, we mapped and classified land use in AlShorja and Bab ALSharqi. We specifically concentrated on apportioning it into residential, commercial, recreational, and administrative functions. We accomplished this by superimposing land use indications onto spatial syntax maps using Space Syntax analysis techniques.

2.5 Interpretation and Analysis

The third phase of research consisted of interpreting the outcomes from the use of space and land utilization evaluations. They were related to the course of history, socio-economics, as well as urban planning principles. This has been done to give an inclusive assessment of how urban life in AlShorja and Bab AlSharqi is influenced by street patterns, visual permeability, and spatial accessibility.

2.6 Integration of Space Syntax and GIS

Space Syntax and GIS methodologies are combined to form a robust analytical framework for examining urban form. The methods used include space syntax techniques such as axial line analysis and segment analysis to determine how much streets are integrated with others in terms of accessibility or choiceability.

In analyzing the spatial properties of urban form, space syntax integration and choice values of street networks were measured using space syntax techniques like axial line analysis and segment analysis. These values represent how well connected and accessible different parts of the city's spatial system are, which can give an insight into how people move, interact, and transact in them.

The analysis has relied on different radii: Rn which represents the whole connectivity in the entire street networks, while R3 represents the local movement conducted by three steps away from the given point. Thus, Rn, expressed in terms of global integration, reveals the overall connectivity and accessibility of the street urban network, a sense of how various built-up areas are integrated into the whole city. In contrast, R3 is a measure of local integration, dealing with more confined and localized movement patterns that allow an understanding of how people move and interact within more localized immediate and pedestrian-scaled environments, which thus shows the relationship between spatial configuration and social behavior. Digitizing historical maps with GIS makes it possible for AlShorja and Bab AlSharqi to be mapped accurately, based on field survey data.

Consequently, ultra-detailed maps that reveal spatial dynamics within these zones were produced as an outcome of integrating those approaches.
In the study, the methodology employed presents a general view of spatial configurations, syntactic properties, and land uses in Downtown Baghdad. By using qualitative and quantitative methods such as field surveys, GIS digitization coupled with Space Syntax analysis this study undertakes a thorough investigation into patterns of streets, visual permeability, and spatial accessibility in AlShorja and Bab AlSharqi. This multifaceted approach ensures a comprehensive understanding of how urban form influences urban life, providing valuable insights for urban planners and designers.

3. RESULTS AND DISCUSSION

The analysis carried out on AlShorja and Bab AlSharqi presented useful information about the structural organization, syntactic structure, and patterns of land use in these two different urban areas of Downtown Baghdad. Hence, it was discovered that the city shape directly influences how its land is employed.

3.1 Spatial Configurations and Syntactic Properties

The high local integration values revealed by AlShorja's spatial configuration show that the area is easily accessible for travelers (for both residents and passersby) as well as connected at the local level; hence it encourages walking among pedestrians and social interaction as well. These local integration values imply a traditional market setting where dense relationships leading to economic activities are vital. The closely-knit street pattern in traditional markets is always reflected in their high integration values; accessibility, therefore, becomes an important characteristic of them, as shown in **Fig. 3**. The choice values witnessed within AlShorja serve as indicators of specific routes frequently used by people today as they travel through this spatial network system. This could support the efficient mania of excellent commercial centers occupied by vibrant commercial activities that dominate such areas. There are high choice densities present along key roads, which are indicative of sustained movement of people, goods, and services within an economy.
Being structured in a grid manner, Bab Al Sharqi attracted higher global integration values than AlShorja did. This means that it links with other parts of the whole spatial network as compared to the latter, hence allowing faster movement for vehicles as well as accessibility. This is because it serves as a central business district where people are supposed to congregate for business and administration purposes (see **Fig. 4)**.
Regarding movement, choice values seen within Bab AlSharqi demonstrate how effective gridded layouts can be concerning offering multiple paths for walking from one point (A) to another (B). One feature that makes such a system beneficial is that cars can be spread optimally on numerous roads without causing any jams while at the same time increasing general accessibility towards one space or another. The high choice values observed along major highways are therefore important in linking up various sides of the district (see **Fig. 4)**.

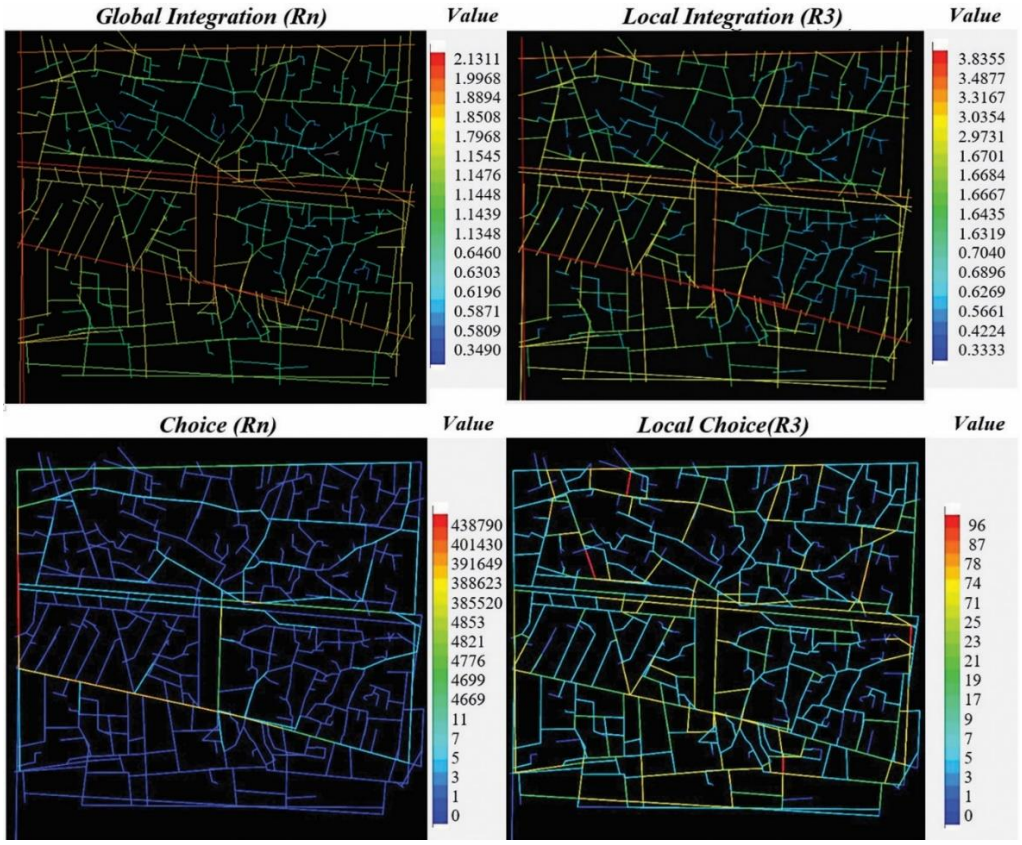


Figure 3. The syntactic properties of integration and choice measures of the AlShorja Area in Downtown Baghdad.

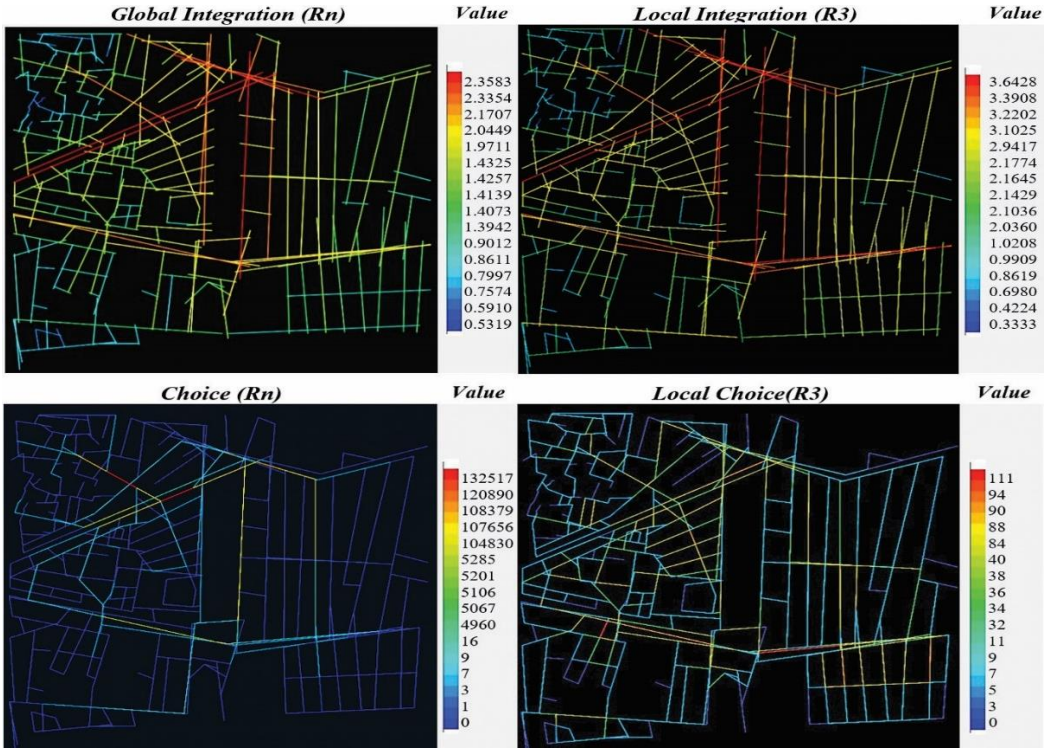


Figure 4. The syntactic properties of integration and choice measures of Bab AlSharqi Area in Downtown Baghdad.

3.2 Land Use Patterns

AlShorja mostly has commercial land uses, with more markets and traditional souqs concentrated there. These commercial activities are made easier by the high local integration values as the location is accessible and walkable. Multiple small-scale commercial spaces result from the street grid system that is densely populated with irregular and organic spatial layouts, encouraging urbanity. This pattern of land use can be seen in old cities, such as mixed-use developments, where they are important for maintaining an attractive environment. higher traffic density on footways is vital in economic terms, see **Fig. 5**.

In contrast, Bab AlSharqi exhibits a more diverse range of land uses, including commercial, administrative, and recreational spaces. The grid pattern in this area facilitates larger-scale developments and open spaces, supporting modern urban functions. Higher global integration values enhance commercial and administrative activities by providing efficient access for vehicles and improving connectivity within the broader urban network. The structured layout also allows for better segregation of different land uses, thereby improving overall urban functionality (see **Fig. 5**).

Downtown Baghdad features a diverse array of land uses, encompassing commercial, administrative, governmental, cultural, and residential activities. Historically, the city center was a hub for various functions, including residential, commercial, administrative, religious, cultural, and public services, with notable buildings such as mosques, government edifices, markets, inns, and residences **(Al-Ashab, 1974; Fethi, 1978; Al-Thahab et al., 2014; Al-Saaidy, 2020)**. The advent of modern urban design led to the functional segregation of districts and a predominance of commercial activities over residential ones.

Commercial and mixed-use areas are primarily located along traditional thoroughfares like AlShorja and AlNahir roads, as well as along modern grid-patterned streets designed for vehicular traffic, such as AlRasheed and AlJumhoria Streets. In contrast, Ghazi Street (AlKifah) has retained more residential uses compared to other newly developed roads (see **Fig. 5**). AlSaadoun Street is characterized by a variety of activities, including commercial enterprises, doctors' clinics, pharmacies, and numerous popular cafes. This street also features a significant number of hotels of various classes. The AlBataween neighborhood has transformed into a major commercial area with well-known market streets. This evolution led high-income families to relocate to quieter areas, leaving the neighborhood to be occupied by workers and lower-income residents. Consequently, AlBataween has shifted from one of Baghdad's most prestigious residential areas to a less desirable one.

The percentage of land and the number of plots used for commercial purposes in AlShorja are significantly higher than in Bab AlSharqi. However, Bab AlSharqi has a higher proportion of mixed-use areas (residential and commercial or cultural and commercial), light industrial uses, and public spaces compared to AlShorja, as shown in **Table 1**. Despite having more plots designated for residential use than commercial use, the total area dedicated to commercial activities in Bab AlSharqi surpasses that of residential areas. The areas and number of plots allocated for residential activities in both districts are approximately equal.

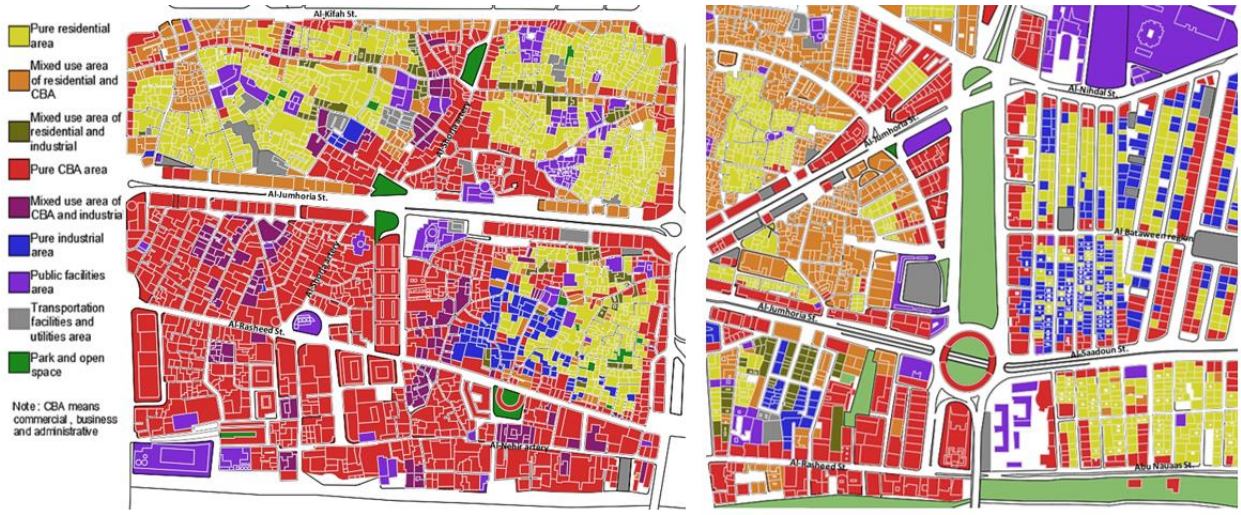
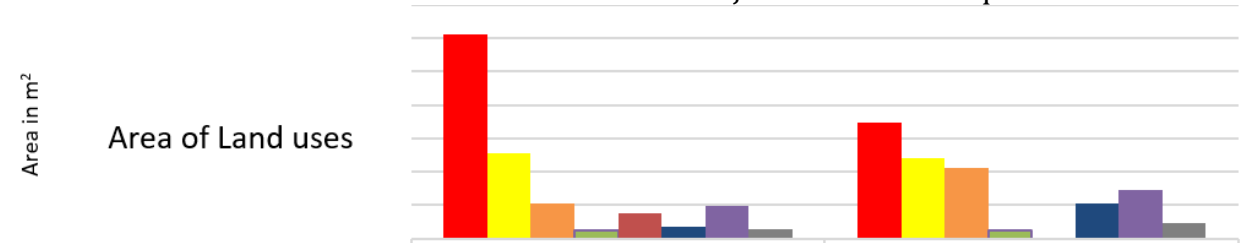


Figure 5. The land use patterns of AlShorja(on left) and Bab AlSharqi (on right) Areas in Downtown Baghdad.

Table 1. Area of land uses of AlShorja and Bab AlSharqi.



	Shorja	Bab Al-Sharqi
Commercial	305000	174200
Residental	127340	120878
Mixed use of residential and Commercial	53110	105475
Mixed use of residential and industrial	12610	12190
Mixed use of commercial and industrial	38300	0
industrial	17260	52225
Public facilities	47930	72860
Transportation facilities	13510	22980

3.3 Overlaying Syntactic Properties and Land Uses

The integration measure applied to the urban network grids of AlShorja reveals that the most integrated streets are the main thoroughfares, characterized by relatively large, regular, and rectangular plots typically associated with commercial and mixed-use activities. In contrast, the residential areas, consisting of small, irregular plots and organic roads with cul-de-sacs, record the lowest integration values. This spatial transition from main streets to secondary (or internal) roads demonstrates a clear hierarchy in spatial network configuration (see **Fig. 6**).

In Bab AlSharqi, however, the differences in integration values between main streets with large plots (occupied by commercial uses) and inner roads with small and medium plots (occupied by residential areas) are minimal and not significant. This lack of disparity indicates that the modern street network in Bab AlSharqi exhibits little to no spatial hierarchy, with no significant distinction between main and secondary streets.

Consequently, the integration values at both global and local levels are relatively similar between the main streets and secondary areas.
Additionally, the results indicate the presence of some commercial and mixed-use streets in areas of low integration in both AlShorja and Bab AlSharqi. Furthermore, certain residential areas in Bab AlSharqi have developed within zones of relatively high integration, as shown in **Fig. 6**.

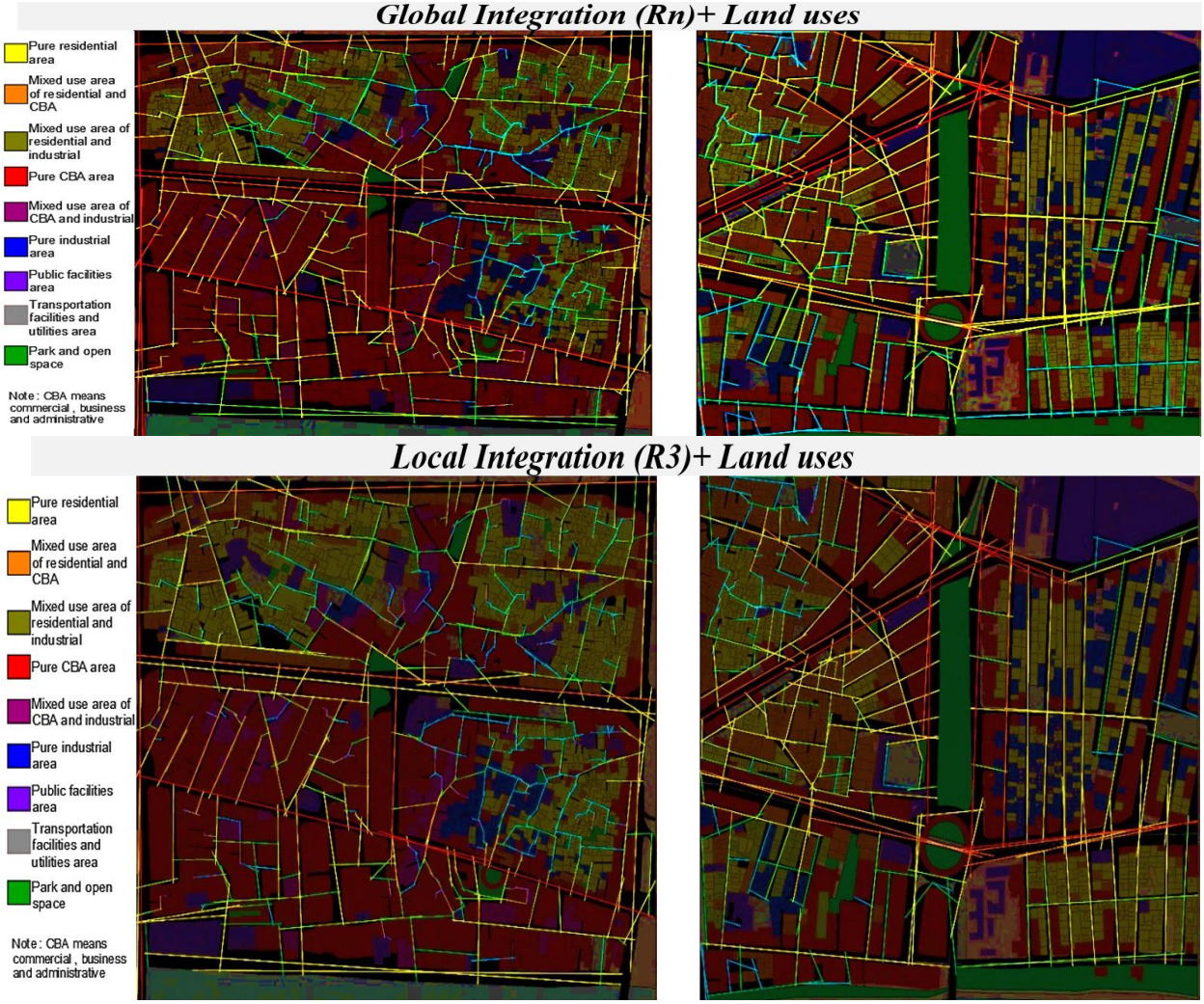


Figure 6. The overlapping between integration values and land uses in AlShorja (on left) and Bab AlSharqi (on right) Areas in Downtown Baghdad.

The global choice maps of AlShorja highlight high choice values in the main streets surrounding the area. These streets, planned and built according to modern urban planning practices, contrast with the internal sections of AlShorja, characterized by an organic urban pattern and lower choice values. The internal area's cul-de-sacs and limited movement routes reflect this organic layout. In contrast, Bab AlSharqi's highest global choice values are found within its main streets. This area was developed with modern planning principles, featuring gridded, straight roads that offer multiple movement paths throughout the area, as shown in **Fig. 7**. Despite this, AlShorja exhibits higher overall global choice values compared to Bab AlSharqi. This disparity arises because AlShorja's finely meshed grid provides numerous movement choices, while Bab AlSharqi's coarser grid offers fewer

movement options (see **Fig. 7**). In AlShorja, local choice values decrease progressively from the main street inward, reaching their lowest in the isolated residential areas. This gradient indicates a clear hierarchy in the street pattern, transitioning from commercial and mixed-use areas on the main street to residential zones. However, the presence of a spatial hierarchy in the urban system is shown by the sporadic distribution of choice values within major commercial and residential streets of Bab AlSharqi.There is an assortment of movement path choices in both public and private spaces owing to this nonuniformity (see **Fig. 7**).

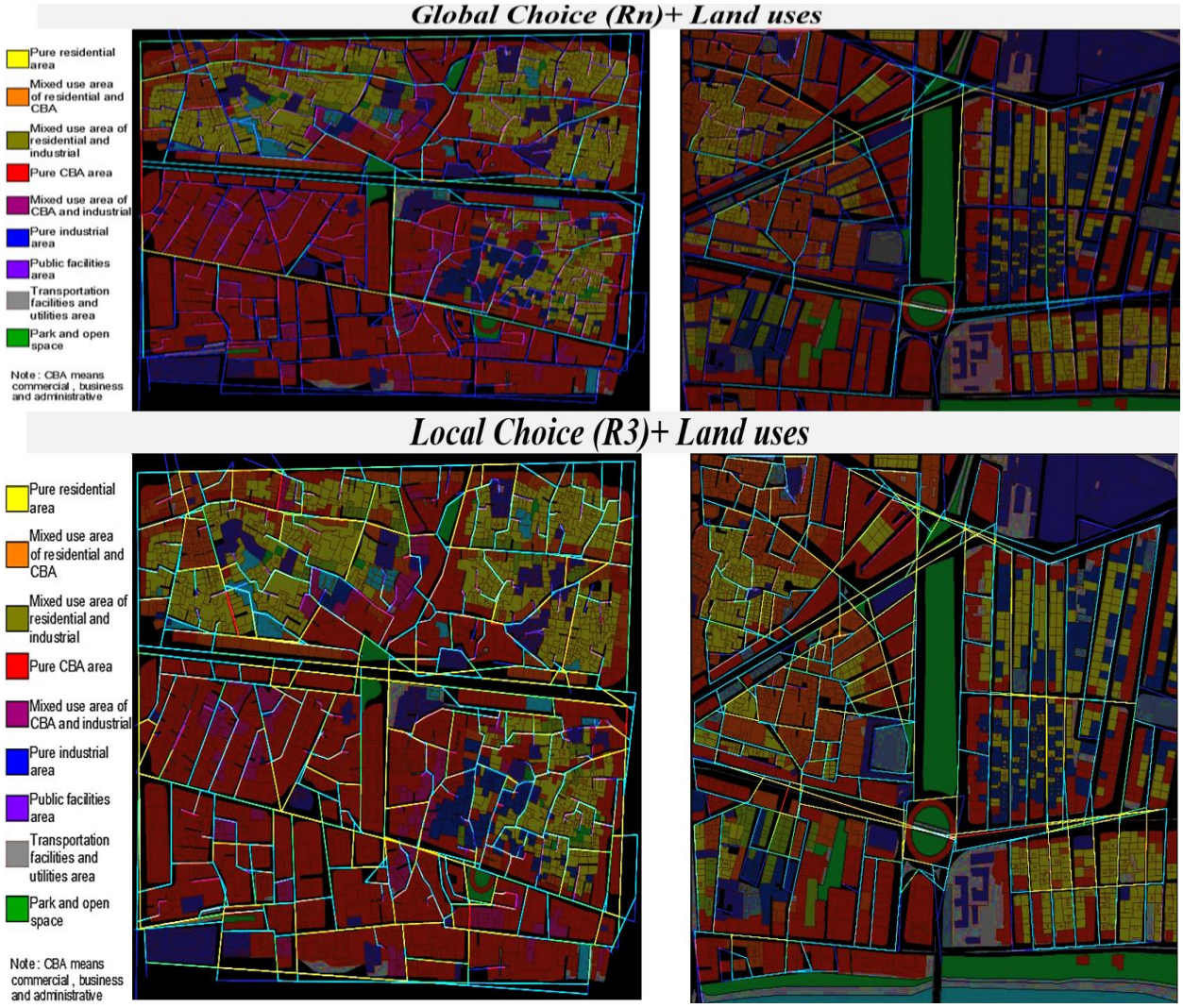


Figure 7. The overlapping between integration values and land uses in AlShorja (on the left) and Bab AlSharqi (on the right) Areas in Downtown Baghdad.

While this study provides valuable insights into the urban dynamics, visual permeability, and spatial accessibility of AlShorja and Bab AlSharqi in downtown Baghdad, it is important to acknowledge certain limitations. The focus on these two specific areas excluded other urban zones that might reveal different urban forms and structures, potentially limiting the generalizability of the findings. Furthermore, while the research employed Space Syntax and GIS, incorporating additional urban analysis tools like UNA, urban simulation models, and walkability/livability indices could have enriched the analysis and offered a more nuanced

understanding of urban dynamics. Finally, the emphasis on street network properties, while informative, neglected other crucial factors such as environmental and socio-economic elements, which contribute significantly to a comprehensive understanding of urban systems. Future research should consider expanding the study area, integrating diverse analytical tools, and incorporating a wider range of urban elements to provide a more holistic perspective on Baghdad's urban fabric.

4. URBAN DESIGN GUIDELINES

When we look at historical and modern downtowns, we can get important insights for future urban design tactics and strategies. These might be discovered from AlShourja which is one of the oldest areas in the City of Baghdad having many features that make it unique with its flexibility as well as good cultural life that attracts people from different parts of the world among others while at the same time also present some issues which require consideration on how best to deal with them; while Bab AlSharqi is a planned downtown, and it does not seem like it has sufficient space for pedestrians or it may not have adequate provisions for other amenities necessary for urban life. This understanding not only helps in design but also planning hence making systems that are sustainable than before.

- When it comes to flexibility in urban form, organic downtowns adapt to change over time, unlike modern areas such as Bab AlSharqi, which are more rigid. Urban designers need to know how to mix the two: flexibility in planning should be part and parcel to let spaces change according to social needs.
- For pedestrian connectivity, organic areas regard walkability and social interaction as significant values as opposed to modern downtowns' concentration on vehicular traffic. Balancing both can improve pedestrian access, initiating more vibrant and socially connected spaces.
- It is quite rare to find a significant amount of cultural identity in some planned urban areas, as opposed to organic downtowns, which have an abundance of cultural affiliation. Urban designers and policy-makers have to try their best to maintain and integrate these aspects for the creation of locales that are easily identified by people, regardless of whether they are new or already existent.
- Space Syntax for urban configuration analysis helps in understanding spatial patterns and accessibility networks in both planned and unplanned downtowns. This method assists in the comprehension of the city's operation hence, it can be employed as a guideline for the development of cohesive, functional urban configurations.

5. CONCLUSIONS

This research examined the spatial syntax, land use, and syntactic properties of Downtown Baghdad's AlShorja and Bab AlSharqi areas. GIS and Space Syntax techniques were employed to identify the spatial configurations and urban dynamism in these business districts.
The high local integration values observed in AlShorja indicate that it is an accessible area with strong pedestrian connectivity, which supports its dense commercial activities and vibrant streets. In contrast, Bab Al Sharqi exhibits higher global integration, functioning as a central business district with heavy vehicle traffic and broader urban-scale connectivity. These values confirm Bab Al Sharqi's role as a well-connected city node that supports economic and governance functions. The analysis also revealed how the spatial configuration of the street network influences urban growth and development.

The grid pattern observed in the studied areas enables order and connectivity for modern urban activities. The high choice values in AlShorja indicate the main pedestrian and goods movement paths that support the area's active business markets. In contrast, the efficient grid layout and high integration at Bab AlSharqi provide multiple routes that minimize congestion and enhance access to different parts of the district, underscoring the importance of the main streets in connecting the various areas. The irregular street pattern and high local integration values in AlShorja's commercial area facilitate everyday trading activities and pedestrian movement, reflecting a dynamic, traditional urban form.
Similarly, the hierarchical grid pattern and high global integration in Bab AlSharqi enable varied land uses, including commerce, administration, and recreation. The grid system facilitates large-scale development planning, allowing cities to undertake projects not feasible in compact areas, such as parks along broad rivers or residential zones near heavy industry. Additionally, the distribution and occupation of property in this district are closely linked to its role as a hub for diverse commercial and governmental experimental initiatives.

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Credit Authorship Contribution Statement

Noor Hadi Alsaffar: Writing – review and editing, Writing – original draft, Validation, Software, Methodology. Dhirgham Alobaydi: Writing – review and editing, Validation, Software, Methodology.

Declaration of Competing Interest

The author states that there is no known financial conflicts of interest or personal relationships that could have influenced the work presented in this paper.

REFERENCES

Al Hashimi, H., Alobaydi, D., 2023, March. Measuring spatial properties of historic urban networks. In *AIP Conference Proceedings*, 2651(1). AIP Publishing. https://doi.org/10.1063/5.0117077.

Al-Ashab, K.H., 1974. *The urban geography of Baghdad*. Doctoral dissertation, Newcastle University.

Albabely, S., Alobaydi, D., 2024. Analyzing movement densities in AlKarkh Districts: A comparative study. *Journal of Engineering*, *30*(04), pp.134-151. https://doi.org/10.31026/j.eng.2024.04.09 .

Alobaydi, D., Al-Mosawe, H., Lateef, I.M., Albayati, A.H., 2020. Impact of urban morphological changes on traffic performance of Jadriyah intersection. *Cogent engineering*, *7*(1), p.1772946. https://www.tandfonline.com/doi/full/10.1080/23311916.2020.1772946 .

Alobaydi, D., Rashid, M., 2017, July. A study of the morphological evolution of the urban cores of Baghdad in the 19th and 20th centuries. In *Eleventh international space syntax symposium at Instituto Superior Técnico, University of Lisbon, Portugal* (pp. 38-1).

Alobaydi, D., Rashid, M., 2024a. Morphological evolution of Baghdad: Analyzing urban growth patterns and transformation processes. *Journal of Engineering, 30*(12), pp.16-32. https://doi.org/10.31026/j.eng.2024.12.02 .

Alobaydi, D., Rashid, M., 2024b. The evolution of street structures: A morphological study. *Journal of Engineering*, *30*(10), pp.203-219. https://doi.org/10.31026/j.eng.2024.10.12 .

Al-Saaidy, H.J., Alobaydi, D., 2021b. Studying street centrality and human density in different urban forms in Baghdad, Iraq. *Ain Shams Engineering Journal*, *12*(1), pp.1111-1121. https://doi.org/10.1016/j.asej.2020.06.008 .

Al-Saaidy, H.J.E., 2020. Urban form elements and urban potentiality (literature review). *Journal of Engineering*, *26*(9), pp.65-82. https://doi.org/10.31026/j.eng.2020.09.05 .

Al-Saaidy, H.J.E., Alobaydi, D., 2021a. Measuring geometric properties of urban blocks in Baghdad: A comparative approach. *Ain Shams Engineering Journal*, *12*(3), pp.3285-3295. https://doi.org/10.1016/j.asej.2021.04.020.

Al-Saffar, M., 2018. Urban heritage and conservation in the historic center of Baghdad. *Journal of Heritage Architecture*, *2*(1), pp.23-36. https://www.witpress.com/elibrary/ha-volumes/2/1/1810 .

Al-Saffar, N., 2022. *Studying Urban Geometric Characteristics in the Downtowns of Baghdad, Iraq*. University of Baghdad, Baghdad.

Alsaffar, N.H., Alobaydi, D., 2023, March. Studying street configurations and land uses in the downtown of Baghdad. In *AIP Conference Proceedings*, 2651 (1). AIP Publishing. https://doi.org/10.1063/5.0105420 .

ALslik, G.M.R., Majeed, F.A., 2014. Succession of urban structures of the city of Baghdad. *Journal of Engineering*, *20*(12), pp.1-30. https://doi.org/10.31026/j.eng.2014.12.11 .

Al-Thahab, A., Mushatat, S. and Abdelmonem, M.G., 2014. Between tradition and modernity: Determining spatial systems of privacy in the domestic architecture of contemporary Iraq. *ArchNet-IJAR*, *8*(3), pp.238-250.

Awad, J. A. 1989. Islamic souqs (bazaars) in the urban context: the souq of Nablus. Manhattan, Kansas: Kansas State University.

Batty, M., 2022. Integrating space syntax with spatial interaction. *Urban Informatics*, *1*(1), p.4. https://doi.org/10.1007/s44212-022-00004-2

El-desokey, A.K. and Yassin, K.A., 2023. From archaic agora to roman forum: Urban organization of public spaces in Ancient Alexandria. *Journal of the Faculty of Tourism and Hotels-University of Sadat City*, *7*(2/3).

Ercetin, A. , Kutlu, R. , and Akbas, G. 2018. Grand bazaar and heart of trade sandal bedesten. International Journal of Science and Research (IJSR), ISSN: 2319-7064.

Fethi, I.A.W., 1978. Urban conservation in Iraq: The case for protecting the cultural heritage of Iraq with special reference to Baghdad, including a comprehensive inventory of its areas and buildings of historic or architectural interest (Doctoral dissertation, University of Sheffield).

Garau, C., Annunziata, A. and Yamu, C., 2024. A walkability assessment tool coupling multi-criteria analysis and space syntax: the case study of Iglesias, Italy. *European Planning Studies*, *32*(2), pp.211-233. https://doi.org/10.1080/09654313.2020.1761947

Gorski, G.J. and Packer, J.E., 2015. *The Roman Forum: a reconstruction and architectural guide*. Cambridge University Press.

Gu, X., 2024. The innovative use of spatial syntax in spatial design of tourism landscape. *Applied Mathematics and Nonlinear Sciences*, *9*(1). https://doi.org/10.2478/amns.2023.2.00338

Hillier, B. and Hanson, J., 1989. The social logic of space. Cambridge University Press.

Hillier, B. and Iida, S., 2005, June. Network effects and psychological effects: A theory of urban movement. In *Proceedings of the 5th International Symposium on Space Syntax* (Vol. 1, pp. 553-564). Delft: TU Delft.

Hillier, B., 1997. Cities as movement economies. In *Intelligent Environments* (pp. 295-344). North-Holland.

Hillier, B., 2007. *Space is the machine: a configurational theory of architecture*. Space Syntax.

Hillier, B., Penn, A., Hanson, J., Grajewski, T. and Xu, J., 1993. Natural movement: Or, configuration and attraction in urban pedestrian movement. *Environment and Planning B: planning and design*, *20*(1), pp.29-66.

Kostof, S., 1991. The City Shaped (pp. 9-39). Boston, MA: Little, Brown and Company.

Kropf, K., 2009. Aspects of urban form. *Urban morphology*, *13*(2), pp.105-120.

Lee, S., Yoo, C. and Seo, K.W., 2020. Determinant factors of pedestrian volume in different land-use zones: Combining space syntax metrics with GIS-based built-environment measures. *Sustainability*, *12*(20), p.8647. https://doi.org/10.3390/su12208647.

Mohammed, L.R., Alobaydi, D., 2020a, March. Evolution of the urban form of historic hit citadel: Deriving a schematic model for Iraqi fortified cities. In *IOP Conference Series: Materials Science and Engineering* (Vol. 745, No. 1, p. 012180). IOP Publishing. https://doi.org/10.1088/1757-899X/745/1/012180 .

Mohammed, L.R., Alobaydi, D., 2020b, July. Studying sustainable actions of syntactic structures of historic hit citadel: A morphological approach. In *IOP Conference Series: Materials Science and Engineering* (Vol. 881, No. 1, p. 012034). IOP Publishing. https://doi.org/10.1088/1757-899X/881/1/012034/meta .

Perry, E., 2014. Art, Architecture, and Space in the Roman Participatory Context. *A Companion to Greek Democracy and the Roman Republic*, pp.482-500.

Pieri, C., 2008. Modernity and its posts in constructing an Arab capital: Baghdad's urban space and architecture. *Review of Middle East Studies*, *42*(1-2), pp.32-39.

Rashid, M., 2017. The geometry of urban layouts. Cham: Springer.

Rashid, M., Alobaydi, D., 2015. Territory, politics of power, and physical spatial networks: The case of Baghdad, Iraq. *Habitat International*, *50*, pp.180-194.

Russell, A., 2014. Memory and movement in the Roman Fora from antiquity to Metro C. *Journal of the Society of Architectural Historians*, *73*(4), pp.478-506. https://durham-repository.worktribe.com/preview/1425348/13955.pdf .

Russell, Amy. 2016. On gender and spatial experience in public: The case of ancient Rome. Oxford: http://doi.org/10.16995/TRAC2015_164_176.

Thompson, H.A., 1954. The agora at athens and the Greek marketplace. *Journal of the Society of Architectural Historians*, *13*(4), pp.9-14.

Turner, A., Penn, A. and Hillier, B., 2005. An algorithmic definition of the axial map. *Environment and Planning B: planning and design*, *32*(3), pp.425-444.

Van de Ven, A., 2016. The spatialisation struggle: The heritage of open spaces in Baghdad. *plaNext–Next Generation Planning*, *2*, pp.48-73. https://journals.aesop-planning.eu/index.php/planext/article/view/73.

van Nes, A., 2021. Spatial configurations and walkability potentials. Measuring urban compactness with space syntax. *Sustainability*, *13*(11), p.5785. https://www.mdpi.com/2071-1050/13/11/5785.

Xiao, H., 2021. How did public buildings and monuments contribute to the evolution of Agora to forum during the early Roman Period in Athens? *Journal of Architectural Research and Development*, *5*(4), pp.1-8. https://ojs.bbwpublisher.com/index.php/JARD .

ديناميكيات الحضرية في وسط بغداد: تحليل نحوي واستخدام الأراضي لمنطقتي الشورجة وباب الشرقي

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الخلاصة

تُعتَبر التَرتيبات المكانية في المناطق الحضَرية التي توجد فيها المدن ذات أهمية كبيرة لأنها تؤثر مباشرة على مدى النشاط أو عدم النشاط في تلك البيئة. تَستكشف هذه الدراسة كيفية دَمج منطقة وسط بغداد لِهذه الترتيبات المكانية في أنماط استخدام الأراضي لدعم الحيوية. يُركز بشكل خاص على منطقتي الشورجة وباب الشرقي (وهما منطقتان في وسط بغداد). يوضح التحليل باستخدام تقنيات وطرق نحوية الفضاء بالإضافة إلى نظم المعلومات الجغرافية أن الشورجة تتمتع ليس فقط بالاتصال الجيد ولكن أيضاً بمساحات موجهة للمشاة، بينما تتميز باب الشرقي بخصائص معاكسة مع شبكات طرق مهيكلة بشكل كبير مخصصة للمركبات. تدعم الشوارع الضيقة وغير المنتظمة في الشورجة حركة المشاة الكثيفة والأنشطة التجارية النشطة، بينما يعزز النمط الشبكي في باب الشرقي سهولة الوصول للمركبات ويستوعب مجموعة من الاستخدامات، بما في ذلك الاستخدامات التجارية والإدارية. تختتم الدراسة بتوصيات للمخططين الحضريين لتحسين الاتصال والحيوية من خلال التخطيط المكاني المُستنير، مع مراعاةِ دمج السياق التاريخي معَ احتياجات ومتطلبات التحضر الحديثة. تَهدُف هذه الرؤى إلى توجيهِ التنميةَ الحضريةَ المستقبلية لخلقِ بيئاتٍ صالحة للعيشِ ومستدامة.

الكلمات المفتاحية: الشوارع، الوصول، استخدام الأراضي، وسط المدينة.