

New Housing Patterns and Spatial Fragmentation in Gulf Cities

Florian Wiedmann, Ashraf M. Salama, Hatem G. Ibrahim, Velina Mirincheva

Journal: *Journal of Urbanism: International Research on Placemaking and Urban Sustainability (RJOU)*

Article ID: RJOU 1626263

<https://doi.org/10.1080/17549175.2019.1626263>

Abstract

In recent years, the rapid growth of Gulf cities has led to a transformation of local settlement structures. The key objective of this paper is to deliver an overview of new residential developments and how they impact urban structure. This paper explores newly formed residential developments in Qatar's capital, Doha. Identifying the spatial distribution of new housing typologies GIS analyses together with an overlay of Space Syntax models were undertaken to explore the recent transformation of three districts. This is coupled with an analysis of the travel routes of 130 residents which were assessed to investigate key aspects related to fragmentation. The outcomes include both new insights into the understanding of urban development tendencies in Gulf cities and the introduction of a methodological approach to establish responsive strategies in fast-growing and car-dependent cities.

Introduction

Today, a fragmented urban pattern is widely acknowledged as a major planning challenge worldwide. The integration of land-uses and appropriate urban densities are preconditions to reducing energy use, as well as to enhancing livability by reducing traffic congestion and pollution (Gordon et al., 1989). Fragmentation is mainly rooted in car-based urbanism, promoted by industries from the financial sector to car manufacturing, and backed by public policies and infrastructure investments (Mumford, 1968). The result has been an expanding urban periphery and the dissolving of clear borders between countryside and cities (McIntosh et al, 2014). Thomas Sieverts (2000) describes the resulting urban pattern as "Zwischenstadt" – places between space and time witnessing continuous transformations and a lack of clear centers and points of identification.

In its core, any suburban sprawl is a result of adopting horizontal development strategies and low-rise housing. Suburban settlements have been a direct consequence of problematic urban conditions of industrial cities, as captured in Ebenezer Howard's vision for the Garden City in 1898 (Hall, 2002, p. 94). In the 20th century, suburban living rapidly gained an elevated socio-economic reputation, by promoting notions related to individual freedom, safe surroundings, and investment opportunities for residents (Calthorpe, 1993). The resulting suburban landscape and its impact on society have been discussed heavily in the literature; notably by Jacobs (1961) in "*The Death and Life of Great American Cities*". Robert Cervero (1986) argues that suburban areas do not engender functionally cohesive neighborhoods, due to their focus on cars as main mode of transport with limited walkability potentials, and the lack of integrated public spaces or community services; in other words, people have fewer opportunities for accidental social encounters and thus the potential for creating communities is unattainable. Instead, a large percentage of suburban areas is defined by a

high quantity of private properties, which are seclusive, rather than integrative, thus creating social boundaries.

In planning and urban design terms, each housing unit is usually connected to a defined road grid, whose geometry is highly rationalized, resulting in repetitive settlement areas (Webber, 1963, p. 23). The main access roads and highways act as the main barriers, and the eventual main reason for the fragmentation of neighborhoods (Schneider, 1979). In a reciprocal manner, sprawling highways have led to the peripheral displacement of businesses and neighborhoods. Consequently, new clusters of commercial developments have emerged, and have become the accessible alternatives for overcrowded inner-city districts; they are what Joel Garreau calls, the “Edge Cities” (1991). The increasing car dependency and the high occupancy rates in these edge cities have led to scattered urban clusters, defined by monofunctionally, rather than integrated and human-oriented satellites to the main city (Kunstler, 1993; Webber, 1964).

In addition to sprawling low-rise urban peripheries and emerging edge cities, transition areas between the fringes of inner-city areas and suburbs have also undergone transformations, now mostly hosting large numbers of dense residential developments, benefitting from a combination of enhanced centrality and infrastructural provisions (Alonso, 1964). While the main business districts still contain the largest share of working places, the transition zones between inner-city areas and peripheries have become the main agglomerations of multi-story apartment buildings for low to medium income groups (Nelson and Wachter, 2012). These residential areas are often the offspring of adjusted zoning policies, which permit higher densities and thus compensate the extensive infrastructure cost of having to build new urban areas otherwise (Schill, 2012, p. 404). On the downside, the resulting neighborhoods, populated by lower income groups, have higher potential for social conflicts, particularly in cases of more isolated and monofunctional residential developments (Davidson, 2012, p. 391).

In recent years, another new tendency has emerged through property-led development initiatives - the themed ‘mega project’. One such phenomenon worldwide is the launch of waterfront developments (Lehrer and Ledley, 2008). The location along riversides and coasts has become a main attraction for developers to build the most exclusive properties including residential high-rise developments.

The previous outline suggests that three types of residential developments can be observed worldwide: (1) The continuous extension of suburban settlements leading to the phenomenon of emerging edge cities, (2) the increasing density of residential developments within transition zones and inner-city areas and (3) the introduction of mega projects as catalysts for urban redevelopment, often along waterfronts in central locations. These newly built residential developments define the overall spatial integration or fragmentation of urban areas due to their patterns being either open and accessible or closed and isolated.

Housing Dynamics and Urban Transformation in Gulf Cities

After the oil production commenced in the Gulf region in the middle of the 20th century, in a period of less than two decades, former trading ports and fishing hamlets transformed into modern cities (Scholz, 1999, p. 77). This rapid urbanization was enabled by fast reinvestment of oil revenues in

infrastructure projects, including basic road networks and utilities. The subsequent migration from rural or desert settlements, in combination with the vast migration of international guest workers, led to the first urban agglomerations, whose structure was mainly defined by basic infrastructural requirements (Salama and Wiedmann, 2013, p. 28). In general, two major phases of residential developments can be distinguished during the first decades of modern urbanization, leading to rather distinctive urban structures in the majority of Gulf cities (Salama et al., 2017, p. 320).

Firstly, the arrival of the rural and desert native population and the political objective to improve living conditions of all citizens, instigated the spread of low-rise residential areas in the urban periphery, modelled after international standards for single-family detached homes. Secondly, the widespread move of a large part of the native population from central districts to these new suburban areas, led to an extensive demolition of dense and low-rise traditional neighborhoods, quickly replaced by modern typologies. This second phase of development witnessed the first multi-story apartment buildings, built to accommodate international migrants, mainly from North Africa, the Levant and South Asia. This process led to an increasingly overcrowded inner-city areas, surrounded by a sprawling low-rise periphery (Salama and Wiedmann, 2013, p. 31).

While the first master plans during the 1970s aimed to manage urban growth and to establish better functioning city centers, the basic urban structure hardly changed during the 1980s and 1990s, due to missing transport-oriented development initiatives. Downtown areas became more and more densely built with new agglomerations of high-rise blocks, while suburban areas expanded with subsequent infrastructural expansion, including the promotion of new shopping malls and centers. These commercial complexes detached the urban periphery from the old historic or inner-city areas that gradually lost their previous significance as main commercial centers for all inhabitants. Thus, the urban periphery became an independent entity separate from inner-city districts, with businesses moving to ever-expanding commercial corridors, such as Sheikh Zayed Road in Dubai (Pacione, 2005, p. 257).

New urban transformation processes were first initiated by development visions at the end of the 20th century, aimed at establishing Gulf cities as international hubs that would diversify local economies. Prime examples were Dubai and Manama, where the local oil production receded at the time and motivated new models of economic growth (Schmid, 2009, p. 56). Other cities, aware of the increasing economically-competitive edge of their counterparts, and still rich of oil revenue, re-invested in similar urban development strategies, to also claim a regional position as emerging service centers. (Adham, 2008, p. 247). Thus, this new phase of urbanization in Gulf cities was mainly based on the introduction of new 'hub' visions, rooted in the geopolitical location between global markets, the feasible development of state-of-the-art infrastructure, as well as the subsequent liberalization of local markets, including real-estate development (Wiedmann, 2016).

The result has been an extensive construction boom leading to new housing market dynamics. The growth potentials attracted a high share of foreign investment in freehold property projects. The scale and speed of development has however resulted in speculative tendencies including a fast turnover of properties. Dubai's real estate sector, for instance, attracted reported 22,834 investors from 136 countries (The National, 2017). The rapid growth supported an overall population increase in all four small Gulf States- UAE, Qatar, Kuwait and Bahrain - from only around eight million inhabitants in 2004 to more than seventeen million in 2017 (Worldometers, 2017). While in the past, most skilled migrants with higher education moved from the MENA region to settle long term, the

newly arrived knowledge workers in emerging service sectors, are now highly international and usually plan to stay only a limited period (Salama et al., 2016, p. 321).

Both investment and migration patterns have created new urban conditions challenging urban sustainability (Wiedmann et al., 2014). The initiation and accommodation of fast urban growth, during the development peak period between 2004 and 2008 was only possible by a continuation of car-based urbanism. Today, increasing traffic congestions endanger future growth perspectives, resulting in the need for major planning interventions to reconfigure the recently developed areas.

This paper therefore, aims to explore the residential development patterns that can be observed in Doha and how they impact spatial configurations at the urban scale. This serves to identify key planning challenges and instigates a discussion on strategic interventions required as a remedy for the spatial and functional fragmentation that the city of Doha experiences currently.

Methodological Approach

The methodological approach adopted in this study is based on an integrated research framework, which is built on three main questions (Figure 1): What are the new residential developments that can be identified in the period after 2004? What is their impact on the spatial configuration on a district and neighborhood scale, as defined later in this paper and as relevant to current planning discourse? What are the resulting spatial practices of residents?

Figure 1: The research framework conceived to analyze the impact of new residential developments on urban fragmentation in rapidly growing cities (Source: Authors).

The main objective of the framework is to identify how new developments have affected urban configurations – either through a process of fragmentation or integration. Urban fragmentation is understood as the development process that results in highly inefficient urban structures with a lack of clearly identifiable centers, resulting in longer travel distances (Zhang et al., 2012). It is conjectured that the framework can provide a broad understanding of how key residential development types have resulted in urban fragmentation, by overlaying the analyses of spatial integration models and the investigations of the residents' activities.

The first procedure towards understanding urban configuration aims at identifying key new residential developments and their main locations, as well as their size. The procedure involves three layers of studies:

- Examining satellite images between 2004 and 2017 to uncover new housing development types.
- Exploring GIS data to analyze the general spatial distribution of new residential types.
- Identifying key districts as case studies.

The second procedure involves the implementation of Space Syntax analyses to investigate various degrees of spatial integration (Hillier, 1999). Space syntax measures the local and global integrative

properties of the street grid, by representing each street segment as an axial line, connected to every other line in its path. The methodology can be applied to assess integration on different scales by changing the radius used to calculate street junctions. The 'district' scale the authors have decided to use is of a radius of 1,500 meters, consistent with the average diameter of defined, in local planning terms, urban districts in Doha. The 'neighborhood' scale, is of a radius of 800 meters, following a similar definition, and applied to highlight the spatial integration within single, more well-enclosed areas. In addition to the local integration in two different scales, the global integration is explored. The axial global integration is defined as the integration values of axial lines at the infinite radius which is used to represent an integration pattern at regional, metropolitan or city scales (Hillier, p. 99). The spatial correlation between global and local integration is an important indicator for 'urbanity', in the sense of accessible, walkable and vibrant urban areas (Paparis, p. 77). The procedure is conducted following three steps:

- At a district scale and a radius of 1,500 m, two Space Syntax models of metropolitan Doha in 2004 and 2017 are analyzed to compare the changing levels of spatial integration.
- At a neighborhood scale and a radius of 800m, a comparison of the spatial integration of three distinct urban areas and their development between 2004 and 2017 is carried out.
- Lastly, a comparison of the various levels of integration of each district on global and local scale is conducted.

The third procedure within the framework is based on studying the spatial practice of residents based on their neighborhood location and activities. A spatial practice exploratory study via a attitude survey is conducted with the aim of comparing the general travel routes and distances for shopping and leisure. The study includes the following steps:

- Questionnaires were distributed to more than 400 employees with a medium to high income that drive to work, and thus are seen the main contributors to daily traffic. After evaluating all received questionnaire responses, 130 questionnaire responses were selected, which are representative for inhabitants residing in the newly developed residential projects.
- Based on the various locations of residences, maps have been generated via GIS to compare the travel routes in relation to the three housing recurrent residential developments, identified previously.
- All travel routes were superimposed and the resulting movement map of 130 residents was compared to the spatial layout of the entire city to identify nodes of activities and their overall spatial integration.

The overlay of various analytical methods illustrates how new developments have been impacting urban configuration and how the resulting new neighborhoods are functioning as places that segregate and seclude from the urban structure. Lack of integration appears to be the main indicator for the existing urban fragmentation, not only based on the visual appearance of scattered urban landscapes, but on the actual spatial layout, which seems to preclude the integration of basic daily services for residents.

Key Characteristics of New Residential Developments

Based on GIS calculations and a review of historic satellite images, the total residential area of metropolitan Doha almost doubled from 109 to 198 square kilometers during a period of rapid growth between 2004 and 2017. The largest percentage of the total residential area is covered by suburban developments. However, due to new zoning regulations in previous suburban areas, the share of apartment buildings increased. Furthermore, new waterfront projects were launched, adding entire districts to the city along the Northern shoreline. The current land use distribution reveals that 89% of all residential areas are occupied by low-rise, 10% by medium-rise and 1% by high-rise developments. GIS analyses reveal three new housing development types in Doha: (1) The high-density clusters of apartment buildings in former suburban areas (e. g. Al Sadd district); (2) The residential high-rises along waterfronts (e. g. West Bay district) and (3) mega compounds along growth corridors (e. g. Al Waab district) (Figure 2).

Figure 2: The Expansion of the urban area between 2004 and 2017 and the distribution of main housing development types (Authors).

Since 2004, former suburban areas, in proximity to the historic cores and commercial districts, have transformed into medium to high-density neighborhoods. In most cases, such as the districts developed along the C-Ring Road, the low-rise neighborhoods that were previously urban periphery have now gained new roles as central cores due to the continuous inland urban expansion. The newly emerging districts appear to be transitional areas between mixed-use commercial inner-city areas and the suburbs. The typical housing development type is the apartment block with an average height of up to eleven floors.

The uncoordinated development of high-density housing development types in areas, previously planned for suburban low-rise types, has led to a rather scattered urban landscape with a lack of public realm, social infrastructure, and green areas. The general lack of affordable housing in Doha has caused overpopulation in these areas due to the tendency of sharing apartment units by single migrant workers. Both the high density and the general lack of efficient public transportation has led to increased traffic and to chaotic parking situations. Examples of such new neighborhoods in Doha can be found in the Al Sadd district, which is located at a very important central junction along the C-Ring Road.

Mega projects are another development type that can be observed along Doha's Northern coasts. These types of developments have transformed the coastal lines through continuous land reclamation and the addition of a new housing type – the exclusive residential high-rise. While in the past high-income groups resided in villas and compounds, the exclusive waterfront projects have begun to offer an attractive alternative to the suburban lifestyle. The sea view and the integration of various amenities and services have attracted international investors. However, the high rents and the temporary usage of the apartment as holiday homes has led to rather moderate occupancy rates in most of these developments (Bertrand, 2012, Salama et al, 2017). In addition to exclusive high-rises, most waterfront projects include other housing types and semi-public promenades, as well as

hotel resorts to attract tourism. Exclusive residential high-rises can be found in West-Bay District and in the Pearl island project.

The third development type is that of the peripheral large-scale compound projects. While in the past compounds hardly exceeded beyond a size that accommodates tens of units, the new developments can cover areas of more than 30 hectares. These mega compounds integrate a variety of services depending on their sizes and are usually themed. Due to the general expansion of highway networks and the relatively lower land prices a large share of the rapidly increasing housing demand is represented in this suburban residential development type. Since 2004, new clusters of individual compound sites have been built, particularly in the Western urban periphery of Doha, such as the Al Waab district. Due to the infrastructural development for the Asian Games in 2006, many new compound projects were launched, which have formed a landscape of sprawling low-rise residential developments with an average building height of two to three floors while offering a mixture of attached and detached dwellings behind gated walls (Figure 3).

Figure 3: The three housing typologies and their urban landscapes (Al Sadd, West Bay and Al Waab) (Source: Authors).

In summary, the three new housing development types have transformed Doha into more complex urban landscapes. The previous monocentral structures of mixed-use districts surrounded by a low-rise urban periphery have been modified by three main development tendencies:

- The urban fringes of inner-city areas witnessed a rapid replacement of former suburban patterns in the form of high-density residential and commercial developments.
- The new waterfront projects integrated new leisure spaces as well as high-rises as new residential typology (e. g. West Bay district).
- The continuously sprawling suburban development types led to the phenomenon of mega compounds (e. g. Al Waab district) in proximity to emerging edge cities (Figure 4).

Figure 4: The historic transformation of each residential district (Source: Authors; Google Earth).

The Spatial Impact of New Housing Patterns

The spatial impact of the three new housing development types has been analyzed using the Space Syntax methodology to investigate the various levels of spatial integration. The level of integration is defined by the number of turns one must make from a street segment to reach all other street segments in the network, using shortest paths (Hillier, 1999, p. 25). The street segments that require the least amount of turns to reach all other streets are called 'most integrated' and are usually represented with hotter colors, such as red or yellow. Isolated areas are visible in cooler colors, such

as blue. Integration can be analyzed by using a variety of radii to investigate the changing spatial integration at different scales. The two applied analyses focus on a historic comparison of the urban development between 2004 and 2017 and a comparison of the three case study districts that represent housing development types and their spatial properties on a district (radius of 1,500 meters) and a neighborhood scale (radius of 800 meters). The drawing of Doha's street networks is based on an official GIS survey of the year 2011 and the authors' update by using satellite images from 2004 and 2017.

The main result of the comparative analysis of the spatial structure of metropolitan Doha in 2004 and 2017 is that the overall integration of residential areas, has significantly decreased on a district scale (Figure 5). This lower level of spatial integration is primarily the result of the large-scale expansion of highway networks toward the Northern and Western urban periphery including the completion of the Doha Expressway in 2008. The addition of more than 140 square kilometers of newly developed areas resulted in the capacity of previous outer ring roads, such as C- and D-Ring Road, to become accessible development corridors.

Figure 5: A Space Syntax comparison between the level of spatial integration (Int) in 2004 and 2017; radius of 1,500 meters (R1500), using a Normalization technique (Na), $NaIntR1500$; applied software: depthmapX (Source: Authors).

Due to the high level of accessibility, many commercial developments relocated from inner-city areas toward C-Ring Road. The Al Sadd district has thus witnessed a rather rapid replacement of former low-rise residential buildings and has emerged as a major business center. Thus, the district's integration on a global scale has increased, evidenced by the attained high integration values of the outer road grid. The investigation on a local neighborhood scale however, reveals that a large percentage of all inner access roads within the Al Sadd district have lost a significant share of their spatial integration. In total, more than 50% of all roads witnessed a decrease from a medium integration (yellow) to a lower level of integration (green) (Figure 6).

Figure 6: The global and local level of spatial integration (Int) in the Al Sadd, West Bay and Al Waab district in 2017; analyzed at a radius of 800 (R800) and using a normalization technique (Na), $NaIntR800$; applied software: depthmapX (Source: Authors, Google Earth).

The comparison of the spatial integration on a global and local neighborhood scale reveals that the Al Sadd district is located at very important and accessible junctions. The inner district areas however, suffer from a rather problematic road grid, which is the result of its recent past as suburban district. Thus, on a local scale, the central access road from north to south as well as any other major access road, are only partially integrated on a higher level (orange) due to a low number of junctions, which would promote their important function as arteries attracting pedestrian movement and thus commercial or leisure activities. This scattered pattern is a result of previous

compound structures and thus unequal plot sizes hindering a coherent and integrated urban structure.

The West Bay district has not evolved as an accessible mixed-use business district and is still viewed as peripheral due to its isolated location. Many initially planned commercial projects have been replaced by residential high-rises, particularly along the Northern half of the district. While the Al Sadd district can benefit from a highly integrated C-Ring Road, the West Bay district suffers from the absence of any highly integrated road network. Thus, the West Bay district has remained part of Doha's spatial periphery despite large scale developments attracting movements. In addition to its low global integration, the high-rise district also suffers from a rather poor spatial integration on a local neighborhood scale with hardly any major grid enabling a clear orientation, rooted in major pedestrian corridors. The main reason for this spatial layout is the large shopping mall complex in the center of the district, which is occupying the West Bay's urban core and that has enforced the development of a surrounding road network, disabling sufficient connections and a better distribution of traffic toward the district's periphery (Figure 6).

The Al Waab district and its cluster of compound developments has benefited from the general shift of centralities toward the Western outskirts and the expansion of the new Doha Expressway. The highway enabled accessibility to many suburban areas on a global scale. It however separated many districts, further isolating their inner neighborhoods. Thus, the spatial integration of access roads within the Al Waab district has decreased and neighborhoods are therefore hardly connected. The compound structure has led to a clear isolation of most areas and thus a rather hindered integration of shared future services or social infrastructure (Figure 6). In essence, the lack of integration is due to the high dependency on shopping malls along highways rather than local neighborhood centers, and the rather low urban densities further exacerbate such a lack.

Subsequently, all three districts suffer from a problematic spatial layout which disables the immediate attraction of commercial and leisure activities along integrated central corridors due to previous or still present suburban structures. Since 2004, main highways have been added or extended, leading to isolated and detached inner-district areas. This is evident in the Space Syntax models that reveal many long lines (highways) and also many short lines (compounds or neighborhoods), but no sufficient number of medium lines, which ideally should connect both. Rapid growth and car-based urbanism have led to basic primary and tertiary road networks, but the secondary one, required for establishing district and neighborhood centers, is rather absent.

A comparison with the old historic center reveals the major difference between recent urban developments and the historical settlement in Doha. The Msheireb district is an important example of how small block structures have led to a high level of spatial integration (Figure 7). Most importantly, a direct access road (Abdullah Bin Thani Street) connecting different districts and neighborhoods is one of the most integrated corridors enabling a high level of activities, such as small business that activate street frontages. The basic structure emerged during the mid 20th century, during a period in which neither car-based urbanism nor modern planning had yet defined urban patterns in Doha.

Figure 7: The Msheireb district in the historic center of Doha.

The Routes of Everyday Activities

Before the travel routes could be investigated, a 400 questionnaires were distributed to more than 20 companies as part of an attitude survey on migrant guest workers from various countries and cultural backgrounds. All respondents share a condition of medium to high income, means of private transport, as well as available leisure time. This social group is currently the main driver of the expanding private sector in Qatar. Today, Doha's urban population is mainly foreign with a share of up to 88% (Salama et al., 2017, p. 317). Since all the respondents moved to Doha relatively recently, a majority resides in newly developed neighborhoods. Both the location of the respondents' residences and their frequent commutes are important reasons for analyzing the routes of everyday activities as a basis for the investigation of the spatial integration or fragmentation in Doha.

In total 348 questionnaires were collected and 130 questionnaires were selected, based on the requirement that residents are located in the specific residential development, discussed in the current study. Most participants are from the Indian subcontinent (40%), while the participants from the Philippines (19%), Western countries (21%) and the MENA region (20%) have equal shares. More male interviewees (63%) participated in the survey and the average age was 33 years. The survey included three key questions: Where do you live? Where do you go for your shopping? Where do you meet friends and spend your leisure time outside? In their responses participants had to prioritize their most frequently visited places.

The travel routes of all participants were analyzed depending on the location of their residences and subsequently mapped via GIS (Figure 8). Due to various commercial developments along the C-Ring Road, the average travel distances for shopping was found to be 6.1 kilometers - the lowest in the case of residents residing in high density transition zones, such as the Al Sadd district. The travel distance is however still rather high, which is mainly caused by the lack of potential for walking or the availability of public transportation, causing many residents to travel by car. The favored leisure spaces are shopping malls in the periphery, which is leading to an average travel distance of 7.5 kilometers of all interviewees in this group. Thus, the lack of integrated leisure spaces in direct proximity to these highly populated areas has led to frequent commuting towards the urban periphery and coastal areas to meet friends and spend leisure time outdoors.

Figure 8: The travel routes of questionnaire respondents residing in transition, waterfront and suburban areas (Source: Authors).

The respondents residing in high-rise apartments along the waterfront differ from those residing in transition areas mainly due to the shorter travel distances to preferred leisure spaces. The average of 6.5 kilometers leads to the conclusion that a larger share of participants is satisfied with the leisure spaces in their direct surroundings. There is however still a significant number of travel routes to shopping mall complexes and to the historic center. The lack of affordable shopping

opportunities has led to long distance commutes towards inland (Figure 8). Thus, in the case of shopping, interviewees commute more than 7.6 kilometers, which is the longest distance in comparison to other groups.

In the case of the new suburban compounds along the urban periphery, the overall longest travel distances can be identified. The participants residing in suburbs need to travel long distances to frequently visited leisure spaces, such as waterfront promenades or the restored historic center. By tracking travel routes an average travel distance of 10.2 kilometers was calculated to reach leisure activities. For instance, in the case of shopping, residents must travel an average of 7 kilometers. This is a clear indication of the lack of supermarkets in most suburban neighborhoods and the high level of dependence on shopping mall complexes.

The outcomes suggest that the recently developed residential areas within the transition areas along the C-Ring Road, the newly emerging waterfronts and along the suburban periphery currently lack a balanced integration of services required to minimize car travels. The frequent commutes for everyday shopping and leisure activities are contributing to traffic congestions and thus, a generally endangered livability. The extension of highways and shopping mall clusters, aiming at accommodating the increasing demand, has furthermore led to a car-centered lifestyle, experiencing the city on a global rather than local, district or neighborhood, scale. Thus, the main share of the highly mobile and international workforce commutes long distances for everyday activities, which is a clear indication of the lack of integrated district and neighborhood centers.

The superimposition of all analyzed travel routes and the Space Syntax model (Rn - global integration) reveal that recent urban developments have led to rather few spatial concentrations of activities (Figure 9). The prioritization of the direct accessibility via highways has hindered the development of more integrated district centers, or a higher diversity of frequently visited places. There is a high dependency on three major shopping mall complexes, which have replaced the historic inner-city areas as retail centers and as main meeting points for medium to high income groups. The two main public leisure spaces, frequently visited by the respondents, are the Corniche (waterfront promenade) and the Souq Waqif. The overall selection of only 10 main locations for leisure and shopping activities among 130 interviewees living in 3 different urban areas is a further evidence of the missing development of functioning district centers.

Figure 9: All travel routes of 130 questionnaire participants and the spatial integration of main activities including the three shopping malls (Source: Authors).

Conclusion

This paper has identified three main housing developments in Doha city since 2004 including (1) the high-density transition zones between downtown and suburban areas; (2) the emergence of exclusive waterfront projects as new landmarks and homes of higher income groups; and (3) the sprawling suburban landscape made of themed and gated compounds. The first study revealed that

the most representative cases of these new residential developments could be found in the Al Sadd, the West Bay and the Al Waab district. All three districts have been developed in their present form during the period between 2004 and 2017 and share the condition that they were previously conceived as suburban extensions. Thus, the road networks, as well as the distributed land-uses and services, were planned for lower urban densities. The Space Syntax analyses have revealed a problematic spatial layout on a local scale offering hardly any highly integrated and accessible corridors for resident activities in any of the three urban areas. The focus on developing new highways, such as the Doha Expressway contributed to further isolation of inner district areas due to the missing integration of secondary access roads.

The examination of everyday activities of inhabitants demonstrate the high level of mobility of medium and high-income groups and the preference to visit long-distant locations by car. This detachment from the surrounding districts underlines the general failure of recent developments to establish integrated urban areas with support social and commercial services. The increase of commercial activities in more walkable distances is furthermore challenged by the concentration of few and far-off retail centers in highly accessible locations along major highways. This urban condition is particularly problematic in densely populated urban areas, such as the Al Sadd district, where daily traffic congestions have begun to reduce the attractiveness of these mixed-use areas with high development potentials. The compound clusters in the Al Waab district have contributed to a highly fragmented landscape of disconnected patchworks rather than one coherent residential district where gates and walls have prevented any identifiable center or shared public realm. Lastly, high-rises along waterfronts benefit from touristic projects but lack basic services. In summary, each new housing development has not, by itself, promoted the emergence of self-contained or integrated districts. The consequence of car-based urbanism and rapid urban growth is a high level of concentration of activities in very few and scattered areas, which have been highly connected on a global level but lack any local integration.

The key challenge of contemporary urban planning in Gulf cities in general and in the city of Doha in particular lies in reconfiguring urban structures through transit-oriented development initiatives, which enable increased densities at key junctions and integrated district cores. The former car-driven urban development needs to be gradually replaced by establishing a robust secondary grid network, as well as an efficient public transportation. The precondition for new transit systems is however the enhanced access to inner district areas, which implies a modification of general spatial patterns. The biggest hindering factor for establishing this access is the current land ownership structure due to the suburban past. Thus, measures must be undertaken to reduce plot areas to enable an improved infrastructural supply and public spaces along key corridors. The applied studies based on GIS, Space Syntax and travel routes can support the identification of these key corridors within districts, which need an enhanced level of local integration to become the starting points for a new urban experience reconnected to the immediate spatial surroundings.

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