The transformation of residential patterns in Al-Ain City, UAE

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Abstract

This paper aims at investigating some of the important features affecting the planning and transformation of urban residential patterns, focusing on availability and accessibility of serviced land on the one hand, and the characteristics of the households and the level of their wealth on the other. The study is concerned with the main factors affecting residential distribution patterns, including land value, transportation cost, and characteristics of the city structure. The study examines the current and future trends of the residential mosaic in Al-Ain city as a unique case study because of the new phenomena caused by the relationship between the post-independence urban development and modern urban planning approaches implemented in the United Arab Emirates. The paper highlights some of the key issues that are emerging as a result of the socio-economic and cultural changes of Al-Ain city. In addition, the study aims to understand the spatial configuration of key factors such as population and household structures, income distribution, social and cultural requirements, and physical and institutional constraints.
Keywords: urban transformation, residential pattern, land value, transportation cost, Al-Ain city.

1 Introduction

Urban populations utilize built space for different purposes, of which housing constitutes the largest part, and may account for over 25 percent of household expenditure [1]. Urban residential structure is not restricted to the result of the interplay between housing demand and supply, but is also shaped by other attributes, such as household characteristics. The household is assumed to find its

optimal location by trading off travel cost, against housing cost; and chooses a location at a point at which total cost is minimized.

Urban planning and development can be understood to be increase and spread of values and institutions that enhance the ability of a society to generate and successfully cope with the continuing change [2]. The rate of change is a function of the level of social interaction, information exchange and communications, which in turn is a function of the physical and spatial structure of a city. The spatial quality and structure of the urban environment is one of the most examined components of urban planning. Most planners and decision makers today are mainly concerned other aspects of urban planning such as the patterns of human activities outside the home, and the mosaic patterns of residential neighborhoods.

The paper attempts to produce a clear understanding of urban patterns and changes of Al-Ain residential neighbourhoods with regards to the effects of modernization. In order to study Al Ain's growth and development, themes on power of socio-economic and cultural relationships and their effects on the urban structure are important.

To achieve the aim of the study, a better understanding of theoretical background of residential location patterns is highlighted, and the main aspects which affect the transformation of residential pattern are identified. Current and future trends of residential mosaic of Al Ain were examined. Socio-economic, cultural changes and other aspects were studied using the following variables: household structure; income distribution; ethnic groups; social and cultural requirements; land value; physical constraints; institutional limitations; transportation; and urban residential patterns. A number of neighborhoods within were selected as case studies. A field survey was carried out by the authors to identify the users' patterns of movement, socio-economic data, and housing typology in selected neighborhoods.

2 Al-Ain city and its structure development

The city of Al-Ain, is located in the eastern region of the Emirate of Abu Dhabi, within the inner desert oasis of the United Arab Emirates. It lies about 150 km east of Abu Dhabi, and 130 km south east of Dubai. The city exploded in size from a small village to a fast growing urban centre in less than 30 years. The old area of Al-Ain was located in an area of about 150 hectares with a small number of populations [3]. In 1980, the area of Al-Ain was increased to 1,800 hectares with a population of around 120,000. At the end of 1990s, with a new geographic pattern, the city has expended to about 15,000 hectares with a population number of 300,000 [4]. A unique national, regional, and local road network was developed in the city, and more than 1,800 km of road length has been built including to its hinterland. The modern development of Al-Ain came with the successful exploitation of Oil in the Emirate of Abu Dhabi and the foundation of the United Arab Emirates in 1971. During the subsequent period, a radical transformation of the area took place, which saw a modern urban development, and a new population structure with particular socio-economic characteristics. As

a hometown of the ruling family of the Emirate, it has benefited from the desert. As a result, a number of standard residential types were developed for citizens and non-citizens during the last few decades, such as apartments, low cost governmental housing, small and large private villas. These types are distributed within and outside the CBD, according to many factors. The most important of which are the physical characteristics of the city, the availability of residential land, decentralization of the city cervices, the level of transportation and street network.

In 1986, a new planning process was established to accelerate the new development of the city and to create and develop new settlements outside the old area [4]. This plan was based upon new criteria in order to: encourage more residents from different tribes to live in the city; create a homogenous social structure by redistribution of the UAE citizens within the new residential districts, and create a new social system of solidarity with the new districts. During the past twenty years, a concerted effort has been made to implement the 1986 master plan with houses and roads being built and hundreds of hectares of residential land have been developed and a number of new neighbourhood units have already been built. The new physical structure pattern is highly preferred by citizens and non-citizens alike who are seeking more privacy than they had previously and large residential lots. A study of the distribution of populations by districts revealed that there is a general trend for redistribution location of residents from areas close to CBD to areas such as Hili, Zakher, and Maqam (for more details see section 4). Those who were initially living close to the CBD seem to relocate to the periphery via areas such as Mutaredh and Jimi districts. This move correlates with the changes that are seen in household incomes especially for the citizens. This raises a question of whether in the future this may lead to urban flight and urban decay to those areas close to the CBD as a result of abandoned and unoccupied buildings.

3   Urban residential pattern: theoretical background

To achieve the aim of the study, it is important to highlight the main theories of urban structure and urban land market, and how they can be fitted to Al-Ain City. Three theories of urban structure attempt to describe the different growth and functional distribution patterns of a city and show the residential location in relation to socio-economic household characteristics. These theories are: the concentric zone theory; the sector theory; and the multiple nuclei theory [5]. The concentric zone theory is based on the idea that similar activities are located at the same distance from the centre of the city. Each zone would have relatively homogeneous land use [6]. This model assumes that a city grows outward from its centre to form a pattern of concentric zones. The first zone, which is the Central Business District (CBD), is the focal point of commercial, social and civic life. It also represents the area of original settlement. The second zone is an area in transition, which is usually contain the poorest quality residence and is being invaded by business and light manufacturing. The third zone is basically an area of low-income people who desire to live within easy access of their

work. Beyond this zone, the middle and high-class residential areas are distributed. This zone is followed by the commuter zone, which contains the patchy development of high-class residence associated with the fastest existing transport facilities.

The second model of city structure, the sector theory, was formulated by Hoyt after examining structure pattern of residential locations in 142 cities [5]. The idea of this model is that the pattern of residential location could be explained in terms of sectors or wedges. The wholesale and light manufactures are located at the opposite end of the city from high quality residential areas. However, low-class residential areas are located close to the manufacturing zone. The remarkable feature of this model is the way it highlights the outward migration of high-class housing districts as the city evolves. It is also clear that the sector theory may be extended to include all types of urban land use, with each of the principle functions occupying adjacent sectors of terrain.

The third model of urban structure, multiple nuclei, was developed by Harris and Ullman [5]. The basic idea of this model is that cities develop around several district nuclei rather than around one centre of origin. The nuclei, sometimes established in an earlier rapid urbanization phase, emerge as a new centre as the city expands. It should be noted that no particular significance is attached to the shapes of each zone. The emergences of separate nuclei are determined by factors such as; the interdependency of some types of activity that need to be close to each other; and the tendency for complementary activities to be near each other. It seems that the multiple nuclei model takes into account more real factors than the other two theories and it is clear that this model makes it possible to construct and elaborate a model of urban structure which is far more widely applicable than either the concentric or the sector models.

The three models are not completely opposed to each other. The first two models, which are based mainly upon conditions of developed cities, cannot fit all developing cities. In most developing cities, the residential pattern is almost the reverse of that proffered by the concentric zone model [7]. The high-income families are willing to locate near the CBD and pay the premium in cost of tenancy, while the low-income families who cannot afford to pay any extra than is necessary are pushed to the outer edge of the city. This could be attributed to the lack of high-level technology in transportation and infrastructure, and therefore the excessive amount of time spent on traveling.

The urban land market theory attempts to rationalize the location of individual activities within an urban system using components of land accessibility, trade or commerce and traveling cost as major variables to influence the household's choice. The determination of residential location is different from the location of any other activity. The household is assumed to find its optimal location by trading off its travel cost against its housing cost, and locating to a point at which total cost is minimized. The household will also consider other factors, such as social, physical, political, and availability of wealth. This relationship is known as the trade-off theory [5]. The basic assumption of this theory is that housing cost declines with increase in distance from an activity centre, but transportation costs are assumed to rise with increase

in distance from that center. The model uses the bid-rent function that is a derivative of urban land market theory (see section 4). This theory is tested for Al Ain city, based on both the observed reactive empirical data and those non-reactive data collected from the field survey, and from the Municipality of Al-Ain. Contributions to residential location theory were mad by Wingo and Mills. Wingo's model focused on the way urban transportation costs affected land rent and the demand for residential land. This model assumes that the demand of residential land per household depended upon the land value and that the elasticity of demand is constant. It also emphasized the fall of population density with the distance from the CBD when land is substituted for capital in the production of housing at locations distant from the CBD [8].

The characteristics of the above residential models show that the costs in renting or purchasing land, and costs of commuting are the main factors in determining the optimal locations of residential land. It is reasonable to argue from the above analysis that the property value gradient should be affected by the land value gradient and the analysis of the empirical study of Al-Ain City shows that the rent or the property value falls with increase in distance from the CBD, but at a diminishing rate. The high income families are willing to make long commuting journeys to the outskirts of the city. However, the low-income groups are unwilling to do so because the direct cost is high as a percentage of their total income.

4   Al-Ain city and its residential distribution pattern

Al-Ain has a unique pattern of land use that is similar to most of the cities within the Gulf region. The field survey that carried out by the authors in 2001 and the structure map of Al-Ain reveal that there is a strong correlation between the residential land distribution pattern to that proffered by both the sector and nuclei models, though predominately the sector model. The high income residential areas are located radially outside the CBD on the periphery of the city boundary in areas with low residential densities. However, low-income residential areas are located close to industrial zone "Sanaiya", and this location is diametrically opposed in comparison to that of the high income residential areas. The high-rent apartment areas are located close to the CBD; however, high-rent single family houses are located a little further away from the CBD.

The study of the household characteristics, land values, and transportation system, reveal four recognizable residential types within the various sectors in the city: rented apartments, rented single family houses, popular residential lots (Shabiat), and large residential lots (villas). The first residential type is located within the CBD. It is composed of mixed-use units containing commercial and residential apartments for low-income and single-family middle-income non-citizen residents. Small urban blocks with a maximum height of 4 stories characterize this type. This area is the most densely occupied part of the city (25-30 dwellings per hectare). The second type is located just outside the CBD, and is characterized by semi-attached, two storey houses for middle-income non-citizen residents with an average density of 15 dwellings per hectare. The third

residential type, the Shabiat, is occupied by the low and middle-income citizens and located a few kilometres away from the central area of the city. It is characterized by low residential density (3-5 dwellings per hectare). The high-income citizens mainly occupy the fourth residential type located on the periphery of the city. This sector is characterized by large residential lots containing large single-family residences with a very low residential density (1-2 dwelling per hectare).
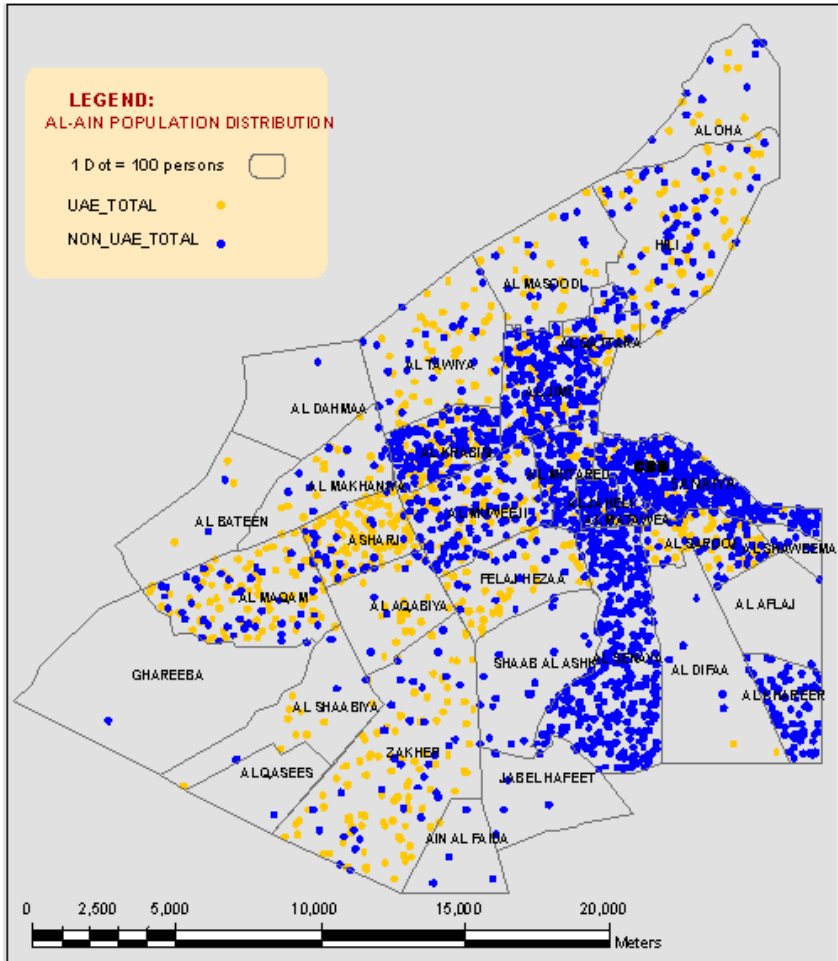

Figure 1: Population distribution pattern of Al-Ain, 2002. Source: the authors, based on the database produced by ArcView.

The analysis of the residential and household growth patterns of Al-Ain reveal that the majority of the UAE citizens live in residential areas farther from the CBD. This results in a desire to relocate farther away from the CBD, in

private lot sub-divisions. This probably is a result of the government's encouragement to the citizens to develop new residential areas on the periphery of the city through provision of land and cheap financing on the opposite side of Sanaiya. The study further revealed that low-income non-citizens prefer to live in the high-density areas near the centre of activities, or other new secondary business centers. The middle-income households tend to move to just outside the CBD. The study also leads as to conclude that residential densities decrease with the distance from the CBD (see figure 1). Table (1) shows the distribution pattern of the population in selected districts. It is recognized that every district, except Sanaiya, had an increase in population with significantly very large motilities visible to areas such as Hili and Maqam. It must be noted that the majority of the redistribution is mainly by the citizens.

Table 1:   Changes in distribution of population in Al-Ain. Source: Adapted from Cox [4] and the Municipality of Abu Dhabi.

Districts	1990		1995		2000	
	Citizen	Non-citizen	Citizen % change	Non-citizen % change	Citizen % change	Non-citizen % change
Central	9,876	24,855	30.00	0.00	4.65	0.00
Jimi	7,778	10,552	5.00	1.70	5.00	0.87
Maqam	12,508	5,339	56.30	190.6	62.30	59.02
Zakher	5,745	1,518	13.10	8.60	7.76	22.2
Mutaredh	12,184	29,486	26.30	52.70	5.20	0.05
Hili	12,283	10,461	50.90	16.90	91.34	14.40
Tawaia	10,626	11,745	78.44	14.60	21.10	12.40
Sanaiya	---	20,044	---	-19.30	---	-6.90

The analysis of land tenure in UAE is somewhat different from those in other parts of the world in that the open market still has a very little role to play in pricing. The Ruler on behalf of the citizens and other non-citizens of long established residency holds all the land in Al-Ain in trust. This confers rights to plots of land for purpose of building self-residence and extra for investments without payment to all citizens. The supply and demand for the land is thus in theory determined by the needs of the citizens and family size an elements that is not very empirical since socio-political factors come into play. This creates uneasy balance between individual needs against the planning policy objectives of the region and the town as a whole.

Assumptions and modification have been made to the urban land market theory in the analysis of Al-Ain. The householders are assumed to be rational and economic persons above and beyond their other human and psychological desires. In a normal market the unit cost of land is assumed to fall with distance away from the CBD. In the case of Al Ain since land is given free of cost to the resident citizens, a measure of value of land has to be derived. We used an index based on rental rates for the various areas, unit cost of construction, which is assumed to remain constant throughout Al-Ain and analysis of maps and master plan. The theory uses the bid-rent function that is a derivative of Urban Land Market theory [9]. The bid-rent should be equated with the utility level for the

lot by the householder, thus the rate of change of the bid-rent for a given household represented by the curve "b"; with distance "d" (see figures 2 and 3).

$$b = \frac{[d.Tc-Oc]}{V.A}$$

where; "Tc" represents unit value of land, which for Al Ain is related to the size and distance, the further away from CBD, the lower the unit cost of land and because of increase in size; "Oc" represents travelling costs; "V" represents actual unit value or cost of purchasing or renting of property; and "A" represents the actual area of land occupied by the householder.
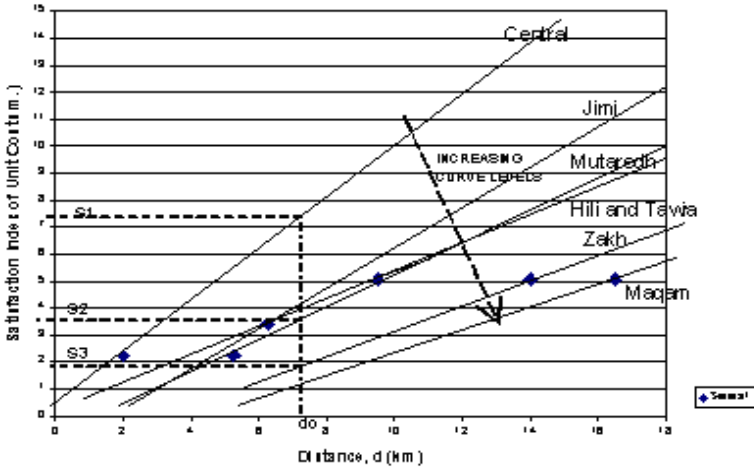

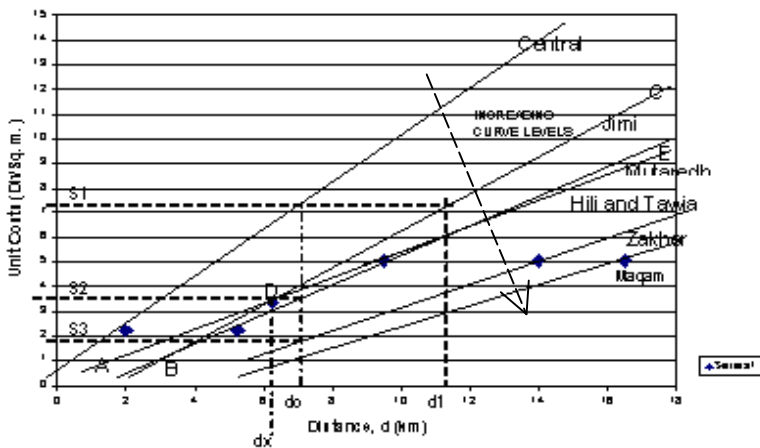Figure 2:   Varying bid-curve levels with distance.

Figure 3:   Unite cost against distance from the CBD.

The household thus engages in manoeuvres aimed at lowering or reducing the unit costs levels and boosting space and levels of privacy available. It is thus typical to relate the high bid-rent curves with high land values and low bid-curves with low values. The high unit cost of land reduces the size of land or space available to the householder, thus the desire to relocate at some distance d1 to continue to enjoy the same level of amenities and utilities (see figure 3).

Respective sets of linear equations for the various districts in Al-Ain could be derived and use them as an easy differencing system for location or spatial competitiveness. The higher curves with lower bide-rents, b, will locate closer to the CBD, while the lower ones will locate further away in attempts to increase cost index and utility levels while at same time maintaining levels of satisfaction. In figure 3, there are two intersecting bid-curves for Mutaredh and Jimi districts, both have location indifference being the same distance dx from the CBD. This is the location at which both neighbourhoods have equal or matching spatial compositeness. The effective bid-rent here are A, D and DC while the failed bid-rent curve is B, D and DE respectively. The Mutaredh bid-curve results from factors such as close proximity to CBD and lower costs in transportation. As the distance d rises, the Mutaredh bid-curve fails due to new high costs in rents, congestions etc and this creates the desire in the householder to relocated further away in attempt to raise the bid-curve. The move then results in relocating to Jimi represented by the curve DC. By using these equations and empirical figure from the survey it is possible calculate the approximate location points for various household groups based on their changing characteristics.

5   Conclusion

 The analysis of the residential pattern of Al-Ain City shows that, the distribution pattern of residential land is almost the same of that proffered by the Sector Model. The majority of the high-income UAE citizens are located radially outside the CBD in private large plot subdivisions. However, low-income non-citizens tend to live in the high-density areas, near the CBD. Therefore, residential density decreases with the distance from the centre of activities. The main reasons for this residential pattern can be summarized in the following points. Al-Ain has been affected by the transport revolution. The well-developed transportation network and the high technology of communication systems have encouraged high-income citizens and those with large families to own or live on a large area of land away from the CBD. The new residential districts that have been and continue to be established on the periphery create a new homogenous social structure. This structure preserves traditional and social values, and is highly preferred by the citizens; moreover, the family sizes are larger and thus necessitate the desire for a large lot of land that is not available in areas close to the city centre. The rate of car-ownership in Al-Ain is very high, which in turn encourages high-income citizens to live farther away from the CBD. Every neighborhood is well supplied with infrastructure and public utilities, and has easy access to the centre of activities.

The study of Al-Ain also reveals a high vacancy rate of residential units mainly due to both oversupply of the units and lack of strong independent market forces. The encouragement of development of new residential areas at the periphery of the city creates other new problems that are associated with growth of cities. These include congested rush hour traffic, longer and pains taking travel to work and school, stratified and homogenous society that do not foster integration between various categories. There is need for further development of an efficient and reasonable public transportation since the report reveals that 80 percent of the commuter traffic is by small private vehicles.

Acknowledgement

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