428

Historic festival cities and the logic of their social spaces

The role of spatial networks and urban fabric on users' experiences during events – the case of Historic Cairo, Egypt.

MARIAM AMER

BARTLETT SCHOOL OF ARCHITECTURE, UNVERSITY COLLEGE LONDON

ABSTRACT

In line with UNESCO's approach to safeguarding historic urban settings, myriad studies have been conducted aiming at establishing an interdisciplinary discourse where research in the field of urbanisation and historic conservation imbricate. Examining the impact of physical, spatial and temporal characteristics of historic settings on locals' and tourists' experiences during event times can help broaden the social and cultural possibilities of these settings, thus integrating urban heritage conservation targets with socio-economic development goals. Accordingly, this research presents the preliminary results of a pilot study evaluating how the spatial structure and urban fabric of Historic Cairo's Fatimid nucleus impact everyday activities and movement patterns, particularly during festivals. A multi-layered evidence-based analysis of the physical, spatial, and social attributes of spaces within the ambit of monuments along Al-Mui'zz street was implemented. The influence of such variables on users' movement during events was also investigated. Based on the tools offered by Space Syntax and the Conzenian approach, the study integrates field observations, statistical models, spatial configuration and urban form assessments. The findings revealed the opportunities and constraints posed by the present land use distribution, building geometry, and spatial layout on people's mobility and interaction along the streets of the historic city during events. The significance of day and night studies in determining the various forms of public space appropriation was also emphasised. Furthermore, patterns of change and persistence in the city's historic urban fabric were highlighted, which is imperative when dealing with concerns like adaptability, sustainability, and historical conservation.

KEYWORDS

Historic Urban Landscapes, Festivals, Space Syntax, Conzenian Approach, Movement Patterns

1 INTRODUCTION

As a declared world heritage site since 1979, Historic Cairo became a part of the pilot cities where conservation and historic management efforts are a priority (Pini, 2012). In recent years, UNESCO (2011) has issued recommendations on the Historic Urban Landscape approach, which is defined as the outlining of urban areas through historic layering and a holistic understanding of the geographic context of those settings. It also encompasses socio-cultural practices and beliefs, economic processes, and heritage's intangible components as they relate to diversity and identity. One of the challenges Egypt is currently facing when it comes to managing historic urban landscapes is the increasing gap between people and the cultural-historic contexts they reside in for which several studies have been conducted aiming to examine the role of utilizing public spaces in those settings for raising cultural awareness (Abdelhady and Radwan, 2020). Since urban festivals located in well-known public spaces are considered a good approach for experiencing a city's atmosphere and unique identity along with helping in shaping the cultural heritage of a particular place (Gold and Gold, 2005; Miśkowiec, 2017), this research presents a multi-layered evidence-based approach for assessing how the different constituents of urban form and spatial morphology of the Fatimid nucleus of Historic Cairo contribute to movement and activity patterns, especially during the time of events. Not only does examining the relationship between street networks, urban morphology, and activity patterns during the events assist in revealing the logic of social spaces within the scope of monuments, but data on the transformation of the spatial structure and urban form over the last few decades also aid in revealing how variations in the spatial configuration over time are related to patterns of transformation in the socio-economic character of the city. Consequently, the research aids in identifying the current barriers to the analysed historic setting's evolution, adaptability, and diversity.

The case study presented in this research will mainly focus on the Fatimid nucleus which still retains parts of its historic character, especially around its main spine which over centuries served as an important commercial destination. Data was collected on 22 street segments along the city's internal pathways because they host events or are near sites where urban spectacles occur. Many events take place in Fatimid Cairo, particularly along Al-Mui'zz street, such as the Festival of Drums and the Tune Festival. Furthermore, throughout Ramadan, Egypt's General Authority for Cultural Palaces organises a series of events in historic buildings or open spaces along Al-Mui'zz as shown in Figure 1. Those events include folklore and Tanoura shows, children's theatre, movie screenings and music concerts (Cairo 360, 2018). The fieldwork and data collection for this research was conducted during the holy month of Ramadan which offers an alternative portrayal of the city's dynamics than that of a regular time of the year. Streets with a high concentration of monuments such as Al-Mui'zz [1-12] and El-Gamaleyia Streets [16-20] are compared to Beean El Syareg [13], Al Dabeeba [14] and Amir al Guyush streets [15] which have a lower concentration of historical structures. Gawhar Al-Qaa'd [18-19] and Al-Azhar [21-22]

streets were also chosen for the analysis since they are destination and main access points to the historic city as highlighted by Mohareb et al. (2008) and Mohareb (2009).

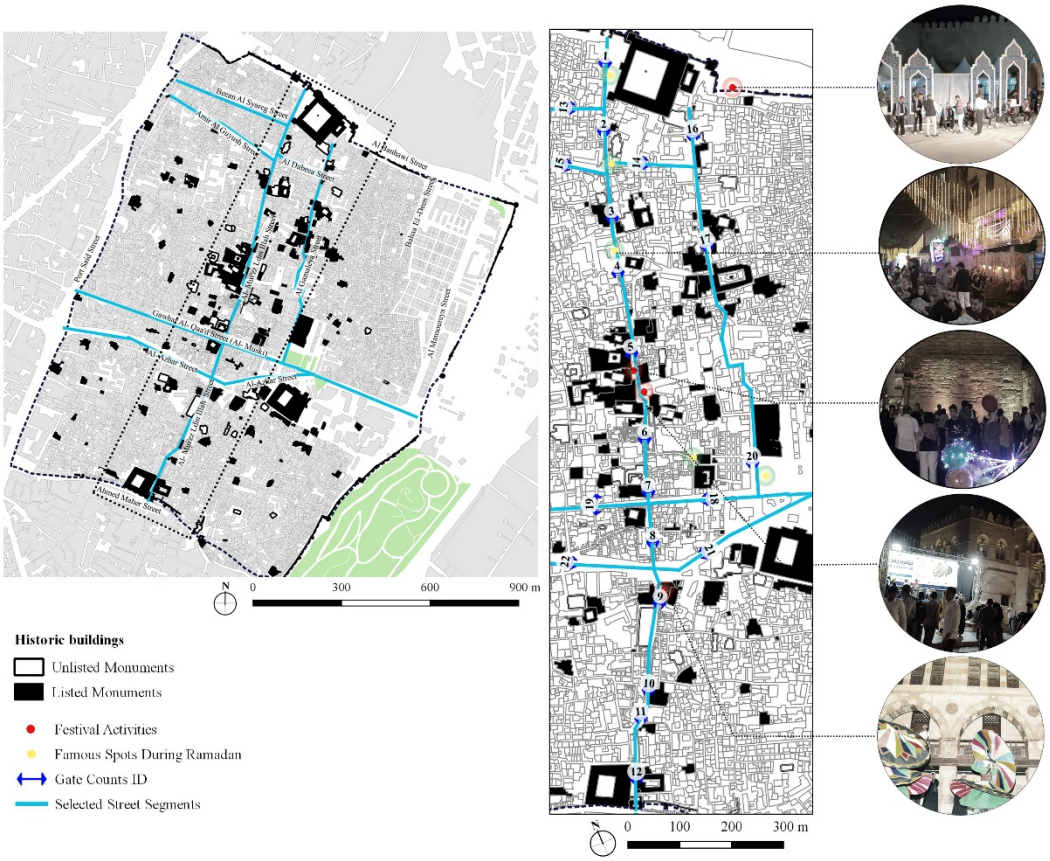

Figure 1: Selected study areas in Fatimid Cairo and the location of festival activities during Ramadan.

2 LITERATURE REVIEW

2.1 Assessment and Characterisation of Historic Settings

For decades, planners, geographers and conservationists took interest in studying the physical characteristics of historic centres to protect them from *'unguided change'* reinforced by political agendas, everchanging densities and land values (Imam, 2017, p.117). The challenge of doing so is reaching an approach where both the physical character and the non-physical factors such as land economics, human needs, politics and ideologies are all taken into account (Imam, 2017). According to recent studies on the topic, the historic urban landscape approach has diverted the efforts of conservation from being solely focused on single entities such as monuments to encompassing whole systems and landscapes within which those elements appear (Alves, 2017). The author builds on the work of James Gibson and Harry Left accentuating how in recent years the word *'Heritage'* expanded not only to encompass the physical, but also the intangible meanings that come in the form of *'inherited traditions'* or *'social practices of contemporary cultural groups'* (Alves, 2017, p.34). In an article on urban morphology and world heritage practice, Palaiologou (2017) highlights the importance of maintaining a dynamic understanding of the complex diachronic character that historic settings pose. The author

elaborated on how an inter-disciplinary approach combining tools and analyses methods from the field of urban morphology such as the M.R.G Conzen Historico-Geographical approach and Space Syntax can offer a systemic investigation of the morphogenetic processes of an urban landscape, the possibility of a multi-layered analysis of the social, economic, cultural and environmental processes along with the historic culture connectivity in historic settings (Whitehand, 2007; Palaiologou, 2017). Not only does this allow the intangible and tangible features of heritage to be examined as approached by Alves, but it also enables the application of interdisciplinary approaches in cross-cultural settings where historic landscapes can be addressed within their broader contemporary setting (Palaiologou, 2017).

The notion of combining the Conzenian approach with space syntax to examine transformation within the built form and the spatial morphology of cities has been adapted on several occasions. A paper by Griffiths *et al.* (2010) has used both approaches to study three Greater London suburbs. The authors provide an overview of how both approaches converge and how they can complement one another, with space syntax allowing one to depict distinctive built features at different phases of urban growth and how various street scales relate to potential movement (Griffiths *et al.*, 2010). On the other hand, the Conzenian approach, through dealing with the street plan, building form and land use distribution, provides a *'fine historical grain information'* about socio-economic activities which the generic nature spatial analysis study doesn't (Griffiths *et al.*, 2010, p.86). Similarly, Birkhamshaw and Whitehand (2012) explore the shortcomings of character area delimitation in maps that does not rely on the Conzenian approach including the risk of overlooking similarities between buildings on both sides of the road. Drawing on Conzen's approach which entails looking at three components of the urban form: the ground plan, the building form and the land utilization, the writers deduced that variations between the three components stem from their likelihood to change and affect how historic landscapes are categorised (Birkhamshaw and Whitehand, 2012). They also argue that street patterns can be the least susceptible component to change while land distribution is the most likely to be transformed over the years (Birkhamshaw and Whitehand, 2012).

Meanwhile, a study by Hiller and Iida (2005) argues that the topological and geometrical attributes of a street network can through their influence on movement flows impact the patterns of land use distribution over time and consequently impact the patterns of life in a city as a whole. Hillier (2007, p.101) elucidates how through spatial analysis one can determine two levels of integration critical to *'the part-whole structure of cities'* the first is more local, covering internal movement and the second is rather global and concerned with in/out or '*through movement*' in the city. According to Hillier and Hanson's (1984, p.27) argument, the variety of spatial forms and orders in our cities and built environment are key reflectors of the cultural differences and evolution instilled in our nature as social beings. Through real-life examples, the authors further elucidate how our understanding of the *'Spatio-temporal'* world is rooted in

constant sync between spatial forms and *'discrete systems'* represented by users experiencing and inhabiting these forms (Hillier and Hanson, 1984, p.35).

2.2 The Role of Festivals in Urban Regeneration

Policy frameworks are increasingly recognising the importance of cultural assets and urban festivals in achieving sustainable urban development (Perry, Ager and Sitas, 2020). Perry et al. (2020) propose that festivals are integrative venues in which tangible and intangible heritage characteristics are interwoven. When festivals are researched for their subjective and historic connotations of location and culture, as well as their contribution to local economies and tourism initiatives, the authors claim that they can be transformative (Perry, Ager and Sitas, 2020). Other studies have investigated the role of urban festivals in interlinking culture to places in the hope of strengthening the sense of belonging to these settings as a part of urban regeneration along with testing potential solutions to problems of mobility (Cudny, 2016; Miśkowiec, 2017). Festivals not only attract tourists and visitors but also develop an opportunity for the local community to benefit from the cultural offer (Miśkowiec, 2017). In a study by Miśkowiec (2017), the author investigates the relationship between urban festivals and changes in the social and spatial-functional structures in a city using the Light Move Festival in Łódź as a case study. The author correlates the spatial organisation of festivals to the guidelines of *the 'Attractive Urban Spaces 2020+ Program'* to examine the potential of using urban festivals in creating sustainable social and spatial policies along with an opportunity to test traffic solutions and to familiarize the residents with them (Miśkowiec, 2017). Since the majority of academic literature conducted on contemporary festivals does not tackle the lived experiences of festival-goers, especially in small-scale festivals, Stevens and shin (2014) observe participants' behaviour during two types of urban festival events street carnivals and art exhibitions in Scotland and South Korea in relation to the festivals' spatial organisation. Their study reveals that such events allow social integration at a local scale and that four kinds of spatial conditions foster local identity and engagement during those spectacles which include enclosure, centrality, axial connection and permeability (Stevens and Shin, 2014). The authors conclude their study by stating that the flow of people during festivals is not necessarily restricted to only choreographed marching and queues based on prearranged itineraries, but that encounters and interactions are constantly occurring between people who are on the move and those who are stationary (Stevens and Shin, 2014).

2.3 Recent Literature on Fatimid Cairo

Recent literature on Fatimid Cairo demonstrates a growing interest in examining the impact of the physical environment on the city's social and cultural identity across time. In numerous pieces of literature Fatimid Cairo has been described as one of the worlds' sustainable historic cities (Salama and Essam, 2014). In a study by Salama and Essam (2014), the authors elucidated that the juxtaposition of residential quarters with mixed-use buildings attributed to the city's distinctive and diverse nature. The authors highlight that the linear format of the spine and the

distribution of the commercial activities were meant to *'promote integration and competition'* among businesses and traders at the time they were first laid out (Salama and Essam, 2014, p.321). El Husseiny *et al.* (2012) present an overview of the socio-cultural nature of Historic Cairo's streets, nodes, and squares, as well as aspects within the architectural fabric that contribute to its stasis and dynamism. A key observation that the authors make is how the introduction of vehicular movement and the presence of motorcycles across the historic city street such as Mui'zz street disrupt walkability (Husseiny and Husseiny, 2012). Although the writers mention important elements that impact users' experience and perception of the historic city, the paper does not explicitly show how empirical and quantitative methods were used to test how the variations within the spatial and morphological character of the city impact movement and human interaction in urban space. A recent study by Mohareb (2016) on the urban periphery of historic Cairo offers an example of how integrated theories in spatial and urban morphology can provide an empirical quantitative assessment of the city's macro and micro spatial configuration and its association with social and commercial activities. It also reflects how the spatial morphology could determine the intangible and tangible visual and physical barriers that define the relation the historic city has with its adjacent modern fabric (Mohareb, 2016). In his research, Mohareb (2016) explores different techniques to study urban edges such as space syntax, mental and visual theories about users' navigational experience which focus on how individuals progressively can enrich and shape their environment.

Form his analysis, he established that: *'there is a direct interrelation between the spatial configuration (syntactic data) and the urban form'* (Mohareb, 2016, p.79). His research also indicated that although the edges and the main internal routes of the city appear morphologically consistent on the surface, they *'are not acting as one homogenous edge along their length'* (Mohareb, 2016, p.79). The impact of the spatial and urban morphology on tourists' navigation across the streets of Historic Cairo has also been addressed by *Mohareb et al.* (2008) to tackle issues related to tourists' access to the city.

Overall, previous literature demonstrates that one of the major issues confronting historic urban landscapes is that the management of historic settings is often primarily focused on the conservation of historically significant monuments or areas, with little attention paid to understanding how the urban form mosaics of these urban settings are interrelated to one another and contribute to how they are susceptible to change over time. The importance of urban festivals on civic and social life is also highlighted in previous literature, bridging the gap between individuals and the cultural-historic surroundings in which they reside. While a great deal of research has been done on the physical and spatial morphology of Historic Cairo, more research is needed to understand how the fabric of the historic city influence how different user groups use public spaces at different times of the day, particularly during events. Since previously mentioned literature highlights how the combination of the Conzenian and configurational approaches can aid in understanding the relationship between the street network, plot patterns,

land uses and the societal activities observed on the ground, the tools based on these approaches will be implemented in this study. The findings of this study can help in highlighting the study area potentials and barriers, as well as guide the development of sustainable social and spatial conservation policies and interventions that could be tailored to improve public spaces along Fatimid Cairo's spine, raising cultural awareness and enhancing the sense of belonging by learning from the historic city during festival seasons.

3 DATASETS AND METHODS

The research framework is divided into two stages: the first stage is a detailed description of the physical, spatial, functional and temporal character of the selected street segments. In the case of the spatial and physical attributes, a comparison between the current and past spatial structure and plot patterns was carried out to pinpoint which attributes continue or seizes to exist today.

The physical and functional attributes investigated in this section are based on the Conzenian approach for examining urban morphology where cartographic data on the current and past urban fabric were solicited and information on plot size and buildings' footprints were captured using GIS software. Similarly, information about the ground floor use and building height was gathered from previously documented survey data recorded in *the Urban Development Project of Fatimid Cairo and Al-Mu'izz Ldin Illah Street* (2000). To investigate the spatial morphology of Fatimid Cairo, space syntax analysis techniques were used. An all line axial map of Historic Cairo was developed and used to generate a segment map subdividing the axial lines at each intersection creating separate road links used in this study. The generated spatial model covers a total range of six kilometres of the current street network with an 800m meter buffer. Both Depthmap X and QGIS software were used to run the analysis. Angular segment analysis was conducted to reflect on how the spatial configuration of the city's street network impacts permeability at micro and macro scales. To do so syntactic measures, also known as centrality indices, were calculated.

The two measures tackled in this paper are angular segment Integration, i.e. *'Closeness Centrality'*, which reflects how proximate a street segment is to others in terms of the angular changes made on each route, thus highlighting the likelihood of streets preference to serve as a destination, and angular segment Choice, i.e. *'Betweenness Centrality'*, which is a measure describing the number of angular paths with least angular changes between every pair of segments (Hillier and Iida, 2005, pp.475- 490). The *Choice* index is thus a reflection of the likelihood of a path to be used for movement through a city (Hillier and Iida, 2005, pp.475- 490). The analysis was conducted for various radii to reflect permeability at different scales, local scales 800m & 400m and global scales 'n' & 4000m. The angular measures in this research were weighted by segment length based on the hypothesis that weighted analysis yielded improvement in syntactical measures accommodating cognitive and physical constraints (Turner, 2007).

The weighted angular analysis takes into consideration the angular variation along the path where the shortest route is defined by least angle change and weighting by segment length corresponds with the notion that the longer the street segment, the larger its probability of having a larger distribution of land uses (Turner, 2007). When comparing the current syntactic measures of the current street network with previous decades, the '*Integration'* and '*Choice'* measures were normalised to accommodate the variation in size between the different spatial models (Hillier, Yang and Turner, 2012, pp.155-193).

To further expand on the impact that the building form and street layout have on the navigation and pedestrians' experience during events, isovists and visibility graph analysis were conducted to measure inter-visibility between different nodes along with the examined street segments. Isovists are a representation of all visible points from a selected point in a space (Al Sayed *et al.*, 2014). The visibility studies help identify the elements that hinder the viewshed of prominent edifices and unveil the sequence by which users experience space. The visibility graph analysis is used to calculate the visual integration which is a metric reflecting the visual distance of space to all others (Hillier, 2007). 120-degree isovists taken from the entrance façade of the monuments were created since humans' vision in a specific direction is never a complete obtuse angle (Vaughan and Sailer, 2017). This study is conducted to investigate the one on one connection between historic monuments and their relation to users' movement patterns during events. Similarly, isovists from the middle of the street segment at an angle of 360 degrees in front of monuments were developed to highlight what one can see standing in the middle of the examined street segments in all directions. The overlapping between different isovists shows the extent of awareness that a pedestrian can have of other spaces and edifices along their path.

An important aspect of reading the city's character during events has to do with how the city is lit at night. Not only does previous literature accentuate the fundamental role of that urban lighting play in the physical character of the built environment, but also a vital factor in pedestrian navigation and orientation in a city (Dwimirnani, Karimi and Palaiologou, 2017). Del Negro (2012) research also confirmed that luminance and colour contrast at night affect the ways in which people identify structures within the city by creating new or eliminating landmarks, thus becoming a salient factor in users' geographic orientation at night. Observing the examined streets of Fatimid Cairo at night during Ramadan showed that some of listed historical edifices in the northern part of the street were colourfully illuminated especially the minarets of mosques. Figure 7 illustrates the location of the lit monuments which serve as a base for the study in the next section where movement patterns along the selected routes at night were correlated with the number of lit monuments to uncover the extent to which the lighting of monuments shapes the activity patterns of different user groups at night during Ramadan.

Meanwhile to examine the variation in the temporal character and users' movement in the selected study areas during the time of celebration and its relation to urban and spatial form, field

observation techniques known as the *'Gate Method'* were conducted. The Gate Method is used for observing moving people and vehicles and to establish an understanding of their flow at different times of the day (Grajewski and Vaughan, 2001). 22 locations were chosen for this study along with the segments of important streets in Fatimid Cairo. Locations where Ramadan decorations and activities are most prominent were noted. The number of people, both locals and tourists, passing across those points was recorded for 5 minutes and multiplied by 12 to estimate the rate of movement per hour. The number of vehicles was also recorded because of its impact on people's occupancy and movement patterns. The analysis was conducted at different times of the day on both weekdays and weekends. Meanwhile, the second stage of the analysis overlaps the physical, spatial and functional variables analysed in stage one with the movement patterns recorded to address any interrelations between the spatial and urban morphology characteristics across the investigated segments on users' activities and mobility at different times of the day during Ramadan. Pearson correlation coefficient (r) was calculated and statistically, significant correlations were noted. A linear regression model was also developed for the different variables.

4 RESULTS AND DISCUSSIONS

4.1 Physical Attributes

4.1.1 Figure-ground Analysis (Streets, Plots & Blocks)

Figure 2: Transformation in the urban fabric between 1807-2006 based on UNESCO (2012).

Although the urban fabric of Historic Cairo has undergone various changes over the years, the areas within the ambit of the monument still retain their organic nature and the open spaces are intertwined with the street network creating a hierarchy of public, semi-private and private spaces. The historic fabric is characterized by three main features: the superblock, the dead-end residential paths *'Atfa'* and public paths accommodating non-residential or mixed-use buildings (Shokry, 2009). A noticeable change over the years is that the organic street patterns are starting to disappear on the edges of the city, especially on the eastern side where large blocks are subdivided into smaller blocks and plots are starting to contain high-rise isolated buildings. When overlapping the spatial analysis with the changes in the figure-ground over time, it could be deduced that areas along streets with the highest accessibility such as Al-Azhar, Al-Mansoureya

and Port Said Streets are the most susceptible to change in the urban form which has its parallel with Törmä, Griffiths and Vaughan (2017, p.15) argument that *'physical changeability follows from multi-scalar redundancy in space and access.'* The data presented in Figure 2 with regards to the urban fabric transformation is based on maps provided in a report by UNESCO (2012) till the year 2006. More data is needed to reflect the transformation between 2006 and today. The analysis in Figure 3 also shows that the number of edifices on one side of the street differs from the other in the majority of the analysed street segments, with the exception of study areas [3, 5, 11 and 21], where the number of buildings and land use is similar on both sides. Study areas [1 and 21] have the most clustering of structures with the highest average footprint. The overall ground subdivisions per street segment length are influenced by the footprint of buildings. Because enormous historic structures take up a considerable amount of the street segment, one side of the street has fewer buildings than the other.

4.1.2 Building Height (3D Form)

The majority of non-historic edifices within the analysed street segments are 1-4 storeys tall as indicated in Figure 3. The stretch of Al Mui'zz Street from Bab El Futuh to Al-Azhar Street has more variance in the skyline than the section from Al-Ghuri Complex to Bab Zuwayla. Regions [2, 3 and 4] along Al-Mui'zz Street and [21, 22] along Al-Azhar Street have the largest percentage of non-historic edifices with a height of 5 storeys and above. The height of buildings varies from one side of the street to the other. Even though the dynamic skyline across the street is imperative to its unique character, the highest concentration of tall non-historic buildings is located near historical monuments, acting as a visual barrier and hindering the role of the monuments as landmarks and focal points. Monuments serve as landmarks and focal points, particularly mosque domes and minarets, which are taller than most normal structures. This will further be highlighted in the following sections. The tallest historic buildings are located in study areas [5, 8, and 12]. A lot of the relatively tall non-historic structures are relatively new additions to the historic city and are mostly present near areas with high accessibility as previously stated.

4.2 Functional Attributes

The land use distribution for the ground level of the analysed street segments is shown in Figure 3. The bulk of studied areas, particularly along Al-Mui'zz and Gawhar Al-Qaa'd streets, have commercial activities as the dominating ground floor use. Historically, Al-Mui'zz street served as the mediaeval city's principal commercial hub; however, when the Fatimid capital was built, the street was primarily constructed to house administrative services and the palaces of the Fatimid Caliph (l-Murri and Wagdy, 2009). Crafts and commercial activities did not appear along the street until the Ayyubid era (l-Murri and Wagdy, 2009). Study Area [6] has the most concatenation of ground floor subdivisions related to retail activity. Meanwhile, region [5] has the highest concentration of historic buildings and culturally significant structures. The concentration of retail activity along the spine according to the nature of commerce is another

historical element that still exists today. A great number of the monuments that are still in use today serve a religious purpose. There are also old buildings that are retail oriented or have been converted into museums and halls for cultural events.

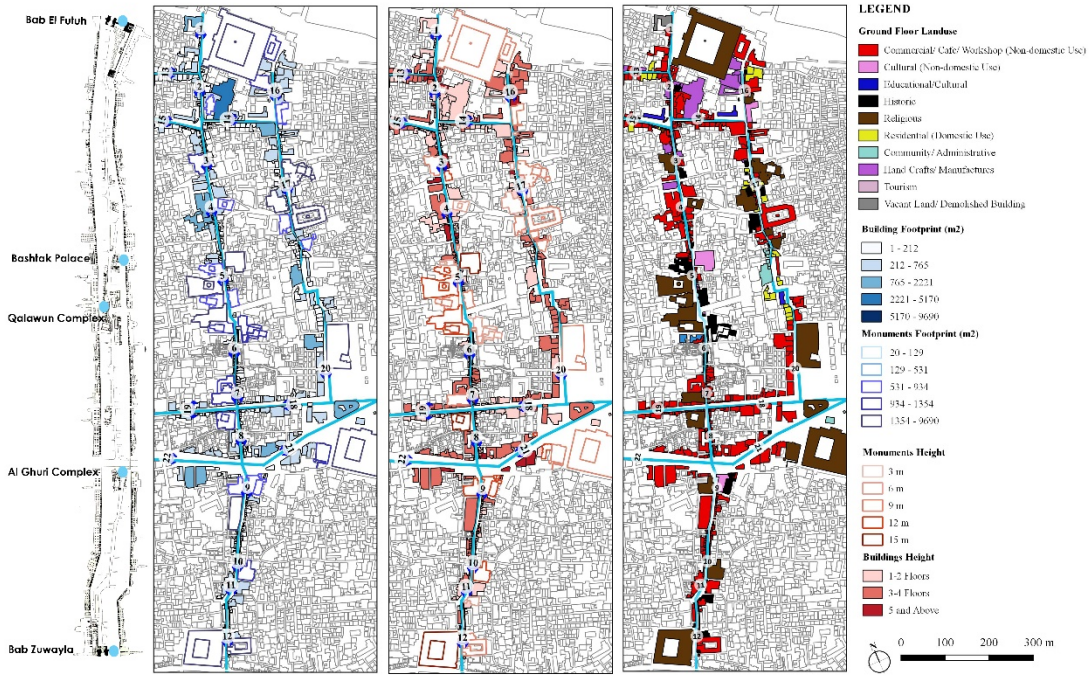

Figure 3: Variations in ground floor use, buildings size and height across the examined street segments [Drawn by author. Source for street elevation: *'Urban Development Project of Fatimid Cairo'* (2000)].

4.3 Spatial Attributes

4.3.1 Accessibility and Permeability

The spatial configuration study presented in Figure 4 and Figure 5 indicates that even though, the spatial characteristics of Al-Mui'zz street, also known as *'Qasaba'*, allow it to act as an integral route to and from the city is still maintained to this day, a noticeable shift in the degree of its importance as a primary attractor of movement flow is accentuated with the modern introduction of Al-Muski and Al-Azhar streets. In addition, the variation in the integration values along Al Mui'zz street is more apparent in today's spatial network. This suggests inconsistency in the permeability along the spine thus contributing to variations in movement and occupation patterns which have been confirmed by the site observations and gate counts presented in the following section. The analysis also highlights that the peripheral roads, i.e. Portsaid and Mansoureya streets are becoming the routes with the highest probability of generating vehicular flow to the examined area. The nodes where Al-Mui'zz Street, Al-Azhar and Gawhar Al-Qaa'd intersect are where the highest integration values along the spine are recorded, both at a global scale [n] and local radii 400m. The current spatial morphology also elucidates that streets at the periphery of the walled city along with Gawhar Al-Qaa'd, Al-Mui'zz and Al-Azhar streets at the centre of the historic city have the highest choice and probability for through movement in the historic city.

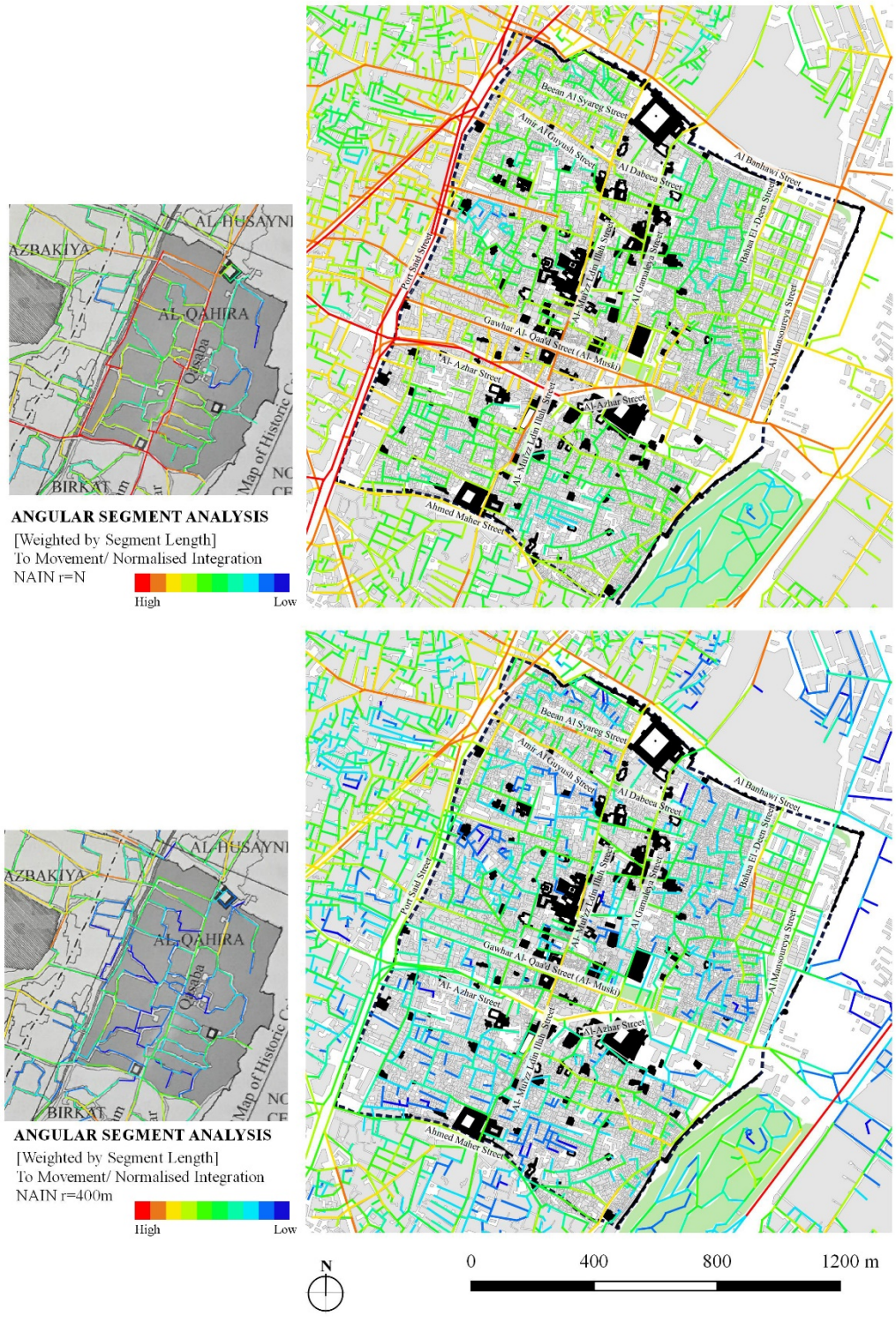

Figure 4: Angular segment integration for Fatimid Cairo Street Network Pre-1800 A.D. [left] and today [right].

Comparing the spatial networks of the city over time also highlights the introduction of a new thoroughfare, i.e. Bahaa El -Deen street which is parallel to Kafr Al Zaghari, on the eastern side of the Fatimid nucleus. It should be mentioned that the high choice value at the global scale might not necessarily be matched with the high vehicular flow at the intersection of Al-Mui'zz street and Gawhar Al-Qaa'd streets, since some parts of those streets have restricted vehicular

access where only motorcycles, cyclists and pedestrian are allowed to pass. This restriction was set to accommodate the historic and commercial nature of the area, especially with street vendors occupying both sides of the street. Unlike the integration indices, the choice values seem to be consistent along with the various segments of Al-Mu'izz street at both the global and local scales. The angular segment choice indices for local radii 400m reflect the potential movement by pedestrians inside the historic city especially the routes that are most likely to be used by residents of the city such as Amir Al-Gyosh and Beean Al-Syareg streets.

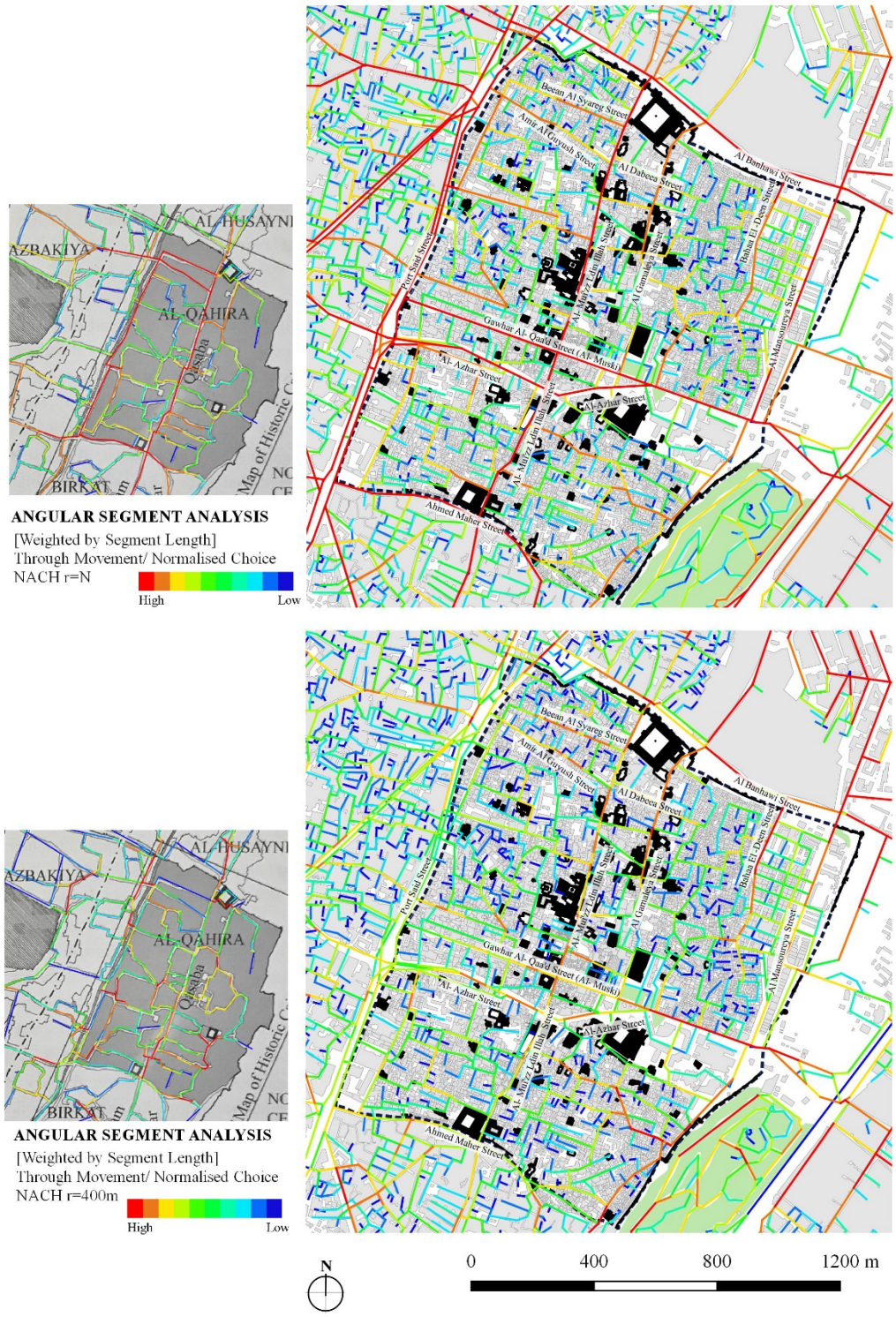

Figure 5: Angular segment choice for Fatimid Cairo Street Network Pre-1800 A.D. [left] and today [right].

4.3.2 Visual Field and Visibility Relationships

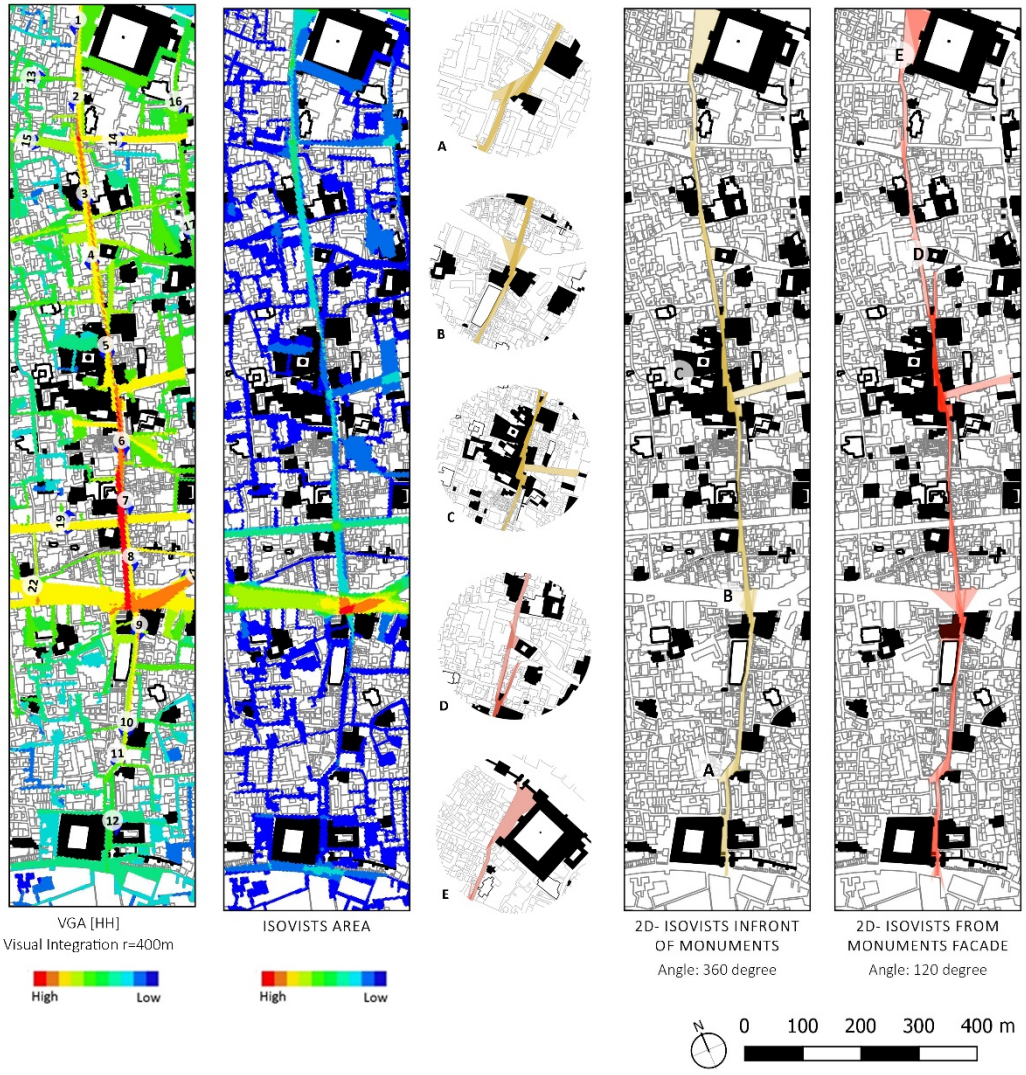

Figure 6: VGA and isovists in front of and from the Monuments Façade

The largest isovist area, according to Figure 6, is found between the two edifices of Al-Ghuri Complex [B], which can be attributed to the nature and length of the street segment, as well as the fact that it overlooks a wide vehicle road with a huge visual field. Compared to other street segments, people in this zone are more likely to be aware of the larger context. The isovist field in front of Tusun Pasha's Sabil Kuttab [A] has a smaller isovist area and shorter segment length. The street's winding shape in this area makes it difficult for pedestrians to predict what will happen next. Furthermore, the space around Qalawun complex [C] has a changing strength of inter-visibility due to the geometry of the building, as can be concluded from the VGA. The largest façade isovist along Al-Mui'zz street is in front of Hakim Mosque [E]. Despite its size, the nature and shape of the street segment result in it having the fewest isovist intersections. It also means that when standing in front of the building, people are less conscious of other historic structures. In addition, in front of Al Aqmar mosque [D], the tiniest façade isovist may be found. Because of the building's interaction with the street, which is offset backwards from the main spine, a contained visual enclosure is established, making it difficult for the building to be

overlooked or viewed from other monumental structures along Al-Mui'zz street. The isovists study described in this research is two-dimensional. To account for the third dimension and the impact of building height on visibility relationships, future research will use composite 2D isovists at various heights.

4.4 Social Attributes

4.4.1 Gate Counts and Movement Patterns

During morning hours, the intersection of Al-Mu'izz and Al-Azhar Streets [Gate 8] witnesses its peak locals movement flow. The dense commercial activities and proximity to major access points along Al-Azhar Street could be the reason. According to the spatial analysis presented earlier, this location is bordered by streets with high global choice and integration values. It also has high visual integration. Although a high density of movement is recorded at the intersection, the movement of tourists and locals starts to decrease as one moves along Al-Azhar street because it is considered a highway and not as pedestrian-friendly with the high vehicular flow. It is also difficult to cross due to the metal fence barrier introduced in the middle of the road which could be the reason why the section between Al-Ghuri Complex and Bab Zuwayla [Gate 9-12] has a reduced total flow of pedestrians, both locals and tourists, when compared to the northern stretch of the Al Mui'zz street between Bab El Futuh and Al-Azhar Street [Gate 1-8].

When compared to the street segment from Bab El Futuh to Al-Azhar Street, which includes souvenir stores, crafts workshops, cafes, restaurants, and other land uses, the portion from Al-Ghuri Complex to Bab Zuwayla contains fewer historical monuments and less diversity of land uses. In addition, gates [10,11, and 12] have lower levels of visual integration than other study sites along Al-Mui'zz street. The presence of few tourists near Bab Zuwayla could be attributed to the fact that the Southern Gate leads to El Khayamiya cloth market, i.e. the Tentmakers Bazar, known for selling colourful carpets and tapestries and the fact that Ahmed Maher street is characterised by high-value choice value at the global scale. Both visitors and locals have the least amount of movement near [Gate 13,16 & 17], which has a high concentration of residential structures and is less integrated on a global scale.

Throughout the evening hours, the open space in front of Hakim mosque, Al-Silahdar Mosque, Qalawun complex and the dome of Najm Eldin Ayoub [Gates 1, 3, 5 and 6] gets enlivened by high movement flow and occupancy patterns. Furthermore, in areas with major clusters of monuments, a high density of activities, shops, cafés, and lively facades, such as near Al-Husayn mosque [Gate 20], the highest movement flow for locals and tourists is noted during the late hours of weekends. The fact that the number of cars observed on Al-Muizz street is lower than on Al-Azhar street can be linked to the major spine's vehicular rules. Even though the area and Al-Mui'zz street, in particular, have great potential as a walkable zone, pedestrian movement can be very difficult especially for visitors in some areas, due to the presence of motorcycles despite the vehicular control. In addition, the heavy vehicular traffic and fence located in the middle of the

road along Al-Azhar street as seen in Figure 7 are currently acting as a barrier to the continuity of the spine.

Comparing movement patterns recorded in this study during Ramadan with pedestrian flow recorded in Mohareb's (2009) at the regular time of the year shows parallel trends especially at the intersection between Gawhar Al-Qaa'd and Al-Mui'zz street where the highest movement count is recorded. This corresponds with the spatial analysis results indicating that both thoroughfares have high choice indices at both the local and global scale as well as high integration indices especially Gawhar Al-Qaa'd at a global scale.

Similarly, the high tourists and local movement flow recorded in Ramadan near gates 18 and 20 leading to Khan El Khalili a commercial area with active ground floor building frontage is also noted by Mohareb, Eladawi and Ayad (2008) during the regular time of the year. On the other hand, Mohareb's (2009) study indicates the low pedestrian flow at Bab el Futuh [Gate 1], while the evening gate counts during Ramadan especially for locals are much higher. The low pedestrian flow highlighted in Mohareb's (2009) research is due to the fact that areas near the gate are characterised by new imposed activities and retail functions that do not fit with the old fabric leading the observed movement patterns not to fit with the spatial model outcome. This phenomenon slightly diminishes during the evening hours of Ramadan due to the diversity of recreational activities, including cultural and street performances in addition to street vendors and coffee shops capitalizing on the affordances that the open space at the gate creates by expanding their activities across the public space of Al Hakim Mosque. This creates a more dynamic and lively experience that is not typically seen in normal days of the year or during the morning hours of Ramadan. This has been tackled by jane Jacob in 'The Death and Life of Great American Cities,' where the author states that for cities to be able to sustain diversity, they must support the existence of primary mixed uses, encompasses a mixture of old and new buildings, short blocks, frequent streets and high concentration of diverse user groups (Jacobs, 1961).

A similar difference in the number of locals and tourists around gates 5 and 6 in front of Qalawun complex during the evening hours of Ramadan and the movement density recorded in Mohareb, Eladawi and Ayad (2008) during the regular time of the year could also be attributed to the cultural activities and the open theatre set up in this area during events season. Despite street vendors and cafeterias contributing to the liveliness of the street, a lot of the seats and stalls they informally expand onto the sidewalks can hinder movement. Consequently, future revitalization plans should consider finding new ways to integrate these diverse activities without impacting the movement flows, especially that these activities cater to the need of different users' groups.

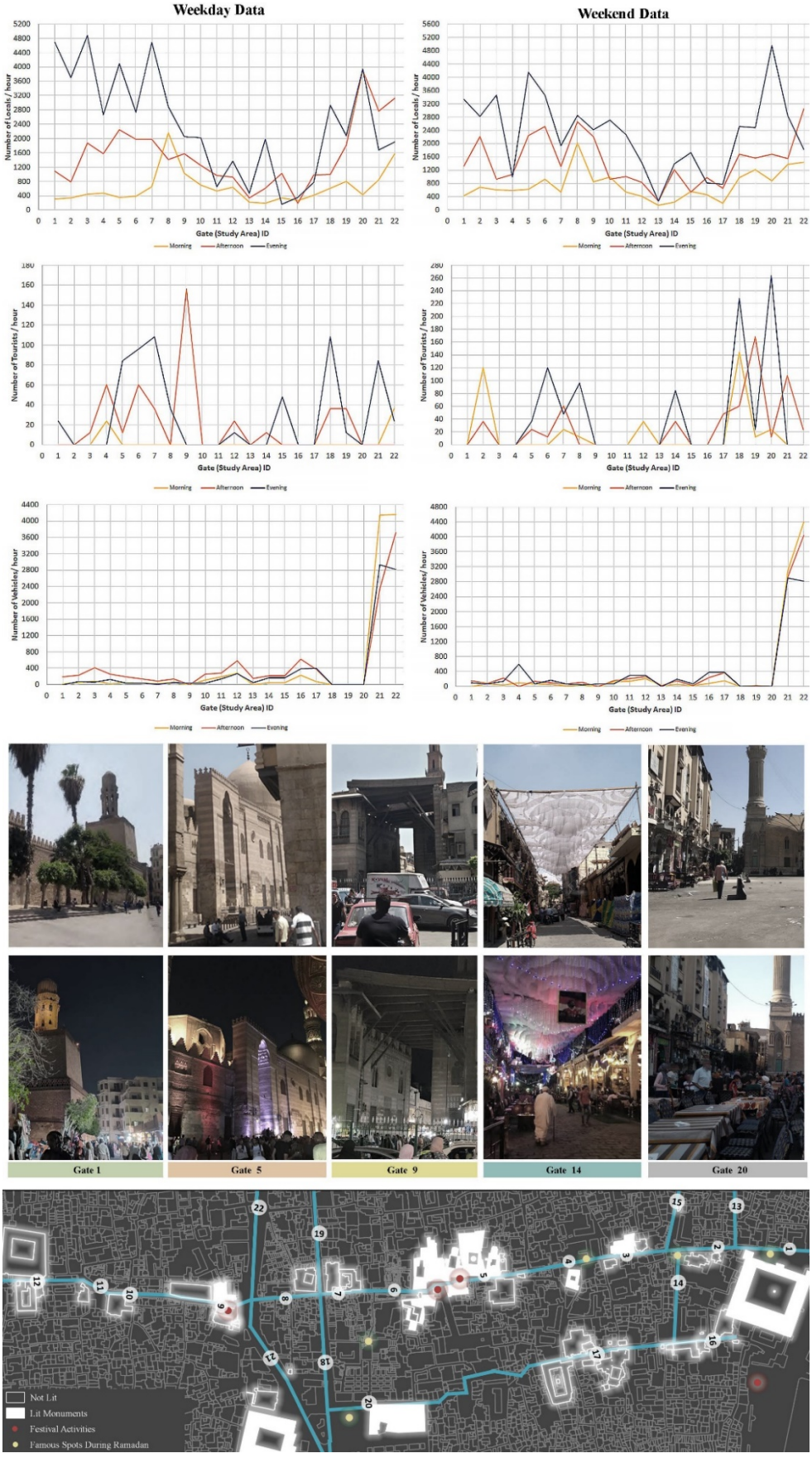

Figure 7: Movement and activity patterns during Ramadan recorded at different times of the day.

4.5 Integrated Approach and Statistical Interpretation

This section provides an overview of how the spatial structure and urban morphology of the study area lead to variance in users' mobility and activity patterns during the time of events. Table 1 shows a statistically significant Pearson correlation coefficient [r] for the discussed variables. While there is no significant association between building size and mobility patterns during Ramadan, there is a substantial correlation between building height, tourists' and locals' movement patterns. A case in point is the association between locals' movement on weekend afternoons and monuments 12 meters or higher in height [r=0.576, p <0.01, n=22] and visitors' movement on weekday mornings and structures with 5 or more storeys [r=0.553, p< 0.01, n=22]. This may be because tall structures can act as landmarks or focal points for visitors as they navigate the city. It has also been previously highlighted in literature by Mohareb (2009) that the pedestrian flow along Al-Muizz street correlates to the ratio of the average building height to street width by 60%. During weekends evening hours, there is only a moderate relationship between lit monuments in Figure 7 and locals movement flow [r=0.517, p<0.01,n=22]. This indicates the potential of environmental attributes such as night lighting in highlighting new landmarks that eventually impact users' perception of the city at night. The fact that lit monuments are only associated with residents' mobility patterns on weekends suggests that the available light is insufficient or poorly distributed to suit tourist movement patterns at night. Future research could take a deeper look into the relationship between centrality indices and currently lit monuments to recommend ways to better inform night illumination during festivals and events.

Examining the relationship between field observations and centrality indices reveals a relatively strong correlation between tourists' movement patterns during weekdays morning hours and the global choice value. Streets with high potential for through movement attracts more tourists to the historic city due to their high accessibility to transportation [r=0.557, p<0.01, n=22]. In addition, linear regression was calculated for both variables indicating that for each unit increase in the global choice index, there is a 27.6% chance increase in the possibility of visitors being present in a space or a street segment. A significant correlation between isovists area and movement patterns of locals, tourists and vehicles at different times of the day was also noted. An example would be the positive correlation between tourist movement during weekdays mornings and the average isovists area [r=0.669, p<0.01, n=22, R2= 0.448] and locals' movement in weekends afternoon [r=0.634, P<0.01, n=22, R2= 0.401] as indicated in Figure 8. Similarly, a significant correlation between locals' movement during morning and afternoon hours of weekends and the average visual integration [r=0.593, p< 0.01, n=22] and [r=0.627, p< 0.01, n=22]. When calculating the linear regression to predict locals' movement patterns based on the average visual integration, a significant relationship was found with an R2 of 0.393. Thus, locals' presence in a street segment during the time of events increases by 39.3% for each increase in visual integration.

A moderate negative correlation between pedestrian movement patterns is noted in association with educational and craft-oriented land use during afternoon hours. This indicates that those functions are located in places that are more private and attract less movement, it is also because during Ramadan a lot of the services close early in the afternoon compared to the regular time of the year. There was no significant correlation between the number of historic monuments and the movement patterns of pedestrians, both locals and tourists, which confirms the initial observation that the primary attractor of movement in the city is not a specific historic structure or a particular land use, but rather the spatial morphology which allowed for variations in activity patterns, albeit the pre-dominantly commercial and historic nature of the city.

Table 1: Significant Pearson correlation coefficients.

		Dependent Variables					
		Weekday Movement Patterns					
		Morning		Afternoon		Evening	
		Locals	*Tourists*	*Locals*	*Tourists*	*Locals*	*Tourists*
Independent variables	**Physical Attributes:**						
	Building Height						
	5 Floors and Above		0.553**				
	Monuments Height						
	12-14 meters		0.492*	0.542**			
	Functional Attributes:						
	Ground floor land use						
	Educational			-0.460*			
	Crafts Workshops			-0.456*			
	Spatial Attributes:						
	Through Movement						
	CH[SegLEN]		0.557**				
	Visibility Relationships						
	Avg. Isovists Area	0.509*	0.669**	0.613**			
	Avg. Visual Integration[HH]			0.428*		0.516*	0.508*
		Weekend Movement Patterns					
		Morning		Afternoon		Evening	
		Locals	*Tourists*	*Locals*	*Tourists*	*Locals*	*Tourists*
	Physical Attributes:						
	Monuments Height						
	12-14 meters			0.576**			
	Functional Attributes:						
	Ground floor land use						
	Residential			-0.484*			
	Spatial Attributes:						
	To Movement						
	INT[SegLEN]	0.473*					
	INT[SegLEN_800m]	0.482*					
	Visibility Relationship						
	Avg. Isovists Area	0.602**		0.634**			
	Environmental Attributes:						
	Lit Monuments					0.517*	

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
segLEN means weighted by segment length

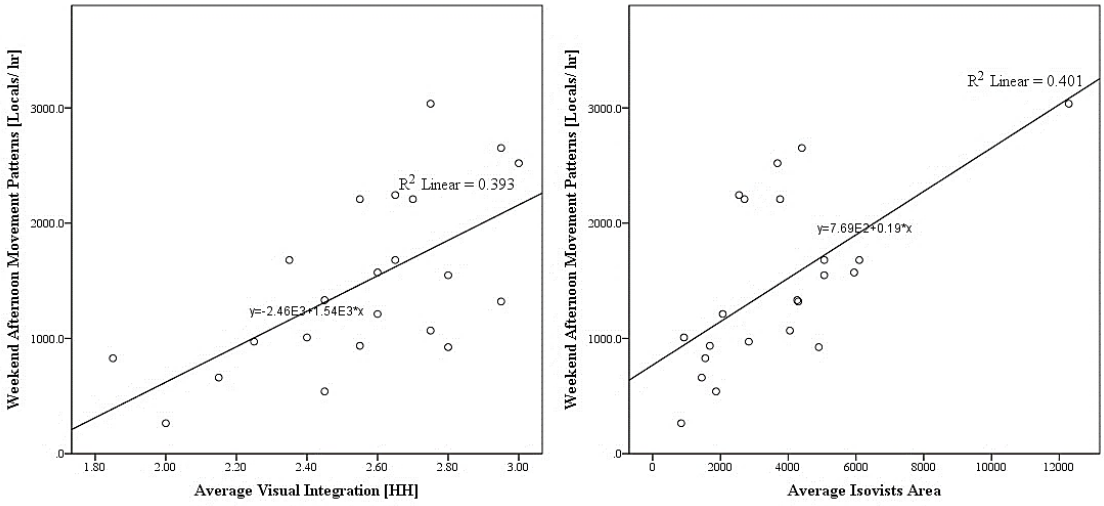

Figure 8: Scatterplot showing the relation between movement patterns, isovists area and visual integration.

5 CONCLUSION

This research presents the preliminary findings of a pilot study conducted to test how a multi-layered evidence-based analysis combining Space Syntax and Conzenian approaches along with observational data on users' movement and activity patterns could potentially help in developing more sustainable social and spatial conservation policies and interventions through learning from historic urban settings during festival seasons. Data gathered for this research was conducted during Ramadan in 2018. Although the Fatimid nucleus in Historic Cairo is currently undergoing a lot of renovations, learning from user's behaviour and how the public spaces in the historic city were appropriated during that time, could contribute to the current heritage management efforts aiming at revitalizing the pedestrian street life and reducing the deterioration of historic sites. According to the analysis results, permeability variations have contributed to the diversity in activity and movement patterns inside the historic city, especially during the time of events. Rather than the number of historic monuments, it appears that the increase in tourists' and locals' movement patterns around specific settings within the historic city during Ramadan is linked to the location of those spaces in the spatial network and visibility relationships. This is consistent with Stevens and Shin's (2014) argument that centrality, axial linkage, and permeability encourage people's participation in events and spectacles. The results also show how investigating the relationship between the morphological character of the city, movement and interaction of tourists and locals during the time of events can help in highlighting the current barriers to the city's adaptability and sustainability as well elucidating potential ways to expand on socio-cultural activities by capitalizing on the affordances that the fabric of the historic city creates such as in the area near Bab El-Futuh. Festivals seasons could also be the time of the year when planning and conservations authorities experiment and test different solutions to the current barriers. In addition, the analytic approaches utilised in this study enabled an empirical evaluation of the spatial structure and visibility links, emphasising the impact of building geometry and spatial configuration on visual field continuity and user experience along Al-

Mui'zz street. It also provides a valuable model for anticipating patterns of change and persistence in the historic city when combined with historical data on building form and land use distribution from prior times. The day and night time observations conducted in this study have proven their relevance to the understanding of the intangible cultural heritage of the historic setting which is often overlooked in the conservation of historic public spaces as indicated in Törmä (2020). While the primary focus of this study was on movement patterns, subsequent studies could concentrate on occupancy patterns and the numerous social behaviours that occur in public spaces during festivals. Moreover, more observation gates along the chosen streets, especially Al-Gamaleyia street, could be conducted to expand on the statistical model.

REFERENCES

Abdelhady, O. and Radwan, A. (2020) 'Public spaces in historic sites as a Tool of raising cultural awareness', 5, p. 20.

Alves, S. (2017) 'Linking tangible-intangible aspects of heritage through an ecological view of perception', in *Historic Urban Landscape Forum*. London: Bartlett School of Architecture, UniversityCollege London.

Birkhamshaw, A. J. and Whitehand, J. W. R. (2012) 'Conzenian urban morphology and the character areas of planners and residents', *Urban Design International*, 17(1), pp. 4–17. doi: 10.1057/udi.2011.22.

Cairo 360 (2018) *El-Muizz Street is The Perfect Place To Spend Your Ramadan Evenings – Cairo 360 Guide to Cairo, Egypt*. Available at: https://www.cairo360.com/article/arts-culture/el-muizz-street-is-the-perfect-place-to-spend-your-ramadan-evenings/ (Accessed: 6 January 2022).

Cudny, W. (2016) *Festivalisation of Urban Spaces*. Available at: http://link.springer.com/10.1007/978-3-319-31997-1.

Del-Negro, D. (2012) 'The Perception of Central London by Night', *Proceedings of EXPERIENCING LIGHT 2012: International Conference on the Effects of Light on Wellbeing*, (1960), pp. 1–5. Available at: http://www.experiencinglight.nl/orals.html.

Dwimirnani, P., Karimi, K. and Palaiologou, G. (2017) 'Space after dark: Measuring the impact of public lighting at night on visibility, movement, and spatial configuration in urban parks', *Proceedings - 11th International Space Syntax Symposium, SSS 2017*, (2015), pp. 129.1-129.18. Available at: http://discovery.ucl.ac.uk/10042787/1/129.pdf%0Ahttps://www.scopus.com/inward/record.uri?eid=2-s2.0-85031102023&partnerID=40&md5=8dbfe88e8cdbaf21f0c9ee7bcd209952.

Gold, J. R. . and Gold, M. M. (2005) 'Cities of Culture: Staging international festivals and the urban agenda, 1851-2000', *Geography (Sheffield, England)*, (3), p. 308.

Grajewski, T. and Vaughan, L. (2001) 'Space syntax observation manual', *'Space Syntax' Observations procedures manual*, pp. 1–18.

Griffiths, S. *et al.* (2010) 'The persistence of suburban centres in Greater London : combining Conzenian and space syntax approaches', 14, pp. 85–99.

Hillier, B. (2007a) *Space is the machine*. 3 (Electro. London, UK: Space Syntax. doi: 10.1016/S0142-694X(97)89854-7.

Hillier, B. (2007b) *Space is the machine*. 3rd edn. London: Press Syndicate of the University of Cambridge. doi: 10.1016/s0142-694x(97)89854-7.

Hillier, B. and Hanson, J. (1984) *The Social Logic of Space*. Cambridge: Cambridge University Press. doi: DOI: 10.1017/CBO9780511597237.

Hillier, B. and Iida, S. (2005) 'Network and psychological effects: a theory of urban movement', (1987), pp. 475–490. Available at: papers2://publication/uuid/51712050-C088-4BAE-B7A0-

6A4372B28C46.

Hillier, B., Yang, T. and Turner, A. (2012) 'Normalising least angle choice in Depthmap and it opens up new perspectives on the global and local analysis of city space', *Journal of Space Syntax*, 3(2), pp. 155–193.

Husseiny, A. M. El and Husseiny, A. A. El (2012) 'Integration of Static and Dynamic Spaces in Historic Cairo: A Community Spirit that May Vanish', *Procedia - Social and Behavioral Sciences*, 68, pp. 687–699. doi: 10.1016/j.sbspro.2012.12.259.

Imam, S. (2017) 'Maintaining Character through urban Morphology analysis', *Open House International*, 42(4), pp. 117–123. Available at: https://search-proquest-com.libproxy.ucl.ac.uk/docview/1989828448?accountid=14511.

Jacobs, J. (1961) *The Death and Life of Great American Cities*. New York: Random House.

l-Murri, T. and Wagdy, A. (2009) *Al-Mu'izz Li-Din Allah Street -The Great Street*. 1st Editio. Cairo: Government of Egypt.

Miśkowiec, M. (2017) 'The role of an urban festival in public space: case study of the Light Move Festival in Łódź', *Acta Universitatis Lodziensis. Folia Geographica Socio-Oeconomica*, (29), pp. 107–119. doi: 10.18778/1508-1117.29.06.

Mohareb, N. (2016) 'Searching for Urban Patterns; an Assessment of Historic Edges and Its Surrounding Context: Historic Cairo As a Case Study', *International Journal of Architectural Research: ArchNet-IJAR*, 10(2), p. 67. doi: 10.26687/archnet-ijar.v10i2.1015.

Mohareb, N. I. (2009) 'Street morphology and its effect on pedestrian movement in historical Cairo', *Cognitive Processing*, 10(SUPPL. 2). doi: 10.1007/s10339-009-0283-x.

Mohareb, N. I., Eladawi, A. G. and Ayad, H. M. (2008) 'Tourist navigation through historical sites: The spatial analysis approach', *WIT Transactions on Ecology and the Environment*, 115(August), pp. 53–63. doi: 10.2495/ST080061.

Palaiologou, G. (2017) 'Urban morphology and World Heritage practice', *Urban Morphology*, 21.1(Article 7), pp. 3–6.

Perry, B., Ager, L. and Sitas, R. (2020) 'Cultural heritage entanglements: festivals as integrative sites for sustainable urban development', *International Journal of Heritage Studies*. Routledge, 26(6), pp. 603–618. doi: 10.1080/13527258.2019.1578987.

Pini, D. (2012) *The Urban Regeneration of Historic Cairo Towards a Management Plan for Conservation and Regeneration The UNESCO technical assistance project*. Available at: http://siteresources.worldbank.org/INTCHD/Resources/Presentation.pdf (Accessed: 23 May 2018).

Salama, A. and Essam, G. (2014) 'Fatimid Cairo : A Sustainable Neighborhood from Medieval Times', in. Barcelona, pp. 315–322.

Al Sayed, K. *et al.* (2014) *Space Syntax Methodology*. 4th edn. London: Bartlett School of Architecture, University College London.

Shokry, H. M. (2009) 'Townscape process ; Towards a Sustainable Urban Form ... in Historic Cairo', (December), pp. 1–12.

Stevens, Q. and Shin, H. R. (2014) 'Urban Festivals and Local Social Space', *Planning Practice and Research*, 29(1), pp. 1–20. doi: 10.1080/02697459.2012.699923.

Törmä, I. (2020) *Urban revitalization with music and dance*. Available at: https://ilkkatorma.com/works-2/urban-revitalisation-with-music-and-dance/.

Törmä, I., Griffiths, S. and Vaughan, L. (2017) 'High street changeability: the effect of urban form on demolition, modification and use change in two south London suburbs', *Urban Morphology*, 21(1), pp. 5–28.

Turner, A. (2007) 'From axial to road-centre lines: A new representation for space syntax and a new model of route choice for transport network analysis', *Environment and Planning B: Planning and Design*, 34(3), pp. 539–555. doi: 10.1068/b32067.

UNESCO (2011) *RECOMMENDATION ON THE HISTORIC URBAN LANDSCAPE*. UNESCO.

Available at: https://whc.unesco.org/uploads/activities/documents/activity-638-98.pdf (Accessed: 22 May 2018).

UNESCO (2012) *UNESCO World Heritage Centre - Management of World Heritage Sites in Egypt Urban Regeneration Project for Historic Cairo*.

Urban Development Project of Fatimid Cairo and Al-Mu'izz Ldin Illah Street (2000). Cairo.

Vaughan, L. and Sailer, K. (2017) 'The metropolitan rhythm of street life: A socio-spatial analysis of synagogues and churches in nineteenth-century Whitechapel', *An East End Legacy: Essays in Memory of William J. Fishman*, (April), pp. 188–210. doi: 10.4324/9781315648484.

Whitehand, J. W. R. (2007) 'Conzenian urban morphology and urban landscapes', *6 th International Space Syntax Symposium*, pp. ii-1-ii–9. Available at: http://www.spacesyntaxistanbul.itu.edu.tr/papers/invitedpapers/Jeremy_whitehand.pdf.